Master's thesis (f/m/d): Measuring solar radiation via HDR images & deep learning

Stellenanbieter: Deutsches Zentrum für Luft- und Raumfahrt e. V. (DLR)

The Institute for Solar Research develops innovative technologies for the use of solar energy. The focus is on electricity generation and the provision of heat and fuels. The primary goal is to contribute to the energy and heat transition and to a reduction in fossil fuels with the help of solar energy.

What you can expect:

The Solar Energy Meteorology Working Group develops methods for deriving measurements and very short-term forecasts of solar radiation from image information provided by cloud cameras, thereby supporting the efficient and grid-friendly operation of photovoltaic power plants.

This thesis aims to further develop a method for determining diffuse solar radiation, which uses the image from a cloud camera and the measurement from a pyranometer (global radiation) as input data. The measurement uses a radiometric camera model and a multimodal machine learning model based on image and tabular data. Currently, images with low dynamic range are to be replaced by high dynamic range (HDR) images generated from exposure series. This is expected to improve the representation of the sun's surroundings, which can lead to more accurate and, in particular, more robust measurements overall.

You will work in a diverse and motivated team, actively contributing to climate protection and gaining practical experience in machine learning, software development, automated testing, version control and modern image processing. As a special feature, you can look forward to a workplace in Almería, one of the sunniest locations in Europe.

Your tasks:

- Familiarisation with data-driven and, to a lesser extent, physical approaches relevant to the task
- Ensuring the valid function of the updated physical model component for the use of HDR images through appropriate tests
- Preparation of multimodal data sets from camera images, pyranometer measurements and derived tabular data
- Implementation of an updated deep learning model architecture
- Developing and implementing an updated training strategy with a focus on maximum transferability between locations and different camera hardware
- In-depth validation and evaluation of the further developed method in comparison to a previous approach
- Documentation of the methodology and results in a well-structured master's thesis

Your profile:

- You are studying for a master's degree in computer science, physics, mathematics, engineering or a related subject and have a good academic record
- Experience in Python and basic knowledge of machine learning
- Ability to work independently and as part of a team
- Strong self-motivation
- Previous experience in data analysis, computer vision and Git version control desirable
- Previous experience in radiometry, digital photography and image processing desirable
- Good written and spoken English skills

If this opportunity appeals to you, please send us your cover letter and CV! Niklas Blum (niklas.blum@dlr.de, +4922036014478).

#MachineLearning #Radiometry #DeepLearning #SkyImager #SolarEnergy #RenewableEnergy #EnergyMeteorology #DLR #Almería #ComputerVision

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