



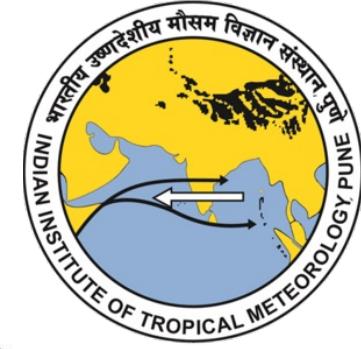
AI/ML Activities

Indian Institute of Tropical Meteorology Pune, India

Ministry of Earth Sciences, Govt. of India



सत्यमेव जयते
Ministry of
Earth Sciences



Ankur Srivastava

With inputs from Deepesh Kumar Jain
& colleagues in IITM & MoES

WGNE40, Beijing, China

IITM-ESMv3

GFS T_{co} ~67 km

MOM4 ~25 km

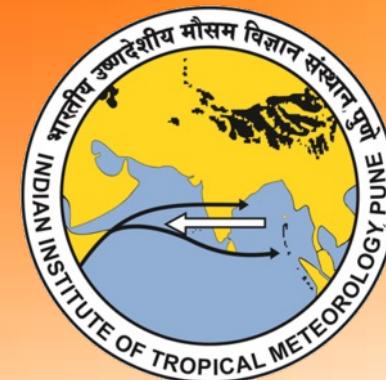
SIS + Noah + LULC
+ Aerosol + BGC

ERPv2

Multi-physics framework:

~50 km

GFS + MOM4 + SIS + Noah



Plan

Climate and
Decadal
Projections

Ready

Seasonal
forecasts

Set

Mid-Range
forecasts

Go!

Short-Range
forecasts

Monsoon Mission Coupled Forecast System version 2.0 (MMCFSv2)

GFS-SL ~38 km

MOM6 $0.5^\circ \times 0.25^\circ$

CICE5

Noah

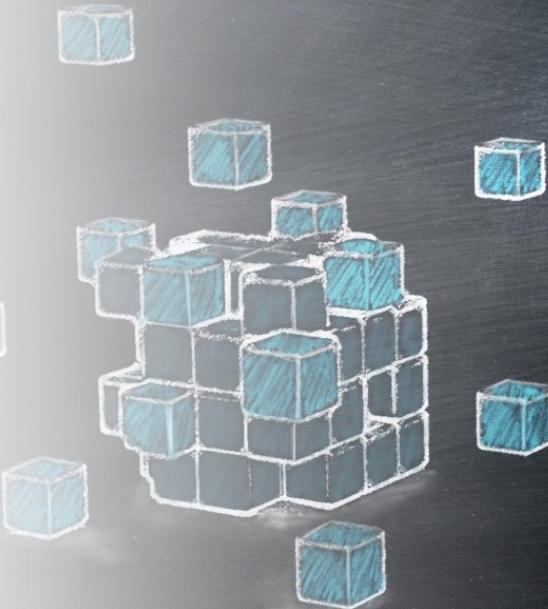
BharatFS ~6 km

Triangular Cubic-
octahedral based GFS

Monsoon Mission has enabled India's preparedness
across scales—
building a weather-ready nation!

