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INNOVATION Newsletter
HUMAN BRAIN PROJECT

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INTERNAL NEWSLETTER

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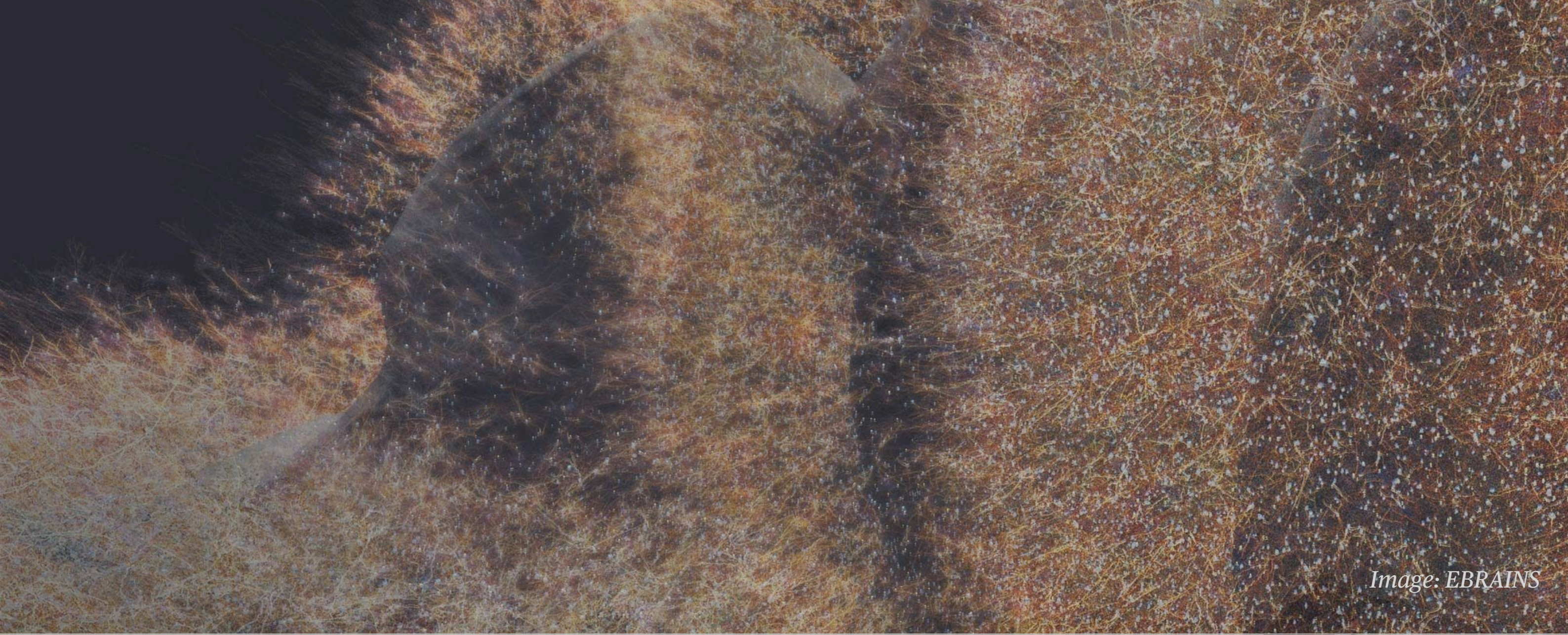

Image: EBRAINS

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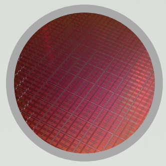
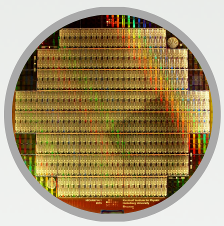


HBP INNOVATION

BRAIN INNOVATION NEWS AND HIGHLIGHTS



UPM Innovation Team

BOOSTING BRAIN RESEARCH INNOVATION: *NOW* IS THE TIME TO ACT!

While brain research has been at the centre of innovation efforts for many years, the time is ripe to shift gears: several key factors are indeed converging to boost the level of innovation ambition.

The first one is the increasing societal demand for brain research innovation. Not only has the Covid pandemic significantly raised major mental health issues, it has also made citizens much more aware of the importance of *brain well-being*, which has become a key part of their "return-to-normal" journey. Demand for improved and more effective diagnosis, monitoring, prevention, treatment, care and support is expected to be increasing significantly in the coming years.

The second one is the wealth of data at our disposal. "Big data", combined with massive computing power, can play a transformative role in brain research innovation, if data is used in rigorous, statistically relevant, responsible and ethical ways. Turning data into innovation is a key challenge several research and start-up teams are tackling successfully.

In addition, and not surprisingly, technology and artificial intelligence have been opening many new doors in different domains and this is certainly the case in brain research. One just needs to think about how sensors and imaging technology have recently progressed to enable better insights into the brain.

Last but not least, all brain innovation stakeholders have become aware of the necessity for enhanced collaboration to achieve their goals. Brain research collaboration needs to expand across countries, across brain diseases, across stakeholders, across disciplines, combining neuroscience with computing, engineering and technology expertise and between academia and industry.

All these converging elements are creating an environment conducive to innovation and new discoveries. We trust this will further enhance the determination of all stakeholders, from academia, to policy makers, industry and start-up companies to leverage the full potential of today's opportunities. Now is the time to act and they can all count on EBRAINS, the Human Brain Project's Research Infrastructure, to put everything in place to help them in their quest and enable brain research advances.

Bringing innovation to society and to patients is our shared goal !

France Nivelle

Human Brain Project
EBRAINS - Chief Communication
and Content Officer

Image: Russ Juskalian

SECOND HBP INNOVATION AWARD FOR MARCELLO MASSIMINI AND THE PCI TEAM

Presenting the interview with the HBP scientist Marcello Massimini, winner of the second Innovation Award together with the PCI team of the University of Milan and the Coma Science Group of the University of Liege for their work on the Perturbational Complexity Index (PCI)

What is the clinical problem addressed and the advantages of the solution provided?

