

StartUP⁷ Stories

StartUp Stories – Dr. Johannes Lang and Prof. Justus Marquetand – founders of Cerebri GmbH

EEGs for anyone, anywhere

(Stuttgart/Tübingen) – Neurologists Prof. Justus Marquetand and Dr. Johannes Lang set up Cerebri GmbH in Tübingen, with the aim of making specialist electroencephalograms (EEGs) available to all patients. An EEG is an important test that is used for differential diagnosis in cases of unexplained impaired consciousness, epilepsy and dementia, for example. However, specialist expertise and a great deal of experience are needed to interpret the EEG waveforms that map brain activity – and small hospitals in particular do not have sufficient qualified staff to perform this complex analysis. The team at this new startup in Tübingen offers a fast, remote diagnosis service by experts. If required, the doctors responsible for treating the patients can be given additional advice and support, and the provision of user-friendly EEG systems can also be arranged. Thanks to this combination of a user-friendly system and cloud-based telemedicine analysis, it takes mere minutes to use the diagnostic solution, even at sites where there is no in-house EEG specialist. The test results can be made accessible to anyone (patients, GPs, etc.) anywhere (doctor's surgery, at home, etc.) – naturally all in compliance with data protection legislation. The story of Dr. Lang and Prof. Marquetand is just one of many successful StartUp stories in the STERN BioRegion.

It's another normal day in A&E. An unconscious young woman, who is 25 weeks pregnant, is rushed in with a suspected epileptic fit. She cannot be given a CT scan due to the risk of radiation exposure, and an MRI scan is not readily available. An EEG would be the quickest and simplest risk-free method of diagnosing her condition. Invented over 100 years ago, an EEG offers a way of mapping the electrical activity of the human brain. However, not all hospitals in Germany actually offer this service. A great deal of experience is needed to analyse the "brain waves", which consist of many

different wave patterns. The progression of these waves provides information about nerve cell activity in one of the various areas of the brain. Dr. Johannes Lang and Prof. Justus Marquetand set up Cerebri GmbH in order to make this completely painless and safe test available to all. Working in collaboration with medical technology partners, they are developing new EEG caps that even non-specialists can put on patients' heads. That's not all, though. More importantly, they are working on a telemedicine service that enables specialists to provide a quick diagnosis remotely, with the help of AI.

The idea – how did the startup come about?

Dr. Lang and Prof. Marquetand first met at an epilepsy conference. The doctors were already focusing intently on epilepsy – Dr. Lang at the Epilepsy Center of University Hospital Erlangen and Prof. Marquetand at the Clinic of Neurology at University Hospital Tübingen. “We were both very active in hospitals and the scientific community – and people who keep themselves very busy are bound to come across each other sooner or later,” Prof. Marquetand recalls. It was when they were talking about their work that the two neurologists realised they shared not only the same enthusiasm, but also the same frustrations. “We’ve worked in centres – what you might call “ivory towers” of epilepsy diagnosis – where we spent many hours dedicated to interpreting results. We also drew on our expertise to train other specialists,” Dr. Lang explains. “However, during our consultation work away from our respective centres, we realised that, in many German hospitals – especially at weekends or during the night – it is almost impossible to have an EEG conducted or the results interpreted properly,” he continues. Both doctors had similar ideas – separately in the first instance – about how to resolve this issue and realised that their shared ideas could lead to a startup company. “We held many discussions, including with other startups and specialists, such as from BioRegio STERN Management GmbH,” Prof. Marquetand says. “Our vision right from the outset was to give everyone 24/7 access to a serviceable diagnostic EEG and expert interpretation of the results. We therefore decided to cut right down on our clinical and research work so we could set up Cerebri GmbH. That meant taking quite a risk.” However, their idea proved a hit right away, winning second place in the 2023 Science2Start ideas competition. The decision to base Cerebri in the STERN BioRegion was an easy one. “Tübingen is the perfect choice for us. The

infrastructure is outstanding and, in terms of AI, we also have excellent links with Cyber Valley here in Tübingen,” Dr. Lang explains.

The need – who benefits from the idea?

