

# Retrieving Pressure-Temperature and Water Vapour Profiles in Earth's Atmosphere from INSAT 3DR data using Machine Learning

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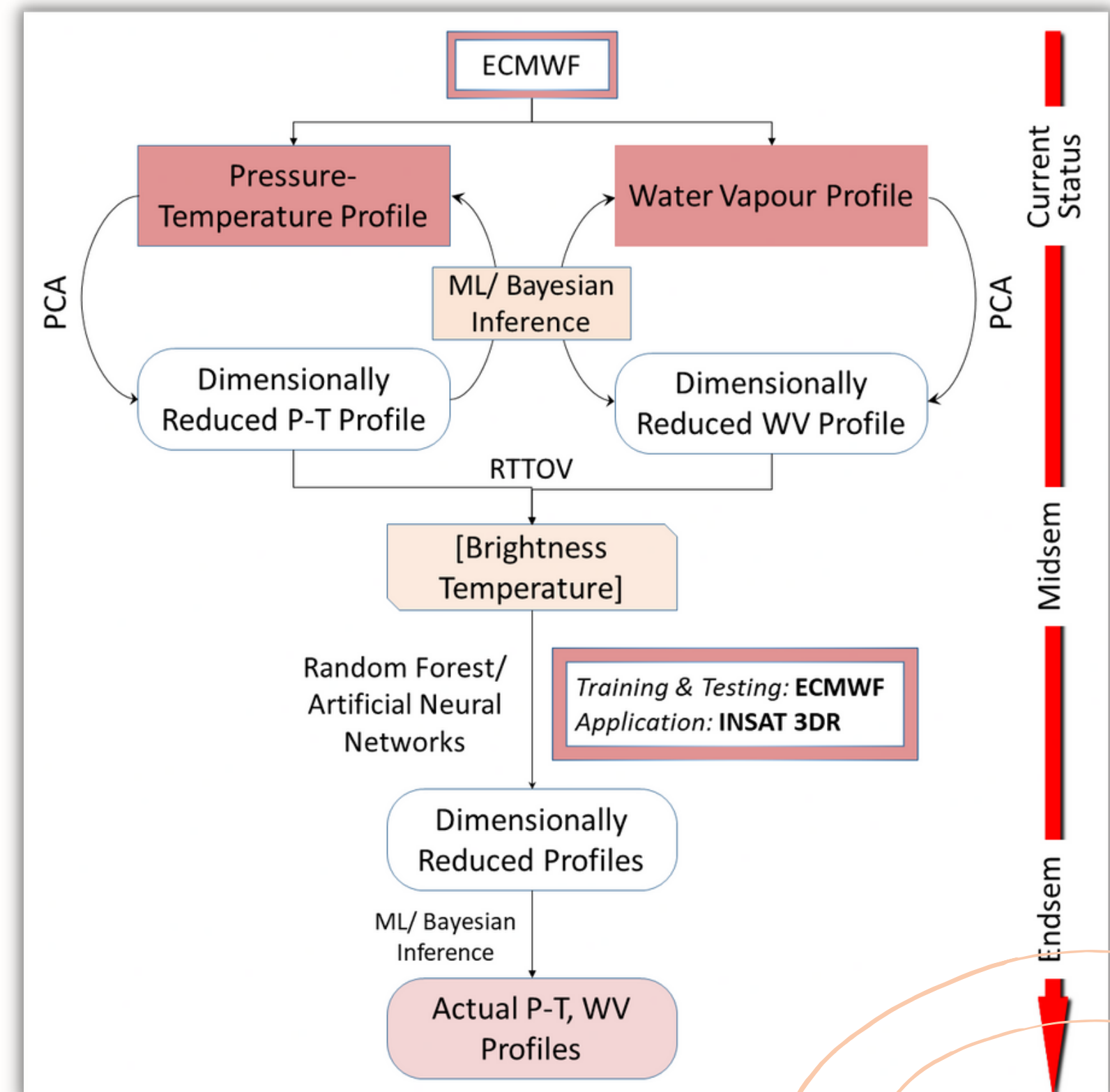
*Idea:* Due to lack of instruments to measure actual sea surface temperature, brightness temperature(s) (BT) from satellite data is used as a proxy in practice. In this project we will use a radiative transfer model (RTTOV) to get the BT from available pressure temperature (P-T) and water vapor (WV) profiles and develop a machine learning algorithm to backtrace those profiles from BT obtained by INSAT 3DR satellite images.