We are trying to use AI to develop applications

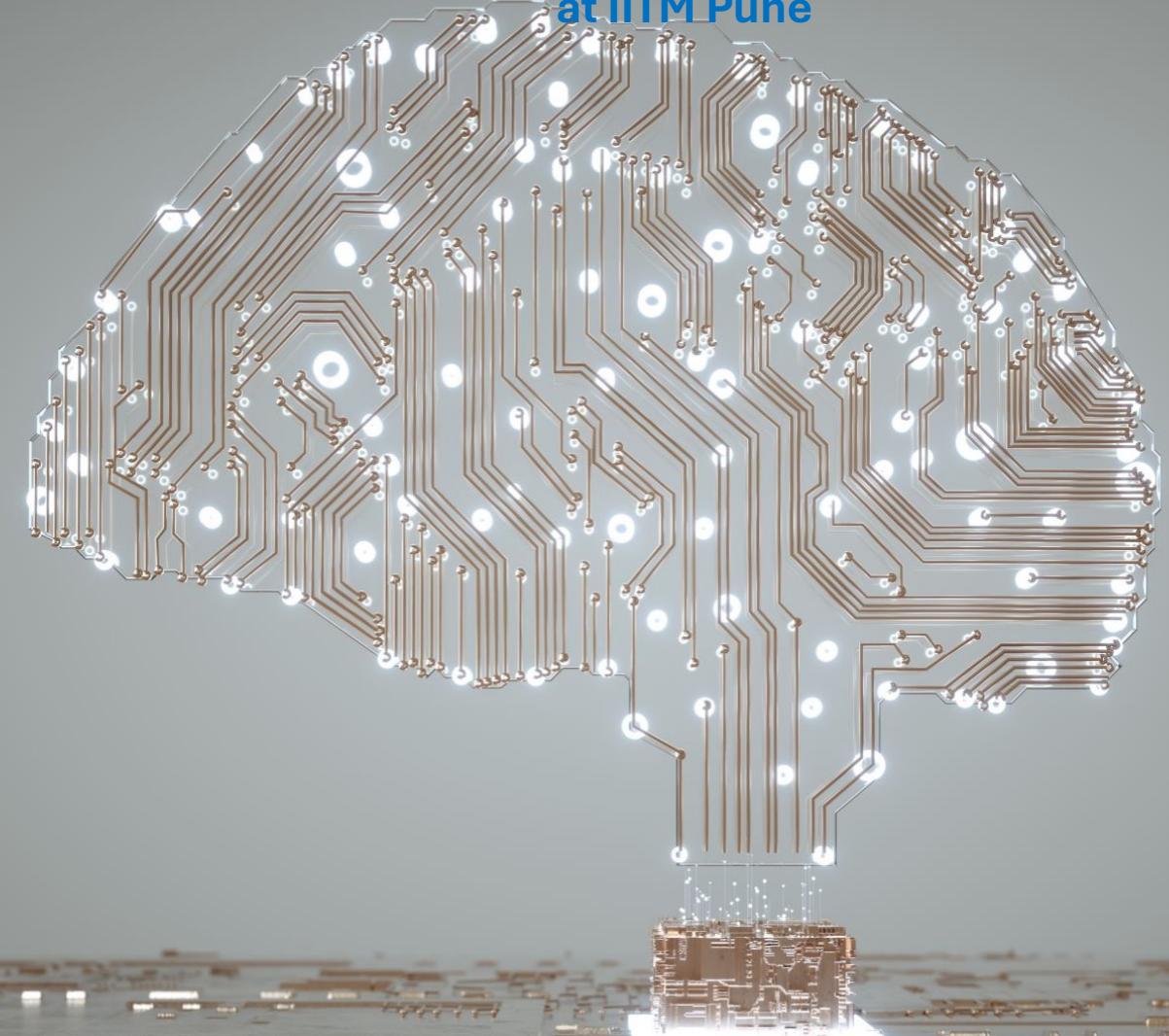
- Reach out to the citizens for proactive early warnings
- Requirement for sub km-scale forecasts
- Provide agricultural advisories
- Develop applications which are not yet supported by dynamical models – e.g. stubble burning, landslides
- Develop Hybrid models

