

EarthPT: a foundation model for earth observation

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 **Aspia Space**



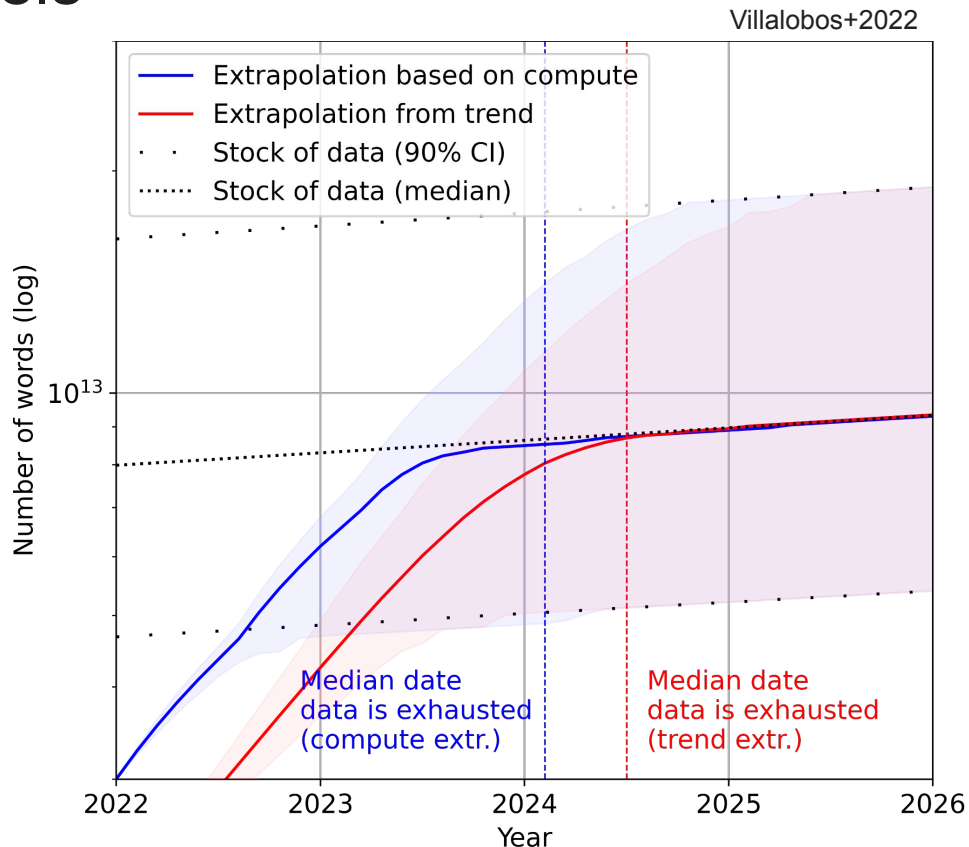
Funded by
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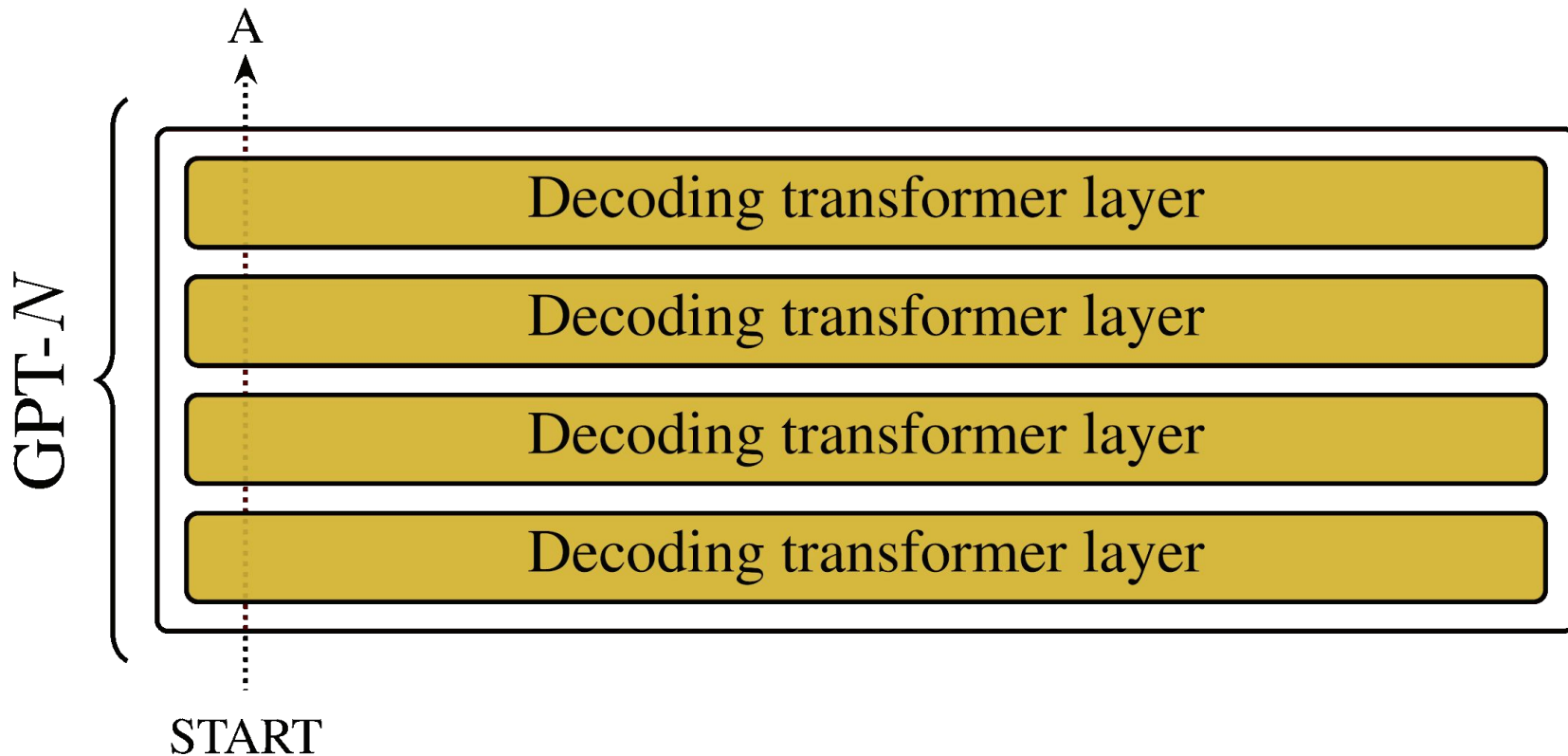
**LEVELLING
UP**