Disorders of consciousness (DOC) after severe brain injury affect more than 1 million people worldwide each year and present a formidable diagnostic challenge. Typically, the level of consciousness in these patients is assessed based on their ability to connect to the surrounding environment and produce appropriate motor responses. A patient that reacts to different inputs, i.e. sensory stimuli and verbal commands, with complex motor outputs that are specific and reproducible is conscious, whereas a patient that remains unresponsive or only shows automatic behaviors is declared unconscious. This behavioural input-output approach at the bed-side by a trained observer currently represents the gold-standard for assessing the presence or absence of consciousness in hospitals and rehabilitation centres.

Image: Russ Juskalian

Yet it suffers from fundamental limitations. First, because consciousness can be entirely generated within the brain, even in the absence of any input-output interaction with the external world; this occurs almost every night, while we dream or during certain forms of anesthesia.

> "In practice, failure to detect consciousness through the typical input-output paradigm results in a high rate of misdiagnosis"

Second, because brain injury can result in severe blockage of sensory and motor functions leading to conditions in which a brain might be conscious but disconnected and not accessible from the world outside. In practice, failure to detect consciousness through the typical input-output paradigm results in a high rate of misdiagnosis (estimated between 20% and 40%), and represents a burden for caregivers and families, as well as an ethical challenge and a major hurdle for rehabilitation strategies.

The Perturbational Complexity Index represents a strategy to overcome this problem. In a nutshell, the idea is that, instead of judging consciousness by the complexity of behavior, one should bypass sensory inputs and motor outputs to directly measure the internal dynamic complexity of the brain to a brief perturbation. Now, we have developed techniques and algorithms to perform this kind of measure at the bedside of patients, and they show an unprecedented sensitivity in detecting consciousness.

Can you describe the equipment, the technology and the software solution involved?

Put simply, the technology works like this: we give the cerebral cortex a knock and then quantify the spatio-temporal complexity of the cause-effects chain triggered by this initial perturbation at the whole-brain level. That initial knock or zap is delivered via transcranial magnetic stimulation (TMS), a technique that activates a local population of cortical neurons in a non-invasive manner, through the skull. For perturbations to be controlled and reproducible, we use SmartFocus® TMS, a navigation system developed by the Nexstim company that enables surgical-degree precision targeting based on the online view of stimulating electro-magnetic-field superimposed onto the 3D reconstruction of the patient's MRI. Then, we use a 60-channel EEG system to record the overall brain response, which typically lasts for a few hundred milliseconds; this post-zap electrical echo is the signal of interest. Taken in isolation, TMS, navigation systems, and EEG amplifiers - have been around for decades;

what is novel is the integration of state-of-the-art systems and their optimization for obtaining high signal-to-noise EEG responses to controlled cortical perturbations.

The other key element of novelty is how we analyze this internal brain echo, to compute its complexity and extract an index of consciousness. Indeed, this represents an interesting example of how concepts from theoretical neuroscience can be directly translated into a number that doctors can use at the bedside. Back in 1998 Tononi and Edelman proposed in an article in Science that consciousness depends on the brain capacity to sustain complex patterns of interactions that are both integrated (due to tight causal interactions among neurons) and differentiated (rich in information). To translate this concept from theory to practice, we quantify the information content of the causal chain triggered in the brain by the targeted TMS zap by applying a classic compression algorithm (Lempel and Ziv), normally used to zip files. In the end, this "zap and zip" procedure yields a number, the so-called Perturbation Complexity Index (PCI), that is high for spatiotemporal patterns that are both integrated and differentiated, and low for brain responses that are either local (low integration) and/or stereotypical (low differentiation) such as those that occur during deep sleep, anesthesia and coma. Theoretical neuroscience aside, what is most exciting about all this is that PCI works extremely well when tested in real-life conditions.

"PCI is unique because it allows detecting recovery of consciousness with unprecedented sensitivity"

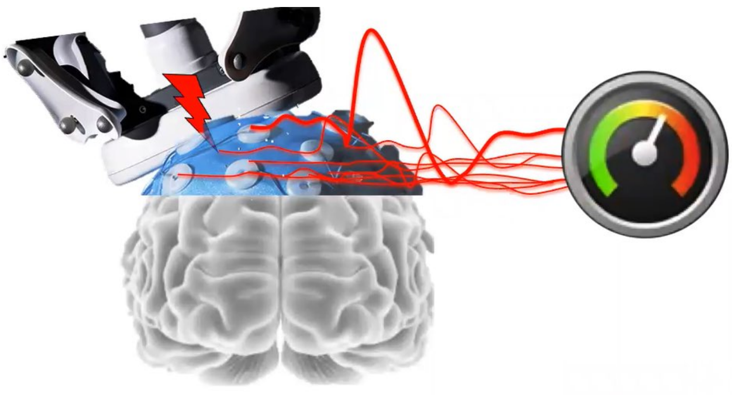


Image courtesy of: Marcello Massimini.

How is the technology positioned in relation to other trends and solutions in the area?

In principle, this technology differs from other measuring approaches because it bypasses sensory inputs and motor outputs and because it combines perturbational measures of causality with measures of information in a single number. In this perspective, it clearly diverges from classic approaches based on sensory-evoked potentials, spontaneous EEG, and commercial consciousness monitors, such as the Bispectral Index. In practice, PCI is unique because it allows detecting recovery of consciousness with unprecedented sensitivity, even in challenging conditions. Over the last 15 years, we have been testing its performance in collaboration with different centers - the University of Wisconsin in Madison, the Coma Science Group in Liege, Fondazione Don Gnocchi in Milan and the Research Center of Neurology in Moscow - in hundreds of patients, spanning all the clinical conditions that follow coma. Here, PCI affords a sharp and reliable stratification of patients, even in the grey zone represented by subjects with little or no behavioral output. For example, when compared to other techniques, PCI shows the highest sensitivity (94% vs 14-70%) in detecting minimally conscious patients and it allows revealing recovery of consciousness in patients that would be otherwise declared in a vegetative state (also called unresponsive wakefulness syndrome), an astounding 1 out of 5 such patients. Such reliable detection occurs also when other solutions fail, such as when sensory evoked potentials are absent/inconclusive or when the spontaneous EEG is severely abnormal.