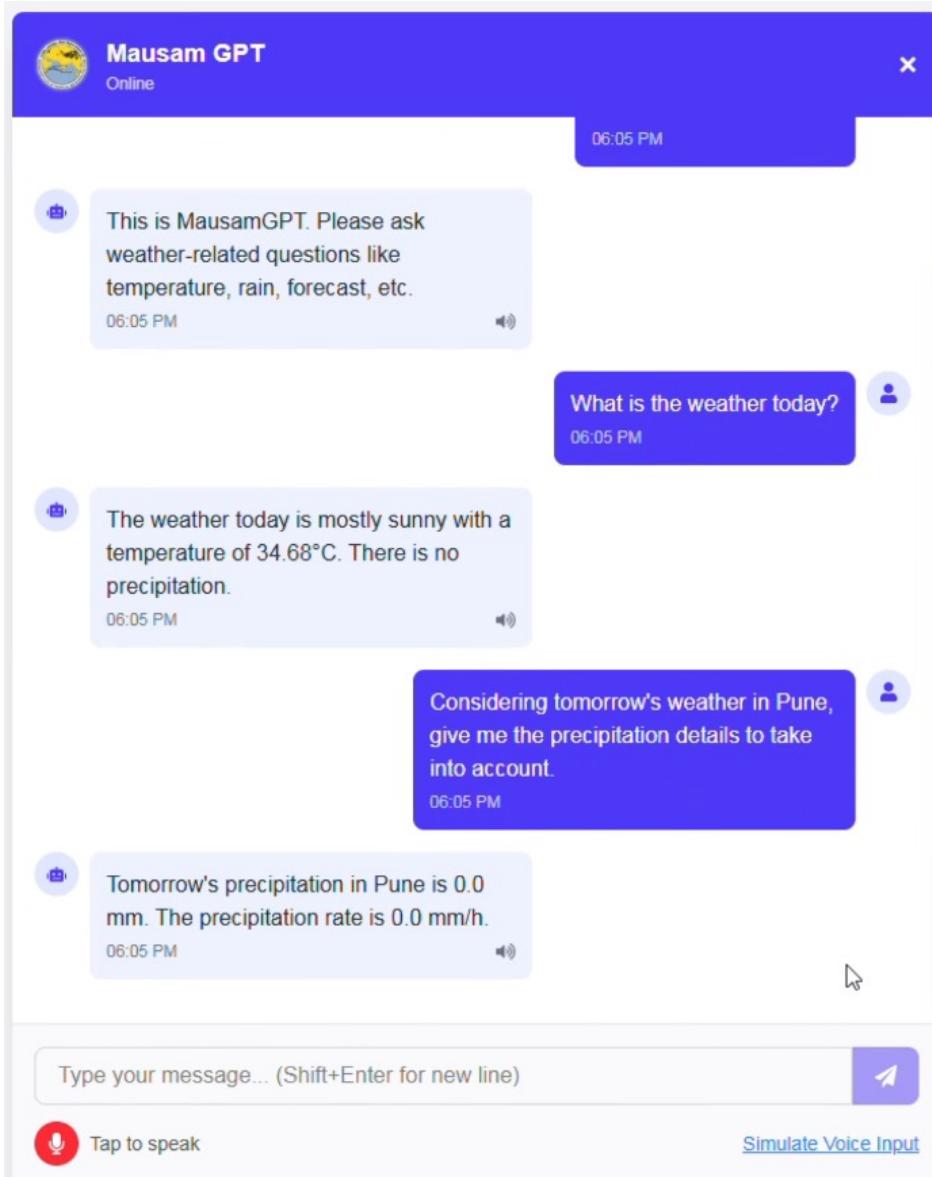


We are trying to use AI to develop applications

- MausamGPT (WeatherGPT)
- Downscaling of precipitation data.
- Fire location Forecasting
- Fog Forecasting
- Lightning/Thunderstorm Forecasts
- Deep learning for improved global precipitation in the numerical weather prediction system.

at IITM Pune





MausamGPT

“Mausam” is Hindi word for Weather

I recommend checking a different source or waiting for an updated forecast closer to your trip for a more accurate idea of the weather in February.

3:10 pm



Can I sow wheat now in Pune?

3:10 pm



The current temperature in Pune is 34.68°C and it is expected to be 33.56°C tomorrow. Considering the temperature and no precipitation forecasted, it might not be the best time to sow wheat as

इस हफ्ते तापमान कैसा रहेगा? (Voice)
3:11 pm



I need to know which location you'd like the weather forecast for. Please specify a city or location.
3:11 pm



आज पुणे में मौसम कैसा रहेगा? (Voice)
3:12 pm



and no precipitation forecasted, it might not be the best time to sow wheat as Pune's climate is generally suitable for wheat during the winter season, typically from October to February, when temperatures are cooler.

3:10 pm



MausamGPT
Weather Assistant

A AA A+

What will be the weather like in Pune in February? Help me pack for my trip.
3:09 pm
3:10 pm

I'm happy to help you with the weather forecast, but I have to inform you that the provided data is for April 18th and 19th, 2025, not February. Based on the current data, today will be sunny with a temperature of 34.68°C and a gentle breeze. Tomorrow, the temperature will dip slightly to 33.56°C with a similar wind pattern. Since I don't have February's data, I recommend checking a different source or waiting for an updated forecast closer to your trip for a more accurate idea of the weather in February.
3:10 pm



Ask about weather...

