Mechanical design for Magnetoencephalography (MEG) systems

Context

Human brain attracts a lot of attention by being probably the most important organ defining our behavior, our thoughts, our personality and by still being probably the most unexplored of all of the human organs. There is already a progress in the study and treatment of such neurological disorders as epilepsy, Alzheimer's and Parkinson's diseases, sclerosis, migraine, autism, brain tumor… Still, the development of new techniques and methods for brain imaging are in a great demand. Magnetoencephalography (MEG) is a functional neuroimaging technique for mapping brain activity by recording magnetic fields produced by electrical currents occurring naturally in the brain, using very sensitive magnetometers. For instance, such techniques are used as a clinical routine for the functional brain mapping and for the seizure focus resection – the most common type of epilepsy surgery.

Mag4Health develops a new generation of non-invasive magnetometers for MEG and an entire new MEG system to allow the imaging of the brain activity in real time with surgical precision. Thanks to the patented quantum technology working at room temperature, we are free from the cryogenic units, which are still the major obstacle for the adoption and commercialization of 'traditional' MEG systems (such systems can weight up to 10 tons and cost ~ 10M$ for 10 years of work). The democratization of the MEG technique thanks to Mag4Health magnetometers will allow the emergence of new clinical applications, expansion of the technique in both clinics and research centers, its use for early diagnostics and even for emergency services.

Mag4Health is a young startup born at the CEA Grenoble. Today the team consists of 12 people working on the development, manufacturing and commercialization of MEG systems for hospitals and medical research centers. Our technology has entered the industrialization stage, the first systems will be delivered to clients in 2024 and more and more systems will be produced in the following years. We design several MEG versions in respect to different applications (routine medical diagnostics, emergency services, research centers, etc) and for both adult and child patients – the key aspect here is the mechanical design compliant to different needs and specifications of each application.

Your mission

The objective of the internship is to improve/design new mechanical parts of MEG systems addressing different application and environments (research center or hospital). Together with your supervisor engineer you will propose several designs, taking into the account the way the magnetometers should be placed on a head, its fixation, ergonomics, distribution of the cables, position of the patient, magnetic shielding etc. The system should be comfortable to use for both a patient and an operator. Of course, we should not omit the aesthetics aspect, the quality of the materials, their resistance to cleaning products, etc. Different system parts may be considered – with different sizes and various level of complexity: from a magnetic sensor itself up to a whole bed of the MEG clinical system. The internship will allow you to express your creativity, to test yourself in a vivid start-up atmosphere, to deal with the design of medical devices.

Practical information

The internship will take place among the Mag4Health team, based in Grenoble – 37 rue Diderot – close to the 'Presqu'ile scientifique', in less then 10 minutes by foot from Grenoble train station.

Desirable date to begin: 1st quarter of 2024

Candidature

The internship is proposed to M2 students (last year of M.S.) or last year of engineering degree having a strong aptitude to experiments and engineering.

An experience in mechanical design and at least a basic knowledge of a corresponding software (ideally - SolidWorks) are essential for this project.

You should be fluent at least in English or French.

The candidature must include a CV and a motivation letter and to be send to the following contacts.

Contacts

The candidates are welcome to send their application to:

sm@mag4health.com – Dr. Sergey Mitryukovskiy, industrialization lead