How was the innovation conceived and by whom? We would like to know the role played by HBP in this conception.

The initial idea was conceived almost 20 years ago when I visited Giulio Tononi in Wisconsin. I was interested in measuring how communication within the brain changes between wakefulness and sleep and he was working on a theory suggesting that the complexity of these interactions is a basic substrate of consciousness. The first time we met, we both pulled out of our backpacks the same paper: the first report by Risto Ilmoniemi, now Distinguished professor at Aalto University, showing that measures of cortico-cortical communication were technically feasible by combining TMS and EEG. We took this serendipity quite seriously and immediately contacted Nexstim, at the time a newborn spin-off company out of Helsinki, Finland, asking them to test their first prototype of TMS-compatible EEG amplifier. Subsequent experiments in sleep and anesthesia showed that idea was very promising. Then, a fantastic group of HBP partners, Steven Laureys, Olivia Gosseries and Melanie Boly at the University of Liege and Mario Rosanova, Silvia Casarotto, Adenauer Casali and Simone Sarasso at the University of Milan successfully applied the approach to patients emerging from coma. From SGA1 to SGA3, the team was able to further refine measurements and to validate them in larger cohorts of patients. Here, a key role was played by Fondazione Don Gnocchi in Milan, which opened a new brain injury division where PCI is used as a routine exam under the supervision of dr. Angela Comanducci. Yet, the contribution of HBP went well beyond support to algorithm development and clinical validation; thanks to a coordinated consortium effort, PCI has been explored across scales and models, from cortical slices (Mavi Sanches-Vives) to rodents (Johan Storm and Mavi Sanches-Vives), intracranially in humans (Andrea Pigorini) and in computer models (Jennifer Goldman and Alain Destexhe). Such a thorough multiscale exploration is rather unique for a bedside clinical index, a truly translational approach that can provide a solid mechanistic background to medical decisions.

> *"The contribution of HBP went well beyond support to algorithm development and clinical validation"*
>
> MARCELLO MASSIMINI - HBP SCIENTIST

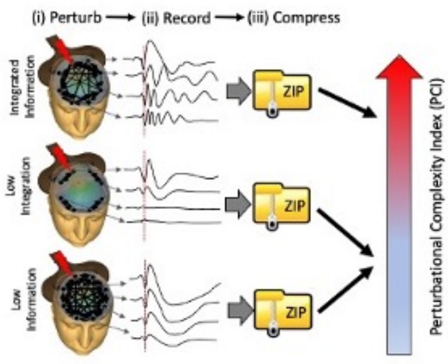
*Click the button to watch the video of the Scientist Marcello Massimini at the **HBP** Summit Innovation Award Ceremony*

Could you summarize what have been, in general, the most important technical difficulties and barriers found?

The first technical challenge has been managing and minimizing the EEG artifacts produced by the magnetic pulse. TMS injects for a fraction of millisecond tens of volts onto the EEG electrodes, enough to saturate the amplifier and obliterate brain responses for tens of milliseconds. This was solved by adopting EEG amplifiers with special circuits, a wide dynamic range and EEG caps with special electrodes. The second challenge was controlling the strength of the initial impact of TMS on cortical neurons. With TMS, the brain can be stimulated with a huge combination of parameters (location, angle and intensity of the stimulating electric field) and not all of them are effective in eliciting the high signal-to-noise responses needed to compute PCI. Together with the research and development team at Nexstim, we solved this problem by a combination of strategies. First, by maximizing a priori information about the cortical target, using individual MRIs and neuronavigation that enable the stimulating electric field targeting with accurate and reproducible TMS pulse delivery. Second, by developing an EEG-based data visualization software that allows the operator to titrate stimulation parameters in real time to attain the desired level of initial neuronal activation. Third, by developing new hardware solutions to maximize the effects of the TMS pulse on the cortex.

Are there companies involved?, What kind of further technical development are you undertaking towards commercialization?

Yes, as I said, a constant collaboration with Nexstim has been pivotal since the start of this endeavour. Now, we are at a stage where we are testing a brand new TMS-EEG prototype that has just been shipped from Helsinki to Milan. The machine implements in a compact package all the features that I have described above. Although the precise nature of the technical solutions are covered by a non-disclosure agreement, I can say that this prototype clearly goes in the direction of transforming TMS-EEG from an investigational device into a user-friendly clinical tool. In essence, we have turned this electromagnetic perturb-and-



measure approach into a tool akin to ultrasound echography (the size is also similar), whereby the operator holds a (magnetic) probe in his hands and performs accurate measurements via an informative readout (the electrical echo of the brain). The expectation is that, thanks to effective probes, real-time readout and training, this electromagnetic probe will become standardized to the point of supporting routine clinical evaluations, just like echography.

How will you standardize and disseminate this approach? Are you planning a clinical trial?

Indeed, we are devoting most of our current efforts towards standardization and dissemination. The goal is to extend testing of TMS-EEG and PCI beyond Milan, Liege and Moscow and to involve other European and US-based institutions. In Europe, we plan to provide normative data, analysis tools and training services to both researchers and clinicians with the coordination and support of the EBRAINS infrastructure. In the US, we are starting a large multicentric study. Here, thanks to the support of the Tiny Blue Dot Foundation, a Santa Monica based Foundation, TMS-EEG devices have been shipped to Massachusetts General Hospital (Dr. Darin Dougherty and Dr. Brian Edlow), to the Department of Psychology and Neurosurgery at UCLA (Dr. Martin Monti), the Medical University of South Carolina (Dr. Mark George) and the Department of Neurology of the University of Wisconsin (Dr. Melanie Boly). After some delay due to the pandemic, data acquisition has started, and these centers are now applying for NIH support and are connecting to the FDA to set up a clinical trial. Clearly, this whole process will take some time, but we are already at a stage where training, protocols, equipment and data acquisition are defined and standardized.

