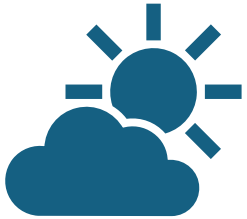

Time Series-based Weather Forecasting

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BIOSINF – IA2

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Introduction

A time series is a sequence of data points recorded at various points in time

Predictions can be made using statistical analysis over a time series

The process can be automated with the help of neural networks

Dataset and methods

Multiple datasets for weather forecast available: Jena Climate, Weather5K, multiple community-made datasets (ex: Kaggle Time Series dataset)

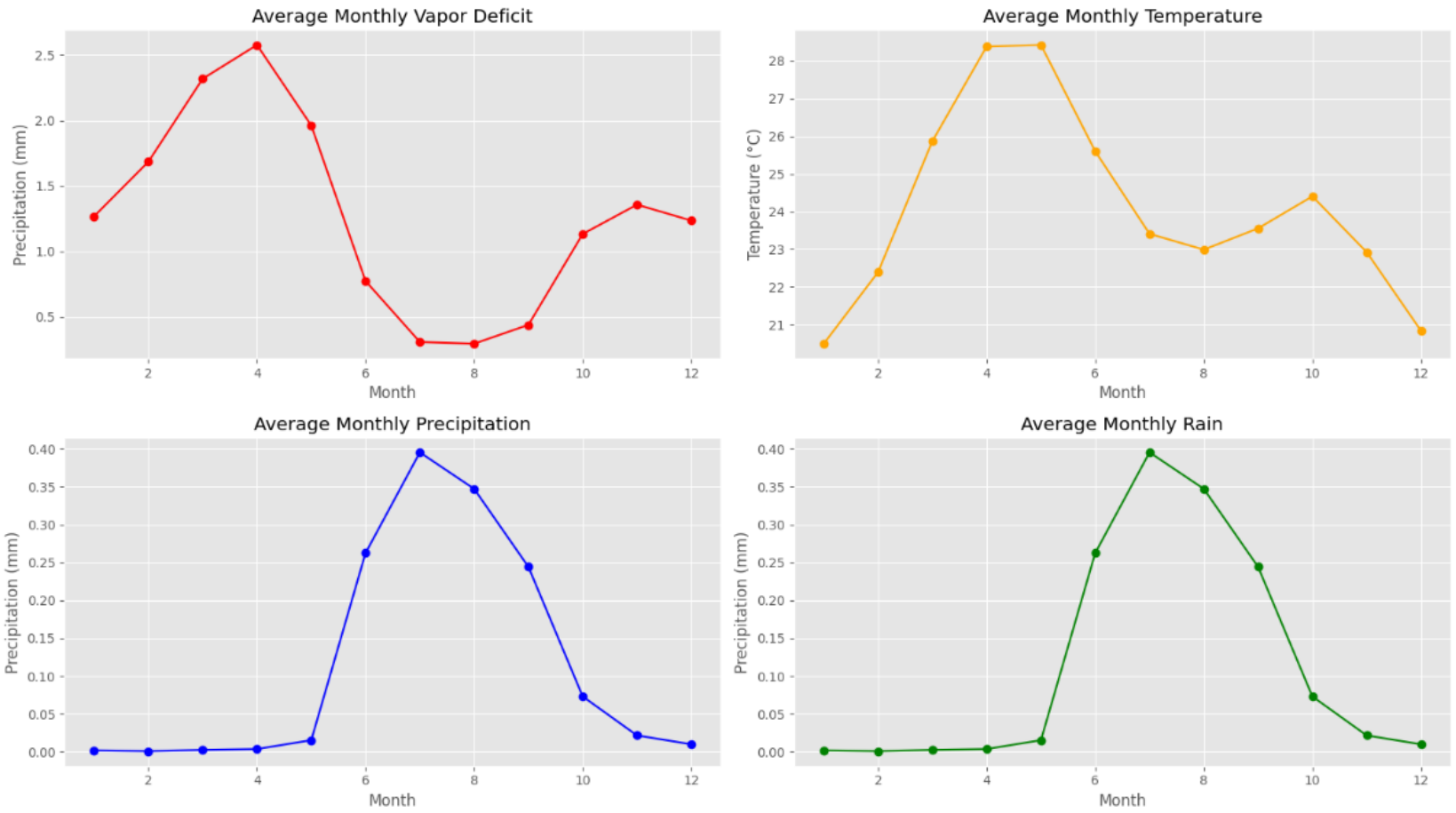
Dataset was analyzed for seasonality/periodicity

