Solar Orbiter Images Challenge

Reconstruction of Multi-Wavelength Sun Observations

Deep Learning School “Basic Concepts”

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The Data

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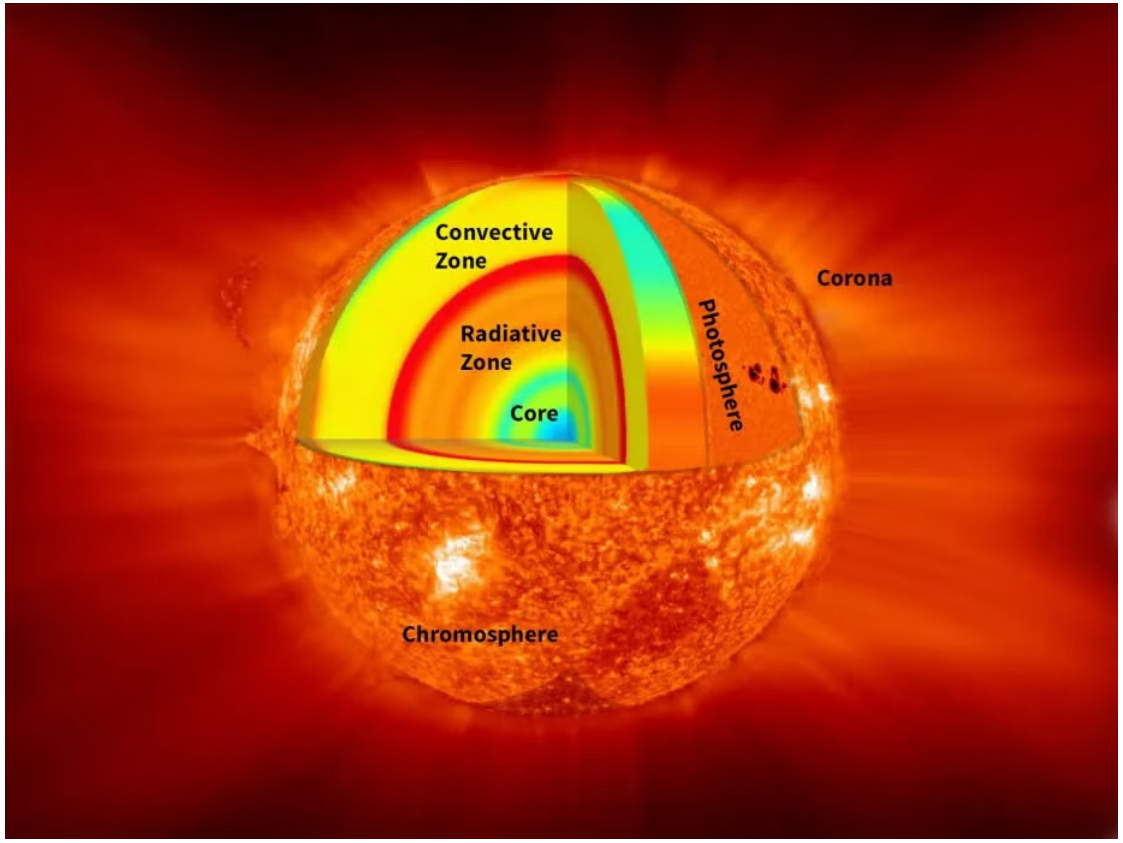
The Sun

Sun's Atmosphere:

- Photosphere
- Chromosphere
- Transition Region
- Corona



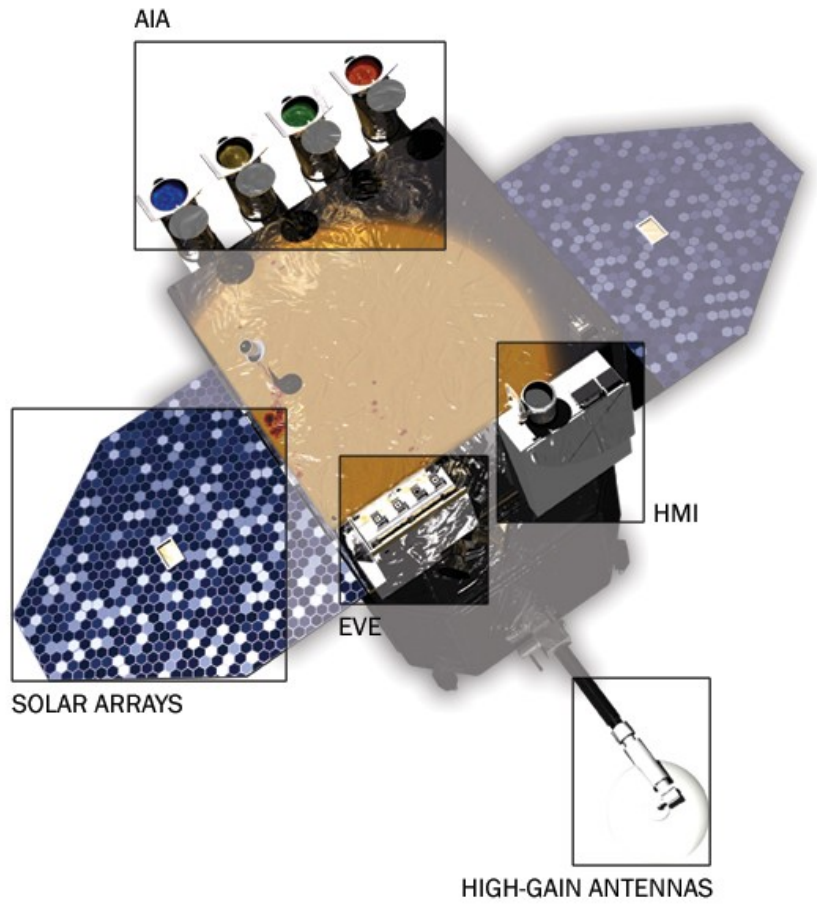
Solar Dynamics Observatory

HMI (Helioseismic and Magnetic Imager)