*Dataset:*

- 25000 P-T and WV Profiles from ECMWF;
- INSAT 3D sounder images produced in every 30 minutes

*Expected Results :*

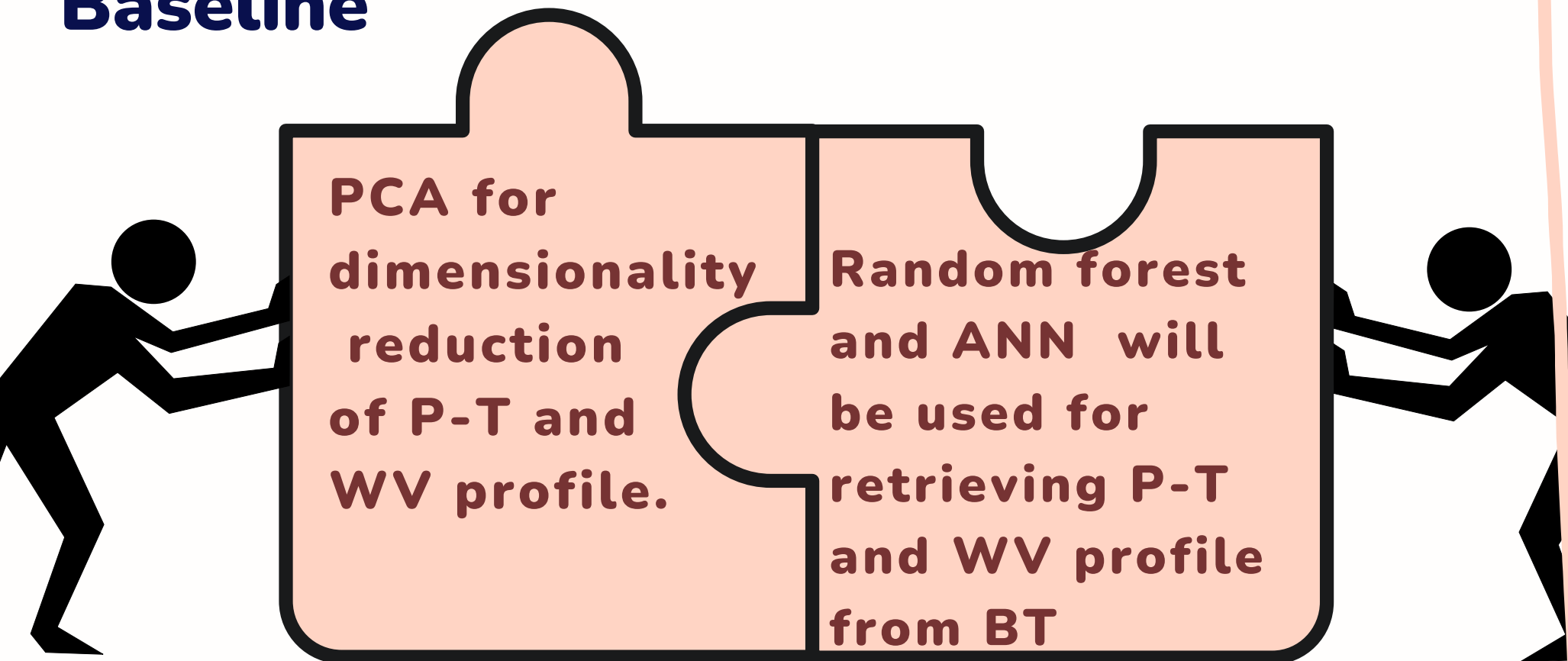
- Dimensionally reduced P-T or WV profiles to get BT within affordable tolerance;
- P-T and WV profiles predicted from Satellite BT



## Relevant Paper

- ★ Lasota, E. Comparison of different machine learning approaches for tropospheric profiling based on COSMIC-2 data. Earth Planets Space 73, 221 (2021). <https://doi.org/10.1186/s40623-021-01548-4>
- ★ Stephens, G. L. (1990). On the Relationship between Water Vapor over the Oceans and Sea Surface Temperature, Journal of Climate, 3(6), 634-645.n.
- ★ Jindal, P et al. Total column ozone retrieval using INSAT-3D sounder in the tropics: A simulation study. J Earth Syst Sci 123, 1265–1271 (2014). <https://doi.org/10.1007/s12040-014-0477-1>

## Baseline



## Midway Target and Work Division

- 1 Data Collection and preprocessing (Combined)
- 2 Feature selection in P-T profile dimensionality reduction algorithm (Soumik).
- 3 Feature selection in W-V profile dimensionality reduction algorithm (Fida).
- 4 Learn about Neural Network and implement an ANN model as initial stage. (Combined)
- 5 Project Report (Combined)