Karlsruhe Institute of Technology

HELMHOLTZ AI | ARTIFICIAL INTELLIGENCE COOPERATION UNIT

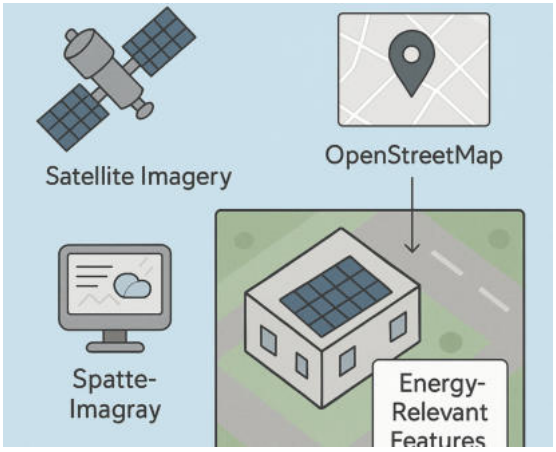
Institute for Automation and Applied Informatics (IAI)

ENERGY LAB 2.0

Master thesis

Building an Open Energy-Relevant Geospatial Dataset

Municipalities and regional planners increasingly rely on spatial data to understand how energy demand and renewable potential vary across urban environments. This project focuses on creating an open, high-resolution dataset that captures energy-relevant features, such as rooftop solar installations, building density, land use, and industrial activity, from openly available geospatial sources.



Objective

The master's student will design and implement an automated pipeline to extract, process, and visualize energy-related spatial features that can later support simulation and planning tasks.

Key Responsibilities

- Collect open geospatial data from OpenStreetMap (OSM), Copernicus Land Cover, and VIIRS Nighttime Lights.
- Develop Python-based scripts to identify and classify energy-relevant features, including:
  - Rooftop solar installations,
  - Building footprints and density,
  - Land-use types (residential, commercial, industrial),
  - Energy infrastructure (power plants, substations, transmission corridors).
- Aggregate and visualize results for selected cities or districts to support municipal energy simulation.
- Produce a documented dataset in GeoJSON/CSV format ready for use in energy modeling tools.

Expected Outcomes

- A reproducible data extraction and processing pipeline.
- An open geospatial dataset describing energy-relevant urban features.
- Visual reports and maps usable by municipal planners for simulating energy scenarios.

Advisor:
Kundan Thota, M.Sc.

Programming language:
Python

System, Framework(s):
Windows, Linux, or macOS

Required skills:
- RestAPIs, LLMs, Agentic AI foundations
- Understand GIS
- Python, Deep Learning and Computer vision knowledge

Language(s):
English

For more information, please contact:

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Submit your application directly, including your resume and transcript of records.

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