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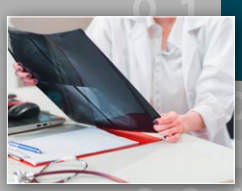
SPECIAL FEATURE

THE FUTURE'S BRIGHT, THE FUTURE'S BIG DATA



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MICROWAVE FOR BREAST CANCER DETECTION

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research*eu
RESULTS MAGAZINE

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EDITORIAL

by the editorial team

CAN BIG DATA GO MAINSTREAM?

In 1999, the advent of blogging gave birth to what we've all come to know as the Web 2.0. From consumers of content generated by a very limited number of sources, internet users had become the creators of this content. The amount of information available ballooned, and suddenly everyone was given a platform large enough to become an influencer.

It didn't take long before businesses and ICT experts realised that the amount of data generated online, although almost impossible to manage, had huge potential for business intelligence. In 2010, former chairman of Google, Erick Schmidt, evoked how five exabytes of information had been created spanning from the dawn of civilisation up to 2003. Fast-forward to now, and we're in the Big Data era where these same five exabytes are being generated every two days.

'In its raw form, Big Data is hard to exploit. But it was never meant to stay that way.'

In its raw form, Big Data is hard to exploit. But it was never meant to stay that way. Big Data is now predicted to become the cornerstone of the future Web 3.0 or 'semantic web', which will itself see a shift to mass production and pinpoint consumption. To get there, however, tools capable of processing and structuring Big Data, without the associated hefty price tag, will be required. Only a handful of companies currently have the skills and means to exploit Big Data, and this is seriously hindering the development of a market set to be worth USD 103 billion by 2027.

With this issue of the research*eu Results Magazine, we wanted to get a sense of Big Data's future. Will it become more accessible? Can its potential translate into applications that will change society for the better? To answer these questions, we delved into concrete applications for the likes of call centres, driverless cars and healthcare, but also into more horizontal research aiming to bridge the gap between the needs of businesses and often too complex and too expensive data mining software. All in all, our special feature section covers 11 recently or soon-to-be completed projects.

The magazine continues with our usual thematic sections, as well as a list of upcoming events hosted by or involving EU-funded research projects.

We look forward to receiving your feedback. You can send questions or suggestions to: editorial@cordis.europa.eu

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Focus on
A decade since disaster - lessons from the economic crisis

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SPECIAL FEATURE

THE FUTURE'S BRIGHT, THE FUTURE'S BIG DATA

INTERVIEW

BIG DATA MINING FOR BETTER CONTACT CENTRE PERFORMANCE

Customers generally frustrated with the experience of reaching out to contact centres may finally get to change their mind, thanks to a Big Data mining solution brought by the BISON project.

We're all familiar with this pre-recorded, often robotic voice that tells us how phone conversations with the likes of e-commerce businesses or after-sale services "may be recorded for quality assurance purposes." Now if you ever wondered what these companies were actually doing with the recordings... the truth is, not as much as they could.

To date, contact centres have only been able to analyse a fraction of the calls they record. They often do this manually or with rudimentary software, and undoubtedly miss out on very important trends and issues in the process.

The BISON (BIg Speech data analytics for cONtact centres) project hoped to toss this problem onto the garbage heap of history with the help of innovative Big Data mining software. Their solution is already being used in several contact centres in Central Europe, and they have big plans for the rest of the continent.

★ What would industry stand to gain from more evolved use of contact centre data mining?

Mr Marek Klimes: Better efficiency and consequently lower costs. Nowadays, contact centres are able to listen to 1-3% of calls only. With contact centre data mining, you would be able to get information from 100% of calls to support your decisions. Who should be trained in your team, what do your customers want or what are the emerging topics? All this information is available in your calls.

★ What are the most innovative aspects of your approach to such data mining?

We have used the complete portfolio of speech technologies, including both speech analytics technologies (speech transcription and keyword spotting) and voice biometrics in multiple European languages. This enabled our teams to cover diverse use cases in contact centres.

Besides its compliance with the law, our product also takes into account new challenges related to big Data and the anonymisation of private data.

★ What legal aspects did you focus on and why?

Legal and ethical aspects were often perceived as an obstacle to the creation of a good product. The BISON consortium believed in the opportunity to create a product complying with all necessary legal requirements by design.

We have created the BISON societal and ethical code, which helps potential BISON users from the earliest deployment to actual usage. This code answers questions from four main pillars: How EU data protection rules can effectively protect citizens from modern technologies; how the EU regulatory framework can be exploited to develop law-abiding technologies; how to develop an ethical system respecting user privacy; and how BISON handles privacy issues.

★ Can you provide an example of possibilities brought by your technology?

There are many different ways to leverage the solution developed under the BISON project. Broadly speaking, you can unveil blind spots in contact centres that result in higher costs. To be more specific, we can tell you if contact centre agents speak too fast, interrupt customers or are having overly long monologues or even what the most common topic brought up during calls is.

Another example: if you are suddenly handling more calls about a problem with internet connections, you will know it from our topic detection tool. Finally, we provide long-term statistics displaying the progress of contact centres in easy-to-understand graphic layers displayed in the BISON dashboard.

★ What were the main outcomes of prototype testing?

We confirmed the soundness of our vision for the contact centre market and gathered valuable user feedback. At the same time, we also found out about various missing details in the prototype. Direct connections with contact centres within the BISON consortium helped us improve our reporting tools and usage of the BISON recording management tool.

★ What has been the feedback from industry so far?

We have had positive reactions on how our system deals with unstructured data. The problem currently being faced by contact centres is not so much the lack of data but rather the lack of solutions to learn from. A typical contact centre produces a wealth of multilingual spoken data that is nowadays mined by humans or by rudimentary technical means. Our system automates this process.

★ What are your plans for commercialisation?

From the very start of the project, we have been striving for the commercialisation of BISON. Due to the geographical position of project participants and the 14 European languages covered in the project, we focus on Central Europe with the plan to spread our system across the rest of the continent. I am glad to announce that we have already successfully deployed our system in production environments across several call centres.

BISON

★ Coordinated by Phonexia in the Czech Republic.
★ Funded under H2020-LEIT-ICT.
★ https://cordis.europa.eu/project/rcn/194308
★ Project website: http://bison-project.eu/


© Marek Klimes

MAREK KLIMES

AUTOMATED VIDEO ANNOTATION FOR RISK-PROOF DRIVERLESS CARS

Manually annotating the huge volumes of video data that are used for testing and training autonomous vehicles and ensure that they safely react to any object or event would be a Herculean task. Thanks to work under the Cloud-LSVA project, it will soon be possible to combine Big Data and cloud computing to perform this task automatically.

The race to put the first-ever driverless car on the market is on. And we already have a pretty good idea of what they'll look like: a car covered in all kinds of cameras and sensors that will record and analyse everything happening in their surroundings, in real-time.

According to experts, that's as much as 10 terabytes of data generated every day for video only. Future driverless cars are foreseen to include approximately 10 CMOS cameras as part of their active driving assisted systems (ADAS), and annotating the data they generate for the likes of road traffic objects, events and scenes will be key to testing and training the computer vision systems without which the car wouldn't be able to make the right decision at the right time.

But there goes the loophole: there is currently a lack of labelled, realistic video datasets of sufficient size, complexity and comprehensiveness to train the computer vision of future driverless cars.

"Metadata generation or labelling is tedious work. It's usually done manually by drawing boxes or pixels and labelling them individually, frame by frame. Such human annotation is slow, inconsistent and excessively costly. Moreover, the opportunity to capture this human knowledge when annotating and to roll it back into the training process is not fully exploited," explains Dr Oihana Otaegui, Head of ITS and Engineering at Vicomtech – a Spanish Research Centre specialising in Computer Vision.

With cloud-enabled video analysis technology, along with tools to fuse video with other data sources, these problems could easily be overcome. And that's what the Cloud-LSVA (Cloud Large Scale Video Analysis) project was all about: creating large training datasets to be used in vision-based detection systems, along with ground scene descriptions based on objects and events to evaluate the performance of algorithms and systems set up in the car.

"Our Big Data platform can automatically pre-annotate large video datasets and upload them to a cloud infrastructure. There, each recorded scene will be analysed and decomposed to detect and classify relevant objects and events for specific scenarios," Dr Otaegui explains, continuing: "In the second stage, the annotation tool assists users in refining and augmenting annotations. Finally, online learning techniques are applied to update detection and classification models, and to incorporate human knowledge into the automatic processes. Reasoning mechanisms will also be included in some scenarios to enable automatic annotation of complex concepts not previously trained or labelled by human operators, yielding automatic scene descriptions."

From there, users and applications can perform semantic queries over video archives via meta-languages as well as faceted queries to enable rapid results sharing – Online Big Data Video Analytics in the palm of your hand.

"Our Big Data platform can automatically pre-annotate large video datasets and upload them to a cloud infrastructure. There, each recorded scene will be analysed and decomposed to detect and classify relevant objects and events for specific scenarios."

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Although primarily aimed at ADAS functions for automated vehicles and HD cartography generation, Cloud-LSVA also contemplates using scene catalogues from accident analysis initiatives (GIDAS – German In Depth Accident Study) or in-vehicle system quality assessment (Euro NCAP – European New Car Assessment Programme). Beyond the car industry, other applications in robotics and healthcare (which has a similar demand for the annotation of medical images) are also evoked.

Future plans

The project will be completed at the end of 2018. By then, the team will still need to fully close the loop between in-vehicle processing capabilities and cloud-level computation, so as to provide a fully recursive processing loop: the cloud learns from the annotations, updates models and delivers them to vehicles to increase performance with time.

Beyond that deadline, Dr Otaegui also foresees how, in "a not-so-distant scenario, fleets of test cars, and possibly one day private cars, will be driving and collecting even larger data volumes, which will then require an equivalent increment in cloud computing and communication capabilities of the platform to ingest and process the data."

Cloud-LSVA is already tackling this future problem by adopting a computing architecture in which processing capabilities are brought closer to the data source, that is, to the car. "The participation of Valeo and IBM in the project has offered the possibility of exploring the latest developments in embedded computer vision for in-vehicle with the aim of pre-annotating all the data on the fly while being recorded," Dr Otaegui says.

Cloud-LSVA

- Coordinated by Vicomtech in Spain.
- Funded under H2020-LEIT-ICT.
- https://cordis.europa.eu/project/rcn/199579
- Project website: http://cloud-lsva.eu/

NEW SEARCH TOOLS OPEN UP ACCESS TO MEDICAL INFORMATION

The EU-funded KConnect project has developed innovative online medical search and analysis tools, enabling researchers to achieve clearer insights into the effectiveness of specific medical interventions and ultimately leading to more optimised treatments.

"The key success of the KConnect project has been to make effective online medical search tools accessible to medical researchers and the public," says KConnect (Khresmoi Multilingual Medical Text Analysis, Search and Machine Translation Connected in a Thriving Data-Value Chain) project coordinator Allan Hanbury from the Vienna University of Technology in Austria. "The project results will now be further developed and should allow better insight into the effectiveness of medical interventions, as well as providing more reliable access for citizens to online medical information." Project partners are currently working with commercial clients to create specific search solutions.

Automated text analysis

The amount of written information that exists in the medical domain is phenomenal. This includes patient-specific information such as medical records, as well as non-patient-specific information including peer-reviewed articles in journals that describe the results of clinical trials of interventions. To evaluate the effectiveness of specific treatments and procedures, all this text needs to be taken into account.

"There is a clear need for computer-supported tools capable of analysing all this information, which can then lead to firm conclusions on the effectiveness of specific medical interventions," says Hanbury. "Computer analysis of text remains a challenge though, and this is even more the case in the medical domain. This is because different styles of writing can be found across scientific papers and medical records, and there is extensive use of abbreviations and of course different languages in medical records."

Accessible, reliable information

KConnect focused on two main challenges: improving medical text analysis, search and machine translation services; and demonstrating the effectiveness of using these tools in medical record analysis and online searches of medical publications and websites. The project was built, to a large extent, on the results of the EU-funded Khresmoi project, which developed tools to search for and analyse medical text and images. Khresmoi's main focus was on visual searches for radiology images, as well as text analysis of medical publications.

Starting from this basis, new search tools were developed and tested, and are now being applied in real life situations.

The medical record analysis and search algorithms have been included in the Clinical Record Interactive Search (CRIS) system at the NHS Maudsley Biomedical Research Centre in the UK. CRIS provides authorised researchers with secure access to anonymised information extracted from the South London and Maudsley NHS Foundation Trust electronic clinical records system. This enables them to look at real life situations on a large scale, making it easier to see patterns and trends and to see which treatments work for some but not others.

KConnect tools are also being used by the Health on the Net Foundation, which promotes the dissemination of useful and reliable health information online. The Foundation's new search system gives users an estimation of the readability and reliability of medical websites. A KConnect plug-in for the Chrome Browser has been released and provides users with estimates of the reliability of medical websites sourced using common search engines.

Hanbury notes that training the medical text-specific machine translation algorithms proved to be a challenge for certain languages where few relevant resources were available, such as Hungarian. Nonetheless, KConnect services now allow multilingual queries in the search engine of the Trip medical database, a tool that enables researchers to find high-quality clinical research evidence. A soon-to-be-released Trip tool using KConnect technology will allow for the rapid analysis of multiple medical publications related to a specific disease, giving researchers an immediate overview of the effectiveness of various medications and interventions.


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KConnect
- ★ Coordinated by Vienna University of Technology in Austria.
- ★ Funded under H2020-LEIT-ICT
- ★ https://cordis.europa.eu/project/rcn/194242
- ★ Project website: http://kconnect.eu/

A MODEL FOR BUSINESSES COVETING A SHARE OF THE EU DATA ECONOMY

As much as we've heard about Big Data and the revolution it embodies, the so-called EU data economy is still in its infancy. To those willing to jump in, the EuDEco project provides recommendations based, among others, on the analysis of the key activities and resources of more than 200 EU data economy actors.

Back when the EuDEco (Modelling the European data economy) project was kicked off in February 2015, Big Data was already used intensively. Mainly large companies but also government bodies and research institutions were actively collecting and using data. But this didn't quite make for a data market, as data sharing and reuse wasn't substantial enough.

"Data sharing and reuse, particularly across borders and with participation of small and medium-sized companies, was still very limited in 2015, and to some extent it still is. There are many reasons for that, including skills gaps, lack of trust and lack of interoperability," says Dr Daniel Bachlechner of Fraunhofer's Institute for Systems and Innovation Research.

To help businesses catch up, Dr Bachlechner and other members of the EuDEco consortium developed a model of the EU data economy by using a largely qualitative, community-focused approach. They enabled all those interested in or affected by the data economy to engage in a discourse while acting as a facilitator, in turn gaining insight into how the data economy was perceived and drawing inspiration from these insights to provide these actors with actionable recommendations that actually met their requirements.

Business models were among the aspects studied within the scope of the project. "We analysed the key activities and resources of more than 200 EU data economy actors, investigated previous work on business models, and finally outlined five business model archetypes that are widespread in the data economy," Dr Bachlechner explains.

The five archetypes cover business models for actors dealing with data acquisition, data manipulation, data exploitation, technology provision and consultation. Besides the key activities and resources that were used to define the archetypes, business model elements including value propositions, cost structures and revenue streams were also studied. "We looked at similarities and differences between actors, and went into more details for specific actors. Many of the insights we gained have influenced our recommendations," says Dr Bachlechner.

Industry feedback was largely positive. Actors in the EU data economy who actively helped develop the EuDEco model said that it was extremely valuable for them to get external assessments of their activities as well as concrete advice on what steps they should take. Several

of these actors stressed that they would like to pursue the collaboration, according to Dr Bachlechner.

A much needed political push

For the EU data economy to really take off, however, further political measures will be needed in order to realise the single digital market and address pressing matters such as skills gaps, lack of trust and lack of interoperability. "Policy makers need to understand the relationships between different elements of the data economy and be able to assess or even predict the consequences of certain measures they take," says Dr Bachlechner.

The EuDEco observatory should be very useful in this regard, as it makes trends related to the data economy, along with differences between individual countries, highly visible. It helps identify good practices and allows for comparing individual Member States or the EU as a whole with other countries in the world. "The EU must learn quickly from the world's leaders but at the same time make sure that European values are preserved," stresses Dr Bachlechner.

The EuDEco project was completed at the end of January 2018. Recently, the EuDEco consortium was extended and submitted a proposal for a new project focusing explicitly on skills gaps, lack of trust and lack of interoperability in the context of the EU data economy. The objective: providing actors, and particularly SMEs, with the support they need to overcome these challenges quickly and pragmatically. Such support will include matchmaking between companies and service providers, insights into the data economy, and assistance with taking action in line with established good practices. Some of the EuDEco results will also be further developed.

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EuDEco

- Coordinated by Fraunhofer in Germany.
- Funded under H2020-LEIT-ICT.
- https://cordis.europa.eu/project/rcn/194301
- Project website: http://data-reuse.eu/
- https://bit.ly/2Ms0YCs

PUTTING QUALITY INTO BIG DATA APPLICATIONS

EU-funded researchers have defined the first open source framework to offer quality-aware software engineering methodologies for start-ups interested in developing and operating Big Data applications.

The key objective of the EU-funded DICE (Developing Data-Intensive Cloud Applications with Iterative Quality Enhancements) project is to tackle skill shortages and learning curves in Big Data application development and shorten the time to market for applications that meet quality requirements. Through developing innovative new methods and tools, the project aims to strengthen the competitiveness of European independent software vendors in the field of business-critical Big Data applications.

An open source version, as well as two commercial products, have since been released, with the aim of ensuring that the benefits of DICE continue long after project completion.

Data-intensive demands

The global spread of Smartphones, increased use of sensors in sectors such as automotive and security and the avalanche of social media content uploaded every day means that the world is swimming in data. Extracting usable information from this swirling pool can help companies to better understand their target audience and identify new trends – but this is still no easy thing to do.

"Organisations that wish to benefit from Big Data must first carefully design computer systems capable of processing and analysing the information they need," explains DICE project coordinator Dr Giuliano Casale from Imperial College London in the UK. "Though new ways of designing, organising and operating Big Data applications are emerging on the market, many tech start-ups don't have the tools at hand to properly develop bespoke Big Data software systems, or fully integrate Big Data analytical technologies within existing products."

This shortcoming is significant, says Dr Casale, because in the rush to tap into the lucrative Big Data market, some tech companies have not paid enough attention to this important quality aspect. And because quality engineering of data-intensive software systems is still in its infancy, predicting and guaranteeing quality-of-service in Big Data software systems is extremely difficult to do.

Methodical data analysis

The DICE project addressed this challenge by creating a set of 14 tools to support – with a high-level of automation – core activities in Big Data application development

including software quality assessment, software architecture enhancement and delivery to the cloud. All tools have been organised in a coherent methodology, inspired by the principles of an emerging software delivery paradigm known as DevOps.

"There has to date been a shortage of methods to express quality requirements," explains Dr Casale. "What we did was define an integrated methodology from design to operation that tackles these shortcomings. This is effectively the first quality-driven development environment for Big Data applications."

Assessments of the DICE methodology, as well application of the tools, were then carried out in three data processing pilot schemes: social media data analysis; batch processing for tax fraud detection; and cloud-based management of real-time port operations. "Preliminary results indicate substantial productivity gains thanks to DICE, particularly in terms of reducing the delivery and configuration time for new Big Data applications," says Dr Casale. "The DICE framework was also able to identify several violations and anti-patterns in the application designs, as well as consistently reduce manual times for testing and evaluation."

An open source version of the DICE framework for developers has been released through the project website. In addition, the DICE framework has been repackaged and customised into two bespoke products: DICE Velocity and DICE BatchPro. DICE Velocity is tailored to the needs of companies developing applications based on stream-processing technology, while DICE BatchPro aims to help companies easily configure and deploy cost-effective batch data processing.


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"This is effectively the first quality-driven development environment for Big Data applications."

DICE
- ★ Coordinated by Imperial College London in the United Kingdom.
- ★ Funded under H2020-LEIT-ICT.
- ★ https://cordis.europa.eu/project/rcn/194256
- ★ Project website: http://www.dice-h2020.eu/

INTERVIEW

EU RESEARCHERS TAP INTO BIG DATA POTENTIAL

Providing European researchers with easier access to data management solutions and large storage systems close to Europe's most powerful supercomputers, while enabling them to move large amounts of data across borders, is the key objective of the EUDAT2020 project.

To remain at the cutting edge, European researchers across a range of disciplines need to be able to preserve and access masses of data and foster cross-border collaborations. EUDAT2020 aims to facilitate exactly this.

Building on previous EU-funded projects, this initiative has brought together a network of European research organisations and data and computing centres across 14 countries to create a pan-European collaborative data infrastructure (CDI). As of April 2018, 23 partners had formally joined the CDI.

Project coordinator Damien Lecarpentier from CSC in Finland discusses the project's achievements as well as its role in helping to ensure future European research excellence.

★ We've heard about Big Data creating new opportunities for researchers. But what have been some of the challenges?

Damien Lecarpentier: The European Union and its Member States have invested heavily in recent years to make distributed grids and high-performance computing (HPC) facilities available for researchers across a range of fields. The challenge is that the rapid growth of data – thanks to powerful new scientific instruments, simulations and the digitisation of existing resources – requires new ways of organising and processing the amount of information now available. We need to develop a more coherent approach to data management, and this is what this project is about. We wanted to connect data centres in order to better support different research communities.