MausamGPT
Weather Assistant

A AA A+

MausamGPT

Weather Assistant

7-Day Forecast

Today



32° 26°

Tue



31° 27°

Wed



29° 26°

Thu



28° 25°

Fri



30° 26°

Sat



31° 27°

Sun



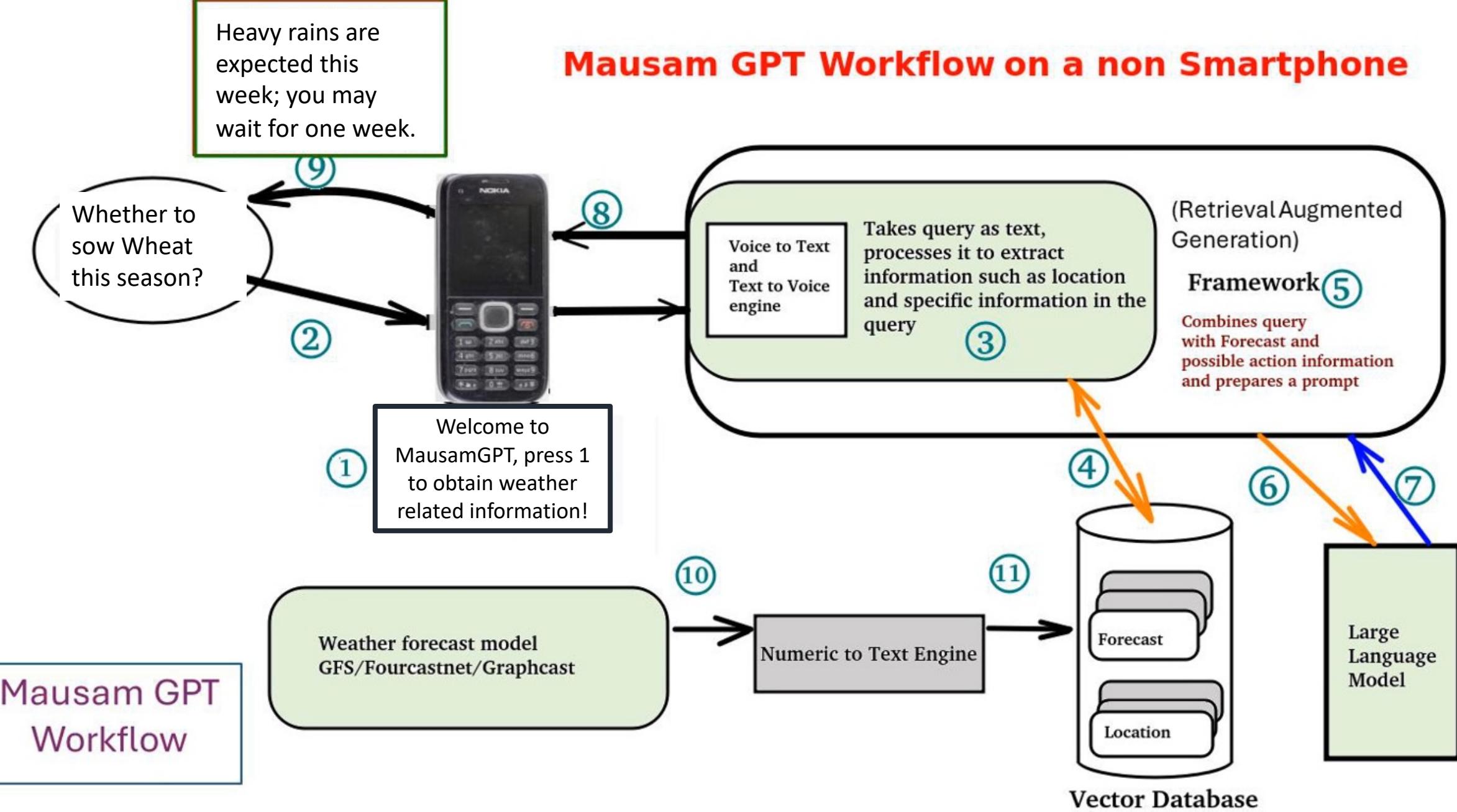
33° 28°

Namaste! Main MausamGPT hoon. Aaj ke mausam ke bare mein poocho!

