MASTER'S THESIS

Ionoacoustic detector read-out based on machine learning (ML)

The Centre for Advanced Laser Applications (CALA) at the Forschungszentrum in Garching hosts one of the world's most powerful CPA laser systems. To support our team in experiments on laser-particle acceleration, we are looking for a talented and motivated

MASTER'S STUDENT

In the framework of your thesis, you will investigate the potential of an **ML-based analysis** of the I-BEAT 3D **detector signal**. The detector aims at measuring the three-dimensional parameters of a **laser-accelerated ion beam**. While the current analytical data analysis focuses on ion beams with a Gaussian distributed energy and lateral distribution, a more sophisticated analysis method based on a **neural network** might allow for reconstructing more complex beam distributions. To train the network, a theoretical model connecting the particle beam properties with the expected detector signal is available.

You will join the operating team of the CALA-LION experiment and build up base knowledge of our devices and methodology. The topic of the master's thesis connects the **scientific research question** of reconstructing ion beam properties with novel tools provided by AI. We will support the development of your **presentation skills** and encourage the **publication of results**.

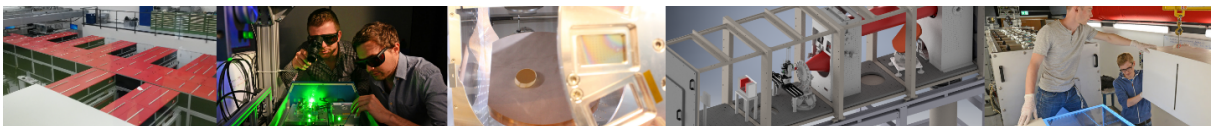
Knowledge in the broader field of AI and specifically in the field of neural networks, along with the enjoyment of computational work, are beneficial. We look forward to your application (transcript of records and CV). You are always welcome to **visit us in Garching for a lab tour** and an in-person chat.

Laser-driven ION (LION) acceleration

LION acceleration has been an emerging research field since its discovery 15 years ago. We use modern ultra-short high-power lasers, applying technology awarded with the 2018 Nobel Prize in Physics. Focused on solid density targets, highly energetic ions are emerging the plasma. Beams from this source feature unique beam properties that will drive manifold applications in medical physics and elsewhere.

I-BEAT 3D detector

The I-BEAT 3D detector is an innovative detector based on the ionoacoustic principle: When ions stop in water, part of the energy is converted into an acoustic wave. Measuring these waves allows us to reconstruct ion beam properties.



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