★ Can you give some specific examples of these challenges?

In solid earth science, the data that is gathered spans real-time and off-line data (such as pictures, videos and organised data structures stored in databases). These different types of data have different technical requirements in terms of access and preservation. In the biomedical community, a key challenge is ensuring that data can be accessed while preserving the legal requirements of patient anonymity and confidentiality. All research fields, including the social sciences and humanities, face challenges related to managing data replicas and

accessing this data in a multiple user environment.

★ What role have researchers played in this project?

Since the beginning, research communities have been in the driving seat in terms of selecting data services. They have also directly participated through multi-disciplinary teams in the design and development of these services. The project brought together over 50 research communities across a range of disciplines, with each one bringing specific requirements and knowledge. These requirements ranged from the need to replicate data for greater availability and ensuring the safety of sensitive data to being able to share data beyond the initial community.

Newer research communities are often still designing their core data workflow processes and are interested in trialling various solutions before they can commit. More mature communities usually have an existing working infrastructure.

Wherever possible, we viewed existing services as opportunities and sought to support them by providing the communities with the possibility of scaling out their computing and storage environment using the CDI infrastructure. This meant considering research communities in their role as service providers and not only customers.

★ How will the project benefit researchers?

Research communities involved in the project were able to plan, implement and use data management services on a European-wide scale. Scientific fields covered include social sciences and humanities, Earth and atmospheric science, climate science, biodiversity, life sciences and physics.

In the past, if I needed to access a storage system where I could also analyse my data I could talk with my local data and computing centre. But this would just cover local users, from the same country. Moving data across borders or sharing data and tools with colleagues from abroad often required a bespoke solution every time, which is simply not scalable. This sustainable partnership, in which all partners share a common vision, has opened up access to data tools at the European level and enables European collaborations to be activated far quicker.

The project has also made providers of data storage and management services much more aware of the needs of research communities. This includes their data management requirements, as well as how they organise their particular research infrastructures; for example, whether they choose to run their own data management services or whether they use pre-existing services that require special adaptations.

★ What have been the key factors behind the project's success?

These achievements were made possible by a generously funded EU project and by a group of highly engaged project partners. By building on previous project experiences and working together, we managed to create a unique culture for open knowledge exchange and collaboration. We have created the EUDAT CDI as a way of preserving and continuing this legacy.

★ How will this legacy be secured?

During the project's final year, we focused on moving from a project basis to a sustainable organisation. EUDAT partners have committed to sustain the CDI and its services for an initial period of 10 years. We have also established a secretariat to coordinate the development and operation of the CDI infrastructure, and in February 2018 a limited liability company was formally established. This will operate on a non-profit making basis as the voice of European organisations working together as part of the EUDAT CDI, providing services related to scientific and research data storage and lifecycle management.

As for the future, EUDAT CDI is a growing organisation based on a contractual agreement between its members. It is one of the key pillars of the European Open Science Cloud, a cloud for research data in Europe. The CDI is an open enterprise and welcomes service providers wanting to join the network with various levels of engagement and integration.

EUDAT2020

- ★ Coordinated by CSC in Finland.
- ★ Funded under H2020-INFRA.
- ★ https://cordis.europa.eu/project/rcn/194928
- ★ Project website: https://www.eudat.eu/

DATA SOLUTION MADE TO MEASURE FOR CREATIVE SMES

EU-funded researchers are giving consumers greater control over their purchases through the application of easy-to-use technology. This is also providing creative SMEs with the information they need to deliver bespoke services, while ensuring personal data is protected.

The Morpheos (MORPHotype EcOSystem – design remote definition based on big data morphology and use ecosystem for creative industries) project has developed a downloadable app, supported by an e-platform, that enables creative businesses to develop tailored products, from clothes to office chairs. Two project partners – one in fashion and the other in interior design – have successfully piloted the concept, and other businesses have expressed interest.

"We're very excited about the potential," says MORPHEOS project coordinator Jose Antonio Tornero from the Polytechnic University of Catalonia in Spain. "From a technical point of view the system is incredibly accurate in extracting exact measurements and guarantees the confidentiality of the user."

The procedure itself is very simple: customers download the app from the Apple store; enter their age, weight and gender; and then take two photos, one from behind and another in profile. The app then transforms these two images into an outline and is able to extract exact measurements. The image is then deleted. Any company wishing to access a customer's data requires their authorisation.

"The process might be simple, but the technology behind this app is incredibly complex," says Tornero. "And everything is designed to ensure that there is no confidential information out there. No one is going to have your picture."

Creative solutions

The concept addresses a number of challenges that creative SMEs face. Many do not have access to as much market information as larger companies, which can put them at a competitive disadvantage. Businesses that use fabrics for example – such as in fashion and furnishing – often need to place orders for colours a year in advance.

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"Returned goods like clothes and office furniture generate a huge amount of unnecessary transport and CO_2 emissions."

Creative SMEs are also at a disadvantage when it comes to measurements. A Spanish fashion start-up looking to expand abroad for example cannot simply enter the Dutch market without conducting surveys and accessing statistics, because average sizes are different. This can be a time-consuming and expensive undertaking.

"Very often, people will buy two or three sizes of an item and then return the sizes that don't fit," adds Tornero. "While this method of shopping might work for the consumer, it is the SME that has to pay for the extra postage. The Morpheos solution directly addresses this issue."

By enabling customers to simply download an app and follow the instructions, the amount of returned goods will be significantly reduced. "This is also about the sustainability of the sector," says Tornero. "Returned goods like clothes and office furniture generate a huge amount of unnecessary transport and CO_2 emissions."

Unleashing innovation

The app, together with the online platform on offer, will also enable companies without access to huge amounts of financing to be truly innovative. From fashion and protective clothing designs through to racing bikes and interior furnishings, a downloadable app that takes exact measurements will help businesses to deliver bespoke products.

"We've only started to address the potential of this application," says Tornero. "We are confident that other sectors offering made-to-measure concepts, which also face issues to do with data protection, will find our platform very useful. It means that there is no need for businesses to collect data themselves."

The Morpheos app will be marketed under the commercial brand ISizeYou, with a spin-off company formed to focus on the commercial side of things. The consortium is confident that business will take off following project completion at the end of 2018.

Morpheos

- ★ Coordinated by the Polytechnic University of Catalonia in Spain.
- ★ Funded under H2020-LEIT-ICT.
- ★ https://cordis.europa.eu/project/rcn/206363
- ★ Project website: https://www.morpheosproject.eu/

INTERVIEW

A BIG DATA PLATFORM TO TAKE ON THE EU'S SEVEN SOCIETAL CHALLENGES

Big Data is such a huge change for businesses that it can easily seem overwhelming. The BigDataEurope project meets interested companies half way by providing an integrated stack of tools to manipulate, publish and use large-scale data resources.


© Sören Auer

SÖREN AUER

Looking at the very long list of projects funded under Horizon 2020 and the large spectrum of topics being covered, it would be easy to forget that the EU's biggest research and innovation programme to date is all about addressing seven major societal concerns: health and wellbeing; food, agriculture and the bioeconomy; energy; transport; climate change; freedom and security; and the place of Europe in a changing world.

What is even easier to forget is the fact that these seemingly very different topics and the related sectors of activities all share at least one common trait: how they could benefit from digital innovation, and more specifically from Big Data.

To ensure that they do, the BigDataEurope (Integrating Big Data, Software and Communities for Addressing Europe's Societal Challenges) project created seven communities and tried to better understand what they would need from Big Data. The result is a platform able to ingest data from a variety of sources, which can be tailored to target innovative applications across the seven H2020 challenges.

★ What gaps did you aim to fill with this project and how is this important?

Sören Auer: It is widely acknowledged that the analysis of large amounts of data (Big Data) profoundly influences our economy and society as a whole. However, it is important that the corresponding technologies are not just available to a small circle of companies, but can also be widely used by smaller enterprises and initiatives as well as in research and academia.

BigDataEurope filled this gap first by providing a platform for realising Big Data applications, and then by discussing requirements and pilot applications with communities representing the societal challenges identified by the H2020 framework programme.

★ What makes your approach innovative?

Numerous events organised with stakeholder groups made us realise that in addition to volume and velocity, the variety of data is a key aspect to be dealt with in societal applications.

To address this requirement, we devised and produced a semantic data description layer for Big Data. This layer uses vocabulary and knowledge graphs, and allows communities to develop a common understanding of their data while at the same time interlinking and integrating this data on a technical level.

★ What were the main difficulties you faced in bringing all these stakeholder groups and data sources together, and how did you overcome them?

A key challenge lay in the different terminologies, cultures and practices found in stakeholder groups, which also resulted in very different requirements and viewpoints. Whilst, for example, open data already plays a key role in mobility applications, data security, privacy and anonymisation are of paramount importance in healthcare scenarios.

We addressed this challenge by avoiding developing a one-size-fits-all platform, instead integrating components that fulfil a very specific purpose such as the processing of streaming data or anonymisation. As a result, the user can combine and integrate the most suitable data management components for any concrete application scenario of the BigDataEurope platform.

★ What are the advantages of integrating all this data? Can you provide a real-life example?

The project produced seven demonstrators showcasing the value of integrated data for the different societal challenges. These included for example the forecasting of road traffic and congestion based on historic and current sensor data in combination with information from social networks.

Another example is precision farming aiming to provide plants such as grapevines with optimal nutrition, fertilisation and irrigation based on climate and research data.

★ Did the project results meet your initial expectations? How so?

Overall the need to deal with data variety was something we expected and was confirmed through stakeholder and community meetings. Thanks to the semantic integration approach followed by the platform, we managed to take a step forward, but we are still slightly away from the vision of seamlessly integrating and analysing large amounts of aggregated data with minimal effort. Besides, the consideration of data privacy and sovereignty of data providers will require more attention in the future.

★ How can interested stakeholders start using your platform?

The platform, the documentation and pilots implementations are fully

open source and available for reuse. Also, there are a number of the BigDataEurope consortium partners (including for example Fraunhofer) who are ready to provide assistance and support.

★ What are your follow-up plans?

Consortium members are pursuing research on the topic of Big Data management in their own domains. For example, there are already several recently-started H2020 projects that continue to maintain parts of the BigDataEurope platform and deepen its application in the healthcare and life-science domains.

BigDataEurope
- ★ Coordinated by Fraunhofer in Germany.
- ★ Funded under H2020-LEIT-ICT.
- ★ https://cordis.europa.eu/project/rcn/194216
- ★ Project website: https://www.big-data-europe.eu/


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BIG LINK DATA BENCHMARKING GAINS GROUND IN INDUSTRY

Making 'Big Linked Data' a bankable solution for industry requires appropriate benchmarking tools to ensure that the developed solutions meet use cases' requirements. Such tools are now available thanks to work conducted under the HOBBIT project.

Ever heard of Linked Data? If not, you probably should have or will have soon enough. Just as Big Data is an evolution of data mining, Linked Data is an evolution of the Semantic Web which is itself the cornerstone of the Web 3.0 – an Internet where all information is categorised in such a way that computers and humans are made equal in their capacity to understand it. In a nutshell, Linked Data consists in using the web to connect related data that previously wasn't.

Industry already uses Linked Data, but its integration with Big Data has so far been hindered by the cost and difficulty of using the latter in a value chain. 'Big Linked Data' is facing obstacles related to the lack of standardised implementations of performance indicators – making it difficult to decide which tool to use and when to use it – and the fact that some of the dimensions of Big Data (velocity, volume, variety, veracity, value) are poorly supported by existing tools.

"For example, managing billions of RDF triples (ed. note: a set of three entities that codifies a statement about semantic data in the form of subject–predicate–object expressions, such 'John Doe loves CORDIS') is still a major problem, volume-wise," explains Prof. Dr Axel Ngonga of Paderborn University and the Institute for Applied Informatics in Leipzig. "Besides, the different streaming semantics and the lack of scalability of existing solutions make semantic stream processing at scale rather challenging (velocity issue). Finally, current learning approaches for structured data often don't scale to large knowledge bases, making the detection of insights difficult (value)."

Prof. Dr Ngonga has been leading a nine-strong consortium under the HOBBIT (Holistic Benchmarking of Big Linked Data) project to address these problems. Focusing on Industry 4.0, geo-spatial data management, smart cities and IT management, the team carried out surveys with over 100 participants before and during the project to determine key areas for benchmarking linked data. "Our surveys suggest that the benchmark families we created address some of the key domains of interest for European companies and researchers," he explains.

HOBBIT created a total of five benchmarking families to evaluate current software: knowledge extraction, storage, versioning, linking, and machine learning and question answering. On storage, they found that some of the solutions that performed best actually did so because the results they returned were partially incomplete. This alone proves that HOBBIT's benchmarking covers previously unconsidered aspects and that there is a need for benchmarks all around Linked Data.

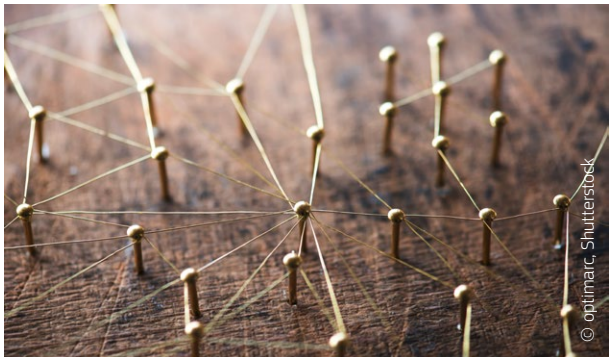
Other findings include the fact that easily distributable solutions for knowledge extraction are still needed; that versioning is poorly supported and requires a standard; that open question-answering platforms still perform poorly in the wild; and that machine learning algorithms specific to Linked Data don't scale too well.

In this context, HOBBIT provides the first open, scalable and FAIR (findable, achievable, interoperable and retrievable results) benchmarking for Linked Data: "The HOBBIT platform is the first generic scalable benchmark for Big Linked Data. Its most innovative aspects include: distributed benchmarking of distributed systems; its portable nature for benchmarking both locally and in distributed environments; a one-command installation both locally and on Amazon Web Services; the reuse of standards for maximal interoperability and flexibility; and clearly defined interfaces for easy adaption to other data types and use cases," says Dr Ngonga.

"HOBBIT created a total of five benchmarking families to evaluate current software: knowledge extraction, storage, versioning, linking, and machine learning and question answering."

The platform has been well received by industry, with ca. 40 clones being created each month and some industrial partners willing to take benchmarking services internally to improve the quality of their tools.

The HOBBIT project will only end in November, as a second round of benchmarks is currently being run. The association created under the project will then take over, serving as a hub for benchmarking in Europe, supporting the further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development of the HOBBIT platform and similar benchmarking frameworks, and providing benchmarking services to European stakeholders.

HOBBIT
- Coordinated by the Institute for Applied Informatics in Germany.
- Funded under H2020-LEIT-ICT.
- https://cordis.europa.eu/project/rcn/199489
- Project website: https://project-hobbit.eu/

PREDICTIVE DATA OPENS NEW ERA IN TRAFFIC CONTROL

EU-funded researchers are developing next-generation tracking systems that increase predictability of trajectories and events, strengthening the ability of air and maritime traffic managers and operators to ensure safety and efficiency of operations across vast geographical areas.

Increased traffic in the skies and at sea requires ever more precise and predictive management to guarantee safety, achieve efficiencies and avoid gridlock. Advanced tracking systems capable of managing and exploiting historical data on moving objects can give authorities predictive powers to prevent accidents and delays and ensure that global transport functions smoothly.

"Accurate forecasts of trajectories and events are important for safety, cost, credibility and environmental-friendliness," explains datACRON (Big Data Analytics for Time Critical Mobility Forecasting) project coordinator Professor George Vouros from the University of Piraeus Research Centre in Greece. "For instance, preventing ship accidents through better monitoring of vessel activity represents a substantial saving for shipping companies, and protects marine ecosystems." The goal of the EU-funded datACRON project has therefore been to develop technology capable of detecting and forecasting moving objects' trajectories, recognising and predicting important events before they happen and then processing and relaying all this data visually to operators.

Smooth operations

Once up and running, the new system will increase situational awareness in the maritime domain and deliver new predictive tools for air traffic managers and controllers. "This might mean for example being able to identify imbalances between demand and capacity of resources (e.g. airspace sectors), and the extent to which aircraft will have to deviate from original flight plans," says Prof. Vouros. "In the maritime domain, continuous, timely tracking of fishing vessels and surrounding traffic can ensure security and limit illegal fishing activities."

In the online layer of the system, streaming surveillance data describes the positions of moving entities. These are then fed into the system, where several online operations are performed, aiming to put online low-level event detection, trajectory reconstruction and compression: This is important given that the goal is to only keep high-quality data that is of importance to trajectory analytics and complex event forecasting components.

The system transforms data from any source into usable information. This means that relevant data originating from other sources are integrated, resulting in information-rich trajectories. Further analysis of these enriched trajectories enables predictions of future locations of moving objects, as well as complex event forecasting. Offline components are used to analyse trajectories and discover hidden patterns.

Visualising the challenge

In developing the system, the project consortium had to find ways of managing data from a wide variety of diverse sources. "This presented a number of challenges, such as scalability of processing, integration and efficient management of data," says Prof. Vouros. "Predicting trajectories and detecting/forecasting events involves the online reconstruction of an object's entire trajectory, supported by online processing and analysis of streams of data. Algorithms to predict anticipated trajectories at different time scales, and algorithms for complex event recognition and forecasting online are further challenges addressed."

"Predicting trajectories and detecting/forecasting events involves the online reconstruction of an object's entire trajectory."

The next challenge facing the team was to make this data fully accessible and complementary to human expertise. "In this respect, visual analytics has created opportunities for human analysts and computers to really work together," says Prof. Vouros. "We developed appropriate visual tools that facilitate the inclusion of the human domain expert's tacit knowledge and his capabilities for reasoning and intuition into the decision process."

Due for completion at the end of 2018, the technology pioneered by Prof. Vouros and his colleagues is currently being evaluated and validated in both air traffic control and maritime monitoring situations. Feedback from these exercises will be incorporated during the final stages of the project. "This is exactly where we are now, though further refinements are constantly being introduced at all levels of the system," he says.

datACRON
- Coordinated by the University of Piraeus Research Centre in Greece.
- Funded under H2020-LEIT-ICT.
- https://cordis.europa.eu/project/rcn/199835
- Project website: http://datacron-project.eu/

BIG DATA ANALYTICS FOR DUMMIES

Big Data is still very much an elite thing: only the most IT-savvy and wealthy businesses have a shot at scratching the surface of its potential. All this could be about to change thanks to a Big Data analytics platform developed under the TOREADOR project, which will automatically handle all major problems related to on-demand data preparation.

"Expectations of Big Data are very high, but the gap between ambition and execution is still large, especially for SMEs," Dr Ernesto Damiani sighs. And he should know: since early 2016, Dr Damiani has been leading a 10-strong consortium looking into the reasons for these mixed fortunes and the possible solutions.

If relatively few SMEs have incorporated Big Data analytics into their offerings or internal processes, it's mainly for two reasons. The first is a lack of competence in Big Data analytics, as Dr Damiani explains. A company willing, for instance, to tailor its offerings to customer behaviour using a free app would have to resort to very expensive consultancy. It's currently the only way to map business goals to a class of data science and technology solutions.

"Concretely, the project brief could be something along the lines of 'collect the events generated by core customers' apps and use them to train a scalable random-forest multi-category classifier of their behaviour to be deployed on a public cloud service'," he says.

The second reason is the long roll-out time and, again, the prohibitive cost of Big Data campaigns even when the data science approach has already been identified. Together, these problems have been keeping SMEs and non-ICT-savvy businesses away from Big Data analytics, although they account for a substantial share of the EU manufacturing backbone.

The TOREADOR (TrustwOrthy model-awaRE Analytics Data platfORm) methodology and toolkit offer a solution to both problems: they automate and commoditise Big Data analytics, while making its tailoring to domain-specific customer requirements much easier than before.

The TOREADOR framework supports two automated transformations. The first one starts from a machine-readable declarative model which collects the data owner goals, and ends in a technology independent semantics-aware procedural model describing the computation to be carried out. Then, the second transformation builds upon the procedural model to compute a technology dependent deployment model. The latter can be executed on an Apache platform, at the customer's premises, on commercial cloud services like AWS, as Python code executable on the Azure platform or as a Docker container.

"Our declarative models can interactively collect the business goals of Big Data campaigns and allow the TOREADOR toolkit to provide automatic advice on the feasibility of solutions. Our procedural models then provide an innovative description of the Big Data analytics computation in the OWL/S semantics-aware standards, and our compilers translate these procedural models into fully executable workflows or even into natively parallelised Python code. We're looking at an iterative development process, where non-IT-savvy users can quickly set up a campaign by generating a workflow executable on a public cloud service, and then – if needed – call in developers for generating self-contained Python code," Dr Damiani explains.

Project partners have already identified four industrial pilots in the fields of predictive aircraft engine maintenance, predictive management of solar power plants, business application logs analysis, and clickstreams analysis for e-commerce applications.