Several features were extracted and used

Split: ~70% for training, only training and testing

Data is normalized before use

Monthly data vizualization



Architectures and ablation studies

- Architectures: LSTM, GRU, CNN
- Architectures were chosen due to their prevalence in consulted sources
- Ablation study #1: data augmentation / depravation
- Ablation study #2: architecture augmentation
- Ablation study #3: hybrid architecture LSTM-CNN

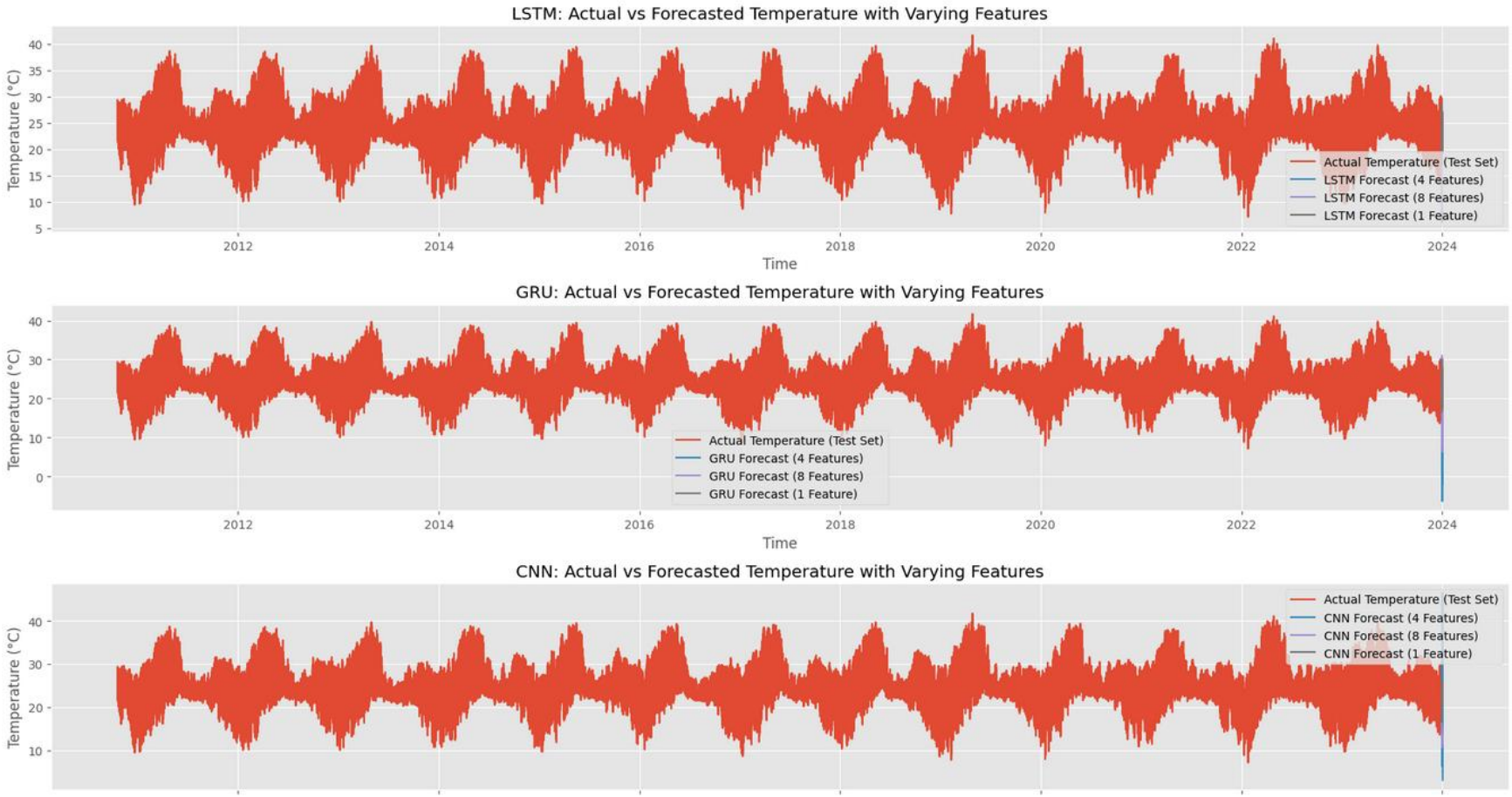
Results

Across the 3 ablation studies, LSTM obtained best overall results

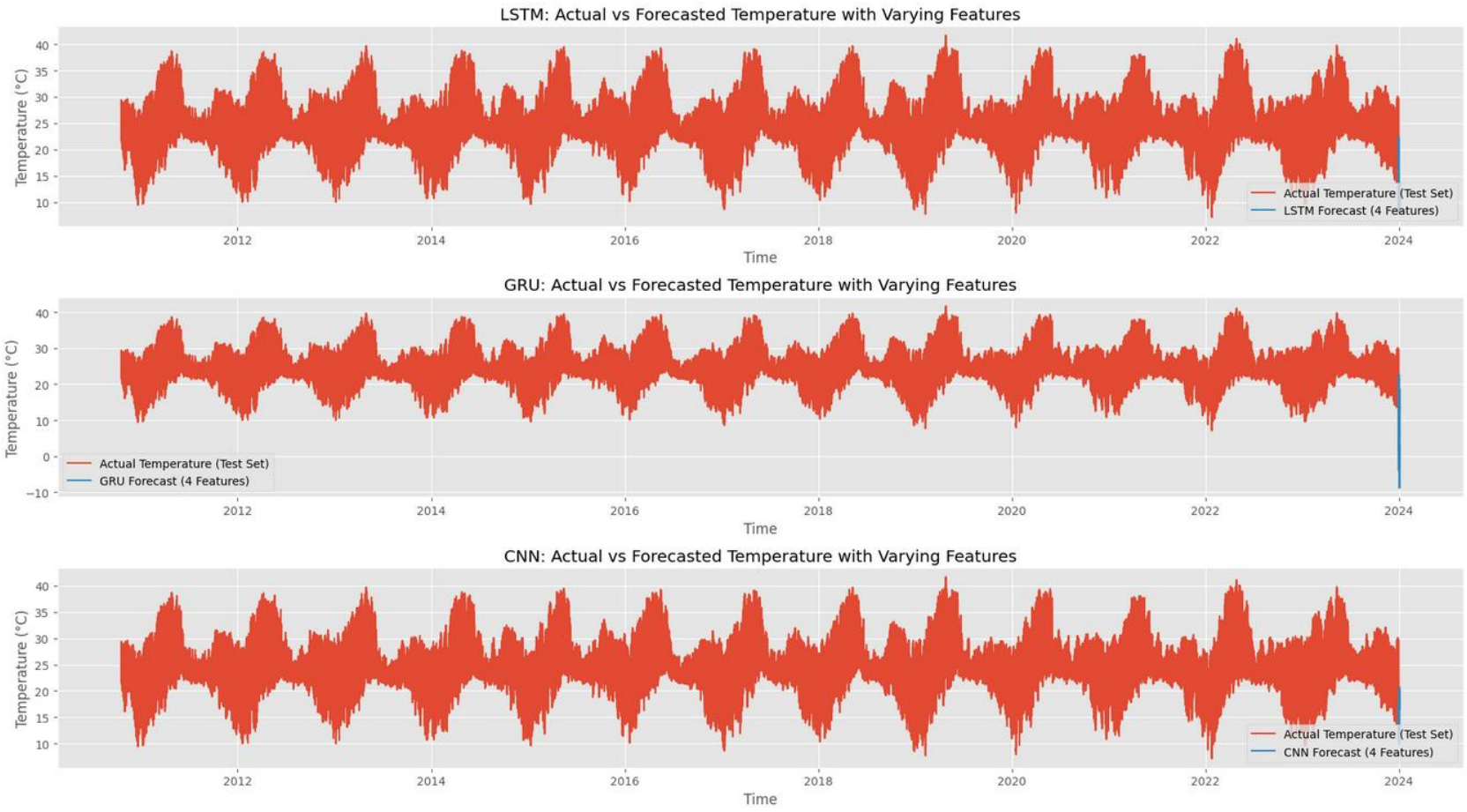
In theory, LSTM-CNN should be the best architecture