EVE (Extreme Ultraviolet Variability Experiment)

AIA (Atmospheric Imaging Assembly)

- Observes Chromosphere, Transition Region, Corona
- 10 different wavelengths (9 here)
- Investigates mechanisms that heat corona



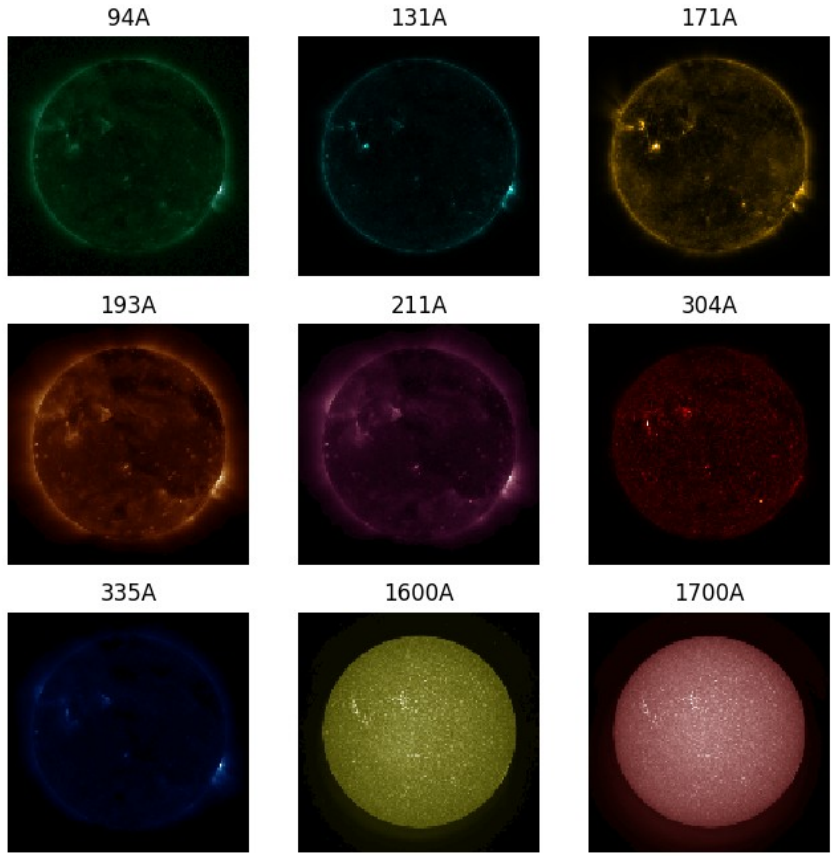
Solar Dynamics Observatory

Data:

- AIA Data from 2010, only 9 channels (see right), downscaled to 128x128 pixels

Problem:

- Prolonged exposure to intense radiation during a solar maximum has led to the degradation of 8 AIA filters onboard SDO
- Only the **94 Å** channel remains operational



The Task

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The Task

1. Train a deep learning model that can reconstruct the missing 8 AIA channels
    a. This should be most of your work

2. Use codecarbon to optimize for best trade-off between model performance and energy consumption
    a. Quantify stopping point for training
    b. This should be the remaining ~10% ;)

Some hints for codecarbon:

- Give your project a recognizable name:
    - `project_name="some_recognizable_name_here"`
- To avoid excessive logging:
    - `log_level="error"`
- Track only energy consumption of your process and not whole machine:
    - `tracking_mode="process"`
- The output file is not overwritten but appended!

The Rules

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The Rules

- Limitations: **NONE**, use anything you want
  - Software: PyTorch, TensorFlow, Keras, JAX
  - Techniques: Convolutional NNs, ResNet
- Starting point: Vispa Cluster
- http://vispa.physik.rwth-aachen.de/

- Teams:
  - 6 teams with 5 people
  - Teams will be assigned
  - After you have been assigned, please put your name accordingly into this spread sheet

- Team names:
  - Machine Learning (5)
  - NLP (5)
  - Chatbots and Speech (5)
  - Graphs & Games (5)
  - Computer Vision (5)
  - Deep Learning (5)

The Presentation

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The Presentation

- **Slides for 7 (+3) min presentation**
- Please mail your slides to info@erumdatahub.de until 10:45 on Friday
- (Presentation template here)
- Also keep the environmental impact of your work in mind!
- Rooms: Here and 2 rooms by the hall behind the reception

Jury (Lecturers & Tutors) will announce a winner based on:

- Teamwork
- Problem investigation
- Ansatz
- Results
- Outlook
- Keep in time
- Bonus points: Creativity