

Large Language Models Energize Geographic Information Science: A Survey

——Explore the boundaries of capability, imagine the impossible

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Date: 2024/4/7

K2: The Pioneer in Integrating Large Language Models with GeoScience

Cheng Deng, et al.

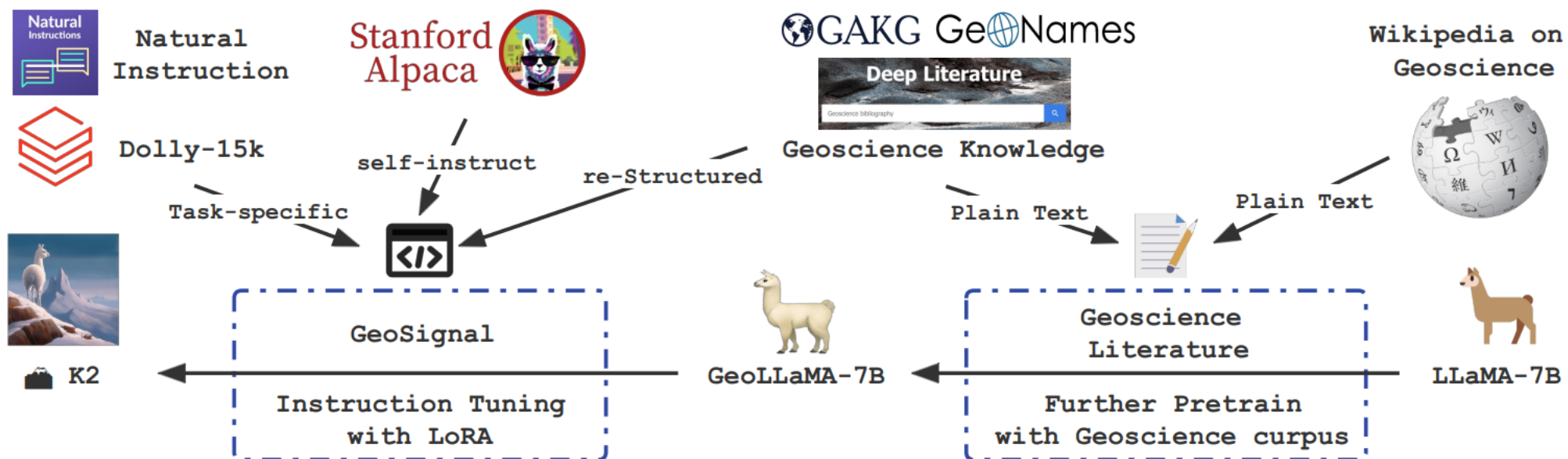


Figure 1: Pipeline of training K2, including two steps, one is further pre-train for absorption of geoscience knowledge, another one is instruction tuning, deploying to make the model align to human, instructed by human, and response like a human.

[K2: A Foundation Language Model for Geoscience Knowledge Understanding and Utilization](#)

(Deng, C., et al., 2023)/(WSDM'24)

Skysense: A Foundation Model in RS

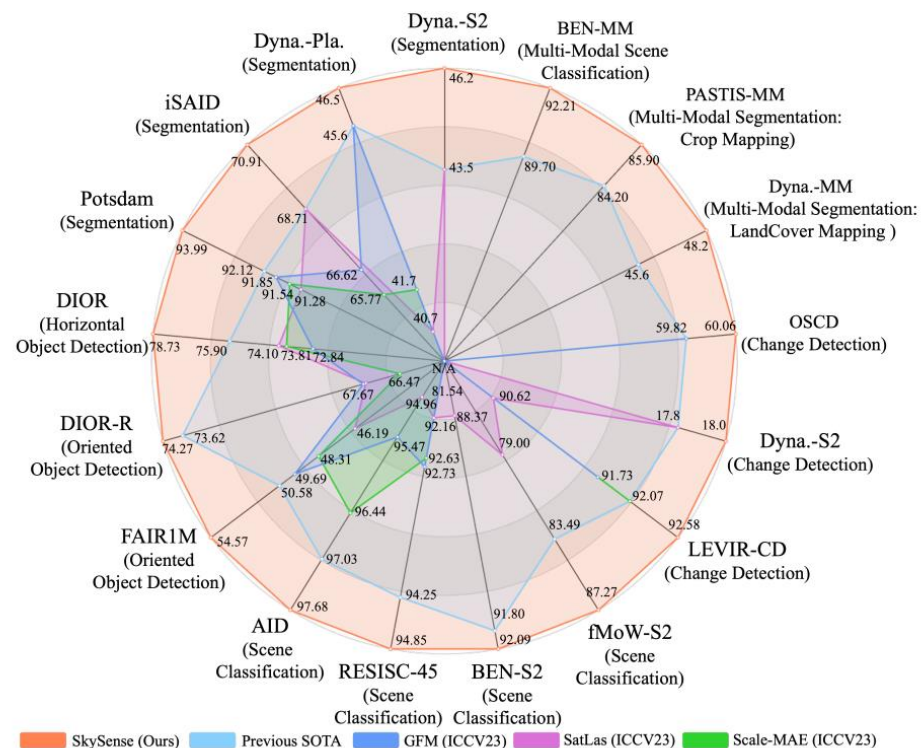


Figure 1. SkySense has achieved superior performance on 16 datasets over 7 distinct tasks compared with 18 state-of-the-art RSFMs and supports a board range of EO imagery interpretations.