Data trends for frontier models

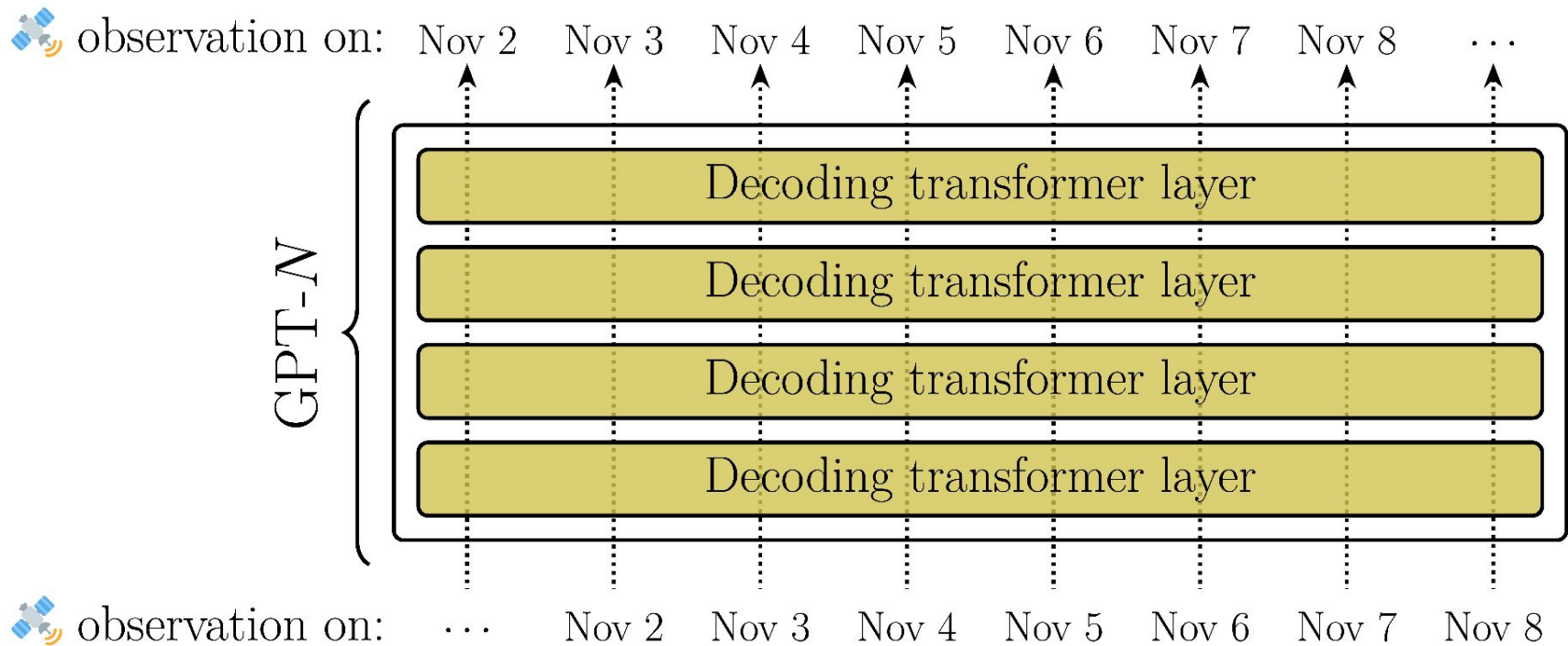
- We are running out of high quality textual data!
- We can supplement these datasets with observation data: the LSST alone will generate ~4.4T ViT tokens per year, and Aspia Space has access to ~5.4T EO ViT tokens across Europe alone.



The base: autoregressive decoding transformer models

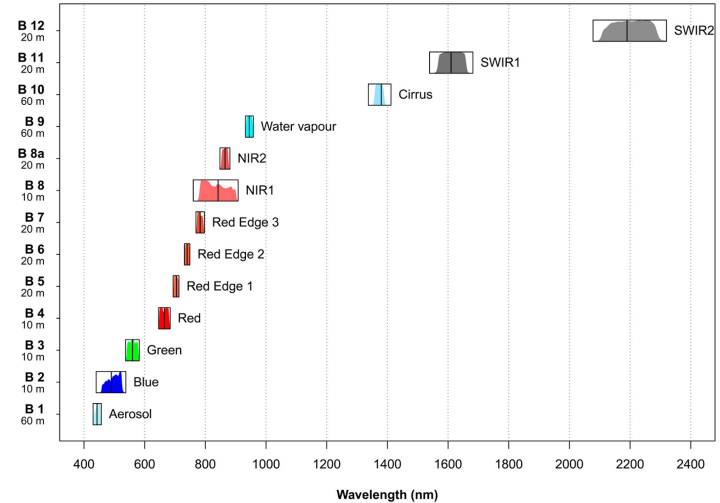
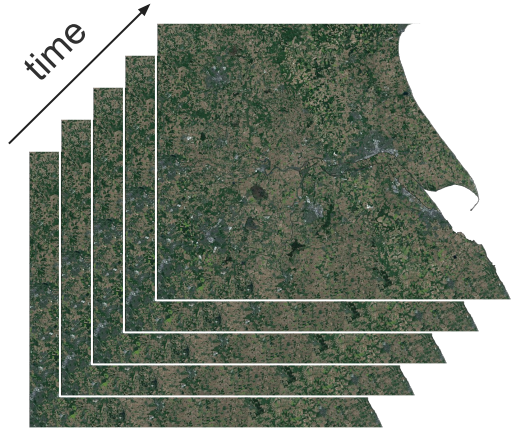


