

The background is a vibrant, abstract composition of organic, flowing shapes in shades of teal, mustard yellow, and magenta. These shapes are filled with various patterns: some have small white dots, others have white dashes or lines, and some are solid. The overall effect is a textured, layered look.

Agathon- 2023

Team 07

Abdur, Tazin, Lakshey, Aden , Madhulika and Supriya

Objective

- Create a model to forecast cool-season precipitation (November – March) in the Sacramento basin.



Motivation

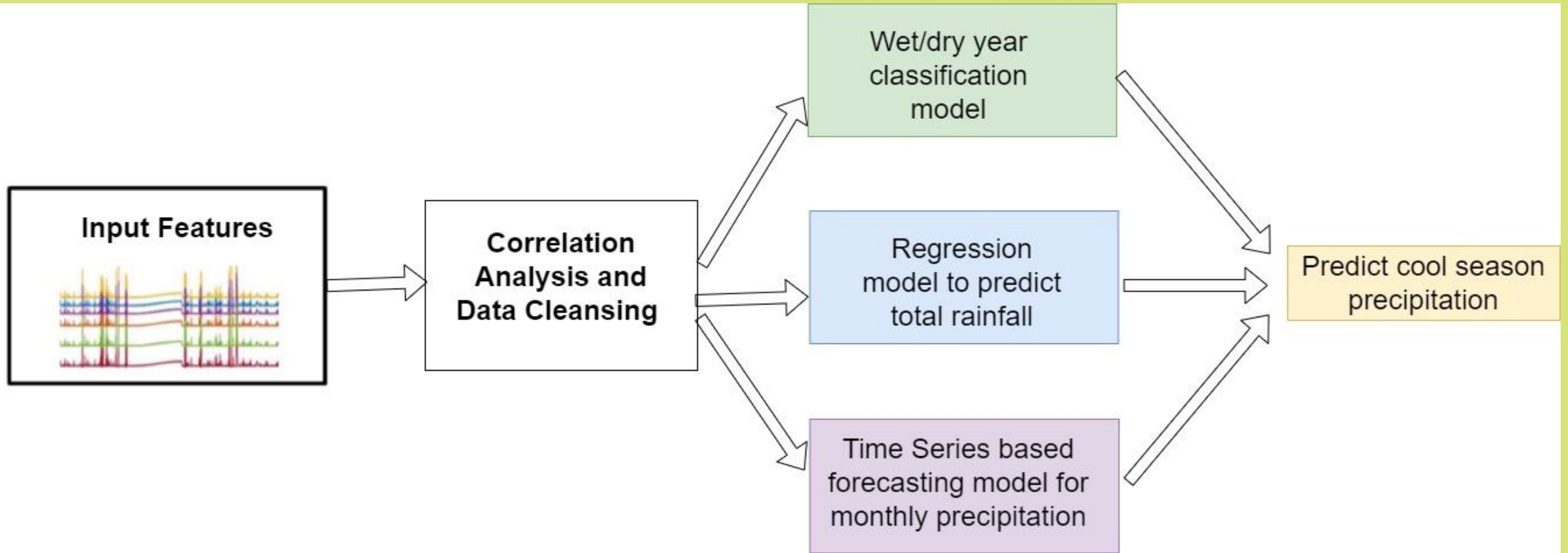
- To improve our ability to forecast precipitation to help improve our water systems and help water managers efficiently manage hydrological regimes as well as predicting the extremes.