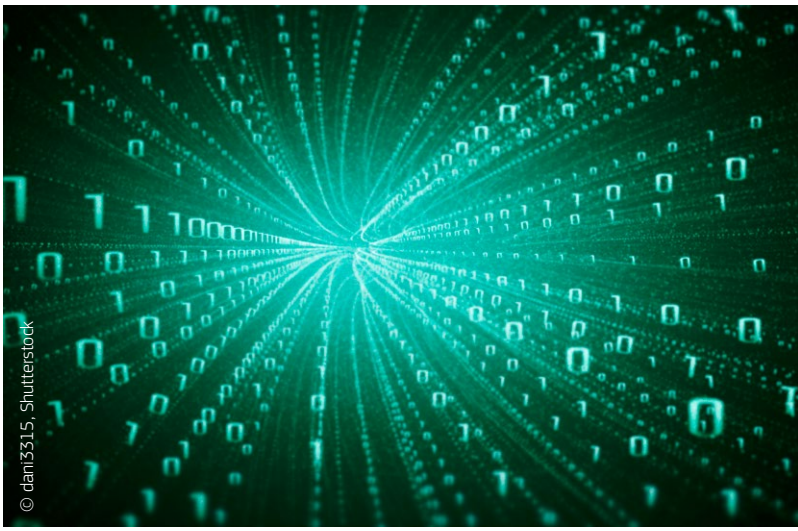
"The TOREADOR platform is available and has been deployed at the four pilot sites. It has also been made available as a free pre-release to selected members of the TOREADOR community, which is composed of European companies (several of them SMEs) recruited with the help of TAIGER (Spain), an innovative SME in the TOREADOR consortium. Details on these early adopters are available on our website. Besides, the TOREADOR methodology has been released to other European projects using Big Data campaigns like EVOTION," Dr Damiani says.

"We're looking at an iterative development process, where non-IT-savvy users can quickly set up a campaign by generating a workflow executable on a public cloud service, and then – if needed – call in developers for generating self-contained Python code."

The project is scheduled for completion at the end of 2018. Until then, the consortium intends to keep enlarging the catalogue of services available in the platform and provide examples of TOREADOR-enabled Big Data campaigns, including training and deployment of advanced machine learning models.

TOREADOR

- Coordinated by CINI in Italy.
- Funded under H2020-LEIT-ICT.
- https://cordis.europa.eu/project/rcn/200253
- Project website: http://www.toreador-project.eu/



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HEALTH

MICROWAVE FOR BREAST CANCER DETECTION

Breast cancer is the most common cancer in women worldwide with nearly 1.7 million new cases diagnosed annually. Regular screening is of paramount importance for early diagnosis to reduce the incidence and improve patient outcome.

Mammography, the gold standard for breast screening and breast cancer diagnosis, utilises X-ray ionising radiation to generate images of breast tissue. However, it is not recommended for women under 50 years old or during pregnancy due to safety concerns related to ionising radiation exposure. This means that nearly 40% of women in Europe between the ages of 25 and 49 cannot use the most conventional breast cancer screening modality.

The EU-funded MammoWave (The first ultra-high sensitive breast imaging device based on non-ionizing safe microwave) project developed a novel procedure that uses microwave frequencies to examine breast tissue. The idea was to perform the first screening using the MammoWave device and then refer positive cases to traditional mammography, thereby limiting the use of harmful radiation.

Microwaves in breast screening

"Microwave imaging has received increasing attention in the last few decades for breast cancer detection due to the considerable difference in the dielectric properties of malignant and normal tissues at microwave frequencies," explains project coordinator Dr Gianluigi Tiberi. The MammoWave microwave device consists of a cup that holds the breast when the patient lies on the examination table. There are two antennas, which move around the cup, for irradiating and capturing the microwaves scattered by the breast tissue.

The signals measured by the receiving antenna are then processed by specialised software to produce images that represent intensity maps of the breast tissue's dielectric properties. A specific algorithm identifies microwave images of non-healthy breasts, which exhibit a greater ratio of maximum to average intensity than normal tissue.

"MammoWave is based on an innovative image reconstruction algorithm that processes the microwave signals, thereby detecting the presence of any suspected tumour in the breast tissue," continues Dr Tiberi. However, as the breast comprises non-homogeneous regions, a certain level of mismatch can also be seen in the healthy breasts and should be related to tissue anatomy on an individual basis.

Clinical application of the MammoWave apparatus

Preliminary data on patients and healthy volunteers has resulted in a 91% sensitivity of the MammoWave apparatus. The accuracy of the imaging device for breast cancer detection is currently being tested in a feasibility clinical study at Perugia and Foligno Hospitals in Italy.

MammoWave researchers are confident that their technology is effective and safe for a widespread breast screening approach. As there is no ionising radiation, it is safe to use at any age, in any condition, with no limit on frequency of breast screenings. What's more, in contrast to traditional mammography units that compress the breast, the MammoWave device is more comfortable for the patient.

The apparatus can be used in hospitals, clinics and private practices, offering an enhancement in breast screening and breast cancer detection. In conjunction with traditional mammography, it can help decrease false-positive and false-negative results, minimising distress for women.

As Dr Tiberi states, "the next step is to start the commercialisation of the medical device, first in Europe and then worldwide." He is confident that implementation of MammoWave microwave screening will not only improve healthcare quality but also help cut down healthcare costs.

MammoWave

- ★ Coordinated by Umbria Bioengineering Technologies in Italy.
- ★ Funded under H2020-LEIT-ICT and H2020-SME.
- ★ http://cordis.europa.eu/project/rcn/211240
- ★ Project website: http://www.ubt-tech.com/en/home/
- ★ https://bit.ly/2tAotRd

WORLD'S FIRST NON-INVASIVE VAGUS NERVE STIMULATION STRESS REDUCER

With stress causing workplace absenteeism, multiple psychophysiological problems and a healthcare burden, a safe, fast and effective solution is urgently needed. Inspired by nature, XANA may have found a fast-track return to harmonious health.

According to EU-OSHA (European Agency for Safety and Health at Work), about 50% of European workers consider stress common to their workplace and it contributes to around 50% of all lost working days.

Current treatment options for stress are limited in their efficacy. They can lead to further psychophysiological complications, are time consuming and are frequently expensive.

Looking for a non-invasive, fast-acting and effective treatment, the EU-funded XANA (Innovative Wearable and Open Platform for a Personalized Treatment of Stress) project developed a wearable device which stimulates the vagus nerve to relieve stress. The mobile solution also comes with a range of integrated functions such as performance feedback and monitoring, as well as access to professional counselling.

The emergent field of bioelectric medicine

There is currently no specific pharmaceutical treatment for stress. Benzodiazepines (minor tranquilizers) are the most commonly prescribed but are actually designed more for anxiety disorders. Furthermore, anxiolytics (such as Benzodiazepines) can have severe side effects such as cognitive impairment, or occasionally aggression, especially after prolonged use.

"Undoubtedly, it will be a unique and powerful preventive tool that will improve quality of life for many Europeans. This mobile-health approach will also reduce the burden on healthcare systems by offering real-time treatment options, with remote medical monitoring and/or counselling as appropriate."

On the other hand, safe alternatives that rely on psychological techniques such as mindfulness or psychotherapy require long-term commitment to regular practice, relying on the willpower of users and the skill of the therapists.

Introducing the XANA project, coordinator Dr Miguel Lopez says, "The starting point for the project is the understanding that regardless of external triggers, what brings on the experience of stress is a personal response to those triggers, and this can be modulated. The XANA solution reduces stress in a safer and more immediate way, compared to the main therapeutic alternatives."

The non-invasive bioelectronic XANA system takes advantage of the vagus nerve, the longest nerve in the autonomic nervous system. This nerve is a key part of the parasympathetic 'rest and digest' nervous system, passing electrical signals between the brain, heart, lungs and digestive tract, and so has a significant impact on mental health.

XANA, through its ear-embedded Heart Rate Monitor, is able to calculate heart rate variability (HRV), an index of the vagal tone which can be checked on the accompanying smartphone app. In this way, the system can monitor stress levels for each individual, as well as the impact of the neurostimulation during vagus nerve stimulation (nVNS) treatment.

The era of mobile healthcare

Within the EU, stress is the second most common reason for work sick leave resulting in a very high cost to the economies of each Member State, collectively estimated to be more than EUR 300 billion per year.

Exposure to stress for short periods has been associated with a range of illnesses and disorders, including: mood changes, fatigue, headaches, sleep disturbance and digestive irritability. Longer exposure has been shown to be associated with a wide range of mental and physical health problems, including: anxiety, depression, suicide attempts, sleep problems, back pain, chronic fatigue, digestive problems, autoimmune disease, poor immune function, cardiovascular disease, high blood pressure and peptic ulcers.

Summarising the likely impact of XANA, Dr Lopez says, "Undoubtedly, it will be a unique and powerful preventive tool that will improve quality of life for many Europeans. This mobile-health approach will also reduce the burden on healthcare systems by offering real-time treatment options, with remote medical monitoring and/or counselling as appropriate."

Currently the team are running two clinical studies to evaluate the safety and efficacy of the XANA device, with the aim of obtaining the CE mark of quality assurance.

XANA

- Coordinated by Walden Medical Neuro Digital Therapies in Spain.
- Funded under H2020-LEIT-ICT and H2020-SME.
- https://cordis.europa.eu/project/rcn/211378
- Project website: https://www.waldenmedical.com

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NEW CLASSIFICATION APPROACH FOR INFLAMMATORY BOWEL DISEASE

Inflammatory bowel disease (IBD) is a chronic inflammation of the gut affecting approximately five in 100 000 people in Europe alone. The disease is incurable with only palliative life-long treatment, emphasising the need for therapeutic interventions.

NF-kB signalling is an important cellular pathway implicated in inflammation and cancer. It functions by regulating gene expression through the transcription factor NF-kB, and accumulating evidence indicates that the pathway is dynamically controlled.

As with many processes following circadian patterns, NF-kB displays sustained oscillations whose biological significance is only beginning to emerge. To investigate how NF-kB oscillations may be associated with IBD, the EU-funded SYSMEDIBD (Systems medicine of chronic inflammatory bowel disease) project proposed a systems medicine approach. "The overall aim was to better understand disease mechanism and to develop new biomarkers that will help stratify patients and suggest personalised treatments," explains project coordinator Prof. Werner Müller.

Instrumental to the overall success of the project were the two small to medium-sized enterprises GeneXplain and Lifeglimmer. SYSMEDIBD scientists developed mathematical models to describe the process of chronic inflammation, focusing in particular on the NF-kB pathway. These *in silico* findings were validated in animal models of the disease and also via patient samples.

Visualising NF-kB dynamics

To measure activation of the NF-kB pathway *in vivo*, the consortium generated animal models with fluorescently labelled pathway components. This approach allowed researchers to follow cells by fluorescence microscopy and determine the NF-kB oscillation frequencies in a number of cell types. "This work also enabled us to measure NF-kB signalling dynamics in primary cells from human patients," continues Prof. Müller.

Researchers discovered selective mediators of inflammation among the signals that triggered NF-kB oscillation in these cell types. Impressively, they were able to identify a minimal gene set responsible for the dynamics of the NF-kB signalling pathway in humans.

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Clinical implications

Using the SYSMEDIBD approach in the two major IBD clinical diseases, Crohn's and ulcerative colitis, researchers were able to stratify patients into further sub-groups. By performing dynamic NF-kB activation measurements on blood cells from patients, they observed higher or lower responses compared to controls. Although SYSMEDIBD partners are working to understand the difference between the hyper- and hypo-responsive ulcerative colitis patients, data suggests a potential link of NF-kB dynamics with disease pathophysiology.

Another major achievement of the project was an *in silico* framework for studying the interactions of NF-Kb with other pathways. Using this approach, researchers performed extensive screening of approximately 1 million natural compounds and small molecules for their potential to interfere with the NF-kB pathway. Among others, they identified a group of antibiotics called macrolides that inhibited NF-kB activation and reduced inflammation in *in vitro* assays.

Apart from visualising the dynamics of the NF-kB signalling pathway during gut inflammation, the SYSMEDIBD study identified genetic mutations associated with increased IBD susceptibility. This is expected to further aid in the characterisation and stratification of IBD patients. Prof. Müller envisages "the information and tools of SYSMEDIBD being implemented for the improved diagnosis of patients, taking into account disease comorbidities."

In clinical samples and mouse models, SYSMEDIBD studies could link genetic variants in a specific cellular pathway, called autophagy, to the NF-kB pathway. "This surprising finding sheds new light on the regulation of the signalling events in chronic inflammation and might be clinically actionable," says Prof. Rosenstiel, leader of the genomics analysis work package.

From a therapeutic perspective, the findings of the SYSMEDIBD study indicate that interfering with the oscillation of biological pathways may provide new options for influencing processes like inflammation. Combined with diet intervention and the use of macrolides as therapy, the future of IBD treatment certainly looks promising.

SYSMEDIBD

- Coordinated by the University of Manchester in the United Kingdom.
- Funded under FP7-HEALTH.
- https://cordis.europa.eu/project/rcn/106178
- Project website: http://www.sysmedibd.eu/
- https://bit.ly/2sLQWmX

SALMONELLA AS A CANCER CURE?

The idea of using salmonella to treat cancer is gaining ground within the scientific community. Now, an attenuated mutant strain of the food-poisoning bacteria is increasing the odds of making this unconventional treatment a reality.

Salmonella as a potential cancer treatment has made quite a few headlines over the past two years. Among the most notable breakthroughs was that of researchers from the University of San Diego (USA), who demonstrated that *Salmonella typhimurium* can inhibit or regress several tumour types in mouse models.

As game-changing as it may sound, the idea of using bacteria to treat cancer is actually far from new. "The exploitation of bacteria on cancer patients has been studied for more than a century, first of all by William Coley, who established evidence that solid tumours may undergo regression after bacterial infection," says Dr Paolo Pasquali of the National Institute of Health in Italy. "The anoxic environment and the high concentrations of nutrients present in the necrotic area of the tumour indeed constitute a perfect niche for the growth of bacteria, and several studies have highlighted the great potential of *salmonella typhimurium* for cancer therapy."

Dr Pasquali and his team have been playing their part in these exciting research efforts. Their research conducted a few years ago, into the creation of vaccines using a mutant strain of *Salmonella enterica serovar Typhimurium* known as STMΔznuABC, encouraged them to explore further. At the time, the team was looking at vaccines for zoonotic diseases and they studied the host-pathogens immune response.

With its reduced virulence, STMΔznuABC seemed like a suitable candidate for cancer therapy. So the team investigated its tumour-targeting efficacy, how it worked and the possibility of introducing it as an alternative treatment strategy.

"Preliminary results have shown that the co-administration of subcutaneous mouse mammary adenocarcinoma cells and STMΔznuABC in immunocompetent mice led to a significant delay in tumour mass growth, as well as a significant increase in mice's average life expectancy," Dr Pasquali explains. Similar results were confirmed when STMΔznuABC was administered after tumour implantation. *In vitro* studies, on the other hand, showed how STMΔznuABC can penetrate and spread into the tumour cell whilst inhibiting its proliferation. Last but not least, the team has demonstrated the ability of STMΔznuABC to reduce the frequency of lung metastases.

"We demonstrated that STMΔznuABC has anti-tumour activity not only in syngeneic breast cancer mice models, but also in genetically engineered breast cancer-prone female mice and chemically-induced fibrosarcoma cancer mouse models."

From tests on mice to clinical trials

Thanks to funding under the BaCTher (Bacteria for Cancer Therapy) project, the team could also investigate the hypothesis that STMΔznuABC can influence the tumour microenvironment (TME). They demonstrated STMΔznuABC's capacity to recall more immune cells in the TME – in both primary and secondary metastatic tumours of treated mice compared to the untreated ones – and showed how it could induce modification of the TME and the systemic immune system.

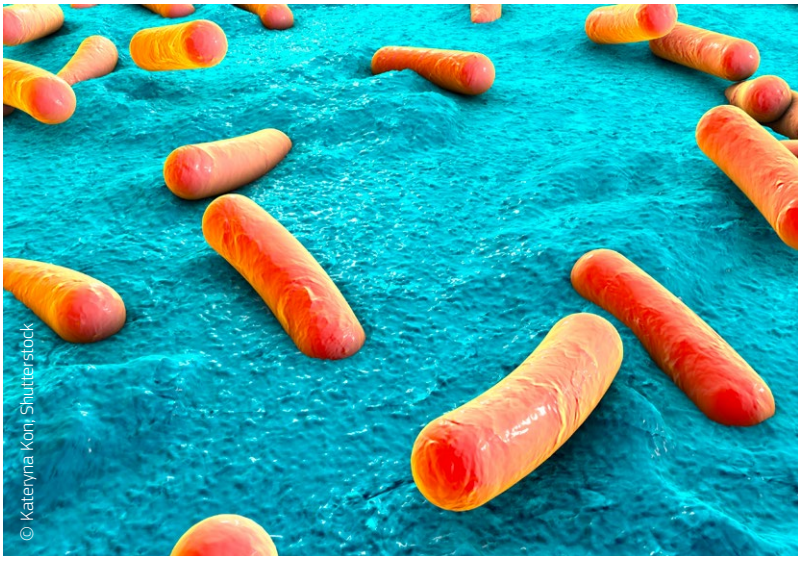
"Moving on, we demonstrated that STMΔznuABC has anti-tumour activity not only in syngeneic breast cancer mice models, but also in genetically engineered breast cancer-prone female mice and chemically-induced fibrosarcoma cancer mouse models," Dr Pasquali enthuses. In other words, a potential treatment based on STMΔznuABC could target many different types of tumours, all this at a much more affordable cost than alternatives.

The BaCTher project is now completed, and the team are planning to publish their results in peer-reviewed journals. They also intend to participate in other European or international grants and, should new projects come out of this process, new treatments based on salmonella could one day become available. As Dr Pasquali points out, a new category of antineoplastic agents could be developed should the mechanisms that make salmonella so efficient in killing tumour cells be elucidated.

"We look forward to a possible clinical trial on pets – mostly dogs with mammary adenocarcinoma – since vertebrates more resistant than mice will be less susceptible to the residual virulence of STMΔznuABC. However, animal testing requires funding and comes with strict requirements on animal safety and welfare. Therefore, a few years ago, we started to disseminate our findings to European industries and mutual collaborations that are still ongoing," Dr Pasquali concludes.

BaCTher

★ Coordinated by the National Institute of Health in Italy.
★ Funded under H2020-MSCA-IF.
★ http://cordis.europa.eu/project/rcn/195248



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NO MORE BATH-TIME ANXIETY FOR AT-HOME BEDRIDDEN PATIENTS

A new miniaturised, portable shower system for use in bed is a groundbreaking solution to the problems of maintaining hygiene for independent living for those with restricted mobility.


© AQB-Care

Three million Europeans are unable to live independently due to ageing, disease, accidents or long-term disability. Not only is washing difficult for the patient getting in and out of bed, but it puts the healthcare provider service under extreme time and work pressure. "Our new AQB system brings significant benefits to caregivers and patients worldwide, reducing the impact of ageing and disability and incidence of infections, while improving life quality of low mobility and bedbound patients," outlines Matteo Monticelli, project coordinator.

Aquabuddy SRL already has two products on the market in the home care area – a professional version of the portable shower for hospitals (AQB-Pro) and a smaller version (AQB-Home) – addressing formal care in nursing homes as well as the caregiver in the patient's home. Sales have extended to many nursing homes and private clients in Austria, Germany, Italy, Poland, Australia and China.

A new generation of home shower

The company has improved its existing products, especially in terms of size and weight, two factors that exacerbate lifting and production costs. "To compete and succeed in the long-term home care market segment, the price, size and weight of medical devices need to be as low as possible while not compromising the functions of the system," comments Monticelli.

Researchers analysed user activities to develop a new mobile system, AQB-CARE (AQUABUDDY-CARE: A Groundbreaking Solution for Elderly and Disabled people with Reduced Mobility that Finally Enables Caregivers to Effectively and Safely Bathe/Shower them in their own Beds). Portable, lightweight, affordable and eco-friendly, the new system is aimed mainly at the growing number of mobile caregivers.

The new AQB-CARE is still in development. Field trials have proven the real effectiveness of the product, but the related clinical trials are not ongoing yet. As Monticelli outlines, "Our plan is to involve Ospedale Bellaria (under Bologna University) and another nursing home in Italy, while in Germany we still have to confirm a clinical partner in the Cologne area. The trial will last up to 12 months in each clinic and the target number of patients will be at least 100 with another 100 in a control group."

For full industrialisation of AQB-CARE, the technical specifications of the mature product and the definition of the scale-up process have all been analysed. The final goal is to reach complete industrialisation of the new AQB manufacturing process and for that we have assessed the techno-economic feasibility of the project. A technical viability plan, a commercial plan, a freedom to operate analysis and a financial plan for the five years post-project are all complete.

Trials and issues in design and funding

With AQB products now on the market and in use, it would be easy to assume design and manufacture are straightforward. On the contrary, this process is complex, lengthy and costly, and it is very difficult to find expert companies that deliver consistent results. The project solution is to rent a 3D printer to pre-design and test our production pieces before sending them to manufacturing. This would ensure that the final product meets expectations.

Moreover, each regulatory structure for medical devices in Europe differs from country to country. Each Member State has its own policies with reimbursement being approved by either private or public insurance companies or a mixture of the two. "Approval for reimbursement from the public health providers requires lengthy negotiations, even when you have previous experience, which is the case with AQB-HOME in Germany."

