Neural Process for ClimaX Paper

Proposing an innovative approach: Leveraging neural process for spatially varying temperature prediction.

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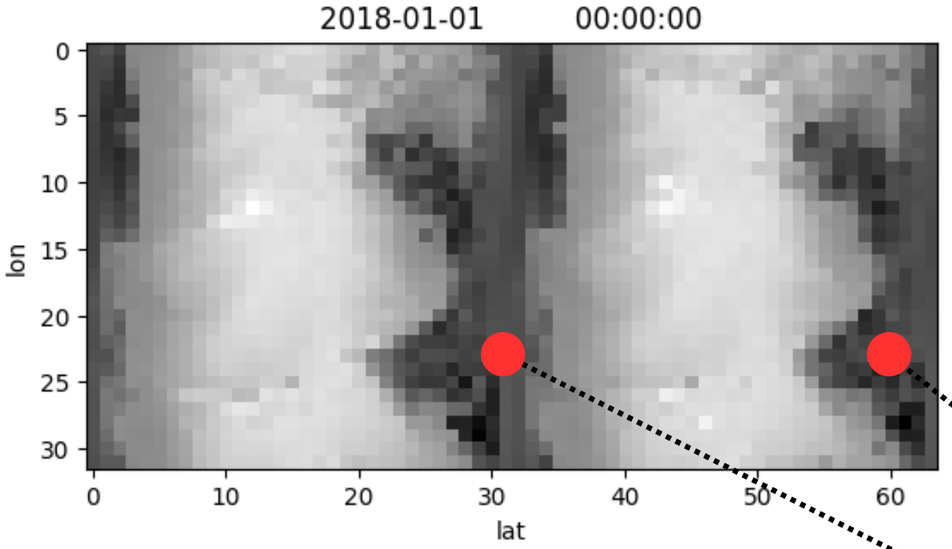
Initiation

- I have used entire **JUNE** month's data for training data(744 timestamps)
- Converted into a tensor of dimensions 744 x 32 x 64 & scaled it to represent the 744 samples of **grayscale** images.
- The conversion into grayscale was performed to highlight the *meaningful relationships* between different data points at a given timestamp.
- By representing the dataset in this tensor format, it allows for efficient storage and manipulation of the images during the analysis and modeling processes.

Insights [Data]



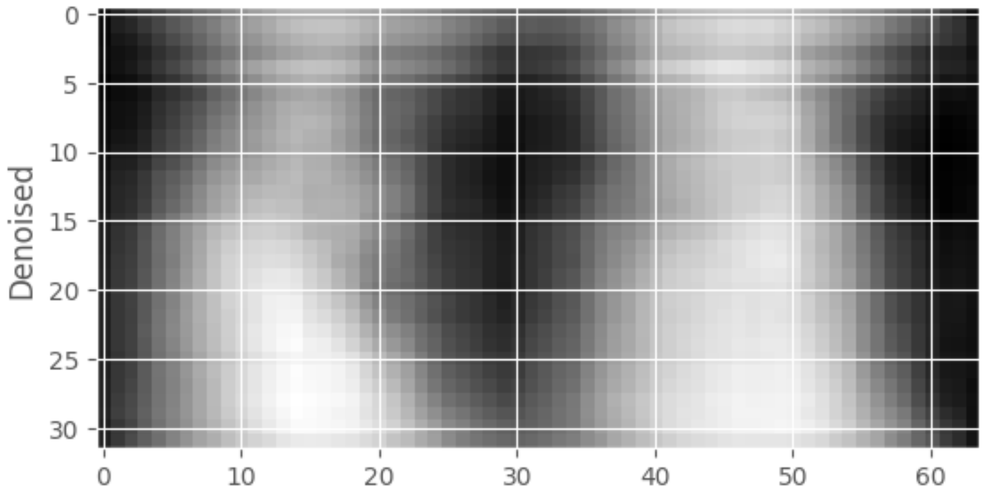
- By selectively masking fewer pixels in the regions between **20-40** & **55-64**, the model can potentially benefit from preserving more important spatial information in those areas.
- Randomly masking a certain percentage of pixels may lead to *loss of critical details*, whereas targeted masking can help retain relevant features and improve the performance of the model.