Today's Headlines: Flooding across California

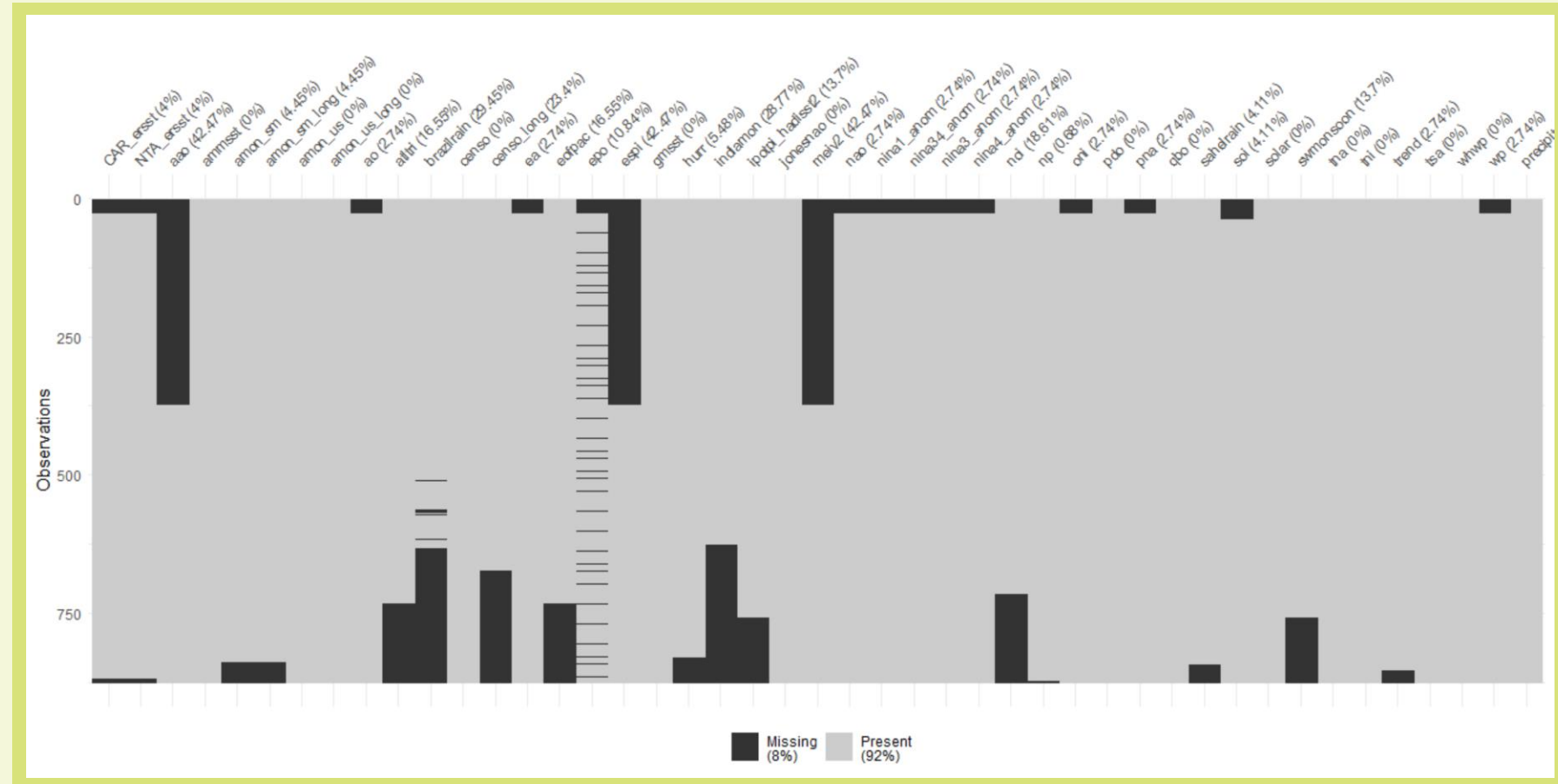


Workflow



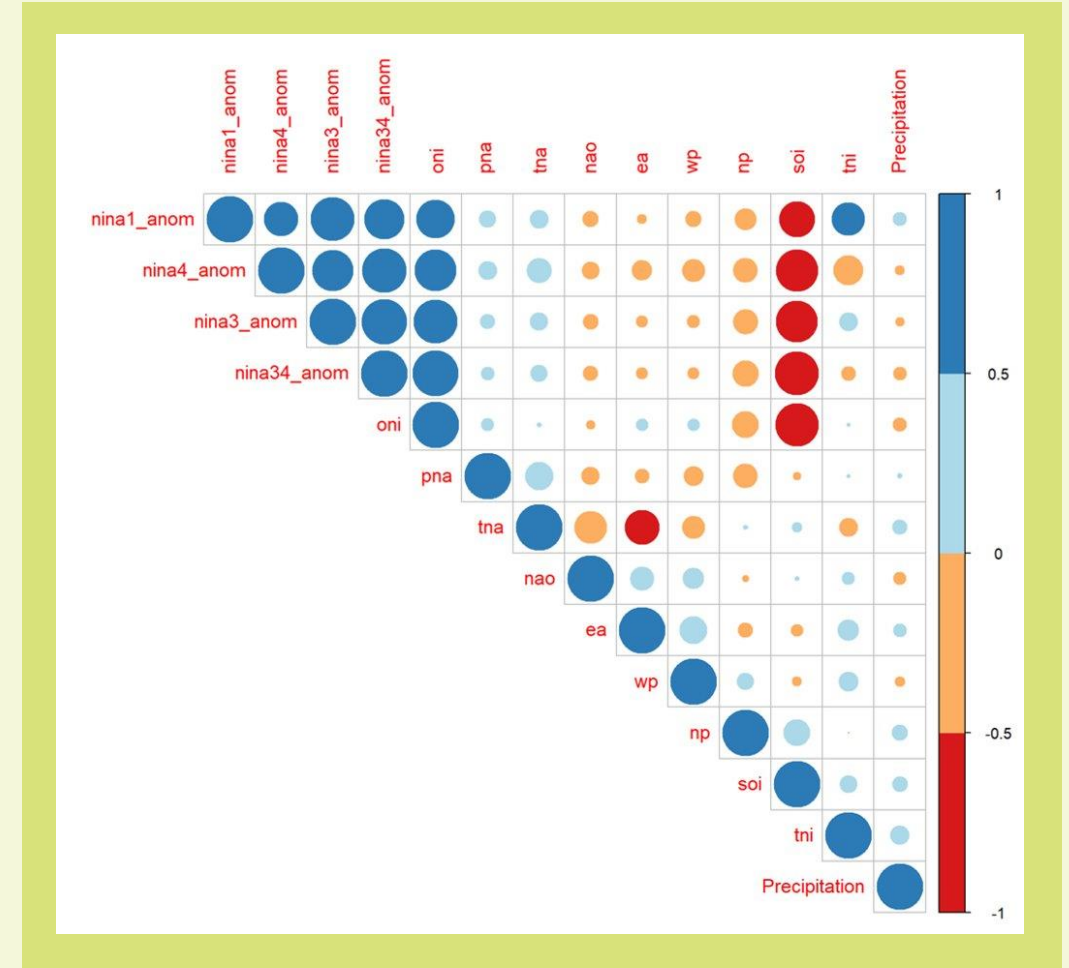
Data

- Sense check of the data
 - Data Imputation
 - Correlation



Data

- Sense check of the data
- Global climate indices from 1948 to 2020.
 - Select from the wide suite of indices
 - Relevance in the region
 - Based on the previous study conducted in the region*, for capturing the relevant
 - Teleconnections,
 - ENSO,
 - SST: Pacific



*Silverman and Dracup, 2000

Experimental Setup

Cloud Platform:

Microsoft Azure

Validation:

Training Data: 70%

Validation Data: 30%

Primary Performance Metric:

Accuracy/Normalized root mean squared error

Three separate Models:

