UNIVERSITÄT ZU KÖLN

DYNAVERSE

Call for a PhD position
Applications are open now

Exploring the origins of repeating fast radio bursts with broadband radio observations

Cluster of Excellence
OUR DYNAMIC UNIVERSE
https://dynaverse.astro.uni-koeln.de

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Supervisors

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Project:

IThe origin of repeating fast radio bursts is still a major astronomical mystery, and their recurring emission enables a wide range of multi-wavelength follow-up observations that contribute to solving it. Currently new sources are discovered by blind surveys with relatively narrowband widths, providing a limited view into their emission. Broadband instruments on sensitive radio telescopes, such as the Ultra-Broadband Receiver (UBB) on the Effelsberg 100-m radio telescope, provide a complementary, broadband radio view of repeater emission.

With Effelsberg and the UBB we are conducting regular monitoring of the known repeaters to investigate their emission physics through studies of burst morphology and polarization, as well as the plasma along the line of sight through propagation effects such as scattering. Moreover, the wider bandwidth and high sensitivity gives us a higher detection rate, which is critical for coordinated, multi-wavelength observing campaigns. Therefore, broadband observations provide important insights into the origin of repeaters.

The UBB receiver on Effelsberg observes at a unique frequency band of 1.3-6 GHz and is supported with the powerful, flexible Effelsberg Direct Digitization backend. With increased bandwidth comes an increase in computational requirements and contamination from radio frequency interference. In addition, our high cadence, regular monitoring requires that we process our data quickly, motivating realtime searches.

Goals:

The successful applicant will implement, test, and maintain a fast single pulse search pipeline for UBB observations of repeaters and other sources of interesting single pulses such as giant pulse emitters or magnetars. Part of the work will include developing robust machine learning models that can accurately distinguish between astrophysical signals and anthropogenic interference. The student will also prepare and conduct observations with the Effelsberg 100-m radio telescope. Finally, they will perform scientific analyses on the bursts discovered with the realtime pipeline and publish these results in a scientific journal.

Requirements:

- Strong proficiency and experience in scripting/programming, in particular in Python
- Strong interest in programmatic problem solving and developing pipelines
- A background knowledge of radio astronomy
- Comfortable working with the Linux operating system
- Proficiency in scientific writing, ideally supported by previously written research articles or a masters thesis
- Enthusiasm working with in a large, international team

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Desired Experience:

- Experience in pulsar or FRB astronomy data acquisition, analysis or inference
- Experience with machine learning techniques
- Experience with interacting with computing clusters

Offer:

Please use the contact information to know more details.

Dynaverse welcome applications from people with diverse backgrounds, e.g. in terms of age, gender, disability, sexual orientation / identity, and social, ethnic and religious origin. A diverse and inclusive working environment with equal opportunities in which everyone can realize their potential is important to us.

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