

Announcement – HiWi/ Master’s Thesis

Microstructural Analysis of Sea Ice Using CT Imaging and Machine Learning for Property Estimation

Motivation:



Sea ice is a porous and multi-phase material, containing brine, air, and ice channels whose volume fractions significantly influence bulk properties such as density and permeability. Accurate estimation of these properties is essential for understanding ice–ocean interactions and for climate prediction models. Recent advances in computed tomography (CT) imaging and machine learning offer new opportunities to quantify sea ice microstructure and infer material properties via data-driven approaches.

Tasks:

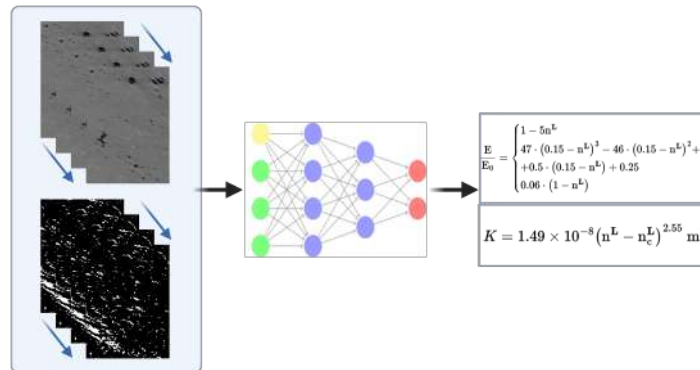
Develop a pipeline to estimate microstructural volume fractions and effective material properties of sea ice from CT datasets.

Procedure:

- Apply ML or deep learning methods to segment CT scans into brine, air, and ice regions.
- Quantify phase volume fractions and morphological descriptors.
- Use empirical or regression models to estimate effective density and permeability.
- Compare predictions with literature or benchmark data.

Requirements:

Interest in ML-based image analysis and porous media. Experience with Python and tools such as PyTorch, scikit-learn, or SimpleITK is helpful.



Editor:
Prof. Tim Ricken



Supervisor:
Raghav Pathak



Supervisor:
Seyed Morteza Seyedpour