PHASE 2 coming up

AQB-CARE has applied for Phase 2 funding through H2020 and aims to start commercialisation in 2021. Monticelli expresses his hopes for the future of AQB-CARE, "Our fingers are crossed to get the SME-Instrument funds! We will take AQB-CARE to the market whatever it takes, but the process will be nicer, easier and more effective with the further help of EU funding in Phase 2."

AQB-CARE

- Coordinated by Aquabuddy in Italy.
- Funded under H2020-LEIT-NANO, H2020-LEIT-ADVMAT, H2020-LEIT-ADVMANU and H2020-SME.
- https://cordis.europa.eu/project/rcn/211492
- Project website: http://www.aquabuddy.it/
- https://bit.ly/2xQAB6a

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SOCIETY

A NEW SOCIAL SCIENCE DATA ARCHIVE SERVICE FOR EUROPE

The EU-funded CESSDA SaW project is supporting Europe's next generation of social scientists via a seamless social science data archive service.

To better coordinate the diverse research happening across the European Research Area (ERA), the EU-funded CESSDA SaW (Strengthening and widening the European infrastructure for social science data archives) project established a seamless social science data archive service. The result is a service capable of supporting the research needs of the next generation of social scientists regardless of where in Europe, or beyond, they are located.

"The project has successfully initiated the transformation of the user experience of social science data in the ERA, with more and more evidence and insight being made available to those tackling social and economic issues in Europe," says project coordinator Ivana Ilijasic Versic.

The project accomplished this by bringing together 25 partners from across Europe and focusing on fostering knowledge exchange between current, future and aspiring data service providers. By offering the necessary administrative, technical and methodological support, the project promoted the establishment of new data archives while also strengthening existing ones.

Strengthening the hub

To strengthen and promote CESSDA's role as an internationally renowned social science data infrastructure, the project performed a range of work aimed at strengthening the hub and supporting the development of national data services in preparation for CESSDA membership. For example, the 'Country Report on Development Potential', a comprehensive overview mapping the current state of play of data archive services in 44 mainly European countries, represents a key result for policy development and benchmarking. "For countries without any infrastructure, we set up a Guide for National Planning for Setting Up New Data Services, which provides information on developing social science research data policy and how to establish a national data service provider," explains Ilijasic Versic.

The project also developed important input for CESSDA's Quality Assessment model, serving as a quality check on its service providers. This model also helps national actors identify gaps between the need for efficient and trustworthy services and the actual services offered.

For service providers, a Knowledge Exchange platform was developed and is now up and running on the project's intranet. In addition, several training modules on archiving, data curation and infrastructure design have also been made available. "We enjoyed the meetings and workshops where policy officers, service provider staff and high officials from the European Commission and ministries met and cooperated," says Ilijasic Versic. "As a result, CESSDA is now a stronger and renowned social science data infrastructure."

Unlocking CESSDA's potential

According to Ilijasic Versic, the CESSDA SaW project was a success and accomplished what it set out to achieve. "The project succeeded in unlocking the capability of the current CESSDA membership to transfer knowledge to others, established the development path needed to build the national data archive services, and supported the development of the pan-European products and services that will ultimately deliver the CESSDA vision," she says. "By engaging national ministries and other funding bodies, we have positioned ourselves as one of the major players in the research infrastructure arena."

Even though the project is now officially closed, the project continues to hold its SaW meetings with established and new service providers and with countries that are interested in setting up a social science data infrastructure. In fact, most recently, Hungary, Slovakia and Portugal have joined CESSDA, and more countries are in the pipeline for obtaining membership.

CESSDA SaW

- ★ Coordinated by CESSDA in Norway.
- ★ Funded under H2020-INFRA.
- ★ https://cordis.europa.eu/project/rcn/198258
- ★ Project website: https://www.cessda.eu/

NEW ONLINE PLATFORM TO MAKE PUBLIC BUDGETS MORE TRANSPARENT

Openness and transparency can act as a disincentive to corruption. Government agencies, data wranglers, journalists and even citizens can access a comprehensive online platform to analyse and participate in public budgets.

When budget data is too complex for citizens and decision-makers to decipher, it becomes impossible for them to formulate valid opinions and take a stance against government policy if they wish. To avoid this situation, fiscal data sets should be simple, easy to comprehend and, above all, accessible.

The OpenBudgets.eu (Financial Transparency Platform for the Public Sector) project, known as OBEU, has developed an open-source software framework and software-as-a-service (SAAS) to support financial transparency and enhance accountability within the public sector at all levels up to European level. "This requires a holistic approach combining learning materials, visualisations and explainers," outlines Dr Fabrizio Orlandi, project coordinator.

Toolbox to visualise, analyse, entertain and learn

OBEU has created a platform with a complete set of 13 tools and three use-cases. After uploading a fiscal data set, the visualisation tool enables sharing with the defined electorate. To accompany this, there are tools to showcase the performance of the city or municipality and one that helps the electorate to become decision-makers in the budgeting process. "The citizen engagement interface enables users to interact by giving feedback with regard to the provided data, by suggesting different priorities for budgeting, or by discussing a particular transaction," explains Dr Orlandi.

Through database aggregation of existing data, a library of data mining facilitates the discovery of those all-important new trends and patterns with the potential to forecast budget measures. Moreover, users can also create custom pipelines to pinpoint, process and convert data from almost any source into a variety of formats.


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The large-scale use-cases include stories, tools, evaluations, studies and tutorials. Games within the stories include 'Read Recipes for Cooking Budgets'. Forty recipes include the fake business card, the secret funds and the Good Ol' Bribe. Imaginative and entertaining, each story outlines how a scam can be accomplished, pointers to look out for and real-life examples.

Extensive trials Europe-wide lead to client cities

Tests using the OBEU toolbox and solutions in Bonn, Paris and Thessaloniki led to extensive evaluation reports and implementations around Europe. All three cities plan to further implement the OBEU tools in their contexts.

Individual partners have already rolled out the tools in the first client cities. Project partners implemented the different OBEU toolboxes and solutions within their expertise and geographical locations. "To this end, OBEU partners will establish a community group which is not legally binding but will maintain, advocate and disseminate the project's results and innovative value proposition."

A great boost for public administration

Managers and decision-makers will be able to easily deploy and use financial transparency applications at low cost and customised according to their needs. OBEU stands to make a great impact on the work currently conducted by public administrations and on the respective public perceptions by rendering the storage and management of large quantities of budget/spending data feasible.

In parallel, this can be done while maintaining the ability to work with multiple, distributed and heterogeneous financial transparency data sets and to extract new usable knowledge from large financial data. According to the project, this will lead to the establishment of an ecosystem consisting of applications and services based on financial data related to public administrations.

Summarising the overall positive effects of the OBEU project, Dr Orlandi points out: "This is the first time that a comprehensive and open platform has been developed to deal with the entire budget life cycle. OBEU impacts a wide range of stakeholders by motivating public administrations to publish their data and enable citizens and organisations to collaborate in generating a more transparent administration."

OpenBudgets.eu

- ★ Coordinated by the Fraunhofer Society in Germany.
- ★ Funded under H2020-SOCIETY.
- ★ http://cordis.europa.eu/project/rcn/194394
- ★ Project website: http://openbudgets.eu/
- ★ https://bit.ly/2M7czH2

A NEW METHOD BASED ON TOOTH MICROSTRUCTURE FOR LIFE HISTORY DETECTION

Pregnancy and lactation are 'crisis' events, when there are significant demands on the mother to provide sufficient calcium for the foetus and the new born baby. EU research has developed a new, more reliable method for establishing these life history events from tooth microstructure.

Some studies on living humans and great apes have indicated that life history parameters (LHPs) such as pregnancies, skeletal trauma and kidney disease can be identified from hypomineralised growth layers of tooth cementum, the surface layer of the tooth root. Lack of available calcium at the mineralisation front of the cementum during those events causes formation of a growth layer where the enamel and dentine are softer than normal.

Using optical magnification with transmuted light, hypomineralised layers can be detected as they appear broader, wider and darker than fully mineralised layers. However, the use of tooth cementum growth layers, the so-called tooth cementum annulation (TCA) method as an individual age estimation method and as a life history identification aid remains sporadic, with results often carefully qualified or disputed.

The EUROLIFE (Life histories of the Neolithic Transition: Estimating and modelling European life history events and human fertility rates) project took a whole different approach to detecting important LHP from human teeth, examining more than just their visual effects as proposed in previous studies. As the project coordinator, Prof. Stephen Shennan explains, "The new test is based on chemical composition and degree of mineralisation of hydroxyapatite of the acellular extrinsic fibre cementum (AEFC)." Hydroxyapatite is the main constituent of the mineral part of bones and teeth.

Tooth microstructure and life history events through archaeological time

Application of EUROLIFE's new findings could include the establishment of fertility rates during the Neolithic Demographic Transition (NDT) when the population size of the world took off. The NDT started around 7 000 BC in Europe and ties in with changes in life style connected to the adoption of agriculture and settlement in villages.


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Radiocarbon dates are already available for the ancient samples along with details of the archaeological context from which they come, for example burial sites.

Two key issues dominating the research

EUROLIFE fellow Dr Marija Edinborough led a clinical study on a large dataset of some 200 sets of human teeth accompanied by documented life history information. This steered the development of new rigorous recording protocols.

The reliability of cementum data then came under the microscope! The project clearly demonstrated the uncertain reliability of cementum as a consistent source of life history data partly due to the limitations of optical microscopy. As Prof. Shennan explains, "this focuses solely on visual effects of the cementum incremental lines that can be variable."

Continuing challenges for the future interpretation of archaeological remains

Although EUROLIFE's new findings currently preclude the use of cementum as a dating tool for life history events in the NDT in Europe, this is not necessarily a negative outcome. On the contrary, it is a highly significant finding as it warns against any temptation to apply superficially plausible life history data from poorly explored cases until the underlying processes are fully understood.

A new highly rigorous method for studying AEFC microstructure has now been established (it will be available for scientific use in a forthcoming publication). Until then, Prof. Shennan sums up, "Even though the main goal of the project has been fulfilled, and a new more reliable source of data for detection of LHP has been developed by EUROLIFE, many aspects of cementum research remain in their infancy. This topic requires significantly more clinical research before it can be applied to archaeological case studies."

EUROLIFE

- Coordinated by University College London in the United Kingdom.
- Funded under H2020-MSCA-IF.
- http://cordis.europa.eu/project/rcn/195215

TRANSPORT

LAYING THE GROUNDWORK FOR SHIFT2RAIL'S TECHNOLOGICAL REVOLUTION

Enhancing the competitiveness and attractiveness of the railway sector – the core ambition of the Shift2Rail joint undertaking – requires other projects to clear the way. The ROLL2RAIL project played this role by focusing on novel rolling stock technologies and methodologies.

Future trains should be more energy-efficient, lighter, more reliable, have more capacity, cost less over their life cycle, be connected and be more comfortable and attractive. Only then will the railway sector be able to raise its market share.

Of course, getting there won't be easy: there are many obstacles to such radical innovation, and technologies with the potential to rise to this challenge are only in their infancy. This is the context that saw the launch of ROLL2RAIL (New Dependable Rolling Stock for a More Sustainable, Intelligent and Comfortable Rail Transport in Europe), an EU-funded project aiming to develop key technologies and remove blocking points for radical innovation in the field of rolling stock. Being part of a wider long-term strategy to shape the rolling stock of the future and ensure suitable results for integration in Shift2Rail, the project addressed several sub-systems including traction, TCMS, carbody, running gear, brakes, interiors, noise and energy.

"Traction systems have reached their maximum possible efficiency with current power electronics technology (silicon). Our goal was to reap all the benefits of incipient silicon carbide semiconductor technology to create smaller, lighter, more efficient and more reliable railway traction systems, while at the same time addressing low-floor wheel-motor assemblies for high-speed trains," Mr Demadonna, coordinator of the project on behalf of UNIFE (The European Rail Industry Association), explains. "We also studied key aspects of performance such as noise emission or reliability/availability, along with possible technical standardisation that will lead to cost reductions."

In 30 months, ROLL2RAIL achieved a substantial reduction in the weight and volume of traction converters and motors, and produced calculations for motor cooling noise and specifications for a semi-conductor based on environmental conditions.

Besides traction, the project led to numerous breakthroughs. The first is a Train Control & Management System (TCMS) that uses wireless technologies for train control and monitoring functions, thereby removing the need for onboard communication cables and simplifying the train coupling procedure. The second is a study on adhesive joints as well as on the reduction in weight linked to composite materials; and the third is a market push for running gear technologies and maintenance – in the form of a Europe-wide cost modelling methodology that can quantify the global impact of running gear performance on the economics of the whole railway system.

That's only the tip of the iceberg, as the project also resulted in the following: a set of reduced and harmonised requirements for a braking system to be used in future authorisation processes; a study of publicly available passenger surveys on train comfort and a weighted flexible scoring metric including 24 comfort features; three new noise separation methods (advanced transfer path analysis, beamforming and wave signature extraction) which were tested in real conditions; and an energy norms and standards application guide for KPI generation as well as a calculation methodology. Finally, the consortium developed a KPI tool to assess the impact/improvements of new developments against a baseline.

"ROLL2RAIL results have been designed for use by Shift2Rail as the ultimate end-user. Their benefits will

impact not only Innovation Programme 1 (Rolling Stock for passengers) but also advanced traffic management and control systems, infrastructure, freight and cross-cutting activities (CCA) such as noise and energy," Demadonna says. "Shift2Rail will now continue the work we started, in a process that is only natural when considering that more than half of the ROLL2RAIL partners are also members of Shift2Rail."

ROLL2RAIL
- ★ Coordinated by UNIFE in Belgium.
- ★ Funded under H2020-TRANSPORT.
- ★ https://cordis.europa.eu/project/rcn/193368
- ★ Project website: http://www.roll2rail.eu/

SMALL HYBRID-ELECTRIC AIRCRAFT ON THE HORIZON

An EU-funded project introduced a truly transformative business model aimed at converting current gasoline-powered light aircraft into hybrid propulsion aircraft. This is a significant step forward in hybrid-electric propulsion for small airplanes.

The average light aircraft in use are more than 30 years old. The aviation industry has been slow to electrify aircraft engines despite the technology being readily available on the market. This is because lack of requisite expertise in hybrid technology could increase maintenance costs, environmental contamination and safety risks.

Hybrid electric and fully electric vehicles have become more popular over the last few years. Several solutions have been proposed on the market regarding fully electric engines in new aircraft. Instead of catering to only new airplanes, the HYBPRO (Hybrid Propulsion for Aviation) project proposed to retrofit existing planes with hybrid propulsion engines as a full service for the owner.

Business model revved up

Researchers drafted a business model around AXTER AEROSPACE's prototype AX-50 (based on the current commercial AX-40S) that hybridises the airplane engine, adapting the current piston engine of an airplane. The business model includes a full installation service, providing services based on the customers' needs, as opposed to a product-driven approach. The proposed hybrid engine utilises the electric engine during the majority of the flight, reducing the fuel consumption as well as maintenance cost of the engine.


© HYBPRO

"The AX-50 prototype is an affordable and adaptable hybrid propulsion system for retrofitting existing fleets and fitting on new aircraft that provides safer, less polluting and cheaper flying," says Miguel Suarez, co-founder of the company AXTER AEROSPACE SL. The prototype is composed of electric motor controllers, lithium batteries, intelligent charging control systems and battery management, and battery chargers.

Bon voyage

Engine failure accounts for a significant amount of crash events and casualties in Europe. "Hybrid motors offer greater in-flight security by offering backup propulsion in case of single engine failure, saving lives and physical damage to aircraft," says Mr Suarez.

Hybrid propulsion systems can reduce engine wear and tear, offering a way to keep older aircraft in circulation while meeting regulatory obligations. Further, hybrid-to-electric planes can serve as bridges to aircraft that will be solely battery powered in the future.

Towards eco-friendly flights

HYBPRO is committed to meeting the EU technical environmental goals of the European Commission's Flightpath 2050 Vision for Aviation, which target reductions of about 75% in CO_2 emissions, 90% in NOx emissions and 65% in noise. These ambitious goals cannot be achieved with existing technologies. For the time being, hybrid-electric propulsion is seen as the most promising technology for addressing these challenges.

"Hybrid-to-electric aircraft are definitely eco-friendlier, and with battery upgrades, fuel utilisation will decrease even further over time."

Hybrid aircraft rely on an electric motor and use the gasoline engine only as backup. Compared to the performance of other small private airplanes already on the market, they are remarkably quiet and use a significantly lower amount of fuel. Short-haul flights are said to produce over 40% of aviation emissions. "Hybrid-to-electric aircraft are definitely eco-friendlier, and with battery upgrades, fuel utilisation will decrease even further over time," concludes Mr Suarez.

Several airlines envision a future where aircraft will be relying at least in part on electric propulsion, and HYBPRO indicates this very likely shift toward hybrid propulsion. Although the technology will be applied to small aircraft at first, it could eventually help address the environmental concerns of aviation.

HYBPRO
- ★ Coordinated by Axter Aerospace in Spain.
- ★ Funded under H2020-LEIT-ICT, H2020-SME and H2020-TRANSPORT.
- ★ https://cordis.europa.eu/project/rcn/210684
- ★ Project website: http://axteraerospace.com/

SMART, AUTOMATED CHARGING TECHNOLOGY FOR ELECTRIC VEHICLES

For all that electrical vehicles (EVs) promise, range anxiety, variable power costs and charging issues remain valid concerns of today's car users. An EU-funded project has developed a novel charging technology that could resolve all these issues through standardised automated EV charging.


© MATRIX CHARGING

The EU-funded MATRIX CHARGING (Novel, automated charging infrastructure for electric vehicles) project has made important advances in its vision to introduce automated conductive charging technology. With this technology, energy is transferred via direct physical contact between the MC Connector and the MC Pad.

The project performed feasibility and full market studies, and defined Matrix Charging® technological features and specifications in more detail. "The positive results of the IPR analysis and the successful securing of freedom to operate are important outcomes of the project," notes Mr Sebastian Demuth, Business Developer at Easelink, the company behind Matrix Charging®.

Safe, clean and minimalistic

MATRIX CHARGING achieved three notable key outcomes in terms of technical development. First, developing a completely new concept that ensures and covers all requirements for electrical safety, a basic requirement when charging EVs. In fact, Mr Demuth emphasises, "the MC Pad is safer than any household electrical outlet."

For a pad surface cleaning device, the project has marked solutions for removing water, ice, dust and small stones from the MC Pad. The third outcome boasts minimal mechanics – with all parts placed in the MC Connector positioned in the vehicle, this solution provides maximal scalability. "At the same time," Mr Demuth explains, "the mechanics on board the vehicle could be reduced to a minimum to guarantee robust functionality and cost efficiency."

"This opens new possibilities in V2G and grid stabilisation, transforming electromobility into an important component of a smart energy supply alongside its original function of transport."

Simple design, comprehensive solutions

Matrix Charging® offers impressive scalability, is stationary and can be easily installed in any parking lot. The so-called parking-charging experience will greatly reduce EV users' range anxiety and remove the hassle of having to plug in their vehicles.

If it becomes the standard for EV charging, it will automate the charging process and also maximise EV-to-grid (V2G) connection time. "This opens new possibilities in V2G and grid stabilisation, transforming electromobility into an important component of a smart energy supply alongside its original function of transport," says Mr Demuth.

Further, as the project website notes: "Because of its light weight, smart design and adaptable geometry, it can easily be retrofitted in any electric vehicle." All these features offer increased convenience and will mark positive headway towards greater acceptance of EVs and electric mobility.

The future is automation

During the course of the MATRIX CHARGING project, research agendas were set in the fields of automotive and infrastructural requirements. Developments related to Matrix Charging® and its novel technology were regularly promoted and presented via various channels, including the Easelink company website and press publications. Project partners also actively raise awareness about Matrix Charging® through participation in global trade fairs, the IAA 2017 in Frankfurt being but one example.

The MATRIX CHARGING project has officially ended, but for Easelink the vision remains: to standardise automated EV charging. "In general, it must be noted that the advent of automated driving will further increase the demand for automated charging solutions and underscores the need for standardisation," Mr Demuth concludes.

MATRIX CHARGING

- Coordinated by Easelink in Austria.
- Funded under H2020-LEIT-ICT, H2020-SME and H2020-TRANSPORT.
- http://cordis.europa.eu/project/rcn/211244
- Project website: https://easelink.com

E-BIKES FOR EVERYONE, SOON AT A CITY NEAR YOU!

Bike-sharing services and infrastructures are increasing in many cities worldwide in a bid to promote the use of bicycles and e-bikes for personal transport, benefiting both individuals and the environment. However, existing e-bike models are primarily designed with commuter riders in mind, neglecting other market segments – a shortcoming researchers from Iceland are working to overcome.

The CityBike (A comfortable, safe, and adaptable electric-bike for everyone) project targets a new e-bike model that emphasises safety and comfort. The design is more inclusive of 'forgotten' customers, such as tourists, individuals with high-risk perception, older people or those with impairments due to injury.

"Our goal is to design and prepare the production of a new electrical bike for use in urban areas. The main quality of the new bike is the flexibility in its frame so it can adapt to different users' needs and body types," explains Mr Ásgeir Matthíasson, CityBike project coordinator. Research has validated the concept, with evidence underscoring the ability to adapt the core design of a regular bike.