Configurations

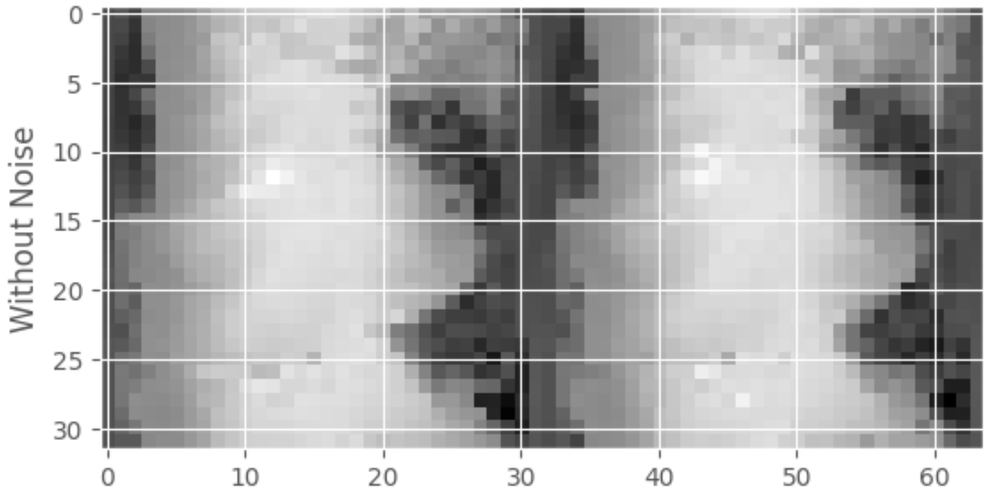
- Image size: [32, 64]
- Batch size: 50
- Latent space dimension (z_dim): 128
- Number of context points range: [100, 700]
- Learning rate (lr): 1e-4
- Number of epochs: 80
- Dataset: 2m_temperature_2018_5.625deg.nc
- Training Time: Approx. 1 hour
- Grids(training) : 700
- Grids(Validation) : 44
- Grids(Testing) : 5