"We plan to provide normative data, analysis tools and training services to both researchers and clinicians with the coordination and support of the EBRAINS"

HBP members and HBP Partnering Projects can already submit candidates for the third edition of HBP Innovation Awards, all you need to do is to fill in this template and send it to:

innovation@humanbrainproject.eu

You can find more information at the HBP Innovation Awards website

Have you explored any venture capital (or similar) investing options to get funding?

Besides HBP, we have received so far significant support from, the Tiny Blue Dot Foundation (TBD) that has been fundamental in financing the development and distribution of the current TMS-EEG prototypes. In the near future, the goal is to find investors that are motivated in supporting the development and certification of a commercial version of the device that is ready for hospitals and rehabilitation centers. Along these lines we have started a coordinated state-of-the-art analysis of the European market in coordination with the HBP Innovation Team led by Gonzalo León and with Guillermo Velasco. Parallel explorations are being made in the US by Zeinab Barati, an expert in the exploitation of clinical research, with the support of the Tiny Blue Dot Foundation. In the previous development of the navigated TMS technology and these current projects, an active role is played by Henri Hannula, Vice President, International Sales and Marketing at Nexstim, through the European and the US-based branches of the company.

What is the market potential of the technology? Can you foresee applications beyond the field of disorders of consciousness?

Disorders of consciousness (DOC) are the source of intense burden on caregivers and patients' families, due to the high cost of life-sustaining therapy, rehabilitation, and diagnostic/prognostic uncertainties. Given the prevalence of these disorders (about one million patients/year worldwide) this can be considered as a relatively small niche, but we expect that successful clinical application in this field will make a significant difference and be the entry point towards the broader domains. Along these lines, two TMS-EEG studies published last year in Brain (one by the Milan/Liege team and one by the group of Dr. Christian Grefkes in Cologne) have shown a local reduction of perturbational complexity in the perilesional cortex of stroke patients, which predicted functional impairment and subsequent recovery. Hence, it is likely that TMS-EEG and PCI-like applications may turn out to be valuable in a much larger population of patients with focal brain injury. Indeed, in this clinical field there is an urgent need for reliable electrophysiological readouts to guide rehabilitation and neuromodulation. In general, this kind of standardized real-time readout from the brain status may also help clinicians titrate TMS-based neuromodulation therapies in larger groups of patients who have decreased or altered cortical reactivity (e.g. due to depression or neuropathic pain).

Sensitivity level of PCI to detect minimally conscious patients

94%

"Indeed, in this clinical field there is an urgent need for reliable electrophysiological readouts to guide rehabilitation and neuromodulation"

1 MM

patients worldwide are affected by disorders of consciousness after severe brain injury

Click below to watch the interview of the first Innovation Award winners

Viktor Jirsa and Jean Marc Ferrier, CEO of VB-Tech (Virtual Brain Technologies)

Image: Rawpixel- Freepik

THE MIP

Analysis of its Technological Exploitation and Scope in the Healthcare Industry

The Medical Informatics Platform (MIP) is a federated digital structure powered by artificial intelligence algorithms and statistical tools, conceived within the HBP/ EBRAINS infrastructure for exploration, analysis and sharing of clinical information stored in dozens of hospitals and associated organisations internationally (31 Hospitals currently). The technology originates from the need of the neuroscience community to acquire and share data with the highest possible quality and accuracy, commonly found heterogeneously in Hospitals, to reduce the problems that arise in the prevention, diagnosis and treatment of specific neurological and psychiatric disorders.

One of the great advantages of using this platform lies in avoiding exposing or transferring sensitive patient information, through a previous anonymization process, preserving the quality of their data. To this end, four main levels have been structured (1): A front-end portal in which the medical researcher explores the available algorithms on the previously integrated hospital data, a Federated level in which analysis requests from the portal are derived and executed over various centres, a local level available for internal exploration from hospitals and finally the MIP's Data Factory that provides data to the platform.

> *"Potential users and the possibility of establishing a related spin-off in medium-term were identified in the report in relation to these groups"*

In the image below, the most valuable outputs of this structure are simplified, in relation to its current *technology features* and *customer service values*, functions that constantly evolving as a result of the demands of the associated medical service, i.e., its main lead users. Furthermore, other potential users and the possibility of establishing a related spin-off in medium-term were identified in the report in relation to these groups.

The MIP as a research platform was ambitious from its beginnings, foreseeing the emerging demands in terms of data privacy and AI in the medical sector

Neurotechnologies need constant transformations to prevail in industry, to offer accurate therapies based on the data obtained, to promote minimally invasive interventions and to maintain its position in a strictly regulated sector, no longer submerged in gigabytes but in zettabytes (2) of medical information, data which is increasingly susceptible to privacy breaches. In this respect, the MIP as a research platform was ambitious from its beginnings, foreseeing the emerging demands in terms of data privacy and AI in the medical sector, integrating as far as possible into their catalog of machine learning algorithms. In our report, it was possible to contrast its current specifications with the solutions offered by other related platforms through a comparative matrix, which allowed, among other aspects, to offer possibilities for software improvement, and to identify marketing strategies, including alliances and collaborations with other groups considering associated risk and benefits.