Reinventing the bicycle

Building on this, project work has produced a first-of-kind bike design: there is no chain. "Once the chain is gone, we are free to rethink what it means to be a cycle. We can move any and all of the parts around and configure them in just about any way," Mr Matthíasson notes. This affords the rider maximum flexibility as well as reduced maintenance.

"Our e-bike will change the way people get around and allow for a further range of travel than is currently possible."

Following production of the first full-size prototype, CityBike moved to 3D printing to print out models for testing. The team further improved the bike design through cooperation with the University of Reykjavik's Biomechanical faculty, working together to analyse the stress of the body while riding the bike.

Cycling into the 21st century

Adding to its array of innovative features, smart devices such as GPS and remote locking can be integrated on the e-bike. "This gives the customer a better overview of their cycle, maintenance schedules, workout information, theft prevention and more," underlines Mr Matthíasson.

In addition to offering maximum flexibility, the cycle's motor will draw a wider audience as a more attractive alternative to traditional bicycles. With cities becoming more and more dense, this has wider implications for the modal shift towards cycling.

"CityBike will be at the forefront of the change to a more pedestrian and cycle-friendly city life style," the project coordinator states. Project outcomes will thus also prove a valuable contribution to efforts aimed at overcoming European societal challenges in transport.

Pedalling towards greater safety and EU support

With ongoing research, the team is confident of the potential to effect changes to EU laws regarding pedal bikes versus mopeds on the basis on biomedical evidence and information on actual cycle usage. The e-bike will also sport optional safety features, which could become standard. These include wider support wheels to facilitate balance and grip, and software to guard against sudden or weak acceleration, helping riders maintain their balance.

Once the design is finalised and tests are completed, production will commence with two models initially. Long term, the plan is to cast the bicycle frame from recycled aluminium, meaning production can be carried out closer to the point-of-sale. This in itself promises a score of other benefits through job creation and more locally produced and sourced cycle manufacturing, thus also reducing the product's eco-footprint.

CityBike plans to attend tradeshows throughout Europe to demonstrate the cycle and engage with resellers, collectors and key stakeholders. "Our e-bike will change the way people get around and allow for a further range of travel than is currently possible – with CityBike 'the last mile' will be longer," Mr Matthíasson concludes.

CityBike

- Coordinated by Kjarnar in Iceland.
- Funded under H2020-LEIT-ICT, H2020-SME and H2020-TRANSPORT.
- https://cordis.europa.eu/project/rcn/211502
- Project website: http://kjarnar.is/en/

ENVIRONMENT

ALGAE-BASED FERTILISER TURNS VEGETABLE FARMING GREEN

There is a growing demand for 'green' vegetables but farmers are reluctant to change to these revenue-generating practices. Researchers have made it easier for farmers to get their products labelled as green through sustainable, easy-to-adopt technology.

Regulations and consumer needs have expanded the market for food products labelled green. However, affordable technological tools to produce vegetables sustainably are not readily available. To compound the challenge, European vegetable suppliers have neither the knowledge nor the willingness to change their cultivation methods.

The EU-funded VegaAlga (Sustainable agricultural eco-system: business and technological solution for eco-conscious vegetable cultivation using on-site produced algae fertilizer) initiative set out to establish a sustainable agricultural ecosystem using microalgae-based fertiliser. The VegaAlga team worked with the Vegetable Trading Centre – regional market leaders in vegetable production, and Multisense – a technology-intensive start-up, to create the new ecosystem.

Project leader, Mr Zoltán Basa, says the innovation process was divided into two important parts. The first was to improve and finalise an algae production system so that the algae can be cultivated securely. The second part was to successfully show that the algae treatment on the soil works. "In the first part, we selected the open pond production system and it was definitely the most crucial factor," Professor Basa explains.

The team tested two different-sized ponds, 12 m³ and 25 m³, and installed all the ponds in a greenhouse to better control the physical parameters. They developed and used a special paddle wheel for a continuous production cycle and to prevent sedimentation.

The researchers next developed the VegaAlga system in which they grew the algae in raceway ponds with optimal conditions to maximise the growth rate. The team created their own control system that they used to monitor the status of every pond, called 'Pond Master'. They used the system to monitor parameters such as pH, electrical conductivity, dissolved oxygen, and oxidation reduction potential.

The project was not without its challenges, however, as Professor Basa explains. "The team faced issues with the size and the material of the ponds, which they needed to get correct to avoid infections that would hinder production." They initially found it difficult to find partners to work with; Mr Basa found that SME companies seldom work with innovative partners outside their comfort zone.

VegaAlga developed microalgae-based fertiliser that was positively received by farmers that tested the product. Farmers completed a questionnaire where the majority (15 of 17 farmers) said the algae fertilisers were more effective than inorganic products in the market.

The new product has generated a significant amount of interest: consumers and industry professionals bombarded the commercial partner with questions.

A Customer Development Plan was created to commercialise their technology to produce microalgae sustainably, and in a cost-effective, environmentally-friendly manner. The team also developed a smaller microalgae-fertiliser production system to allow farmers to produce fertiliser on their own land in a cost-effective and eco-friendly way. This would allow farmers to label their products as 'green' and sustainable, which comes with a significant revenue boost.

Looking forward, Mr Basa says the VegaAlga team will look for distributors of the product, as they have already started to build up a sales team. The project already has orders in the field of agriculture, but they plan to focus on other potential business opportunities as well.

The VegaAlga open pond system was selected by Budapest Savage Works Ltd for innovation support for the company from 2018. "In the beginning we definitely want to obtain experience from support and maintenance coming from onsite ponds installed in Hungary, Austria and Romania," Mr Basa says. "After that we will expand into other markets as well."

VegaAlga

- ★ Coordinated by Zöldségcentrum Kft in Hungary.
- ★ Funded under H2020-SME and H2020-FOOD.
- ★ https://cordis.europa.eu/project/rcn/198490
- ★ Project website: http://vegaalga.eu/
- ★ https://bit.ly/2JxW7BS

IMPACT OF RODENTICIDES ON VOLE AND PREDATOR POPULATIONS

Voles and other small mammals act as 'keystone species' as they can achieve such high densities that many predators frequently feed on them. Though important for the maintenance of the ecosystem, farmers usually consider them as pests due to the damage they cause to grasslands.

Many farmers suffering damage to their crops and grasslands from large populations of voles attempt to control them using bromadiolone, a chemical that inhibits the coagulation of their blood. Small mustelids such as stoats and weasels are often regarded as specialist predators of voles, and eating prey affected by bromadiolone treatments can expose them to the effects of anticoagulant rodenticide (AR).

The EU-funded VOLES (Is rodenticide use disrupting the natural autoregulation of vole populations?) project studied the role of AR as a 'super-predator' that eliminates both vole and predator populations via its transference up the food chain.

Super-predator modelled

Society is increasingly concerned about the use of pesticides given their negative effects on biodiversity and public health. "Controlling voles with bromadiolone reduces the amount of food available to predators and increases their risk of secondary poisoning when they eat the contaminated rodents," says project researcher Dr Javier Fernandez de Simon.

However, this could result in recurrent vole outbreaks and the continuing need to control vole population by reapplying ARs. Using this form of rodent control could also impose higher production costs, thereby reducing farmers' profits.

A modelling study revealed that ARs may behave as super-predators when treatment is carried out at low vole densities (around 50 voles per hectare). But if rodenticides are applied at intermediate vole densities (around 250 voles per hectare) and in low quantities, small mustelid populations could grow and eventually regulate vole populations. When that happens, fox population densities could increase as there is no poisoning. "This treatment protocol could reduce the impact of rodenticides on predator numbers, while maintaining relatively low densities of voles, thereby benefitting farmers' interests," comments Dr Fernandez de Simon.

Loss of voles and their predators

Fieldwork data from footprint tracking tunnels coincided with the modelling results, indicating a significant decline in the abundance of stoats and weasels at sites where ARs were used between spring and autumn. In contrast, abundance of these predators did not greatly change at untreated sites. "As small mustelids can consume dead voles and we only found rodenticide residues in voles and small mustelid droppings from treated sites, we concluded that application of anticoagulant rodenticides in grasslands may generally reduce the abundance of small mustelids," claims Dr Fernandez de Simon. Similar abundance reductions have also been previously observed with red foxes, suggesting that ARs may play the role of super-predators.


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VOLES' findings represent a breakthrough in understanding the transfer of bromadiolone and its long-term effects, enabling scientists to develop the best protocols for guiding management and conservation decisions. In addition, field results on predators provided crucial information about the population impact of ARs within the European context. Overall, important new insights were obtained on how the chemical control of pests impacts ecosystems and affects biodiversity.

VOLES

- Coordinated by the University of Franche-Comté in France.
- Funded under H2020-MSCA-IF.
- http://cordis.europa.eu/project/rcn/195989
- Project website: http://volesblog.wordpress.com/

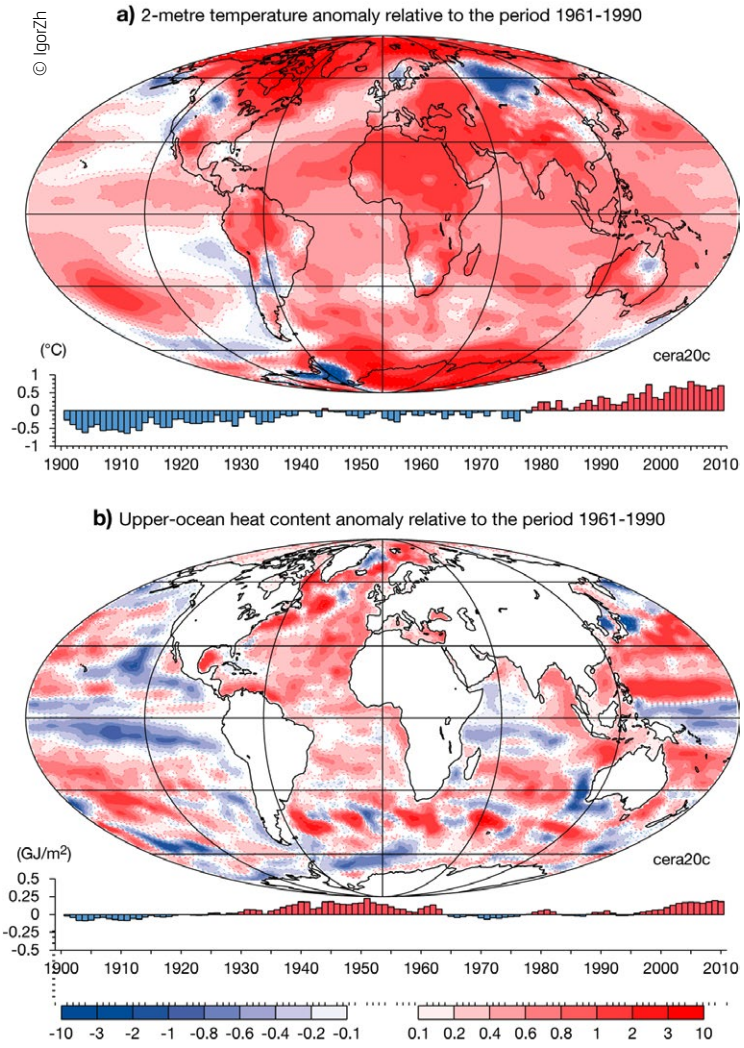
REANALYSING PAST CLIMATE DATA IS KEY TO UNDERSTANDING FUTURE CLIMATE CHANGE

Vast amounts of data about climate in the 20th century hold the key to understanding the future of climate change. Researchers have developed tools and reprocessed old data to strengthen our understanding of how the climate has evolved. This will help to understand future climate evolution.

The key to developing good climate change mitigation strategies for the future lies in looking at the past and understanding how the climate has evolved. An essential starting point to look back to is the 20th century, and all this depends on finding data based on observations of the atmosphere, land, oceans and sea ice.

Understanding the climate of the past century also depends on developing coupled ocean-land-atmospheric models and assimilation systems that can process the data. Thanks to many dedicated research initiatives, Europe is at the forefront of these activities.

The EU-funded ERA-CLIM2 (European Reanalysis of the Global Climate System) project set out to gather and process data from observations made in the past century. The researchers aimed to digitise the data they found and prepare it to be used in models the research team developed.



"C3S has provided a natural way to continue some of the activities started within the ERA-CLIM2 project, transforming them into lasting operational services."

"The more we go back in time, the smaller the number of observations, and the less accurate they are," ERA-CLIM2 project coordinator Dr Roberto Buizza says. "What we do is to blend them with our 3-dimensional models of the Earth, using coupled models that simulate all processes of the ocean, the land and the atmosphere."

By using very few observations with models they have developed, the ERA-CLIM2 team can reconstruct the climate of the areas where there are a very few or no observations. "Reanalyses are the best source of information of the past climate because they merge all available sources of information from the observations and the models," Buizza explains. "The ensembles of reanalyses generated in ERA-CLIM2 help us to estimate the uncertainty of the past climate and provide insights on how to deal with uncertainties in the future climate projects."

Achieving objectives

ERA-CLIM2 helped advance the science of reanalysis through developments in areas such as observation data rescue and post-processing. The researchers supported a large effort to rescue data for historic *in situ* weather observations around the world and prepared satellite climate data records.

The team developed and tested coupled assimilation methods that could include observations from the different Earth systems, including sea ice. The researchers developed these methods to produce a more consistent estimate of the Earth system evolution, especially at the Earth's surface.

ERA-CLIM2 developed the first European coupled ocean-land-atmosphere reanalysis of the 20th century, which also factored in carbon use. The team advanced the understanding of uncoupled and coupled reanalyses, which led them to develop methods for estimating uncertainty in reanalyses.

Three innovations

First, ERA-CLIM2 produced a first-of-kind European coupled reanalysis of the Earth system of the 20th century. Called CERA-20C, it includes the ocean, sea ice, land and atmosphere. The team went further, using the CERA assimilation system to generate a second data-set, CERA-SAT, which has a higher resolution and covers about 10 years of the satellite era.

Second, they used the CERA assimilation system to assess the impact of ocean observations on temperature modelling of the lower part of the atmosphere, and vice-versa. "Given that in the early parts of the 20th century observations were very scarce, this meant that we could generate more accurate data sets," Buizza notes.

The third innovation was to generate a new estimate of the uncertainty of the reanalysis data, generated using ensemble methods. Both CERA-20C and CERA-SAT included an ensemble of 10 analyses, instead of only one. This allowed the researchers to take into account the uncertainty of the observations and the models, and estimate the accuracy of our knowledge of past climate variation. This new approach goes a long way to further understanding of climate change, since similar methods can be used looking into the future.

Looking forward

The CERA system will be used for future reanalyses of data, such as the ones planned to be generated by the Copernicus Climate Change Service (C3S). The data rescued and reprocessed by the ERA-CLIM2 team will be made available to the whole community, so that any future reanalysis can include them. "C3S has provided a natural way to continue some of the activities started within the ERA-CLIM2 project, transforming them into lasting operational services," Buizza says.

ERA-CLIM2

- Coordinated by the European Centre for Medium-Range Weather Forecast in the United Kingdom.
- Funded under FP7-SPACE.
- https://cordis.europa.eu/project/rcn/188832
- Project website: https://www.ecmwf.int/en/research/projects/era-clim2

AGRICULTURE AND FORESTRY

SMARTER BIOLOGICAL CONTROLS

Biocontrols manage crop pests using their natural enemies instead of pesticides. The BIOCOMES project studied 11 new biological controls, two of which are market-ready.

Pests have always affected agriculture. Unwanted organisms eat crops and/or cause disease, in both ways reducing yields. For a time, pesticides were effective. However, in many cases pest species have evolved resistance. As such, the use of such chemicals causes environmental pollution and food safety concerns, with no benefit.

An alternative is biological control, involving the use of one species to control another. The EU-funded BIOCOMES (Biological control manufacturers in Europe develop novel biological control products to support the implementation of Integrated Pest Management in agriculture and forestry) project aimed to develop 11 new such biocontrols. The applications target insect pests and/or fungal diseases affecting European vegetable, fruit, grain and forestry industries. Each new development will replace particular pesticides.

The organisms intended to control insects include other beneficial insects, roundworms and viruses that affect insect pests, plus bacteria and fungi. The latter two were also used to control fungal diseases. The team additionally developed new production techniques for existing biocontrol agents.

"Two of our 11 applications are mature, and ready for the next stage," says project leader Dr Jürgen Köhl. "The others have shown promise but still require further development."

Biocontrol success

The first market-ready application uses a naturally occurring virus to kill the caterpillars of three related moth species that plague European tomato and potato crops. The team isolated a highly infectious strain of the virus and demonstrated effective caterpillar control using it. For tomato leafminer (*Tuta absoluta*), one of the three moth species, market analysis demonstrated substantial likely benefits given the costs of registration. Registration will proceed during 2018. Future work will focus on optimising the application and lowering costs.

A roundworm, *Heterorhabditis bacteriophora*, is the other mature biocontrol and its target is insect pests of various crops, including Western Corn Rootworm (*Diabrotica virgifera virgifera*) in maize. The worms have long been used in this way in practice, delivered to the customer as a powder. Conventionally, however, handling and processing reduce the treatment's effectiveness and shelf life, which increases costs.

Team researchers began a breeding programme intended to make the worms more infectious and hardy. Use of genetic markers assisted the breeding. Cross-breeding of strains resulted in a new roundworm strain having the necessary combination of traits. The breeding will continue in follow-up projects, leading to use of the new strain in large-scale agriculture at much lower costs than previously.

Further studies

Results from trials of several other biocontrol possibilities also encouraged the BIOCOMES team. Researchers worked on a fungus that attacks other fungi, and developed a seed treatment that helps protect cereal crops against fungal diseases. The project furthermore used aphid parasites to control the insects and manage orchards, plus another parasite to kill a cabbage-eating moth. These, and numerous other applications, remain under development.

"Our project has proven that biocontrol SMEs and research organisations can work together in a project of certain size to achieve significant progress," notes Dr Köhl. Aside from the biocontrol products themselves, the scientific community has also acknowledged BIOCOMES for its process knowledge. "Other research groups were interested in how we constructively brought all parties together and avoided conflicts regarding IP rights."

BIOCOMES' new biological control agents will help European agriculture phase out synthetic pesticides, while improving yields. With such developments, the era of pesticide usage is gradually shrinking, in favour of smarter and more environmentally friendly solutions.

BIOCOMES

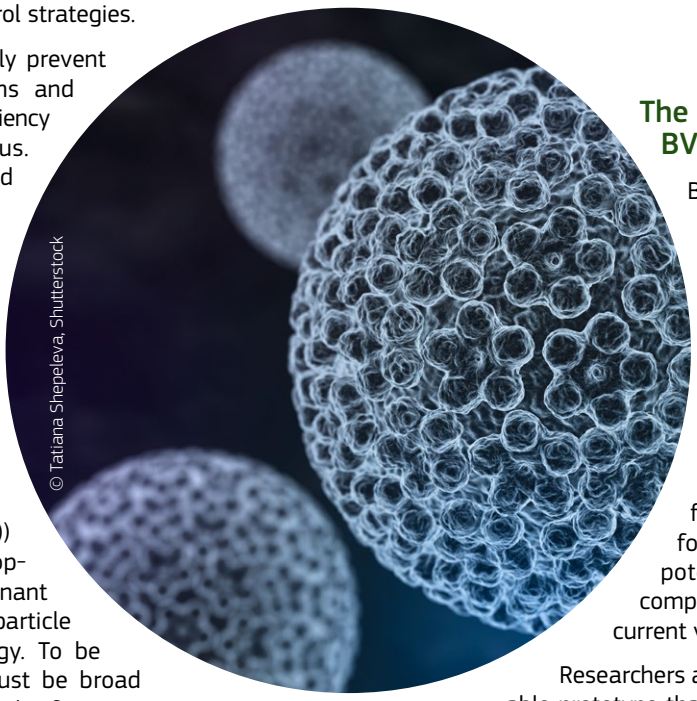
- ★ Coordinated by Wageningen University and Research in the Netherlands.
- ★ Funded under FP7-KBBE.
- ★ https://cordis.europa.eu/project/rcn/111189
- ★ Project website: http://www.biocomes.eu/

NOVEL TECHNOLOGY FOR BETTER CATTLE VACCINES

Excessive antibiotic use in veterinary medicine and agriculture has prompted EU authorities to turn to vaccination to fight diseases in livestock. To comply with this European directive, an EU-funded study developed a novel vaccine against bovine viral diarrhoea (BVD), a common cattle disease.

BVD virus (BVDV) adversely affects herd productivity and reproduction. Lack of measures to systematically eradicate BVDV has rendered BVD an endemic disease with nearly 50 % of cattle having been exposed to the virus. The variable or undetectable clinical symptoms alongside viral genetic variation, persistent infections, and viral tropism for immune cells pose a significant challenge to disease control strategies.

Vaccination can effectively prevent acute systemic infections and increase reproductive efficiency by protecting the foetus. Although live attenuated vaccines have been available for more than 50 years, BVD incidence remains high, emphasising the need for improved vaccines. The EU-funded BoVLP-BVD (Development of Tagged (DIVA), Virus-Like-Particle polyantigenic Vaccine against Bovine Viral Diarrhea virus (BVDc)) project proposed development of a new recombinant vaccine using virus-like-particle (VLP) patented technology. To be efficient, this vaccine must be broad spectrum, cost-effective and safe.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VLP technology

"VLPs are empty structures without DNA and hence have no risk of virus replication. However, they mimic real viruses in that they can induce an immune response," explains project coordinator Dr Luis Ruiz. Based on the VLPs' pathology-associated antigens, chimeric nanoparticles capable of inducing either humoral or cellular responses could be generated.