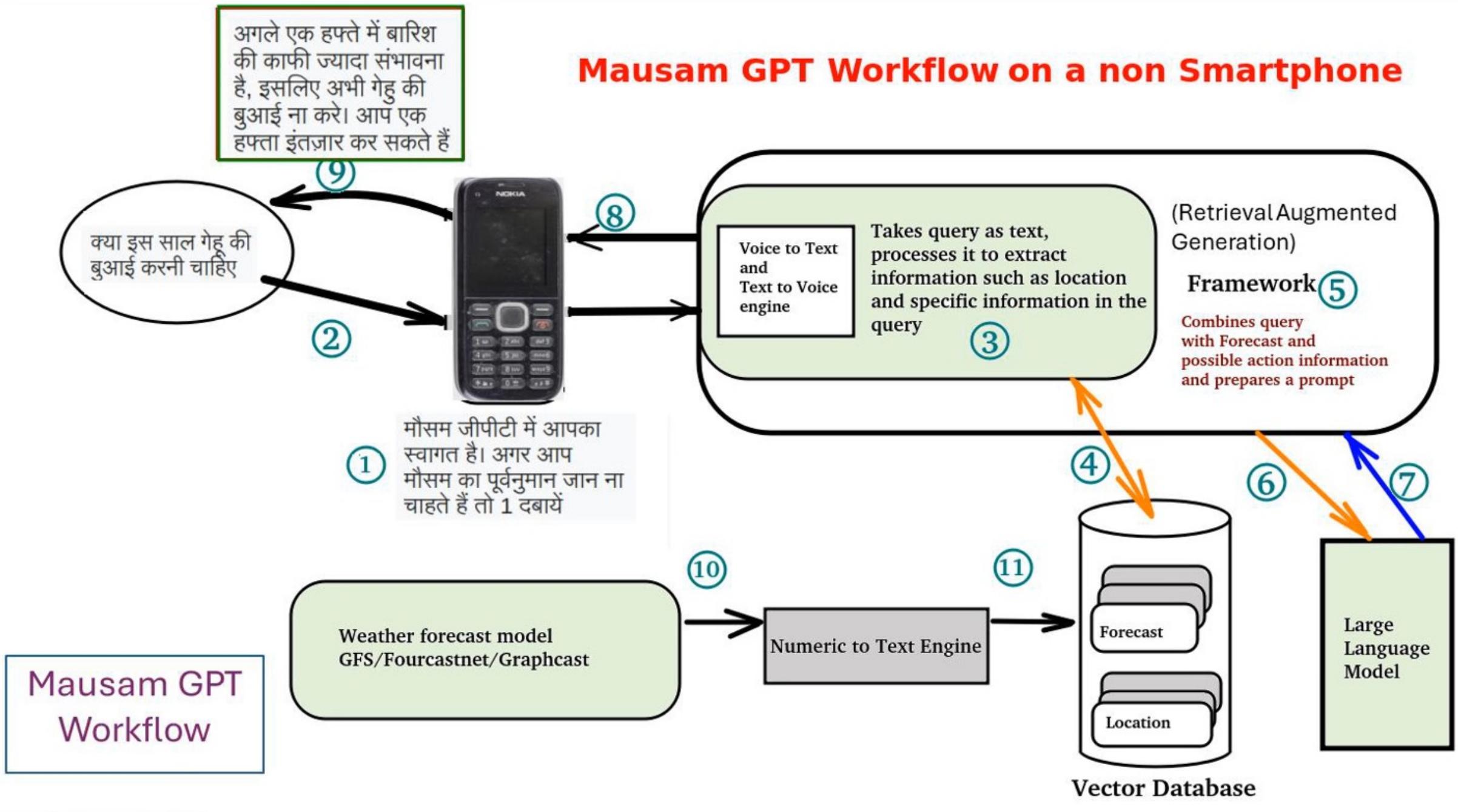
3:08 pm



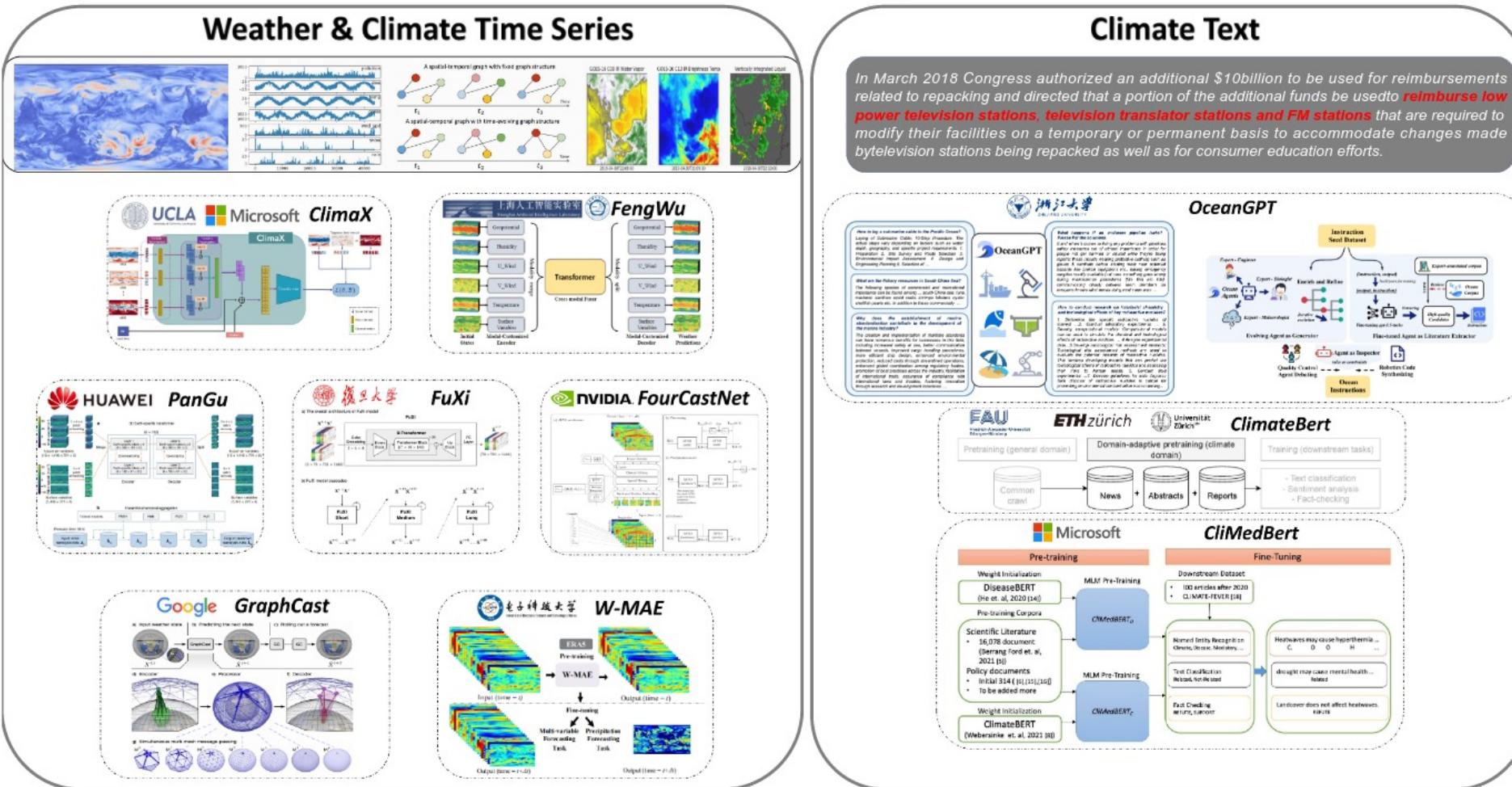
Mausam GPT Workflow



Mausam GPT Workflow on a non Smartphone

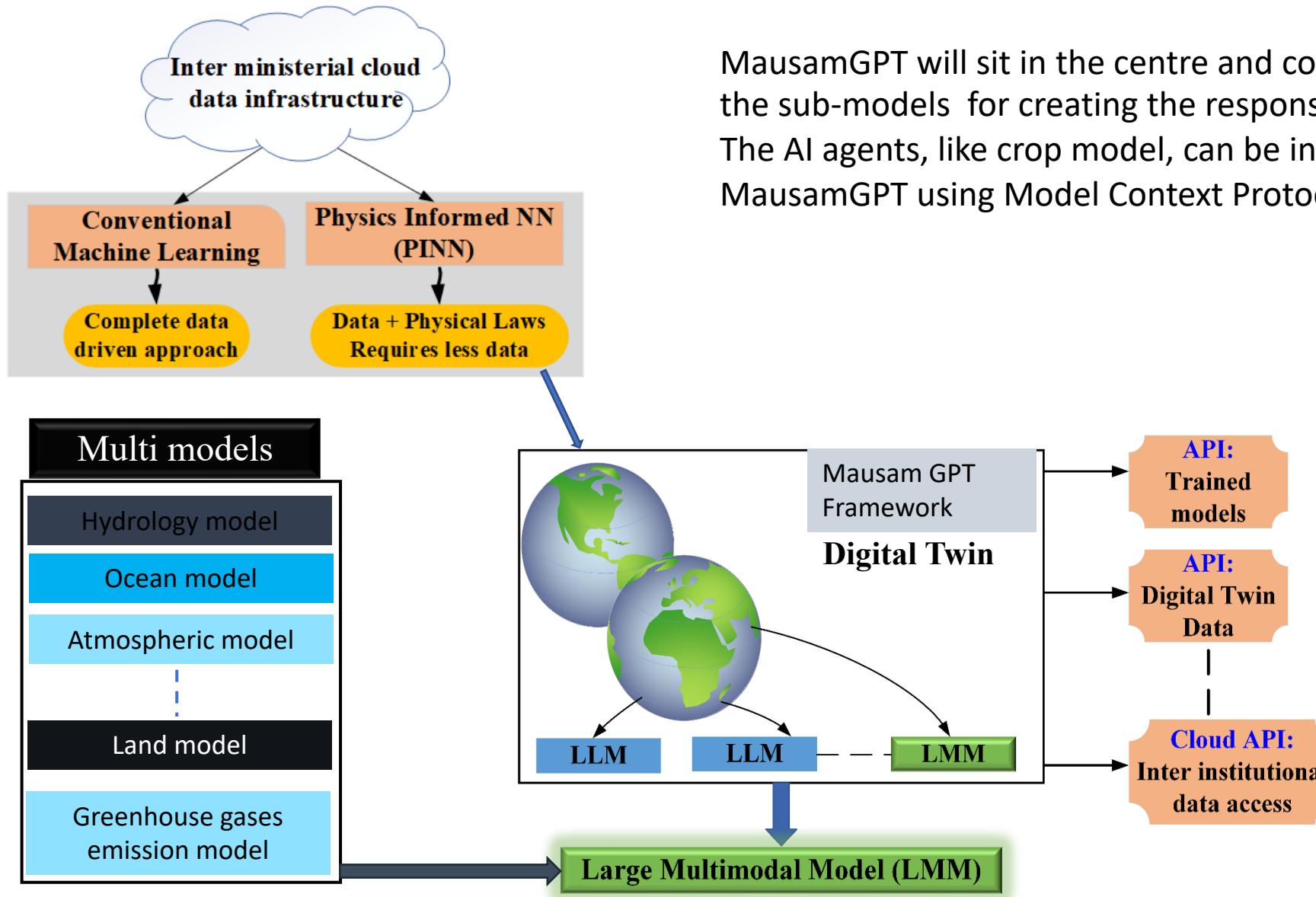


Large Foundation Models for Weather and Climate

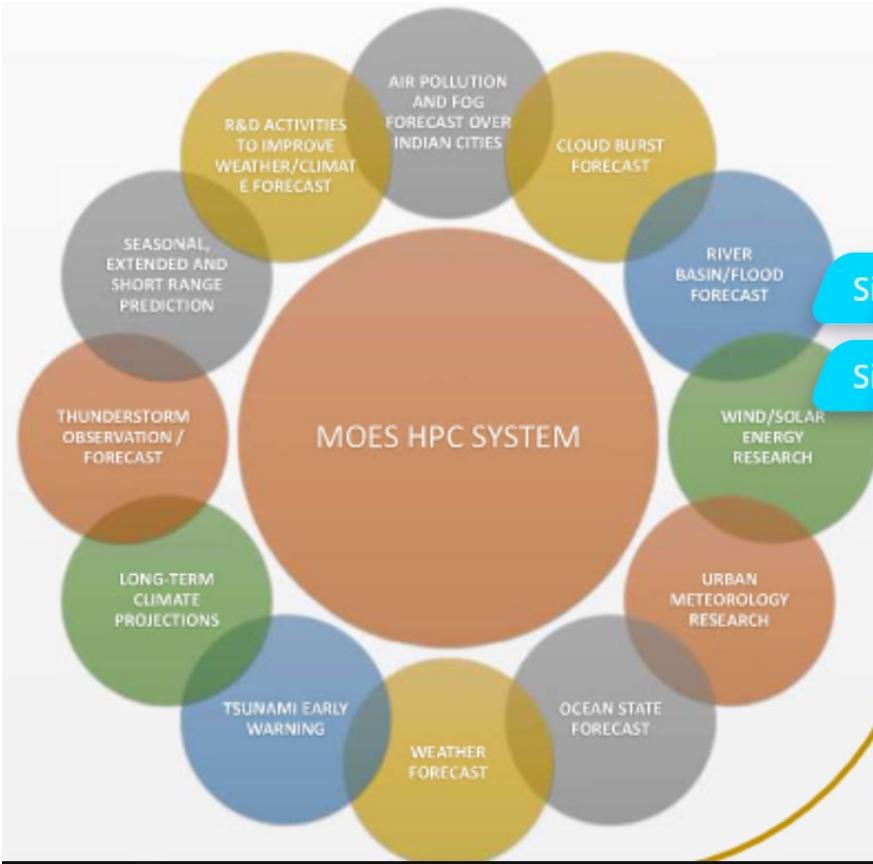


An overview of large foundation models for weather and climate, **Left:** Foundation Models specialized in weather and climate time series (including time