Training “Large Observation Models”



We use ClearSky generated observations of the UK

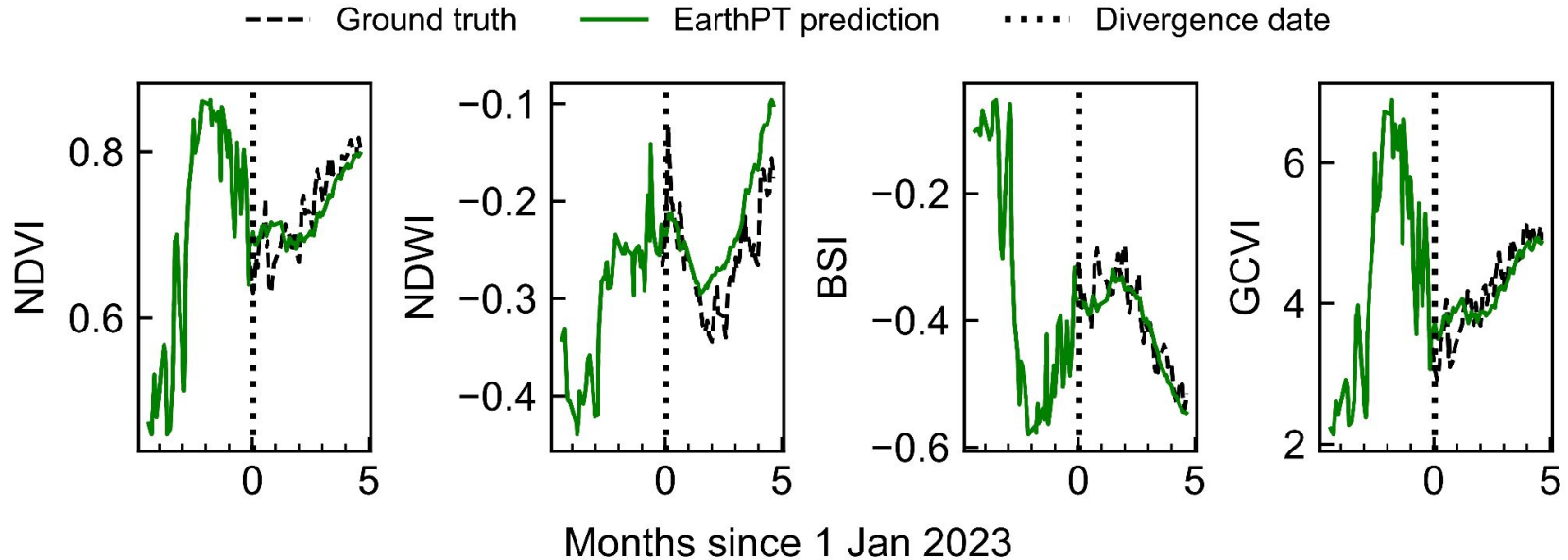
- ClearSky predicts cloud-free data from Sentinel 2 V/IR multispectral data while retaining the original 10 band signal
- We therefore have access to an uninterrupted cloud-free time series of V/IR satellite data in the 400-2300nm spectral range