"An important attribute of the technology is that the vaccine is tagged, thereby allowing differentiation between animals that have been vaccinated from those that have been infected. As such, it is an ideal instrument for the management of cattle diseases in territorial-wide campaigns," continues Dr Ruiz. From a manufacturing perspective, it is cost-effective and safe as it contains no live virus.

Importantly, VLP technology could be used to develop human vaccines. Apart from the absence of potential adverse events, VLP vaccines offer high flexibility; they can be enriched using a variety of antigenic determinants, and also combined in formulations displaying different antigens (cellular, humoral or both).

"VLPs are empty structures without DNA and hence have no risk of virus replication. However, they mimic real viruses in that they can induce an immune response."

The next phase of the BVD vaccine

BoVLP-BVD partners have confirmed the commercial feasibility of the vaccine, defining precisely the target product profile and exploring systematically its market potential and prospective cost. They have screened different peptides derived from the BVDV proteins, and identified high-potency antigens for BVD vaccines, offering potential protection from a completely different angle than current vaccines.

Researchers are working towards a testable prototype that complies with regulatory requirements and will initially be screened in healthy calves to confirm serological responses against the selected antigens. The next step will be to use appropriate experimental infection models to assess the efficacy and safety of the vaccine under controlled conditions and to scale up the production.

Considering the reduced cattle performance and associated financial loss incurred as a result of BVD, the impact of the vaccine in BVDV-endemic countries is estimated to be hundreds of millions of euros. Importantly, it will bring a tool to the market to manage various diseases without using antibiotics, thereby minimising drug resistance, a major health concern nowadays.

BoVLP-BVD

- Coordinated by Aquilon Cyl in Spain.
- Funded under H2020-SME and H2020-FOOD.
- http://cordis.europa.eu/project/rcn/210415
- Project website: http://www.aquiloncyl.com/proyectos-i-d/vacuna-contra-la-diarrea-virica-bovina/

HEAT TREATMENT PROTECTS HONEY BEES FROM CRIPPLING VIRUS

Help for Europe's endangered honey bee populations may be at hand now that Austrian researchers have found a way of combatting the Deformed Wing Virus by heat treating larvae in brood frames.


© Wolfgang Wimmer

Bee populations across Europe are in trouble, but Austrian researchers have found a way of reducing the viral load in honey bee colonies which is efficient and totally free of chemicals. Researchers from engineering consultancy company Ecodesign used funding from the HApi (Hyperthermia in Apiculture – A new product against the Deformed Wing Virus of honey bees) project to assess how well an existing product, the Varroa Controller, performs in protecting honey bees from the Deformed Wing Virus (DWV).

Managed bee populations seem to be declining in Europe, although scientists do not always agree on how fast or why.

The tiny red-brown Varroa mite, which attacks honey bee larvae inside the cell, is a major contributor. But this parasite also acts as a carrier for a growing army of viruses, such as DWV, a pathogen which can leave young bees crippled and unable to fly. The combination of the two can be lethal for honey bee colonies.

"Usually the first task of a new-born bee is to nurse the next generation in which case it transmits the virus and so it goes on."

"The Varroa mite being present is one thing, but the situation is getting really dangerous because the mite is a highly effective vector transmitting viruses by directly injecting virus particles into the unborn bee's hemolymph," says Adriana Díaz, HApi project coordinator and senior researcher at Ecodesign.

Treatment involves placing up to 20 frames containing the capped bee brood inside the Varroa Controller. This is then heated to a controlled temperature by warm, humidified air for two hours. They reach "a temperature that damages the Varroa mite significantly," says Wolfgang Wimmer, Ecodesign managing director. He explains treatment is based on the principle that bees tolerate higher temperatures than the Varroa mite, a fact discovered by German academic Wolf Engels in the 1980s.

Applying hyperthermia in this way kills 97% of the Varroa mites, according to tests by the Bavarian Bee Institute in January 2017, and while the HApi team are not yet ready to publish the data on its effect on DWV, the results are promising.

Early break-out

Field observations of beekeepers using the Varroa Controller and Ecodesign's own tests show a secondary, key effect: the heat treatment seems to accelerate the break-out of DWV in young bees at clinical and significant sub-clinical viral levels, by placing the larva under a small amount of stress. Other bees detect these infected bees and expel them from the hive.

The benefits of this are manifold. Removing this diseased cohort not only has an immediate cleansing effect but is preventative too as it stops the virus being passed on to future generations. "Usually the first task of a new-born bee is to nurse the next generation, in which case it transmits the virus through feeding, and so it goes on," says Dr Díaz.

Under HApi, the team has examined the local regulatory and patent requirements for introducing the Varroa Controller as a way of combatting DWV in honey bees in seven European countries and is preparing for commercial launch.

They plan to apply for SME funding to assess other impacts of the earlier break-out of the virus on hives and to find the best time of year for a combined heat treatment, as well as quantifying the extent of the cleansing effect.

Much is at stake. Recent data from the European Commission shows Austrian beekeepers are losing on average 30% of their hives a year. "The unofficial numbers are much higher," says Dr Díaz, "during HApi phase 1 we interviewed beekeepers in Slovakia who were losing more than 50%."

HApi

- Coordinated by Ecodesign in Austria.
- Funded under H2020-SME and H2020-FOOD.
- http://cordis.europa.eu/project/rcn/210654
- Project website: http://www.varroa-controller.com/en_GB/

ORCHARD-SPECIFIC FRUIT TREE MANAGEMENT

Chemical applications to vineyards are currently based on land area. New technology that takes into account foliage dimensions will save on chemicals and reduce the impact on the environment.

Current agricultural practices mean that air-assisted spray machinery is based on a continuous but random mixture of air and chemicals. Tree dimensions and environmental conditions are not taken into account, leading to waste, and worse, over-application of dangerous chemicals.

The EU-funded TEVINS (Teyme Eye Vineyard Sprayer) project took up the challenge of developing variable rate technologies that make smart decisions on the amount of chemicals and air flow rate applied in real time. A foliar detection system determines the dose according to density, volume and spacing of foliage. "Given that traditionally such decisions are made on a field-by-field, rather than plant-by-plant basis, the opportunities for efficiency are clear," points out project coordinator Mr Ferran Iturbe Recasens.

Big Data meets individual needs

The new TEVINS technologies are accompanied by Big Data analysis of orchard and environment status that will transform chemical applications into a user-friendly, appropriate-to-needs activity. The main result will be an increase in high-quality marketable products for human consumption.

A cloud-based interoperability platform with Big Data sensor analysis and 3D crop modelling capabilities emulates the orchard status and gives feedback to the decision support system integrated in the control computer and user interface. "Generating variable prescription maps, this is valuable not only for spraying operations but also for other orchard operations such as pruning and crop thinning. Ultimately, TEVINS is designed to put data-driven analytical tools where they should be, in the hands of farmers," explains Iturbe.

Integration of other existing smart equipment such as water/humidity sensors on farms is anticipated. "Properly implemented, the result will be sustainable production with traceable data records from the field to the food chain."


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Different challenges met head-on

Technological challenges addressed were related to the algorithms needed to develop a variable rate spray system for a highly dynamic flow rate range. Calculated by the decision support system in real time, these are based on the machine's vision system for measurement of vegetation indices.

Demonstrating the cost efficiency of precision spraying in horticulture and promoting use of new technologies to small farmers is a complex task. The answer is to pitch the sales strategy with direct sales to existing customers and an already developed sales distribution network. Teyme, the coordinator, already distributes machinery for vineyards.

Internet-based sales channels like Twitter will be used to communicate product features and benefits to new customers and influencers in the market. Also targeted are manufacturers and trade associations that will testify to the advantages of using the precision sprayer.

Market development and impact

After successfully completing the TEVINS project and fulfilling all the objectives, the company's intention is to bootstrap technology transfer with the development of other lines such as super-intensive olive and almond plantations.

Adaptation of the technology should be fairly straightforward due to the similarities of the crops in terms of canopy and foliage detection. "Due to that reason, we reckon the new systems will be ready for commercialisation in year three of the TEVINS vineyard and orchard sprayer commercialisation plan in 2021 after all-important testing and validation," says Recasens summing up the financial projection and expectations for the new product.

Not only does the new sprayer technology cut costs and help the environment, the TEVINS system will also help farmers to embrace cross-compliance in the context of the Common Agricultural Policy. Developed in line with the environment, food safety, animal and plant health and animal welfare standards that farmers must adhere to, it will aid growers in successfully applying for EU subsidies.

TEVINS

★ Coordinated by Teyme in Spain.
★ Funded under H2020-SME and H2020-FOOD.
★ http://cordis.europa.eu/project/rcn/210690

"Generating variable prescription maps, this is valuable not only for spraying operations but also for other orchard operations such as pruning and crop thinning. Ultimately, TEVINS is designed to put data-driven .'analytical tools where they should be, in the hands of farmers."

INDUSTRY

ADVANCED MOBILE TECHNOLOGY TO MANAGE UNDERGROUND UTILITIES

An EU-funded project has unveiled user-friendly mobile technology that assists utility field workers in viewing and managing pipes, cables and other underground utilities.

Utility companies from the UK alone create over 1.5 million street holes each year, often causing damage to third-party assets. Damage can be both expensive and dangerous, while also seriously impacting a company's reputation. Outdated and inefficient systems account for a great part of faulty interventions that costs the British economy in the region of EUR 5.5 billion annually.

To address these issues, a consortium stemming from six European countries established the LARA (LBS Augmented Reality Assistive System for Utilities Infrastructure Management through Galileo and EGNOS) initiative. The project developed innovative mobile technology to cut down these unpredictable maintenance operation costs that are often paid for by tax payers. "LARA's mobile technology enables the field workforce to view geospatial data securely on site, instead of relying on old systems and their own individual experience to interpret maps," states Mr Konstantinos Smagas, deputy project coordinator.

High-accuracy, 'virtual' excavations

The LARA system is a handheld, low-cost mobile device that enables field workers to 'see beneath the ground'. The device brings together Global Navigation Satellite System (GNSS) technology, 3D geographic information system (GIS) technology and geospatial databases with computer graphics and augmented reality to render complex 3D models of underground networks including water, gas, sewerage and electricity. GNSS technology includes Galileo and EGNOS as well as GPS.

LARA's high-precision, low-power, long-autonomy GNSS receiver module is able to achieve accuracies at the level of a few centimetres. "The receiver – which consists of a GNSS module and an IMU module – is able to work with multiple constellations including Galileo, EGNOS and others, but Galileo is key to helping improve accuracy, and increase availability and integrity," points out Mr Smagas.

Fusing augmented reality with GIS technology is key to the LARA concept. Acting like '3D X-ray vision', augmented reality enhances the user's perception of the underground infrastructure with virtual data. Superimposing digital data on GIS display content not only adds to the user's experience, but also makes GIS useful in a new and interesting way.

Increasing productivity

Pinpointing the exact location of underground utilities is critical to the safety and mission of utility field workers. Other than this, poorly mapped regions slow down work and add an element of uncertainty to the work of excavation teams and their office-bound supervisors.

Being able to identify underground utilities located in an excavation area prior to conducting the work is a game changer for public and private utility companies. "With the LARA system, they will know exactly 'where is what', thereby conducting far more accurate maintenance interventions on their own underground infrastructure while keeping other neighbouring underground grids intact," explains Mr Smagas.

Precise intervention will reduce the overall maintenance cost, at the same time minimising the economic and social implications of lengthy surface works. The latter include unnecessary traffic congestion, pedestrian disruption, material wastage, use of people's time, increased energy demand, visual intrusion and noise.

Marketing the new technology

To aid smooth market adoption, they have brought together a broad range of stakeholders and have been particularly active in networking activities. Launching of a dedicated website, press releases, official publications and international

conferences have greatly helped LARA achieve its dissemination goals.

For the time being, the consortium is making minor improvements regarding the system usability and autonomy to showcase their technology in two major utility companies in France and the United Kingdom. Once the final prototype is completed, LARA's affordable and simple-to-use system is expected to have a significantly positive impact on the competitiveness of the European utility industry as well as equipment vendors.

LARA

- Coordinated by Geoimaging Limited in Cyprus.
- Funded under H2020-LEIT-SPACE.
- http://cordis.europa.eu/project/rcn/193818
- Project website: http://www.lara-project.eu/

MICROWAVE TECHNOLOGY FOR ASPHALT SURFACE REPAIRS

Innovative microwave technology offers a radical new, environmentally friendly approach to asphalt surface repairs. An EU-funded team has progressed with the steps necessary to verify its technological and economic feasibility.

Benefiting infrastructure owners and operators, enhancing road safety and enabling seamlessness of European transport, microwave technology is set to usher in a new era for asphalt road surfaces. It promises durable, seamless repairs, and compared to currently applied technologies, it is simple, faster to apply, and more effective and economic.

These are the highlights of a feasibility study carried out by an EU-funded team. The RADARR (Innovative Technology for Rapid and Durable Asphalt Road Repairs) project had just one core goal and deliverable: "to prepare a feasibility study for commercialisation of the FT3 machine," notes Mr Václav Mlynařík, a partner on the project. The device uses microwave energy to effectively repair asphalt roads and surfaces, including common potholes.

Groundbreaking solution for asphalt repairs

When designing the feasibility study and conducting related market research, partners engaged with stakeholders to discuss the FT3 machine's features and identify issues crucial for successful commercialisation. "Our customers put strong emphasis on repair time, operability and quality," says Mlynařík. "These results helped to design a business plan for commercialisation of the FT3 machine."

Optimisation of product features was proposed to better fulfil customer needs, and findings were incorporated into the development strategy. The suggested optimisation will make it possible to deliver an innovative solution for asphalt repairs, surpassing the quality of technologies currently in use. "We believe that the microwave repair technology will shortly become a new standard for high-quality repairs of asphalt pavement," states Mlynařík.

In the years to come, it will be possible to offer a completely new technology that can improve the quality of the EU's road infrastructure system. Beyond its being operable year-round, another advantage is the potential for important savings in resources needed for road maintenance. Further, depending on the quality of the road's sub-base, the microwave technology will double the lifespan of presently applied repairs, which translates to significant savings in general and a great market opportunity for its developer, FUTTEC.

Advancing technology and know-how

RADARR also developed a complementary product: an asphalt microwave oven, which has recently been prototyped. The development team is working to increase the oven's power output to deliver the means for preparing hot asphalt mixture at the repair site. Locally prepared hot asphalt mixture will accelerate repair time and could also be used for conventional repairs.

Project partners participated in trade fairs and conferences and have demonstrated the technology to potential customers. They have cooperated with the Technology Centre of the CAS (national contact point (NCP) in the Czech Republic) and attended their seminars and workshops related to the European Commission's SME Instrument. Mlynařík noted the team's appreciation of the NCP's coaching service: "The coaching really helped us to identify crucial points and concentrate on them at the beginning of the project."

From feasibility to commercialisation

Work will continue towards commercialisation of the FT3 machine, with sights set on Phase 2 of the SME Instrument to help in this regard. A Phase 2 grant agreement would speed up the costly final stages required to bring the FT3 to market. "We plan to optimise the product features and offer it on the market together with the complementary asphalt microwave oven that will be used for local pavement repairs and other accessories," Mlynařík explained.

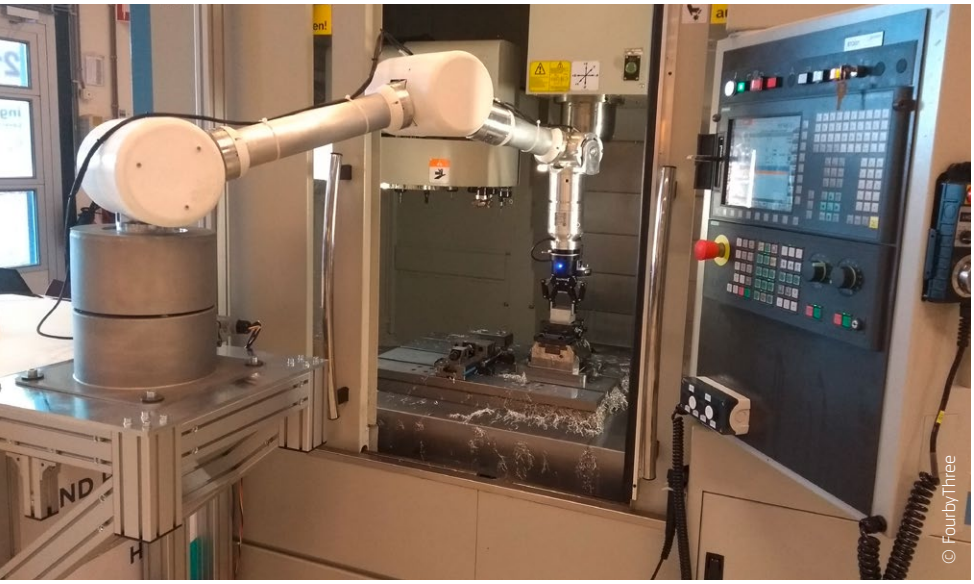
RADARR's feasibility study marks an important step towards reaching the overall commercialisation goal and attracting potential investors. "Together we will be able to offer a complex solution for asphalt pavement repairs."

RADARR

- Coordinated by FUTTEC AS in the Czech Republic.
- Funded under H2020-LEIT-ICT, H2020-SME and H2020-TRANSPORT.
- http://cordis.europa.eu/project/rcn/210437

HUMANS AND ROBOTS WORKING SAFELY HAND IN HAND

EU-funded scientists designed and tested pioneering robotic solutions that collaborate safely and efficiently with human operators in industrial manufacturing companies.


© FourByThree

Robots have been transforming the way humans interact with and benefit from technology, helping industries automate processes and boost productivity. However, most robots are limited in terms of what they can do as each movement is highly engineered, and thus, prone to error with a small change in the environment. In addition, their rigid programming mechanisms are making them unfit for dealing with soft objects, and lastly, they can prove dangerous due to their focus on efficiency and speed.

Increased functional safety in human-robot collaboration will take current production systems a step closer to being more flexible and efficient. Within the EU-funded FourByThree (Highly customizable robotic solutions for effective and safe human robot collaboration in manufacturing applications) project, researchers successfully developed a new generation of modular industrial robotic solutions that are suitable for safe and efficient task execution in collaboration with humans. Furthermore, these robots are easy to use and programmable by factory workers.

Safe interaction between humans and robots

The project name FourByThree revolves around four main characteristics of collaborative operation (modularity, safety, usability and efficiency) and three main actors (humans, robots and environment) in the manufacturing scenarios.

"FourByThree responds to the demand that robots used in industry not only provide a high degree of dexterity, accuracy and efficiency, but are also able to ensure safety when collaboration between operator and robot is required, even when the workspace is shared," says project coordinator Iñaki Maurtua. Thanks to the development of innovative hardware and software for collaborative robots, the solutions proposed by the project are modular, safe and efficient.

Smart actuators for safe robots

Project partners successfully developed actuators that enable safe robotic behaviour in cooperation with humans when integrated into robotic arms. The drives are based on a novel spring design. Its use increases the inherent safety of the actuator in human-robot applications by absorbing shocks and reducing the contact transient forces. The springs also allow an additional deflection in case of collision. Partners developed four different sizes of actuators, allowing the integrator to freely select the number and size of each drive, depending on the robot arm's requirements.

Projection-based workspace monitoring

Researchers developed a projection- and vision-based proximity monitoring system that is modular, robust and suitable for industrial use. The newly developed workspace monitoring system projects safety areas around the moving robot, dynamically adjusting size and shape according to the robot's movement. "Its basic function is to oversee robot movements and stop it should a person or an object enter into the defined safety zones," explains Maurtua. This technology enables intuitive human-robot collaboration by projecting for the user relevant information directly into the workspace and generating virtual buttons that allow intuitive control of the robot by humans.

FourByThree's hardware and software solutions have been tested in four pilot scenarios focused on industrial processes such as riveting of aircraft parts, welding on sheet metals, mould assembly and wax deburring. Furthermore, most of the components developed can be used with commercial off-the-shelf robotic arms.

FourByThree's robotic hardware and software solutions could find wide applicability in many industrial sectors, especially in areas where minimising human exposure to occupational hazards are key considerations. These solutions are now available through an online platform. In this online shop, visitors can find more information about most of the components developed, some of which are open-source software.

FourByThree

- Coordinated by the Tekniker Foundation in Spain.
- Funded under H2020-LEIT-ADVMANU.
- https://www.cordis.europa.eu/project/rcn/193464
- Project website: http://fourbythree.eu/
- https://bit.ly/2JDesd5

INFORMATION AND COMMUNICATION TECHNOLOGY

IT'S AS EASY AS ABCDE FOR VIRTUAL REALITY HEALTHCARE EDUCATION

The alarming incidence of medical errors has recently raised global concern about patient safety. Simulation and gaming technology developed by the abcdeSIM-VR project has provided revolutionary training solutions for medical staff.