GRU should offer better portability (lower inference time)

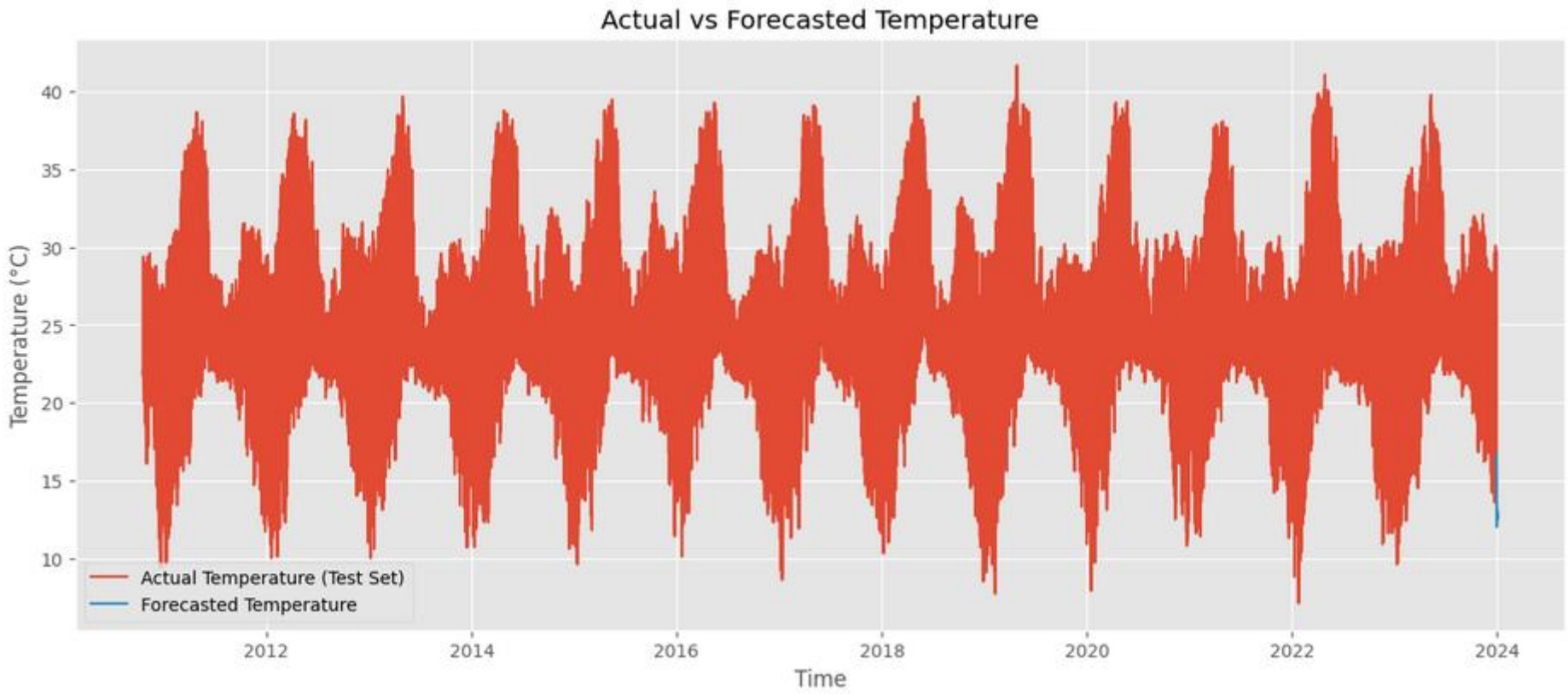
Prediction results (Study #1)



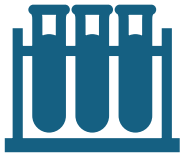
Prediction results (Study #2)



Prediction results (Study #3)



Conclusions



Future plans: apply methods and fixes to testing procedure, better ablation studies, implementation on real task

Overall results show that the LSTM/GRU is the best system when both dimensionality and performance is concerned

Mistakes and limitations:

1. Normalization applied across the entire dataset, not just on the training dataset
2. Predictions only done for one parameter while training on 1 or more parameters