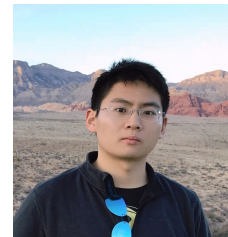# ChatGPT, Foundation Models, and Geo-Foundation Models

Dr. Gengchen Mai

[2022 - Now] Assistant Professor at *Department of Geography, University of Georgia*

https://gengchenmai.github.io/

Large Language Model

Image from Huggingface (https://huggingface.co/blog/large-language-models)

Foundation Models

Task-Specific Models

Training **specific** models for **specific** tasks

Question Answering Models

Machine Translation Models

Common Sensing Reasoning Models

Reading Comprehension Models

Natural Language Inference Models

Image Classification Models

Text-to-image Generation Models

Image Editing Models

Paradigm shift

Foundation Models

A large task-agnostic pre-trained model which can be adapted via **fine-tuning** or **few-shot/zero-shot** learning on **a wide range of domains**. (Bommasani et al, 2021)

GPT-3 (Brown et al., 2020)

GPT3

Few-shot Adaptation

Various NLP Tasks

- Closed Book Question Answering
- Machine Translation
- Common Sense Reasoning
- Reading Comprehension
- Natural Language Inference
- …

DALL·E 2 (Ramesh et al., 2022)

DALL·E 2

DALL·E 2 is a new AI system that can create realistic images and art from a description in natural language.

Zero-shot Transfer

Various CV Tasks

- Text-to-image generation
- Image Completion
- Image Editing
- Style Transfer
- …
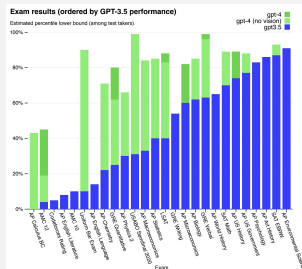
The Success of Artificial General Intelligence

Natural Language Processing
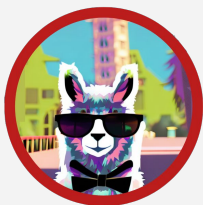
Stanford Alpaca

ChatGPT/GPT-4 (OpenAI 2023)

Computer Vision

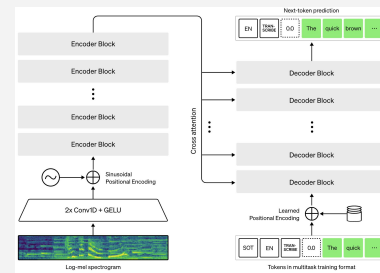**Imagen** (Saharia et al. 2022)

Segment Anything (Kirillov et al, 2023)

Reinforcement Learning

Gato (Reed et al. 2022)
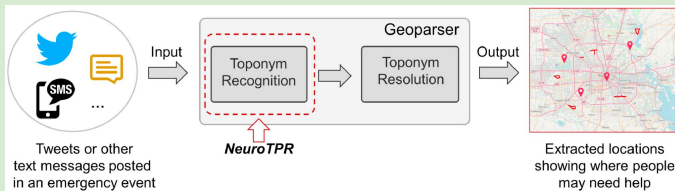
Signal Processing

Whisper (Radford et al. 2022)

AGI on Geospatial Problems

How do the existing cutting-edge foundation models perform when compared with the state-of-the-art fully supervised task-specific models on various geospatial tasks?

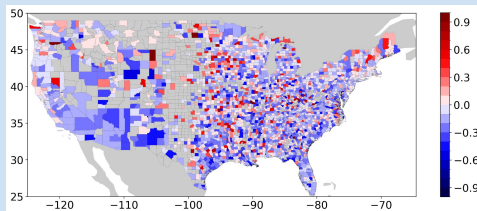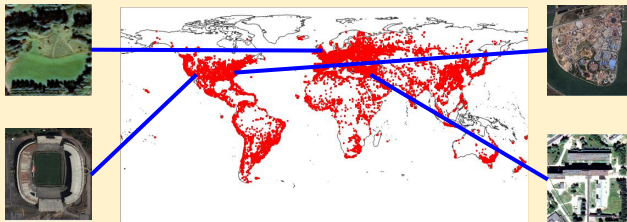**Geospatial Semantics** – Topo.Recg.