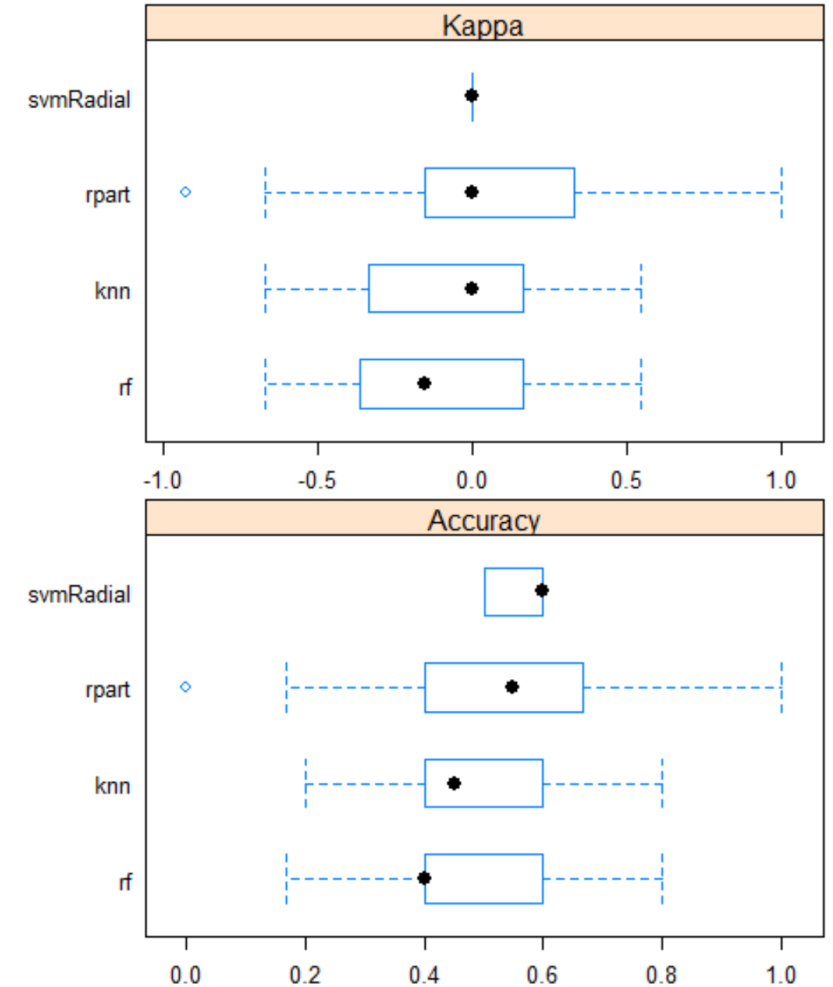
Classification model to predict wet/dry year

Regression Model to predict total precipitation in cool season

Time series based forecasting model

Classification of Dry and Wet Years

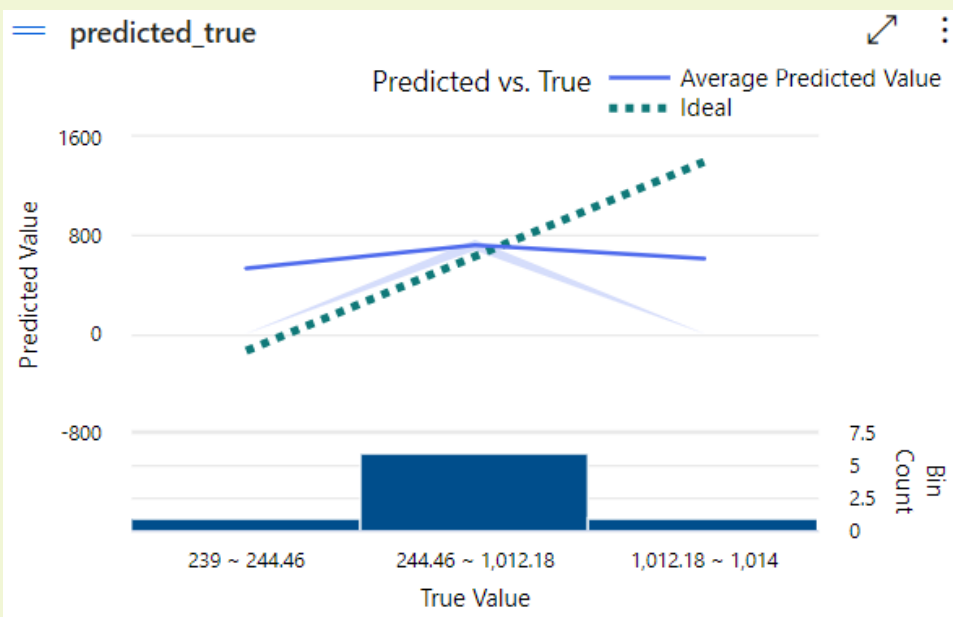
- Cool-Season Precipitation Threshold = 600mm
 - Precipitation ≤ 600 ~ 'Dry Year'
 - Precipitation > 600 ~ 'Wet Year'
- The value is on the higher side* (about 33%), this was done to have a more balanced data.
- Models used for Classification are
 - Random Forest (RF),
 - k-Nearest neighbor (knn),
 - CART - Classification and regression trees (rpart),
 - Support Vector Machine (SVM_radial)