Privacy-preserving solutions have acquired greater momentum in industry in recent years, also combining with new projects and cutting-edge technologies such as blockchain and federated learning, opening space for the incorporation of participants with greater bargaining power, both because of their experience in the healthcare field and their historical data, as well as for the practicality of its solutions, and that together are part of the global ecosystem of federated learning. Some of

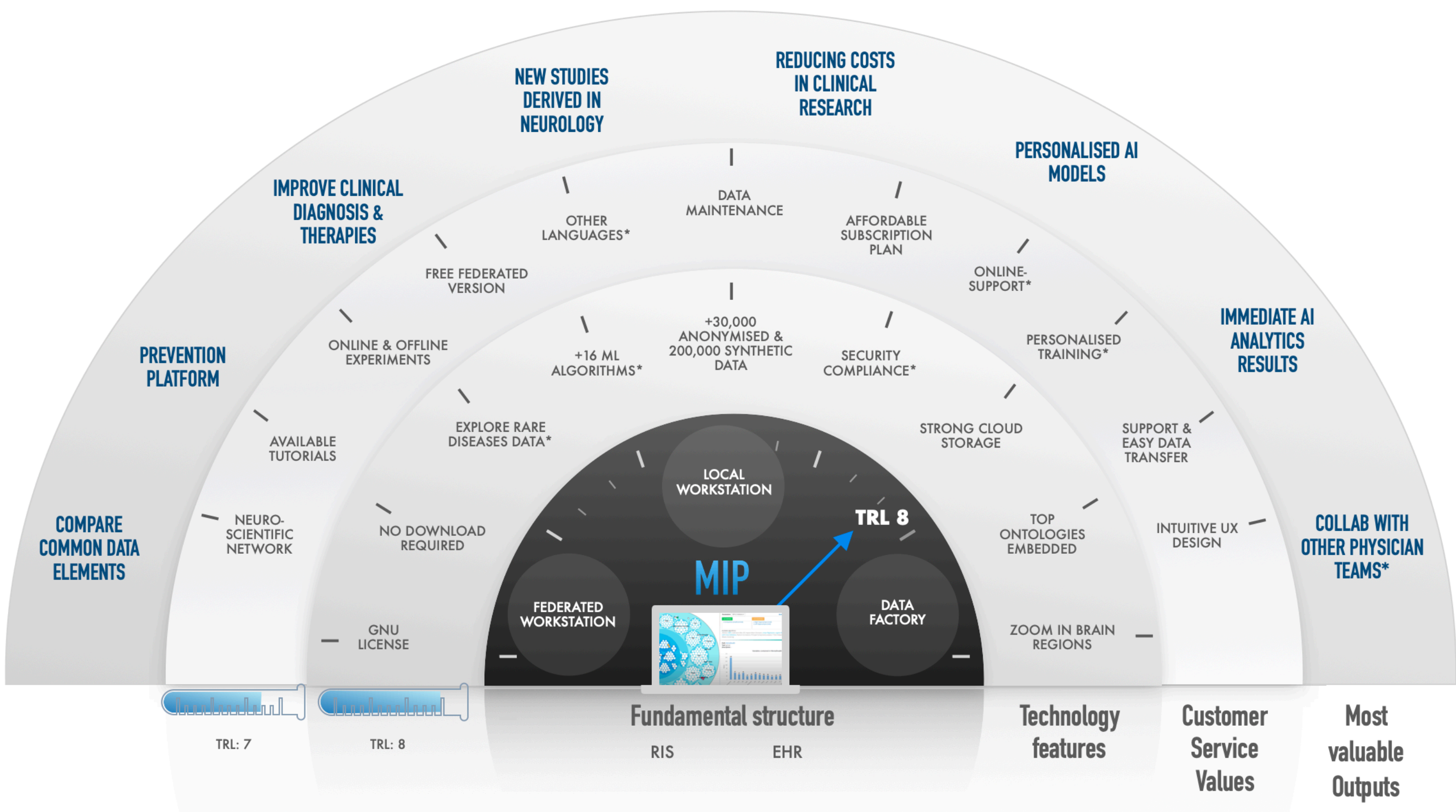


Image: "MIP Identified Outputs". Duran, T., León, G., Velasco, G., Strange, B. (2021)

these participants have been identified in our report (3) and analysed on a strategic and business perspective, in order to clarify with real cases the possibilities of technological exploitation in the current scenario. Finally, after an exhaustive comparative analysis with other start-ups and emerging projects, a SWOT matrix was constructed, also of interest for neurotechnology leaders, investors, and researchers in and outside HBP/EBRAINS.

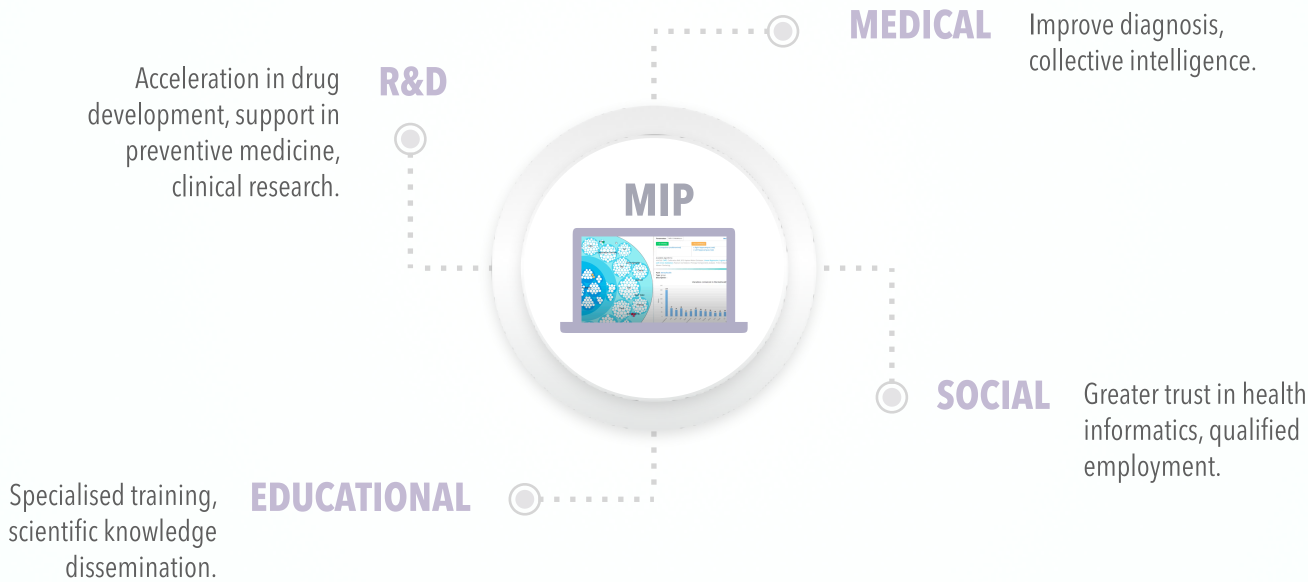


Image: "Summary of positive impact from MIP".
Duran, T., León, G., Velasco, G., Strange, B. (2021)

Upcoming Market Analyses
2nd Semester 2021

- (Medical Informatics Platform).
- HBP-EBRAINS services for Pharmaceutical industry & neurotechnologies.
- NEST Desktop Simulation Tool.
- HBP-EBRAINS Brain Atlases.

