The Rheinische Friedrich-Wilhelms-Universität Bonn is an international research university that offers a wide range of degree programs. With 200 years of history, about 38,000 students, over 6,000 employees, and an excellent domestic and international reputation, Bonn University is among Germany's leading universities.

The Cluster of Excellence **PhenoRob – Robotics and Phenotyping for Sustainable Crop Production and the Remote Sensing Research Group (Department of Geography, University of Bonn)** seeks for the next possible date, limited for 3 years, for

PhD student (75%)

that would carry out a doctorate work on the topic:

"Combining radiative transfer modelling and machine learning for phenotyping retrievals of plant biochemical traits from optical remote sensing observations".

The work will be leveraging the strong aspects of physical radiative transfer modelling (RTM) and non-linear data driven machine learning (ML). The main novelty, in the context of phenotyping, is an effective combination of both techniques. On one hand, RTM provide physically based knowledge base (i.e., virtual data for crops in different growth stages and under various environmental conditions). This can be exploited to learn about causal relationships between plant traits and simulated reflectance data, including confounding effects (e.g., reflectance polarization by the leaf surfaces) and environmental conditions (e.g., image acquisition solar geometry or underlying terrain topography). On the other hand, ML methods with modern mathematical features (e.g., active learning and algorithms with floating self-adjusting kernels) trained with RTM simulations allow for fast and efficient retrieval of the plant traits of interest from real spectral observations. Finally, since 3D RTM is computationally demanding and time inefficient for operational use, it can be potentially replaced by a ML-based virtual emulator.

The Cluster of Excellence PhenoRob is a large-scale research initiative that has been funded in the context of the Excellence Strategy of the German Federal and State Governments. Its research agenda addresses one of the central challenges for humanity, namely to produce sufficient food, feed, fiber, and fuel for an ever-growing world population while simultaneously reducing the environmental footprint of agricultural production. In order to achieve this, Bonn University and the Forschungszentrum Jülich adopts a technology-driven approach characterized by the integration of robotics, digitalization, and machine learning on one hand, and modern phenotyping, modeling, and crop production on the other. For more information about the Cluster and the core projects, visit the official website: www.phenorob.de

Your profile:

- Applicant must hold Master of Science degree or equivalent qualification (e.g., a First-Class Honours degree) in one of the respective fields: remote sensing/geo-information sciences, computer science/machine learning, plant biology/physiology, agriculture, and forestry.
- Applicant must be able to demonstrate strong analytical scientific thinking and practical computer skills at the level of scripting in scientific computer languages.
- Applicant must be fully efficient in English speaking, reading, and writing and demonstrate the ability to write scientific communications (articles, posters, and presentations).
- Applicant must undertake this position on a full-time basis.

Applicant knowledge and skills that will be ranked highly include:

- Practical skills in optical remote sensing image analysing software (e.g., ENVI, QGIS, etc.).
- Active ability of computer scripting/programming (e.g., MATLAB, Python, R, IDL, etc.).

- Expertise in statistical data analyses mainly using advanced machine learning approaches (random forest, support vector regression, neural networks, etc.).
- Experience in vegetation radiative transfer modelling (e.g., PROSPECT/FLUSPECT, SAIL, etc.).
- Experience with operating and processing data acquired by drone-based sensors.
- Advanced computer skills in both Windows & Linux OS.

We offer:

- Full-time 3-year PhD position (i.e., 75% of E13 in German salary scale).
- Work with the state-of-the art radiative transfer codes, imaging spectroscopy remote sensing and plant phenotyping technology.
- Supervision by experts in quantitative remote sensing of vegetation.
- Work in friendly and creative scientific team.

Applicants are asked to submit:

1. Letter of motivation (max. 1 page)
2. CV

The University of Bonn is committed to diversity and equal opportunity. It is certified as a family-friendly university and aims to increase the number of women employed in areas where women are under-represented and to promote their careers. To that end, it urges women with relevant qualifications to apply. Applications will be handled in accordance with the *Landesgleichstellungsgesetz* (State Equality Act). Applications from suitable candidates with a certified disability or equivalent status are particularly welcome.

If you are interested in this position, please submit your **complete application documents by 31.03.2023** to rsrgsekr@uni-bonn.de . Before sending your application, please combine and convert all of your documents into one PDF file. For further information please contact Vanessa Spitzer, M.A., vspitzer@uni-bonn.de.