series, spatio-temporal series, video streams, etc.), **Right:** Foundation Models specialized in climate-related text data.

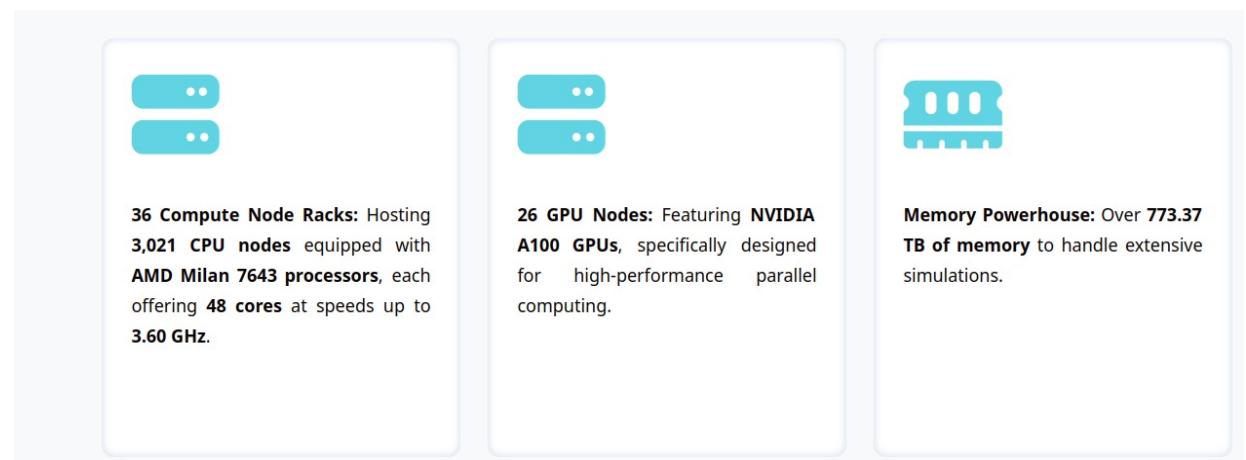
Prithvi AI – Prithvi Pratibimb



The Arka and Arunika HPC



ARKA



ARUNIKA



Peak Performance of 11.77PF and **dedicated 1.9PF for Artificial Intelligence research**

<https://arka.tropmet.res.in/Arka/introduction.html>

<https://nwp.ncmrwf.gov.in/computing/hpc-systems>

Harnessing deep learning for forecasting fire-burning locations and unveiling $PM_{2.5}$ emissions

Sushrut Gaikwad^{1,2} · Bipin Kumar¹  · Prafull P. Yadav^{1,5} · Rupal Ambulkar^{1,7} · Gaurav Govardhan^{1,6} · Santosh H. Kulkarni³ · Rajesh Kumar⁴ · Dilip M. Chate³ · Narendra Nigam¹ · Suryachandra A. Rao¹ · Sachin D. Ghude¹

Fig. 5 Ground Truth vs. forecast ($PM_{2.5}$ and wind as input) for the R1 region for 3 days lead time forecast. The date of these days are: 7–9th Nov, 2018