References:

(1) Demiraj, A., Karozos, K., Spartalis, I., & Vassalos, V. (2019, June). Meta-data management and quality control for the medical informatics platform. In Proceedings of the 23rd International Database Applications & Engineering Symposium (pp. 1-9).

(2) Sabharwal, S. Gupta and K. Thirunavukkarasu, "Insight of big data analytics in healthcare industry," 2016 International Conference on Computing, Communication and Automation (ICCCA), 2016, pp. 95-100, doi: 10.1109/CCAA.2016.7813696.

(3) Duran, T., León, G., Velasco, G., Strange, B. (2021), "The Medical Informatics Platform (MIP): Analysis of its technological exploitation and scope in the healthcare industry."

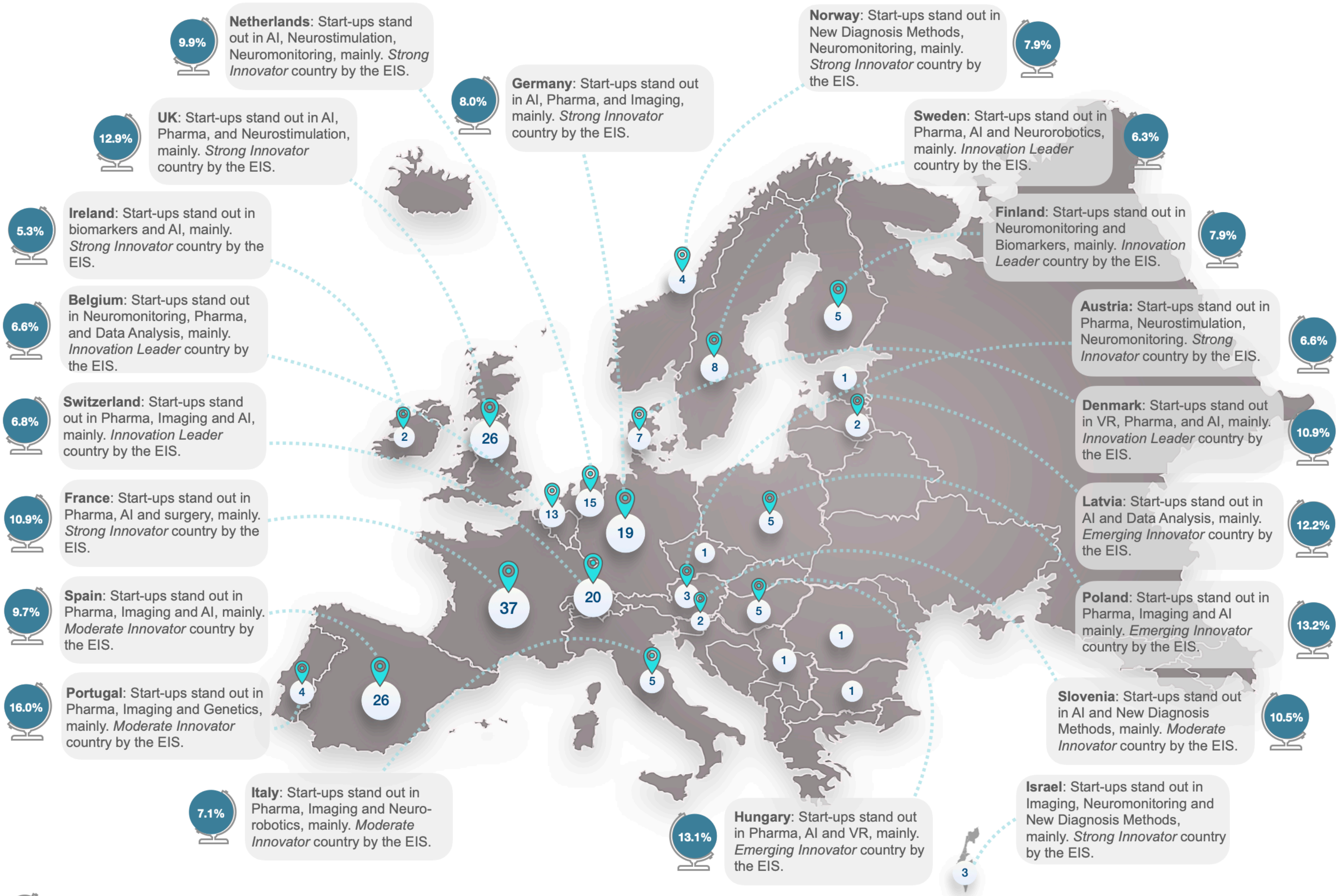
WHERE IS EUROPEAN BRAIN INNOVATION HAPPENING?

Image: Shutterstock

The European start-ups analysed seem to be immersed in continuous transformation at organizational, economic, and/or strategic levels. Keep reading to find out the details

During the last two years, national and European authorities are demonstrating an increasing interest in supporting entrepreneurship initiatives, especially when they imply the generation of technological spin-offs and/or start-ups. Aligned to the *Small and medium-sized enterprise (SME) strategy of the European Commission*, there are remarkable policy actions that aim to stimulate the growth and consolidation of young businesses. *Startup Europe*, for instance, is an initiative that aims "*to connect high tech start-ups, scaleups, investors, accelerators, corporate networks, universities and the media*". It includes programmes like the *EU Startup Nation Standard,* with a focus on helping entrepreneurs to setting up a company and expanding it internationally. *Startup Europe* also hosts the *Innovation Radar*, which is the EC data-driven instrument to locate high potential innovations emerging from EU-funded R&I projects. The *Digital Innovation and Scale-up Initiative* (DISC), in addition, is a geographically oriented action that seeks to reduce the market gap between the central, eastern, and south-eastern Europe (CESEE) regions and the innovators operating in other European places.