Medication errors constitute a large, yet potentially preventable, cause of patient morbidity and mortality, resulting in 95 000 deaths per year in Europe alone. Indeed, 23% of EU citizens claim to have suffered from medical practice errors. One solution is to improve training for medical staff using virtual reality systems. Despite already existing in the market, most of these technologies present limited clinical scenarios and lack of medical validation.

Success for a medical training flagship platform

Mr Ronald Nanninga, abcdeSIM-VR (The flight simulator for Medical and Health Professionals) project coordinator, explains the evolution of the new revolutionary training system, "We created abcdeSIM some years ago, initially focusing on residents at the Erasmus MC Medical Center, training in acute medicine based on the international ABCDE standard." The airway, breathing, circulation, disability, exposure (ABCDE) protocol is an approach designed for all deteriorating or critically ill patients.

The initial abcdeSIM was validated by several publications, achieved continuing medical education (CME) accreditation, and has gained public recognition by winning several awards – the winner of the Accenture Innovation Award 2014 and finalist in Best Educational Innovation 2015. The flagship product reached 50% of all Dutch hospitals and more than 200 institutions in the United Kingdom by partnering with the British Royal College of Physicians.

Evolution of education for medical professionals

Training is an extremely dynamic area where adaption of medical professionals' experience to new environments is crucial, and more complex patient treatment scenarios are associated with the elderly population. Moreover, a 56% increase in the over 60 population is expected by 2030. This means a heavy demand for healthcare and the need for a broader health workforce will increase dramatically in the coming years. "Therefore, it is of utmost importance to develop and implement efficient, scalable and affordable medical training," Nanninga points out.

Revamped initial model

The new revolutionary system, the abcdeSIM-VR, comprises a virtual reality headset and the web-based simulation platform includes the games. The medical trainee wears the VR headset, and is fully immersed in a simulated real environment, being able to perform on virtual patients, in real-time, under different clinical settings. Using serious gaming and state-of-the-art simulation technology (including a real-life physiological virtual patient model) ensures that medical staff will have a higher level of knowledge and skills before entering the conventional face-to-face classroom training.

The researchers have high hopes for the abcdeSIM-VR. Projections anticipate that sales will increase 20-fold and reach EUR 4.6 million by 2022, while creating six new direct jobs three years after market launch. Benefits for target

customers – hospitals and academic centres – include reduction of training time and costs as well as a safe way to gain hands-on experience in real-world clinical situations, while assuring patient safety.

Future plans

Now the so-called SME Instrument phase 1 is complete, the abcdeSIM-VR team have a fresh list of ambitious objectives. Upgrades of the simulation and physiological patient models are on the drawing board plus the addition of more medical scenarios. These include core acute medicine to pre-hospital, remote and rural care as well as trauma. The target user is the global market including developed and developing countries.

Teaching methods and strategies will also be optimised by backend extension. Other improvements include compatibility with smart devices and seamless integration with the VR hardware.

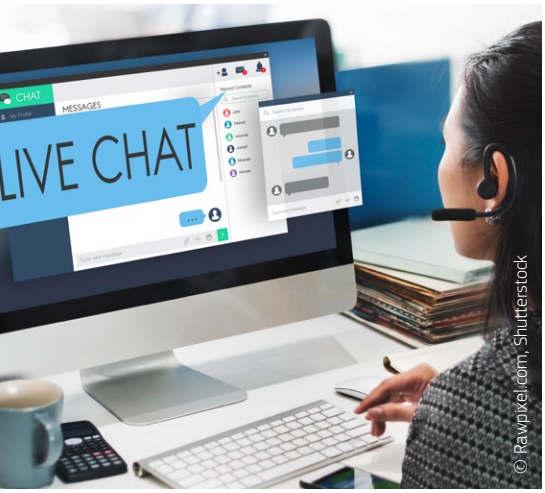
The plans for the next phase have just been submitted and these are accompanied by letters of support and recommendation from Dutch as well as international hospitals and industry partners. Nanninga sums up the success of the project, "abcdeSIM-VR is reinventing medical training. Users, both doctors and nurses in training as well as experienced professionals as part of their 'refresher course', can fully experience real-emergency-environment situations and intervene in treatment of patients in various clinical settings in a safe setting."

abcdeSIM-VR

- ★ Coordinated by ABCDE-SIM BV in the Netherlands.
- ★ Funded under H2020-LEIT-ICT and H2020-SME.
- ★ https://cordis.europa.eu/project/rcn/211480
- ★ Project website: https://virtualmedschool.com/

ARTIFICIAL INTELLIGENCE GIVES A BOOST TO ONLINE CUSTOMER SERVICE

As customer service migrates increasingly to online platforms, an enterprising software tool is helping customer service agents provide quicker and better answers. This will increase consumer satisfaction and enhance a company's productivity.



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Several decades ago, customer service moved from a face-to-face interaction to the telephone. In more recent years, it migrated to the internet to support numerous sectors from e-commerce and telco to gaming and transport. In Europe alone, over EUR 11 billion is being spent on delivering text-based customer service.

Against this backdrop, the EU-funded TRACS (Commercialisation of TRACS, An Artificial Intelligence Inspired, Text Response Automation system for Customer Support) project worked on an innovative solution to make the customer service experience more effective and affordable. It based the solution on artificial intelligence (AI), while still maintaining the critical human factor in the equation. "As much as 60-80% of customer queries are simple and repetitive," says Pyry Takala, project manager for TRACS and CEO of True AI. "This provides a huge opportunity for improved customer experience and cost savings by automating part of the agent."

Online customer service to improve significantly

To achieve its aims, the project built an AI tool called TRACS (Text Response Automation system for Customer Support). "TRACS supplies the customer service agents with suggested replies to the customers' inquiries, freeing up agent time and improving customer satisfaction," notes Mr Takala. The project team conducted a feasibility study which showed that the tool successfully provided accurate suggestions between 60 and 83% across different scenarios that covered e-commerce, telco, gaming, media, transport and customer service outsourcing. "When TRACS provides an accurate suggestion, agents can answer with a single click rather than searching for a template or writing the answer from scratch," explains Mr Takala.

Demonstrating the concept's success, the TRACS feasibility study brought together seven prominent companies and led to forging new commercial partnerships. "Lead generation campaigns and sales conversations have shown high conversion rates comparable to industry benchmarks," reveals Mr Takala. "Clients who used the system in our feasibility study saw increased customer support productivity of 20-40%."

Better for companies, agents and consumers

Overall, TRACS frees up agent time to deal with more challenging queries, improves quality and consistency of support, and helps train agents faster. The results provide strong incentives for clients who can save a large share of their support costs by deploying TRACS. The software, which is easy to install with the help of a video, is available in many languages, including Danish, English, Finnish, French, German, Italian, Spanish and Swedish.

Consumers also stand to benefit from the technology. "Consumers will see better and faster service in text-based channels across chat applications and social media as the technology becomes more cost effective," highlights Mr Takala. "It is also popular with customer service agents as it helps them concentrate on complex issues and provide more personalised care rather than answering repetitive questions and spending time on simple administrative tasks," he adds.

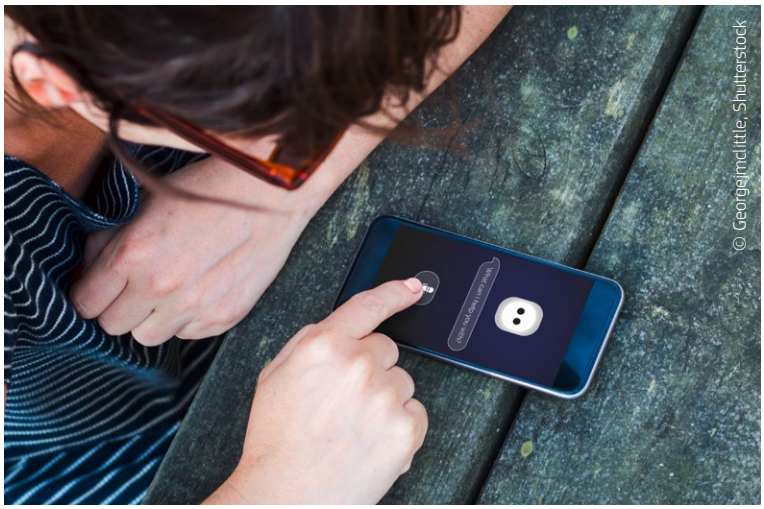
The future looks bright for the TRACS application as the company behind the technology, True AI, has worked on enabling companies to integrate the software within 10 days. There are solid plans to commercialise TRACS rapidly in Europe and across the globe, reaching a considerable amount of companies that want to streamline their online support. The result should be more effective business support, happier customer agents and more satisfied consumers, thanks to AI.

TRACS

- Coordinated by TRUE AI in the United Kingdom.
- Funded under H2020-LEIT-ICT and H2020-SME.
- https://cordis.europa.eu/project/rcn/211527
- Project website: https://trueai.io/
- https://bit.ly/2JEriHM

A 'SOCIAL' VIRTUAL ASSISTANT FOR MIGRANTS

Migrants have been very high on the EU political agenda for the past few years. But far from the political debate, there are cases where technological innovation can truly make a difference. The KRISTINA project has been developing such technologies with a focus on overcoming language barriers.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As great as it sounds on paper, freedom of movement in Europe can pose enormous challenges. Imagine you get a great job opportunity thousands of kilometres away from home, in a Member State you have never even visited. Sure, it's still Europe, but on a daily basis dealing with the administration or telling the doctor about a health problem in a language you don't speak can quickly become insurmountable.

Here, a true 'multilingual conversational agent' capable of understanding and providing the information you need would be a game changer. "The idea would be to develop such an agent with emotive, social and cultural competence. One capable of: automatic speech recognition (ASR) with linguistic analysis of the transcripts to understand the concern of the speaker; facial and gesture analysis; dialogue planning that doesn't rely on predefined scripts; understanding of emotive signals; multilingual language generation techniques; and featuring advanced virtual character design," says Leo Wanner, ICREA research professor at Pompeu Fabra University specialising in computational linguistics.

At first read, this list of features can seem technologically out of reach, but with some advances in state-of-the-art technology it could be right around the corner. Actually, work under the KRISTINA (Knowledge-Based Information Agent with Social Competence and Human Interaction Capabilities) project has already enabled Prof. Wanner and his team to create the first generation of this conversational agent and run it on tablets and laptops.

The assistant is very simple to use. Once initiated (which requires going through some settings concerning the language, the desired topic of conversation and the like), KRISTINA's virtual agent appears on screen, greets the person wishing to interact with it, and enquires about the possible concerns or questions he/she might have. "Based on the reaction of the person, a conversation develops during which the agent may provide background information on health issues of interest. The agent can provide advice with respect to health, social and other types of activities, offer to read the newspaper to those with visual impairment, etc.," Prof. Wanner explains. KRISTINA can interact with people in German, Polish, Turkish and Spanish.

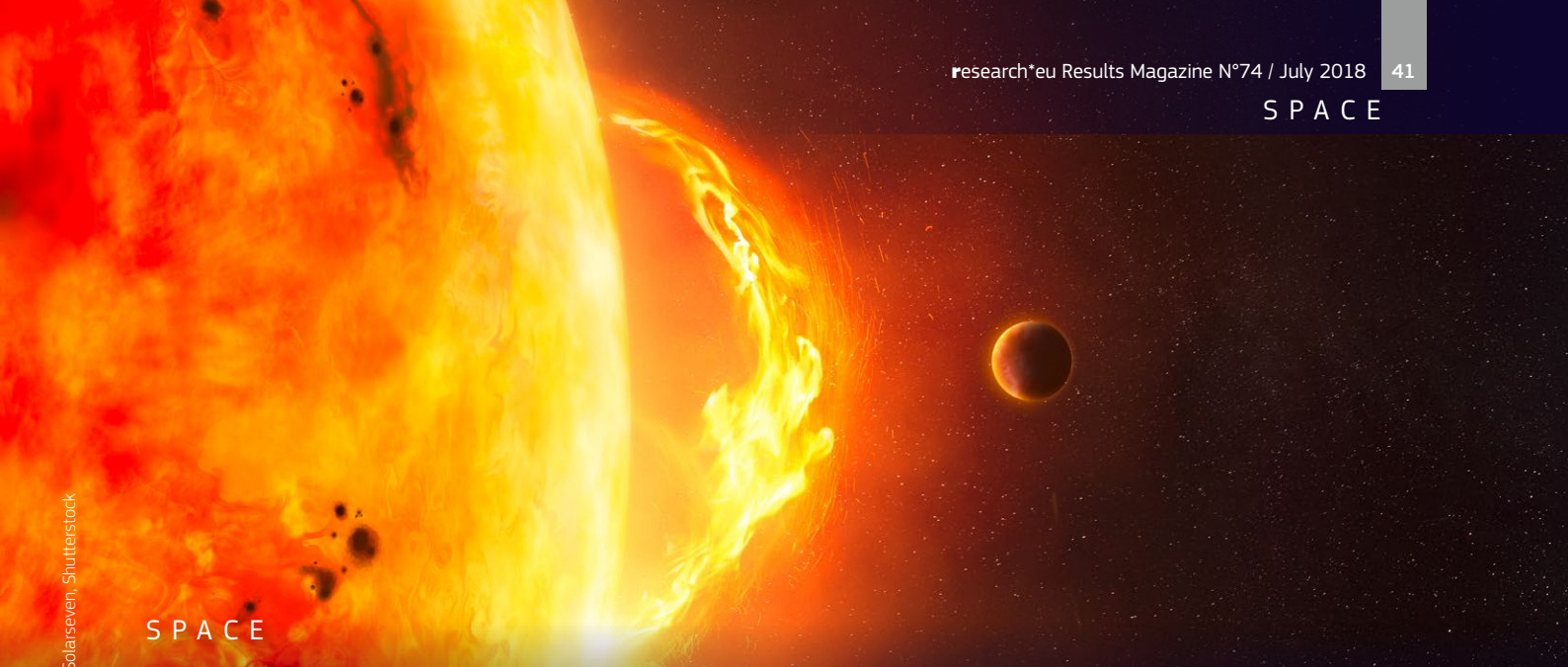
Whilst not a Big Data project per se, KRISTINA needed to be 'trained' to accurately recognise the emotions of the individuals in the targeted groups, learn the way they speak and interact. This required a considerable amount of data, such as recordings of conversations between individuals of the targeted groups and experts who simulated the agent. The team annotated these recordings with the relevant meta information, and Prof. Wanner says that "a good share" of this resource will be made available to the research community.

Prof. Wanner admits that it's still too soon for the KRISTINA agent to be deployed as an "off-the-shelf" conversational agent that can assist migrants (or another relevant target group) in their everyday lives.

"Further development is needed. Project partners continue to work on the individual technologies – although, unfortunately, not as a consortium due to the lack of common funding. We are working in order to change this situation, and our objective is to expand the KRISTINA agent to enable it to serve as an assistant in other domains," says Prof. Wanner. According to him, KRISTINA should reach maturity in its second or third generation.

KRISTINA

- Coordinated by Pompeu Fabra University in Spain.
- Funded under H2020-LEIT-ICT.
- https://cordis.europa.eu/project/rcn/194272
- Project website: http://kristina-project.eu/en/



SPACE

SOLAR FLARE FORECASTING SERVICE TO BE LAUNCHED SHORTLY

Humanity is becoming ever more vulnerable to adverse space weather conditions due to our increasing reliance on networked space-borne technologies. Losing one or more of the network nodes even for a short period of time will have major repercussions and cost billions of euro.

Adverse space weather results from solar flares and coronal mass ejections released from the turbulent and highly complex magnetic fields of active regions of the Sun. Understanding how active region magnetic fields evolve and behave will enable scientists to develop accurate and reliable space-weather monitoring and forecasting capabilities.

The EU-funded FLARECAST (Flare Likelihood and Region Eruption Forecasting) initiative studied the drivers behind the triggering of solar flares to improve flare prediction through the application of physics, state-of-the-art mathematics, statistics, Big Data and machine learning. The initiative is an example of a research-to-operations project, using methodologies taken from textbooks and scientific articles to create arguably the most systematic flare prediction service worldwide.

Advanced image-processing techniques were employed to determine the properties of solar active regions. These included area, magnetic flux, shear, magnetic complexity, helicity and proxies for magnetic energy from solar magnetogram and white-light images in near-real time. The team correlated the results with solar flare activity and optimised prediction algorithms via statistical, unsupervised clustering and supervised learning methods. “This enabled researchers to validate image processing and flare prediction algorithms before launching a near real-time flare forecasting service,” says project coordinator Manolis Georgoulis.

A range of disciplines utilised

The consortium employed open-source Docker engine technology as a breadboard to facilitate the project’s infrastructure on a highly modular ensemble of Docker containers. “Big Data handling and machine learning showed that predicting solar flares is not and should not be just about heliophysics,” explains Manolis Georgoulis. “A combination of expertise from the mathematics, statistics, computer science and artificial intelligence communities is required to make a breakthrough in this area.”

The project generated three databases with the FLARECAST native and external data amounting to a mind-boggling 240 terabytes. This indispensable collection of data will help to support many future research efforts. Manolis Georgoulis states: “Currently about 15 peer-reviewed papers highlight different aspects of the project, such as new and promising predictors, machine-learning algorithm performance, the relation or connection between flares and solar coronal mass ejections and other findings. More publications focused entirely on the project are planned for the near future.”

Science supported around the world

FLARECAST therefore forms the basis of a quantitative and autonomous active region monitoring and flare forecasting system, which will be of use to space-weather researchers and forecasters, both in Europe and around the globe. They include scientists working in the field of solar physics and heliophysics who will use its results and databases to advance the understanding of the physics behind solar eruptions and future prediction efforts. The project will also help the machine learning and Big Data communities hone their skills and devise new methods, like the ‘hybrid’ and ‘innovative’ machine learning techniques developed during the project.

The modularity and open-access nature of the FLARECAST infrastructure will enable other research teams to expand on and add more information (such as on flares, coronal mass ejections, and solar energetic particles) to an integrated space weather forecasting facility, thereby avoiding duplication of effort. "As a consortium, we have already seen preliminary expressions of interest from Europe and beyond, either for using the results of the service or for migrating the entire facility to their premises," points out Manolis Georgoulis.

FLARECAST

- Coordinated by the Academy of Athens in Greece.
- Funded under H2020-LEIT-SPACE.
- http://cordis.europa.eu/project/rcn/193702
- Project website: http://flarecast.eu/
- https://bit.ly/2JvG87x

DARK MATTER: SEARCHING FOR THE INVISIBLE IN THE UNIVERSE'S TINIEST GALAXIES

Scientists have created a new technique to measure dark matter at the core of dwarf galaxies. The secret to their success? Star clusters.

Dark matter – that strange, invisible substance believed to hold galaxies together – remains one of the greatest astrophysical mysteries. Although it makes up 27% of the universe, it's exceptionally hard to spot. This is because, unlike ordinary matter, dark matter doesn't absorb, reflect or emit light. In fact, so far, researchers have only been able to deduce that it exists from the gravitational effect it appears to have on visible matter.

However, a new method of measuring dark matter in the centre of dwarf galaxies is opening new vistas in the pursuit of this elusive substance. With support from the EU-funded CLUSTERS (Galaxy formation through the eyes of globular clusters) project, a team of astrophysicists developed this technique by focusing on star clusters. Their findings have been published in 'Monthly Notices of the Royal Astronomical Society'.

Star clusters, and more specifically globular clusters, are old systems of thousands to hundreds of thousands of stars that are held together by gravitational attraction. Researchers realised that if they were to study how these clusters behaved within a galaxy, they could learn more about dark matter.

The best candidates for exploring star clusters are the universe's smallest galaxies, called dwarf galaxies. Galaxies like these, found orbiting the Milky Way, are dominated by dark matter. The tiniest of the dwarf galaxies, the ultra-faint dwarfs, are made up of at most tens of thousands of stars – a drop in the ocean compared to our Milky Way's 200-400 billion stars.

Probing dark matter

In their efforts to find out what dark matter is made up of, scientists have been using detailed models to compare its distribution in galaxies. If dark matter could be successfully measured, it would be a start towards solving the mystery of its nature. But the absence of gas and the small number of stars in ultra-faint dwarfs made such measurements impossible. That is, until the CLUSTERS researchers developed this new method.

The key element in the scientists' method was the use of dense star clusters that orbit close to the centre of the dwarf galaxy. Unlike galaxies, these star clusters are so dense that their stars gravitationally scatter from one another, making them expand. The project team realised that the gravitational field that the star cluster orbits in and, consequently, the distribution of dark matter in the host galaxy play a role in how fast a cluster expands.

Computer simulations showed that the structure of star clusters is sensitive to whether dark matter is smoothly distributed or densely packed at the centre of galaxies. The astrophysicists tested their new method on the ultra-faint dwarf Eridanus II. One of the smallest known galaxies, it has a lone star cluster about 147 light years from its centre. Although the scientists' results pointed to a dark matter core for Eridanus II, there was much less dark matter than expected.

Professor Justin Read, a co-author on the study, commented on their findings on the Phys.org news portal: "One possibility is that the dark matter at the very centre of Eridanus II was 'heated up' by violent star formation, as suggested by some recent numerical models. More tantalising, however, is the possibility that dark matter is more complex than we have assumed to date."

The CLUSTERS dark matter findings are being used to further knowledge on globular clusters.