* <http://www.rssweather.com/climate/California/Sacramento/>

Regression based Cool Season Total Precipitation Prediction Model

Best model: Voting Ensemble



Normalized root mean
squared error: 0.27

Prediction Models

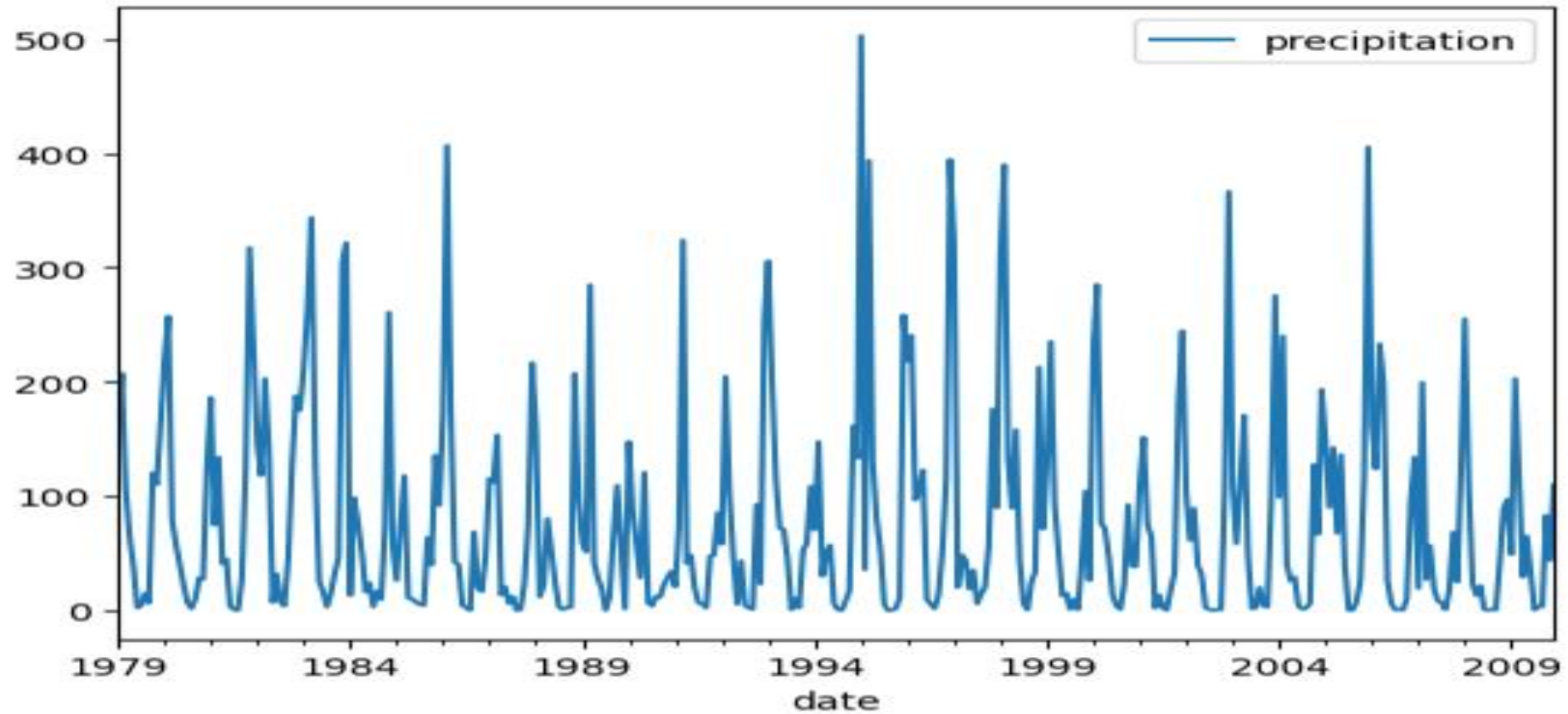
Voting Ensemble

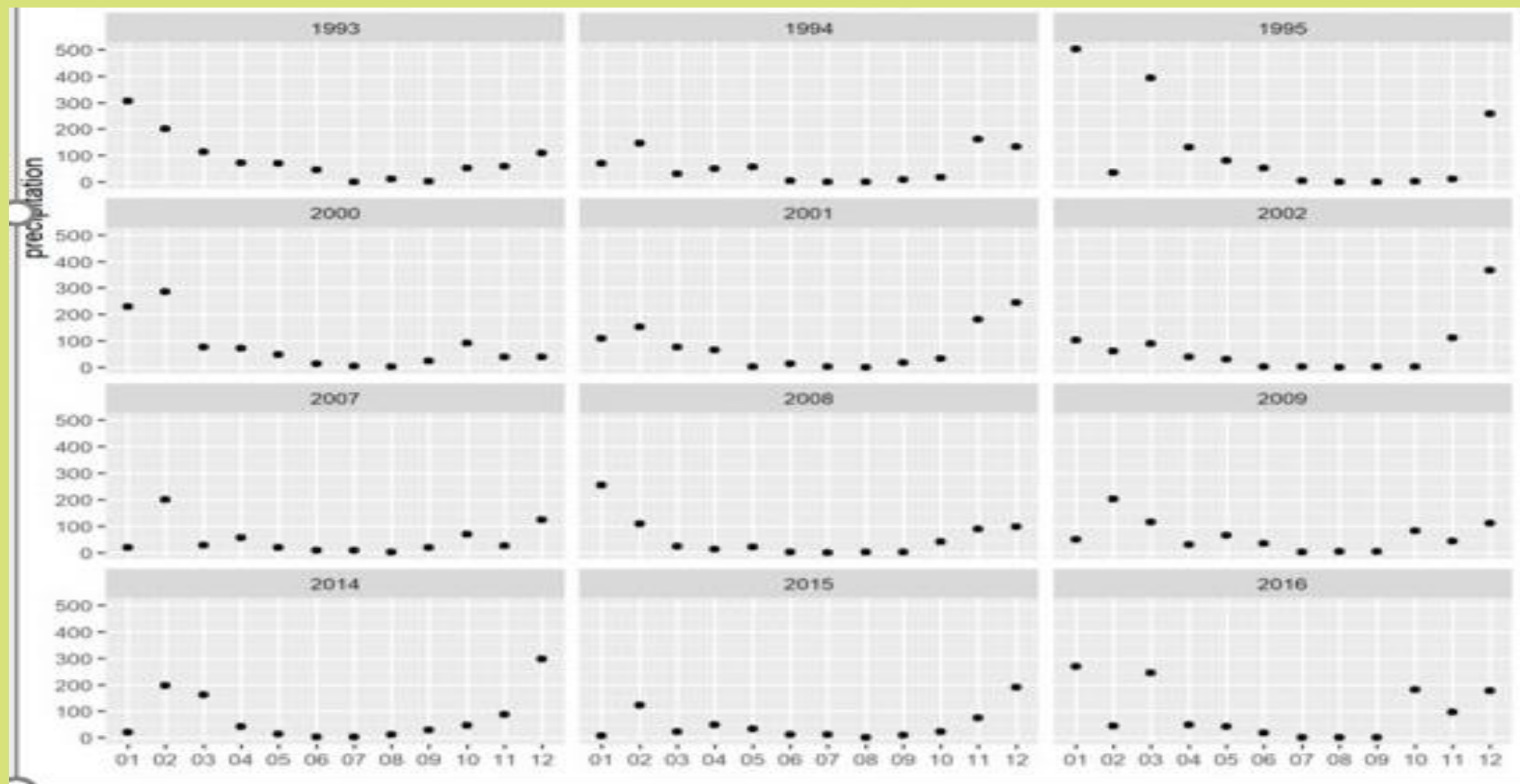
MinMaxScaler

RobustScaler

SGD

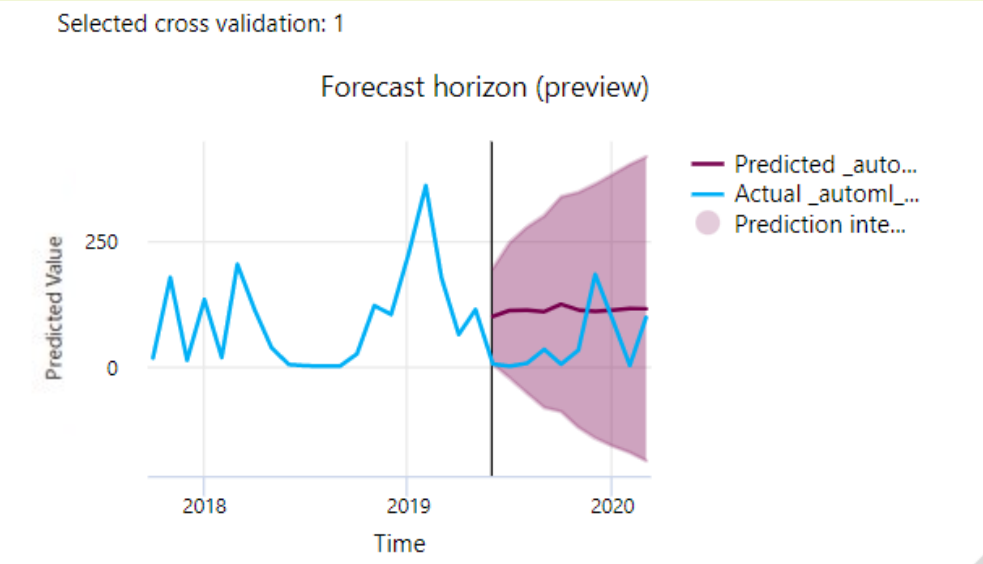