In this context, the Human Brain Project is putting in place a program, which is being conducted by the HBP Innovation team during



The Enterprise Birth Rates reflect the new companies created as a proportion of the total number of active companies. For the EU the ratio was 9.7% in 2018. Eurostat (2021)

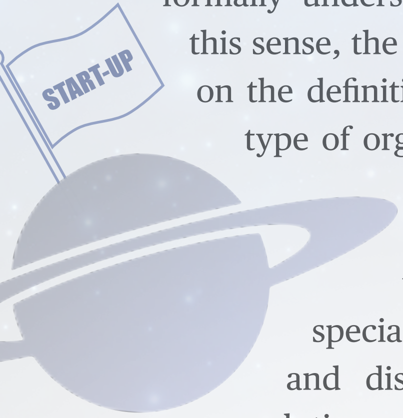
The European Innovation Scoreboard (EIS), as a framework to compare innovation performance between European countries.

Description: 216 start-ups have been analysed in the report "Where is European Brain Innovation Happening?", Velasco et al, 2021

the project period 2012-2023, that tries to mobilise brain-technology start-ups around the services offered by the research infrastructure EBRAINS. An effective connection of this type of actors to HBP should help to progressively build a critical mass of users that guarantees the sustainability of the infrastructure beyond 2023. In particular, the initiative implies the organization of participatory *solution-workshops* between selected start-ups and HBP leader scientists. A dynamic dialogue with these companies is essential for HBP to gain visibility and demonstrate in a practical and straightforward manner, the full potential of the developed tools and services.

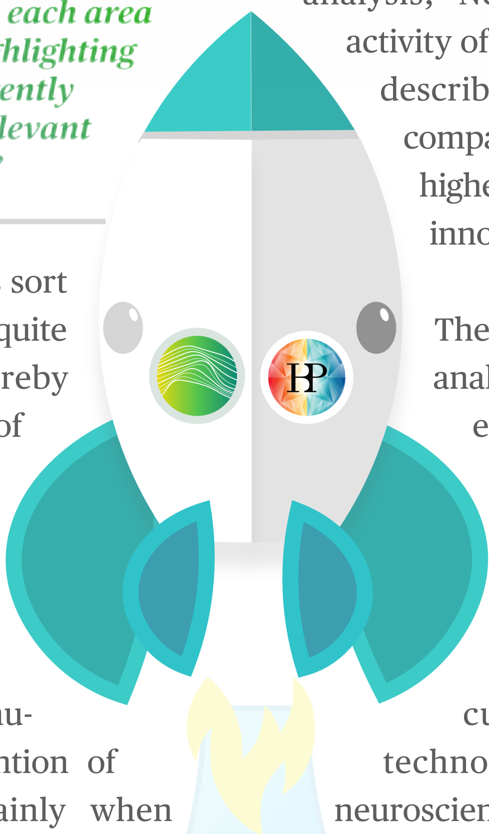
As background material and empirical evidence for the program, the UPM has analysed and mapped where European brain innovation is happening in practice. The analysis, which should also serve as supporting material for further action plans and engagement decisions, concisely presents the results of an intense searching, mapping, and classification process on European start-ups actively working in different regional areas and scientific fields of the brain-technology domain. The map in this section presents the geographical location of the 213 start-ups analysed, being the age of these companies (less than 10 years) a filtering variable of the analysis. Remarkably, there is not a clear consensus in Europe on what should be

> *"As background material and empirical evidence for the program, the UPM has analysed and mapped where European brain innovation is happening in practice"*



formally understood as a 'start-up'. In this sense, the report drafts some lines on the definition and profiling of this type of organization, showing that these firms generally present a strong culture of innovation, with special emphasis on radical and disruptive solutions. The solutions provided by these companies normally have as well a strong technological dimension. As the age of these small companies is often less than 10 years, the European start-ups analysed seem to be immersed in continuous transformation at the organizational, economic, and/or strategic levels. Because of their youth and small size, these companies are also subject to very quick changes, instabilities, and exponential growths. Management decisions are taken rapidly and changes are adopted with high levels of flexibility.

"The activity of the start-ups in each area has been precisely described, highlighting those companies that are currently showing the highest and most relevant advances and innovations"



A very common problem that this sort of company must also face is the quite limited access to capital, thereby leading to the common practice of utilisation of personal financial resources. Related to this, these companies also tend to use big players' endorsements, recognitions, and awards as a practical and convincing way of communicating and capturing the attention of investors. In parallel, and mainly when making strategic decisions, they are very frequently - and often informally - supported by business advisors or elite scientific boards. Some strengths found in European brain start-ups include the usability and versatility of their tools, the solidness of some partnership agreements, and their effective academic relations and professional connections. On the other side of the coin, they need to struggle with problems related to existing and competing alternative tools, the low visibility of their products, the size of their staffs, and their rather weak marketing and communication activity. These and other reflections on the characteristics of the European start-ups, and discussions about their innovation performance, can be found in the report.

The analysis has been structured along twelve technology areas, which have inductively emerged from the data: Neuropharma, Artificial Intelligence, Neuromonitoring, Neuroimaging, Neurostimulation, New diagnosis methods, Biomarkers, Virtual reality, Neurorobotics, Data analysis, Neurosurgery, and Genetics. The activity of the start -ups in each area has been described in detail, highlighting those companies that are currently showing the highest and most relevant advances and innovations.

The report complements the mapping analysis with a very practical matching exercise, trying to find evidence that the activities of European brain start-ups are already well aligned with the EBRAINS services offer, and compatible with the HBP ambition of putting in place cutting-edge tools that facilitate technology advances in the fields of neuroscience, neurocomputing, and brain-disorders medicine.