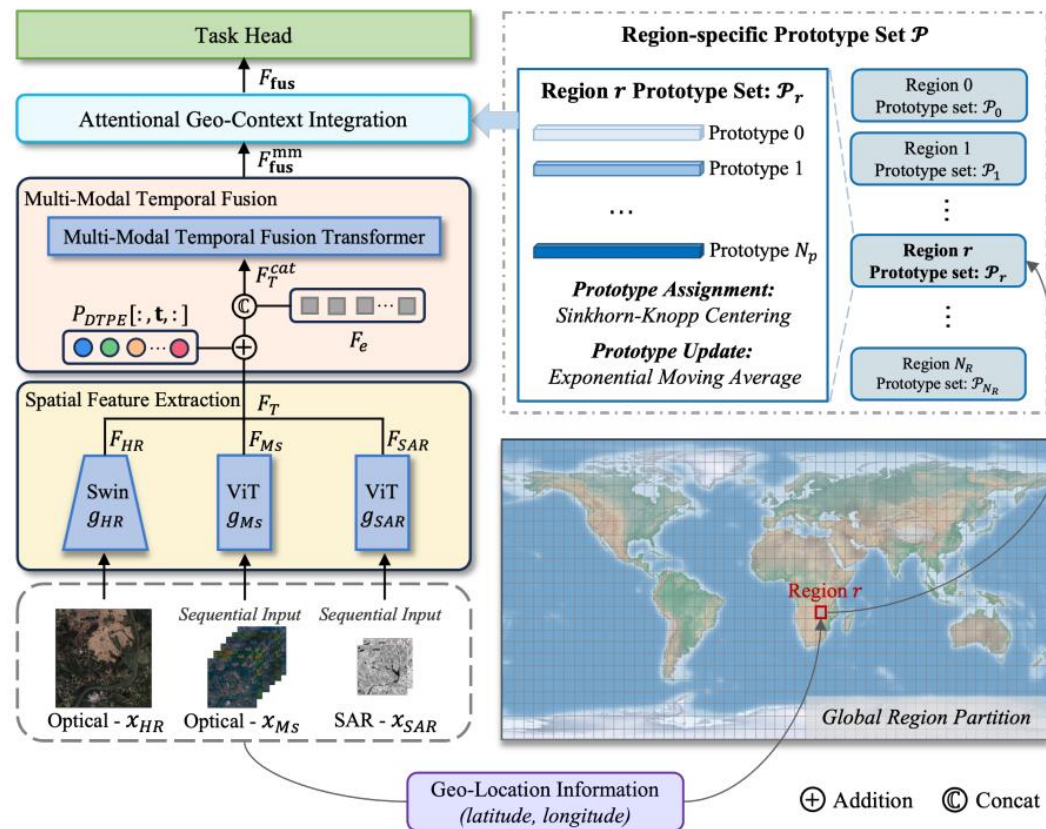


Figure 2. The overview of our SkySense model architecture.

[Skysense: A multi-modal remote sensing foundation model towards universal interpretation for earth observation imagery](#) (Ant Group & Wuhan University & MYBank,2024) /(CVPR2024)

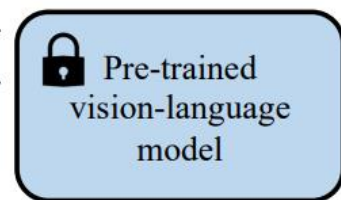
Mixture of Experts & Modality Bridging

Low-shot training data

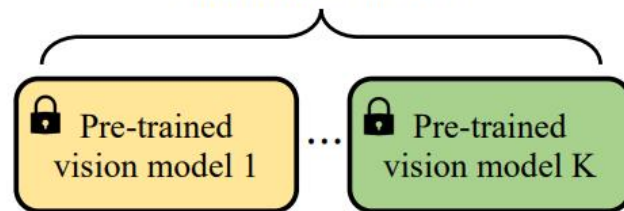


$$f \sim \mathcal{GP}(\cdot, \cdot)$$

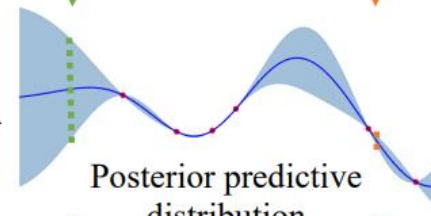
Zero-shot predictor



Assembled kernel



Test images



Shark
(Uncertain)

Dog
(Fairly certain)

Figure 1. Overview of our method. We leverage a GP regressor to tackle the low-shot image classification problem. To integrate knowledge from CLIP and other pre-trained models, we use them to specify the GP mean and kernel. The label is determined by the mean, and the uncertainty estimate is determined by the variance.