Around two million EEGs are carried out in German hospitals each year, although Prof. Marquetand estimates that at least twice that number are actually needed. After all, EEGs are not only performed on epilepsy patients – they are also used on dementia and coma patients and for differential diagnosis in cases of unexplained impaired consciousness. However, Dr. Lang’s concern is that EEGs are only conducted when suitable specialist staff are available nearby. “When a hospital conducts an EEG, the results cannot be accessed by an expert who is not on site. There are no interfaces, so there is no option for sharing the information that is stored locally on a PC. In reality, because important diagnostic and therapeutic decisions often depend on the results, doctors resort to printing out EEG waveforms or taking photos of them with their smartphones and then sending them to other doctors. This happens hundreds of times a day in Germany, even though it’s obviously a no-go from a data protection perspective.” Given that the digitalisation of the healthcare sector is moving so slowly, this poses a major, and sometime even life-threatening, issue for patients – and it is precisely this problem that Cerebri aims to resolve. “An EEG is a neat and simple technology that makes it possible to assess brain function in real time and monitor the effects of treatment. What’s going on in this patient’s brain right now? Why is the patient not regaining consciousness? Has a particular region of the brain stopped working? We want to make it possible for pretty much anybody to access EEG diagnostics in next to no time while also saving on resources and costs.” In addition to improved availability, especially in regions that lack infrastructure, the two founders of Cerebri believe there is high savings potential in relation to transfer and treatment costs in medical practices and hospitals. What’s more, in times of staff shortages, telemedicine offers an ideal opportunity for sharing the expertise of highly qualified specialists across an entire region of Germany, as it enables these medical experts to work from home.

The USP – what is the innovation?

Of course, the two founders have no intention of reinventing the EEG. What they are keen to do, though, is to make the established – and, in their view, underrated – test

method standard in the healthcare sector. The two doctors are working with medical technology engineers to develop new EEG caps, with the aim of making the EEG of the future as simple as an ECG is today (a modern smartwatch can take an ECG). “Normal EEG caps are very tricky to manipulate. Even experienced staff need several minutes to position the cap and its many electrodes on the patient’s head correctly,” Prof. Marquetand explains. “However, in the near future, anybody should be able to set up an EEG, even without any prior knowledge.” The second innovation is the interface for data and results. Nowadays, when a patient goes to a radiologist, they get a link so that their doctor can view the images. This has been entirely standard in imaging for a long time now – but it simply doesn’t exist in the case of EEGs. “Thanks to the Cerebri cloud, everything can be transferred securely – from the recording to the analysis and back to the patient. Neurologists can access the data from anywhere. If necessary, they can also initiate further tests and consult with colleagues.” Finally, they are also changing the way that EEGs are analysed. “The aim is for AI to support experts – not replace them,” the doctor emphasises. “Ultimately, however, EEG analysis is about pattern recognition. It’s only because I’ve spent years analysing several kilometres of waveforms over the course of my medical career that I can recognise these patterns reliably. Not every colleague needs to be able to do that perfectly, because we offer them a complete service package.” The neurologists are less concerned about speed – what matters most to them is the quality of the diagnosis they provide with Cerebri. “We want to offer patients in the intensive care units and A&E departments of general hospitals direct, on-site access to the same services that patients receive in specialist centres, i.e. the EEG ivory towers.” Thanks to Cerebri GmbH, highly specialised doctors can interpret the results remotely. This not only addresses the ubiquitous skills shortage, but also takes account of the way we now live our lives, allowing staff to benefit from a good work-life balance and from flexible working arrangements, such as working part-time or working from home.

Milestones – what happens next?

A good work-life balance is not currently a priority for the two founders of Cerebri. The first contract with a pilot hospital is already in the pipeline, with the Neurology department of Rosenheim Hospital preparing to implement the Cerebri system at the end of the year. “The system is ready for application, and we already have other interested parties waiting in the wings. Our aim for the coming months is to build up a

customer base,” Dr. Lang explains. At present, the five-strong team is still financed by a combination of self-funding and grants, but this could soon change. “We’re focusing on hospitals that don’t have large neurology departments, but that need EEGs in their intensive care units and A&E departments. The challenge often lies in the detail. The frustrating part of our work is when, for example, hospital IT departments shy away from interfaces and telemedicine applications, and nobody is willing to take on the relevant responsibility.” In the medium term, the Cerebri team also aims to reach out to registered neurologists with a view to ultimately being able to offer home monitoring and home diagnostics. “In principle, EEG electrodes could also be incorporated into headphones or similar devices and produce long-term recordings.” Epilepsy affects around one percent of the population. The scientists agree that this group of patients is very heterogeneous and that expanding EEG testing offers a great deal of potential for learning more about the condition. “EEGs can do so much more. We simply need to ensure that they are made available to anyone, anywhere,” says Prof. Marquetand. “Through Cerebri, we are working on democratising EEGs.”

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Link to the technology transfer page

<https://www.bioregio-stern.de/en/projects/technology-transfer>



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About BioRegio STERN Management GmbH:

BioRegio STERN Management GmbH promotes economic development in the life sciences industry, helping to strengthen the region as a business location by supporting innovations and start-up companies in the public interest. It is the main point of contact for company founders and entrepreneurs in the Stuttgart and Neckar-Alb regions, including the cities of Tübingen and Reutlingen. The STERN BioRegion is one of the largest and most successful bioregions in Germany. Its unique selling points include a mix of biotech and medtech

companies that is outstanding in Germany and regional clusters in the fields of automation technology and mechanical and plant engineering.

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