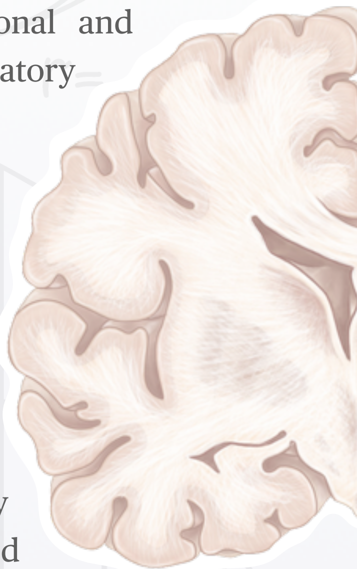
(1) https://digital-strategy.ec.europa.eu/en/news/sme-strategy-launched-european-commission;
(2) https://digital-strategy.ec.europa.eu/en/policies/startup-europe; (3) https://digital-strategy.ec.europa.eu/en/policies/startup-europe;
(4) https://www.innoradar.eu/; (5) https://digital-strategy.ec.europa.eu/en/news/launch-digital-innovation-and-scale-initiative-disc

CALL: A COMPETITIVE HEALTH-RELATED INDUSTRY (2022)* SETTING UP A EUROPEAN ELECTRONIC HEALTH RECORD EXCHANGE FORMAT (EEHRXF) ECOSYSTEM

Applicants should propose activities in all of the following areas:

Building on the outcomes of activities and projects related to the EEHRxF Recommendation, establishing and sustaining a scalable public infrastructure for digital health innovation based on the EEHRxF principles and the functional and technical specifications of its information domains (i.e. laboratory results, medical imaging, discharge letters, etc.).

Demonstrating feasibility of real-life interoperable digital solutions for use by individuals, researchers, health services and the workforce across borders in the EU Digital Single Market by leveraging the above EEHRxF-based infrastructure. Omics type of information associated to the use and exchange of health datasets and artificial intelligence should be strongly considered with special regard to analysis and corresponding further health-related data.

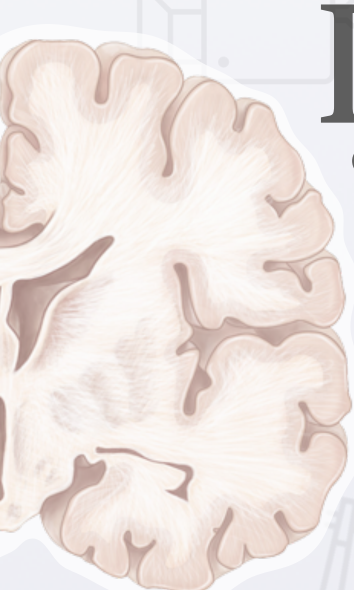


Deadline date: 21 April 2022. *More info* ***here***

CALL: STAYING HEALTHY* – TRUSTWORTHY ARTIFICIAL INTELLIGENCE (AI) TOOLS TO PREDICT THE RISK OF CHRONIC NON-COMMUNICABLE DISEASES AND/OR THEIR PROGRESSION

Proposals should address all of the following:

Leverage existing high-quality health-relevant data from multiple sources (i.e. cohorts, electronic health records and registries, taking into account the individual's genotypic/phenotypic, medical, life-style, socio-economic, behavioural data etc.) and/or generation of new high-quality health data necessary for the rigorous development of the AI disease-risk tools.

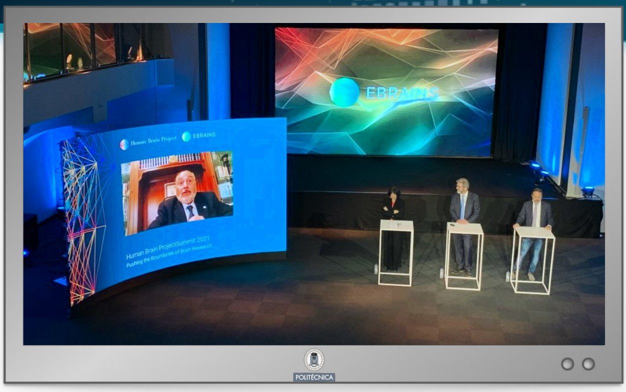


Develop the criteria to assess the effectiveness of the AI tools for disease risk assessment in terms of improving health outcomes and enabling personalised prevention strategies.

Deadline dates: 01 February 2022 and 06 September 2022. *More info* ***here***

*(1) *(HORIZON-HLTH-2022-IND-13);* (2) (TWO STAGE - 2022) (HORIZON-HLTH-2022-STAYHLTH-01-TWO-STAGE)

THE HBP INNOVATION TEAM AT THE SUMMIT



As most of you already know, the HBP Summit took place last October, from the 12th to the 15th. Due to COVID-related restrictions, the event had to be organized in hybrid format, with only some physical presence in Brussels. As for the participation of the HBP Innovation team, we would like firstly to highlight the exceptional welcome of the first edition of 'Innovation Awards', whose ceremony was really pleasant and warm. The first two Innovation awards went to two brilliant HBP leading scientists and their respective teams: Professors Viktor Jirsa - for the Virtual Epileptic Patient solution -and Marcello Massimini - for the Perturbational Complexity Index innovation. The session was chaired by Professor Gonzalo Leon and Ms. France Nivelle.

As a second contribution to the event, the HBP Innovation team delivered a very interesting and practical parallel session, "Broadening Horizons with Brain Market Analyses", which aimed at shedding some light on the usefulness of market analysis to identify commercial opportunities of mature technologies and boost their introduction into the scientific and industrial markets. The session, chaired by Dr. Guillermo Velasco, also included the description of two practical examples, "The Medical Informatics Platform (MIP): Analysis and options for its exploitation in Healthcare", presented by Ms. Teris Duran, and the "Human Brain Project/EBRAINS tools for Pharmaceutical Industry" , presented by Dr. Roman Kireev.

HUMAN BRAIN PROJECT

León, G., Velasco, G., Strange, B., Kireev, R., Gasset, B., Beltrán, A., Duran, T., Beltrán, B., Chrayah,.M