CLUSTERS

- Hosted by the University of Surrey in the United Kingdom.
- Funded under FP7-IDEAS-ERC.
- http://www.cordis.europa.eu/project/rcn/110566

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COASTLINE FLOODING THREAT ASSESSED FROM SPACE

One of the greatest challenges facing human society, the risk of future flooding, continues to grow due to climate change and increasing population pressures on deltas and floodplains. Adequate monitoring, improved management and the restoration of ecosystems and vegetated foreshores are urgently needed.

Coastal, marine and riverine ecosystems benefit society by delivering 'ecosystem services', like carbon storage, and support for sustainable fisheries and acting as a protective buffer between the sea and the land. However, marine foreshores are not currently included in water safety assessments and in levee design, and river floodplains are only managed to maximise river discharge capacity.

Nature-based flood defence has enormous potential as a sustainable and cost-effective strategy for flood and erosion risk reduction, but it is not widely implemented at present. This is because engineers need trusted and practical tools to provide them with quantitative information on key parameters and foreshore status before adopting a nature-based approach to flood protection.

To develop reliable tools, the EU-funded FAST (Foreshore Assessment using Space Technology) project utilised the services of the Copernicus Earth Observation (EO) programme to determine the characteristics of vegetated foreshores and help harness their potential to reduce the risk of coastal flooding and erosion.

Wetlands measured and modelled

Project partners studied ways of measuring aspects of coastal wetlands from the air and space EO data. Project coordinator Dr Mindert de Vries explains, "The aim was to acquire such data at the global level and determine the importance of coastal wetlands to society at specific locations in great detail as well as globally raising awareness of the importance of nature for flood risk reduction."

Know-how from a wide range of disciplines was brought together to develop the MI-SAFE open source open data package of services, which provides users with knowledge, data and modelling services. The main vehicle for accessing and demonstrating these services is the MI-SAFE viewer. "The viewer gives access to a wealth of Earth observation information on coastal wetland habitats and storm surge model results and was made available to the public through a freely accessible online service," outlines Dr de Vries.


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Researchers conducted a series of standardised measurements on different types of wetlands and assessed their capacity to reduce wave energy and erosion. They also improved current models used to predict wave attenuation by coastal wetland vegetation and ensured computer models can replicate what they measured at these specific locations. "To generate the MI-SAFE package, the FAST project team measured vegetation characteristics, wave attenuation and sedimentation and erosion at eight different coastal field sites in four different countries and in different seasons and compared results to well-known coastal areas worldwide," Dr de Vries explains.

"At the global scale, we produce brand new and unique EO-based information. On the local scale we deliver highest resolution information relevant for coastal engineers and managers."

From global to local

The MI-SAFE package, including the viewer, was developed with key stakeholders, and government, non-governmental and private sector organisations to perform at various scales. EO data from various sources was transformed into global map layers, such as global vegetation cover, vegetation change and elevation maps for the coastal zone. "At the global scale, we produce brand new and unique EO-based information. On the local scale we deliver highest resolution information relevant for coastal engineers and managers," says Dr de Vries.

By working together with engineers and coastal managers, the platform is developing into a management tool for continually observing and quantifying coastal safety and threats for whole regions of coasts in relation to the increasing impact of climate change and sea level rise. "If scientists want to develop natural solutions they need to understand the dynamics of the natural system," Dr de Vries concludes. "Tools like those developed by FAST can be used for monitoring and forecasting what is happening at the coast, and providing that information to coastal engineers, so that they can achieve their goals."

FAST

- Coordinated by Deltares in the Netherlands.
- Funded under FP7-SPACE.
- https://cordis.europa.eu/project/rcn/188840
- Project website: http://www.fast-space-project.eu/
- https://bit.ly/2t0NbKb

FUNDAMENTAL RESEARCH

A STEP FORWARD IN TOPOLOGICAL QUANTUM COMPUTATION

The speed at which future quantum computers will be able to perform operations is enough to make anyone's head spin. Now imagine if all these operations were 100 % resilient to errors? This is the potential the CNTQC project is betting on.

The very thing that makes quantum computing revolutionary – its reliance on subatomic particles' ability to exist in more than one state at any time – is also the thing that makes it highly difficult to master. Performing calculations quicker while using less energy comes at the price of environmental noise and operational errors, at a point much more severe than in classical computation. In fact, this is one of the most important obstacles on the path to exploitable quantum computing.

Quantum error correction can allow fault-tolerant quantum computation for sufficiently isolated quantum systems and sufficiently precise quantum gates. But as Dr Carmine Ortix of the Leibniz Institute for Solid State and Materials Research Dresden puts it, the requirements for doing so are too stringent. Opting for topological quantum computation – in which qubits are topologically protected against decoherence – with Majorana fermions to carry it would be a much better solution, but it isn't exactly straightforward to achieve.

"There are two main complications," says Dr Ortix. "The first is the requirement of a substantial, intrinsic spin-orbit coupling. This largely reduces the number of potential candidate materials. The second is the low control of superconducting pair correlations. Cooper pairs are introduced in the non-superconducting region with strong spin-orbit coupling via the proximity effect, thereby requiring a very high level of control in the fabrication process and quality of the superconductor-semiconductor interface."

With the EU-funded CNTQC (Curved nanomembranes for Topological Quantum Computation) project, Dr Ortix aimed to overcome these two problems by introducing novel platforms where the generation of Majorana bound states can be regulated on demand. "The feasibility of this concept is rooted in the fact that the quantum mechanical properties of charge carriers constrained to curved nanostructures are intrinsically different from those in a conventional flat nanostructure. As a result, electronic, and thus transport, properties are also very different," he explains.

The CNTQC team successfully proved that the interplay between the curvature-induced effects on electronic properties and the topology of the ground state of a low-dimensional system is significant. For instance, periodic buckling of a semiconducting nanowire induces a metal-insulator transition, and thus defines a nanoflex transistor switch – 'on' when the nanowire is flat and 'off' when the nanowire is planarly curved.

"Furthermore, the insulating phases are endowed with a non-trivial topological structure, which leads to a novel 'fractal' butterfly spectrum," Dr Ortix continues. "We have also introduced the concept of geometric-shape control of the spin quantum-geometric phase in elliptically-deformed semiconductor quantum rings with Rashba spin-orbit interaction. Shape deformations that result in a non-uniform curvature give rise to complex three-dimensional spin textures unveiling the way to get an all-electrical and all-geometrical control of the electron spin orientation. Furthermore, these geometrically tuneable spin textures render different

Aharonov-Casher (AC) interference patterns in spin interferometers."

These findings reveal enormous potential for new device concepts of spin-orbitronics where the electron spin and the electronic transport are directly controlled by the system geometry. Moreover, the geometric-shape control of the spin geometric phase may pave the way for future spintronic applications, such as control of persistent spin currents.

All in all, CNTQC: introduced the concept of Geometric anisotropic magnetoresistance (GAMR) in curved open tubular nanostructures; predicted that a semiconducting channel patterned in a serpentine shape at the mesoscopic scale can act as an electronic topological charge pump once subjected to a weak rotating magnetic field; created a technique called zero-offset anomalous Hall magnetometry which can improve the reach of lab-based transport investigations in the thriving field of antiferromagnetic spintronics; devised a first-of-its-kind room-temperature memory element that is based purely on antiferromagnets and can be written by using an electric field instead of a current; and advanced magnetic imaging at the mesoscale.

Building upon these promising outcomes, the CNTQC Consortium decided to start developing a roadmap for future exploitation of curvature-induced effects in nanosystems. The project's outcomes point to the fact that the curved geometry of novel nanosystems can be used to launch new functionalities in which the generation of Majorana bound states in a controlled manner will play a central role.

CNTQC

- ★ Coordinated by the Leibniz Institute for Solid State and Materials Research Dresden in Germany.
- ★ Funded under FP7-ICT.
- ★ https://cordis.europa.eu/project/rcn/111129
- ★ Project website: http://www.nano2qc.eu

HIGH-SENSITIVITY SINGLE-PHOTON DETECTORS PREPARED FOR COMMERCIALISATION

The company Single Quantum has developed a new form of single-photon detection technology that could be used for improving bio-imaging, microelectronics as well as light detection and ranging systems.

© SQP

Single-photon detectors are the key components behind many of the old and emerging technologies. But unlike their semiconducting counterparts, superconducting nanowire single-photon detectors are significantly better at detecting photons more efficiently, especially at low light levels.

The EU-funded SQP (Bringing to market the single quantum photon detector) project has developed a single-photon detector based on superconducting technology that is one of the fastest and most sensitive light sensors on the market. The main focus was to explore opportunities to commercialise this breakthrough technology for wide-ranging applications.

Expanding technology into a wider marketplace

To date, people working with single photons are mostly scientists. Quantum computing applications were among the main precursors for the accelerated development of single-photon detectors.

Single Quantum had introduced superconducting nanowire single-photon detectors to the scientific market five years back. "The company identified the opportunity to develop this product based on a strong market pull from physicists all over the world, resulting in turnover increasing from EUR 200 000 in 2013 to EUR 1.6 million in 2016," says CEO of Single Quantum Sander Dorenbos.

The primary objective of the feasibility study undertaken by the company was to identify and evaluate several opportunities to bring its product to a wider array of applications and users other than the scientific quantum technology field. "Working with individual light particles is of practical importance for many diverse fields. Single photons hold great promise for bio-imaging, microelectronics, and light radar systems," says Dr Sander Dorenbos. During the feasibility study, the company gained its first clients from these different markets.

In addition to offering a more detailed insight into the potential markets, the feasibility study aimed to thoroughly define system specifications, a good price range and the certifications required for the product to conquer the broader market.

Potentially disruptive technology

Competing technology suffers from low detection efficiency, limited time resolution and high noise level, leading to low image quality. "Single Quantum provides single-photon detectors with excellent performance on the market. Given that they are the most sensitive light sensors ever produced, they are very relevant in all applications where very low light levels are involved," says Dr Sander Dorenbos. "Our ground-breaking technology is based on detecting single photons with superconducting nanowires, offering, other than high detection efficiency, outstanding time resolution and noise performance with no compromises. This disruptive technology operates at the fundamental physical limit regarding the minimum light intensity," continues Dr Dorenbos.

Single Quantum's solution is a superconducting nanowire single-photon detector

closed-cycle system with unparalleled detection efficiency in the near infrared spectrum. It has low timing jitter, low dark counts and robust fibre coupling and is capable of broadband photon detection. Its easy-to-use 'plug and play' design consumes no helium.

Project partners see big possibilities for their technology, especially for applications requiring high sensitivity. The company that now employs 15 engineers will soon be ready to scale up production and optimise its business plan so that it can establish a wider commercial basis for its product. For instance, single-photon detection systems based on superconducting nanowires can increase quality and sensitivity in medical imaging techniques, help chip manufacturers check defects in their products and also provide light detection and ranging systems with rapid, high-resolution 3D mapping.

SQP

- ★ Coordinated by Single Quantum in the Netherlands.
- ★ Funded under H2020-LEIT-ICT and H2020-SME.
- ★ http://cordis.europa.eu/project/rcn/210859

GAMMA-RAY LASER MOVES A STEP CLOSER TO REALITY

Once cited as one of the 30 most important problems in physics, the gamma-ray laser now looks more plausible thanks to new technology introduced by an EU-funded project.

Building a gamma-ray laser has been a long-standing challenge for scientists. Just as an ordinary laser produces coherent rays of visible light, the much-discussed but not yet realised device produces coherent gamma rays, heralding a new generation of technology for research and industry.

Until now, the production of coherent gamma photons has been hindered by fundamental mechanisms or technological limitations. Within the EU-funded GAMMALAS (Towards gamma-ray lasers via super-radiance in a Bose-Einstein condensate of 135mCs isomers) project, a team of researchers conceived a proposal for producing coherent gamma photons that overcomes some of the most difficult problems.

'Cool' process for gamma-ray emission

The new proposal of GAMMALAS for such a device is achievable with current technology. "The approach relies on laser cooling and magneto-optical trapping of caesium nuclei. Unlike other possible candidates, caesium is well suited for the proposed technique," says Prof. Ferruccio Renzoni.

"The idea was to produce a Bose-Einstein condensate of caesium isomers after cooling them down to 100 nano-Kelvin. At such extreme low temperatures, the atoms with excited nuclei start displaying purely quantum properties, especially spatial coherence," further explains Prof. Renzoni. "In this state, excited nuclei emit their energy simultaneously, triggering a powerful burst of coherent gamma radiation." The team's approach overcomes three main problems: accumulating a large number of isomeric nuclei, narrowing down the laser beam's emission line, and exceeding the theoretical limitations of photon power density.

At the Accelerator Laboratory of the University of Jyväskylä in Finland, GAMMALAS has also built an experimental facility for laser cooling of radioactive caesium isotopes and for the production of coherent gamma radiation. There, a cyclotron particle accelerator produces unstable caesium nuclei. Caesium is then neutralised by adding an external electron through thin foil implantation. The newly developed laser system traps and cools caesium-135 and other desired isotopes down to around 150 micro-Kelvin. If all goes according to plan, the first test of caesium-135 trapping is scheduled for the end of spring 2018.

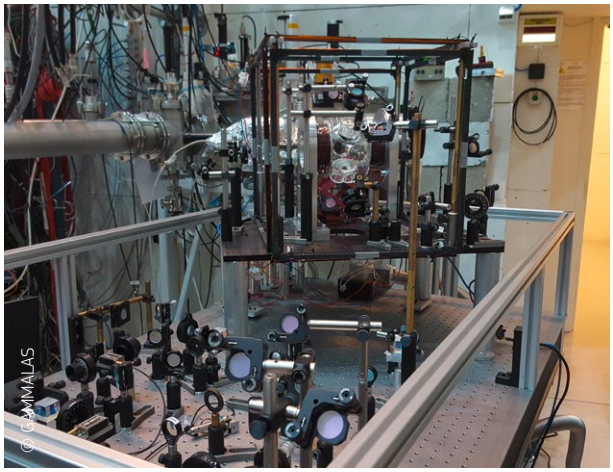
The ultimate light

The possibility of producing coherent gamma photons will enable scientists to study several milestones in physics and science generally. Undoubtedly, the benefits of such a game-changer technology will be dramatic. "GAMMALAS outcomes will pave the way for further investigating ultra-cold nuclear matter, a merge between atomic and nuclear physics. In addition, coherent gamma rays will enable high-resolution gamma spectroscopy and will facilitate the tracing of dangerous, explosive or radioactive isotopes," Prof. Renzoni concludes.

Coherent gamma radiation could also open up several useful applications in everyday life. For example, it will enable ultra-precise imaging that will dramatically impact our approach to managing stereotactic radiation therapy to more effectively treat brain tumours. The energy sector can also benefit from on-demand coherent gamma photons. Storing and retrieving energy from isomeric nuclei has the potential to revolutionise battery technology, as energy density can increase by several orders of magnitude.

GAMMALAS

- ★ Coordinated by University College London in the United Kingdom.
- ★ Funded under H2020-MSCA-IF.
- ★ https://cordis.europa.eu/project/rcn/195403



EVENTS

AUGUST 27

Montpellier, FRANCE

WORKSHOP

OFF THE SHELF – SOLUTIONS FOR FIN-AND SHELL-FISH SELECTIVE BREEDING

The EU-funded EMBRIC project will be running a workshop in Montpellier, France, on 27 August 2018.

EMBRIC will hold a company forum workshop titled '"Off the Shelf" – Solutions for Fin-and Shell-fish selective breeding', during the World Aquaculture Society and European Aquaculture Society meeting at AQUA 2018 in Montpellier, France.

A keynote lecture will be given on some of the novel techniques now available to the industry and illustrate this with ongoing research. Free oral communications allow any provider or user of novel 'off the shelf' solutions for selective breeding in any field of aquaculture to use this as a forum to discuss both advantages and disadvantages. Invited participants will cover specific areas, with input from the audience together with real-time polls and a Q&A session.

The EMBRIC (European Marine Biological Research Infrastructure Cluster) project is working to accelerate scientific discovery and innovation in the field of marine bioresources.

For further information, please visit:
https://www.was.org/meetings/pdf/AQUA18_OffTheShelf.pdf

AUGUST 29

Montpellier, FRANCE

WORKSHOP

ACTING TOGETHER TO BETTER PREVENT AND MITIGATE FARMED BIVALVE DISEASES

The EU-funded VIVALDI project will be running an open workshop in Montpellier, France, on 29 August 2018.

In the framework of Aqua 2018 in Montpellier, France, the VIVALDI consortium will organise an open workshop titled 'Acting together to better prevent and mitigate farmed bivalve diseases', with the support of Ifremer, Aqua 2018, CeMEB and Montpellier University.

Scientists from all over the world, industrial stakeholders, farmer representatives, and national and European competent authorities will share their expertise, experience and views on current threats to the European shellfish industry. VIVALDI partners will also present and discuss recent project findings, as well as expectations of the main stakeholders regarding research.

Three sessions will be held on the following topics: preventing the entry of diseases; establishing effective breeding programmes against mollusc diseases; and defining biosecurity measures.

This workshop is open to all participants attending the World Aquaculture Congress.

For further information, please visit:
http://www.vivaldi-project.eu/Activities/Events/Stakeholders-workshop-29-August-2018-the-programme-is-out

AUGUST 27▶29

Saarbrücken, GERMANY

WORKSHOP

FINAL NABBA MEETING AND 12TH INTERNATIONAL CONFERENCE AND WORKSHOP ON BIOLOGICAL BARRIERS

The EU-funded NABBA project will be holding a final project meeting and conference session in Saarbrücken, Germany, on 27-29 August 2018.

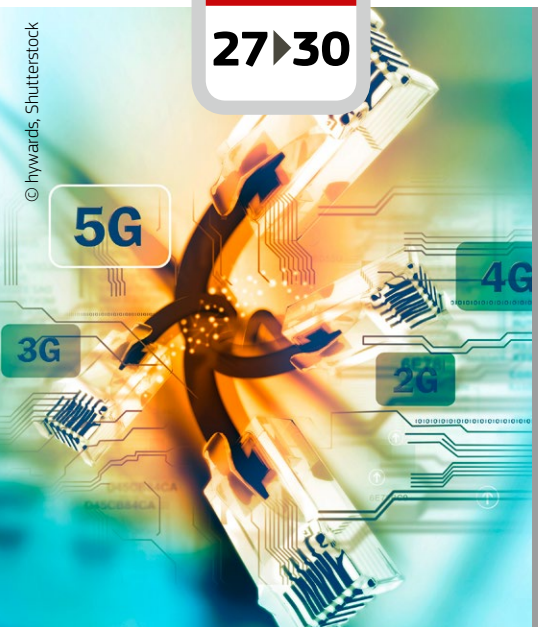
In conjunction with the 12th International Conference and Workshop on Biological Barriers, NABBA will be hosting a conference afternoon session titled 'Advanced nanocarriers to overcome biological barriers'. Speakers include Gert Storm, J.C. Leroux, Patrick Couvreur and Maria-Jose Alonso from the NABBA consortium. Selected students of the NABBA project will also have the opportunity to give a talk. On Thursday, 30 August the NABBA consortium will hold a private meeting, to include students and student presentations.

The focus of the BioBarriers 2018 conference is human cell and tissue models for facilitating clinical translation of new drugs and delivery systems, especially in the context of infectious diseases. Target audiences are experienced scientists and professionals from academia and the pharmaceutical industry as well as early-stage researchers.

For further information, please visit:
http://biobarriers.hips-wordpress.helmholtz-hzi.de/
http://nabbaproject.eu/our_work

EVENTS
For more forthcoming events:
http://cordis.europa.eu/events

AUG. 27▶30



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Hamburg, GERMANY

WORKSHOP

IORL WORKSHOP ON 5G NETWORK SECURITY @ ARES 2018

The EU-funded IoRL project will be running a workshop in Hamburg, Germany, on 27-30 August 2018.

The IoRL (Internet of Radio Light) 5G PPP project Phase 2 is organising a workshop on 5G Network Security. It will be held in conjunction with the ARES Projects Symposium 2018.

While it is envisioned that 5G communication will offer significantly greater data bandwidth and an almost infinite capability of networking, it will also surely bring tremendous challenges for security, privacy and trust.

Against this background, the 5G-NS 2018 workshop aims to collect the most relevant ongoing research efforts in the field of 5G network security. It will also serve as a forum for 5G PPP Phase 1 and Phase 2 projects in order to disseminate their security-related results, tighten and boost cooperation, and foster development of the 5G security community comprising 5G security experts and practitioners who proactively discuss and share information to collectively progress and align in the field.

For further information, please visit: https://5g-ppp.eu/event/iorl-workshop-on-5g-network-security-ares-2018/

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research*eu Results Pack

FOOD 2030 - Food Systems Transformation

CORDIS brings you the latest results from EU-funded research and innovation projects through our theme-specific Results Packs, including scientific breakthroughs and fascinating new products and technologies.

Our latest Pack focuses on 12 ambitious new approaches to scientific research that contribute to the 4 FOOD 2030 priorities of NUTRITION, CLIMATE, CIRCULARITY and INNOVATION, and were funded under the EU's FP7 and Horizon 2020 research programmes relevant to food systems transformation.

Please see the following link for more information:

https://cordis.europa.eu/article/id/400948-food-2030-innovative-eu-research-ensures-food-system-is-future-ready_en.html

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