Immitzer+2016

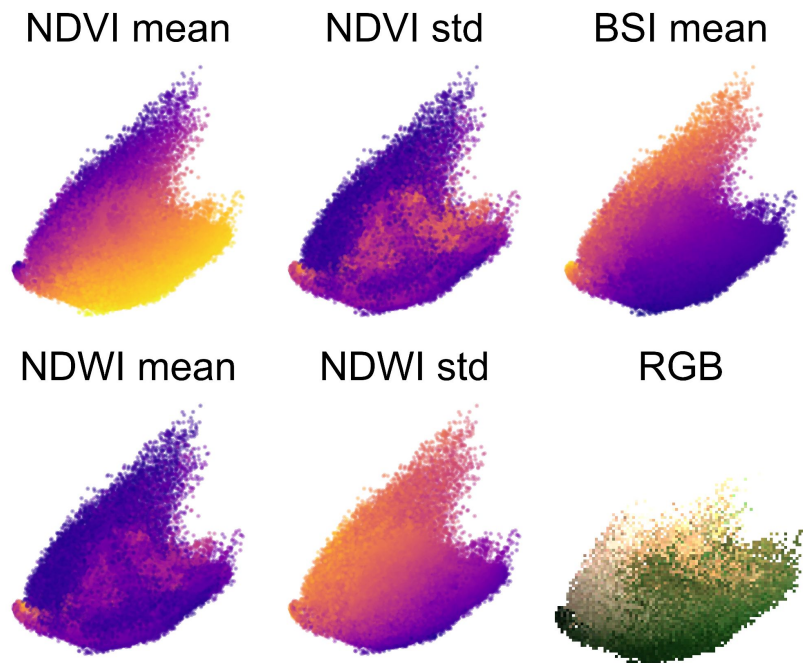
EarthPT can forecast future satellite observations

- We can use EarthPT to predict future observations in a time series just like how an LLM predicts future words in a sentence ↓



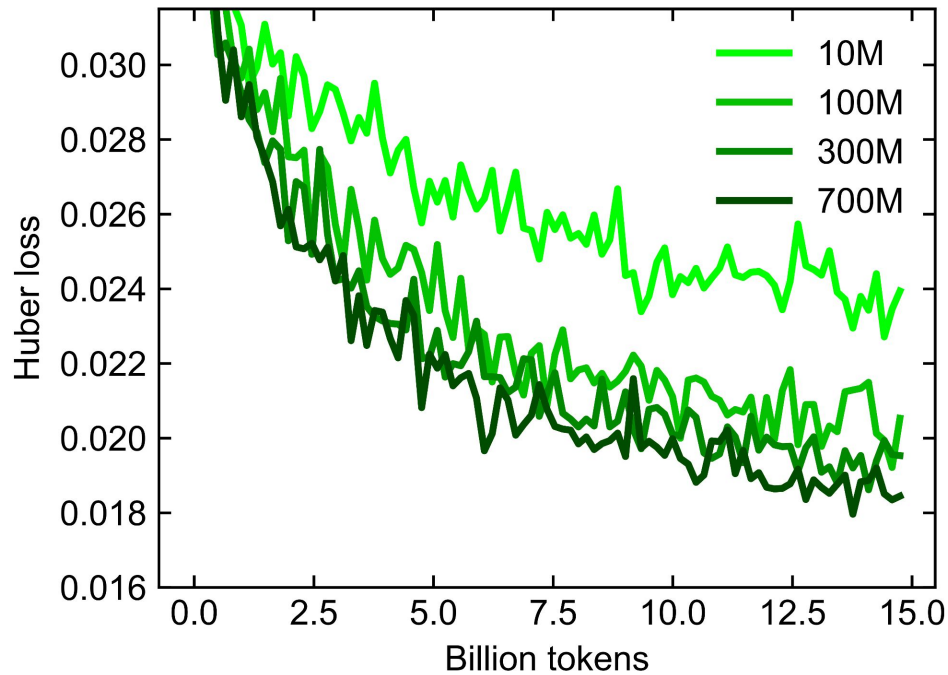
EarthPT produces meaningful embeddings

- We can use EarthPT's penultimate layer's outputs as semantic embeddings describing a pixel's history
- Averaging these embeddings over 2023 and projecting onto a 2D space shows that EarthPT captures relevant information →



EarthPT scales like an LLM

- We trained several EarthPT models from 10M to 700M parameters
- The larger models still showed improvement at the end of the 15B token training run: there is still more to squeeze from this model!



What is next?

- Application to downstream tasks like crop classification, yield estimation, drought and flood prediction
- Potential release of weights and reference code
- Further scaling of model with a domain specific scaling law

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ArXiv: 2309.07207