Time series-based forecasting model





Time Series based Cool Season Precipitation Forecasting Model

Best model: TCN Forecaster



Normalized root mean
squared error: 0.17

Prediction Models

TCN Forecaster

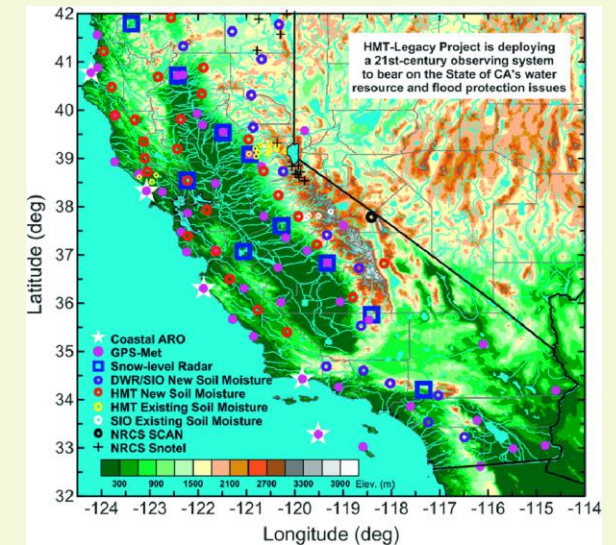
Seasonal Naive

Arimax

Auto Arima

Future Scope

- Incorporating Spatial Data in a spatial-temporal RNN model
- Additional information from other variables (like Meteorology, Observational data which is more region specific where we can divide the basin into zones)



Our Learnings

- Collaboration and teamwork
- Using Microsoft Teams for round the clock sharing of data, meetings, reaching out to individual team members, mentors and recording the final presentation.
- Azure platform, Azure repos, Azure Auto ML, Azure ML studio, Azure Blob Storage, Azure notebooks

MODEL DEMO

Thank you!