Urban Geography

Urban Function

Urban Perception

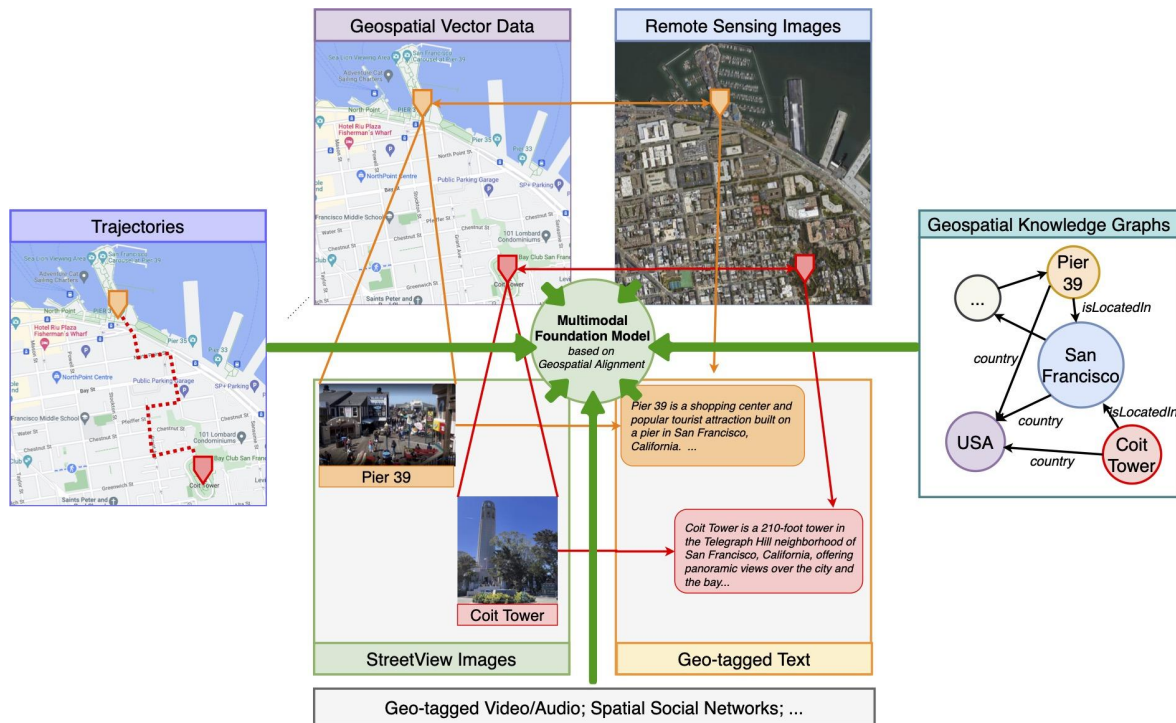(a) Very Quiet (0.100)

Health Geography – Dementia Forecast

Remote Sensing – RS Image Clas.

A Multimodal FM for GeoAI

Vision: a multimodal FM for GeoAI that use their **geospatial relationships as alignments** among **different data modalities.**

Reference

1) **Gengchen Mai**, Chris Cundy, Kristy Choi, Yingjie Hu, Ni Lao, Stefano Ermon. Towards a Foundation Model for Geospatial Artificial Intelligence, In: *Proceedings of ACM SIGSPATIAL 2022*. [Vision Paper]

Contact

Prof. **Gengchen Mai**

Email: gengchen.mai25@uga.edu

Website: https://gengchenmai.github.io/

UNIVERSITY OF GEORGIA

Single Line Name