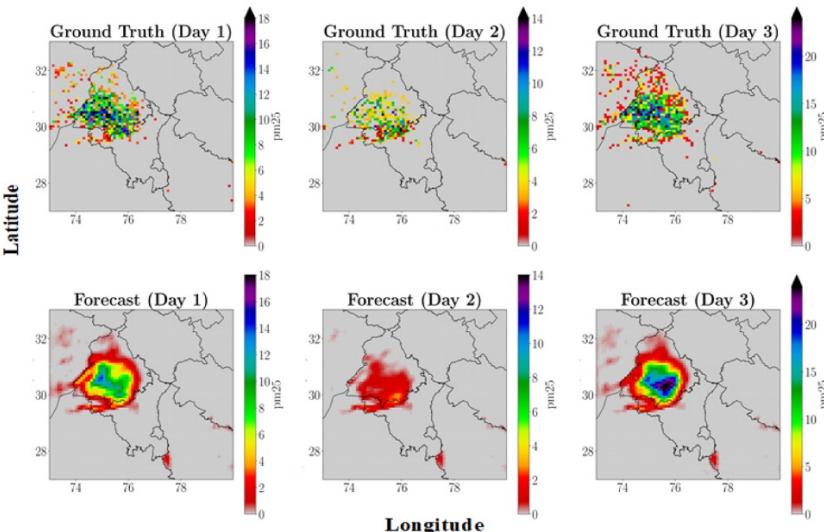
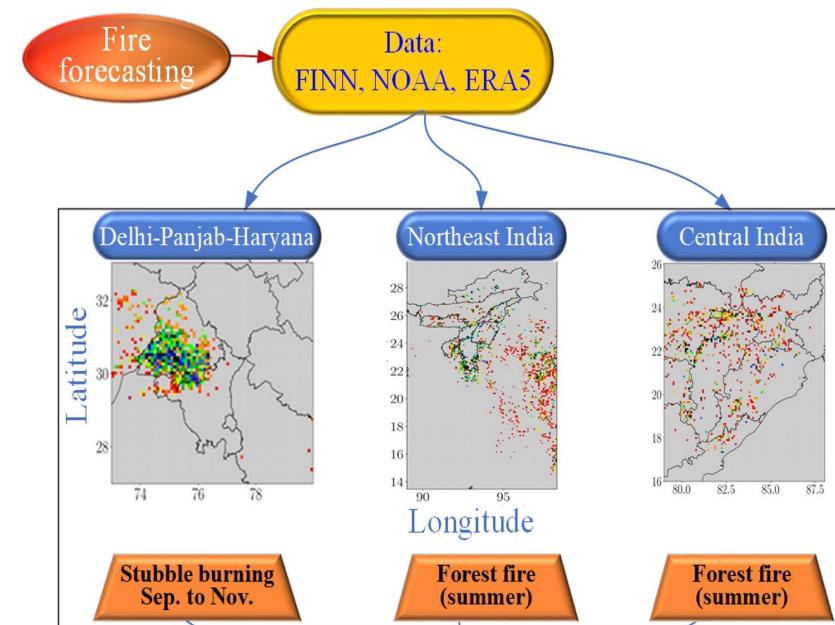
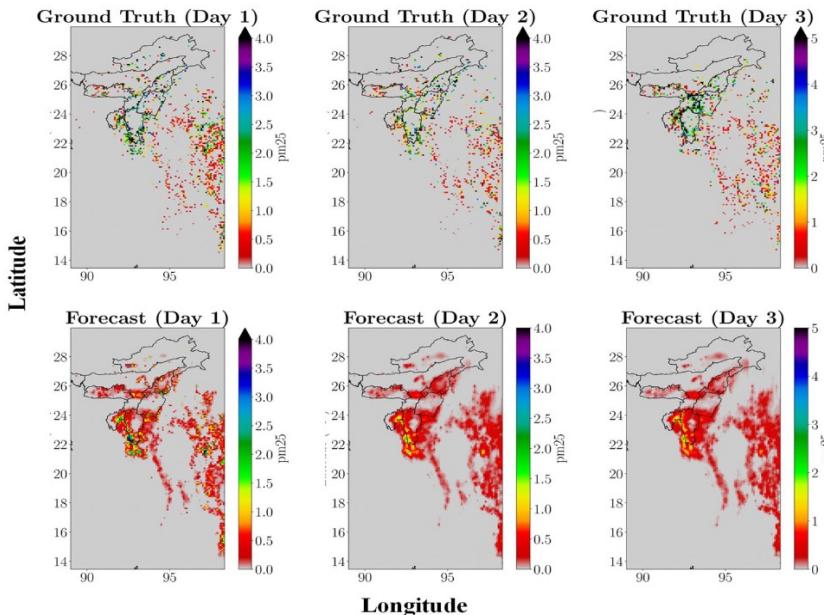


Fig. 9 Ground Truth vs. Forecast for the northeast Indian subcontinent region (R2). The 3 days shown here are 21 – 23rd March, 2018



A flowchart illustrating different steps for developing the deep learning fire location forecasting model

- Delhi-Panjab-Haryana:
 - Good results for all 3 days
- Northeast and Central India:
 - 1st day good | 2-3rd days moderate

Thank You

Questions??