[Bayesian Exploration of Pre-trained Models for Low-shot Image Classification](#)

(Yibo Miao, Yu Lei, Feng Zhou, Zhijie Deng, 2024)/(CVPR2024)

DS-Agent: A Self-Reflection Agent Specialized for Machine Learning Tasks

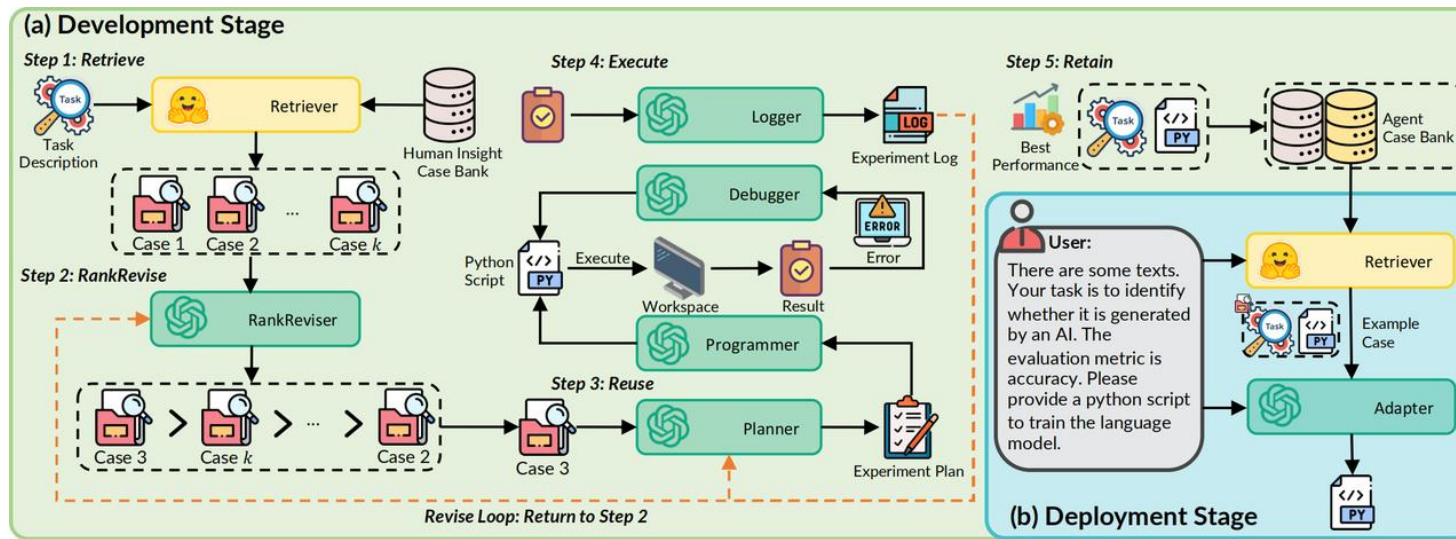


Figure 3. The diagram of DS-Agent. (a) **Development Stage**: DS-Agent structures an automatic iteration pipeline to build and revise the model based on execution feedback. (b) **Deployment Stage**: DS-Agent adapts past successful solutions for code generation.

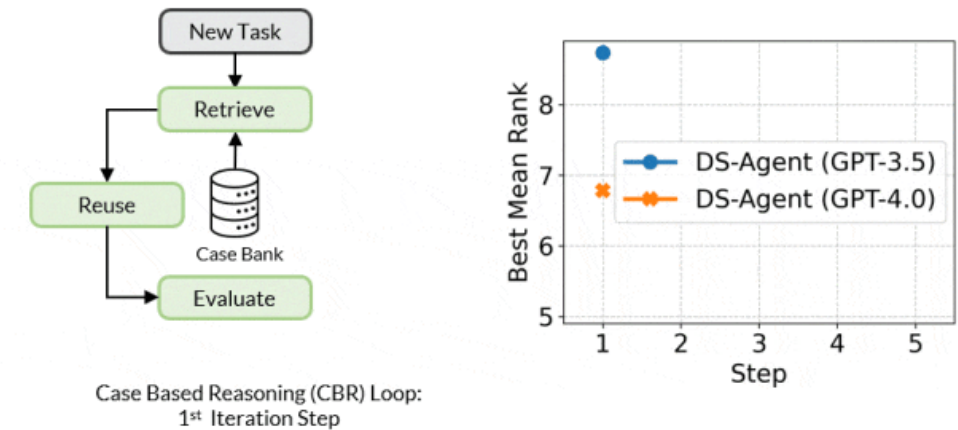


Figure 1. (a) Overview of DS-Agent with CBR based LLMs. (b) Performance improvement of DS-Agent with increasing iteration steps by CBR over 12 development tasks.

Prospects: Agent is Future!



Andrew Ng ✓

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I think AI agentic workflows will drive massive AI progress this year — perhaps even more than the next generation of foundation models. This is an important trend, and I urge everyone who works in AI to pay attention to it.

Using LLM to revolutionize all the traditional paradigm of research with high-level automation

GPT-3.5 and GPT-4 performance using zero-shot and agent workflows

