LECTURE 4

SELF-SUPERVISED LEARNING, FOUNDATION MODELS, AND EXPLICIT EMBEDDINGS

Geospatial Representation Learning

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Learning Outcomes

Lecture

- Explain the motivation for self-supervised learning on large geospatial and Earth observation archives.
- Compare contrastive, masked, generative, and multimodal pretraining strategies.
- Describe how foundation models produce reusable representations for downstream geospatial tasks.
- Explain explicit geospatial embeddings as precomputed representations derived from foundation models or large-scale feature extractors.
- Use the concepts of transfer learning, linear probing, fine-tuning, and embedding-based retrieval to reason about downstream model use.
- Critically assess benefits and limitations of explicit embeddings, including domain shift, scale mismatch, bias, storage cost, and evaluation difficulty.

Lab

- Use pretrained geospatial or vision foundation models to extract representations from geospatial data.
- Apply extracted embeddings to a downstream task such as classification, clustering, or retrieval.
- Compare pretrained representations with task-specific baseline features.
- Discuss transferability, domain shift, and evaluation challenges of pretrained geospatial models.

PRACTICAL 4

USING PRETRAINED GEOSPATIAL MODELS

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