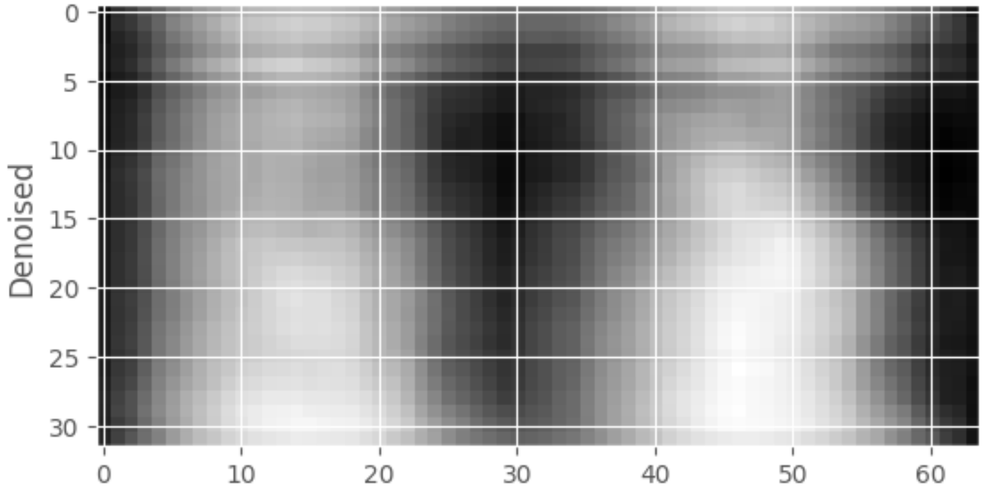
Prediction

Ground Truth



2018-01-01 00:00:00





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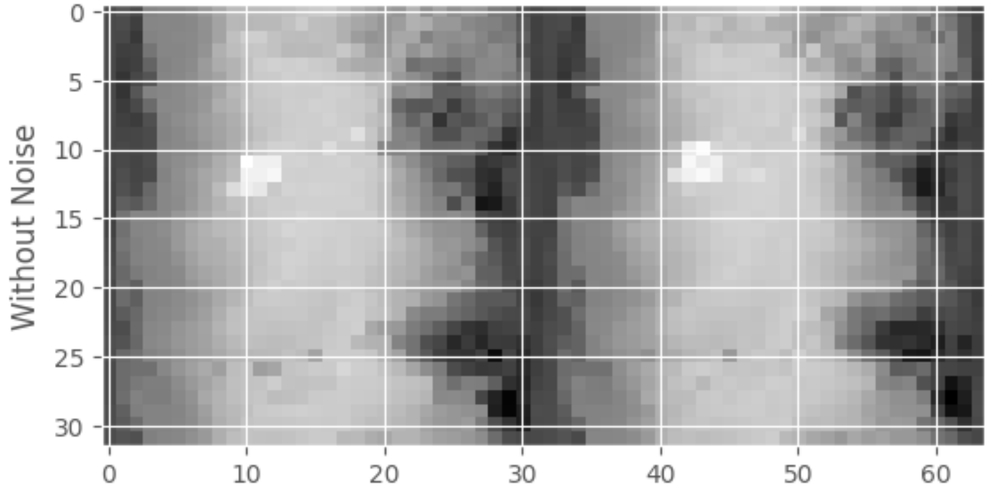
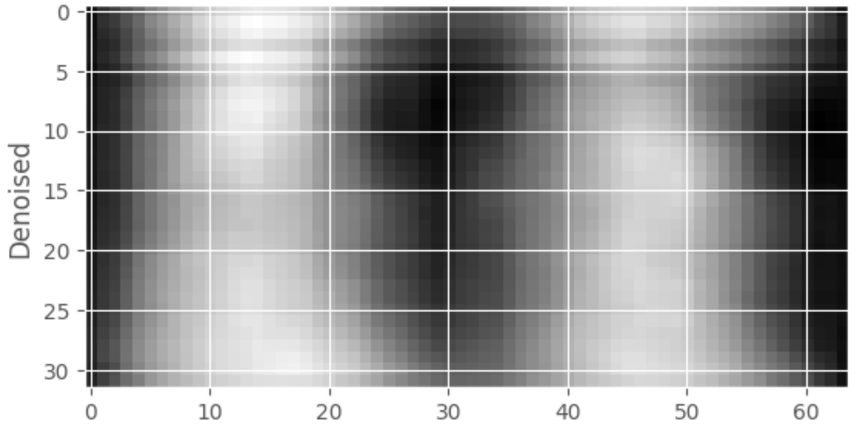
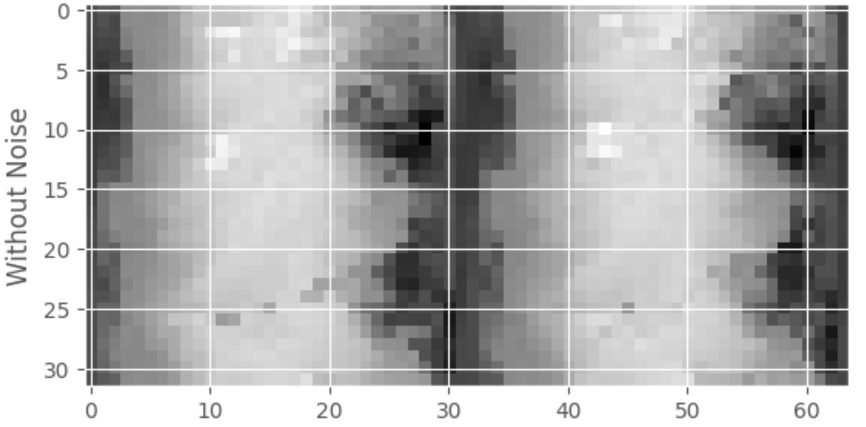
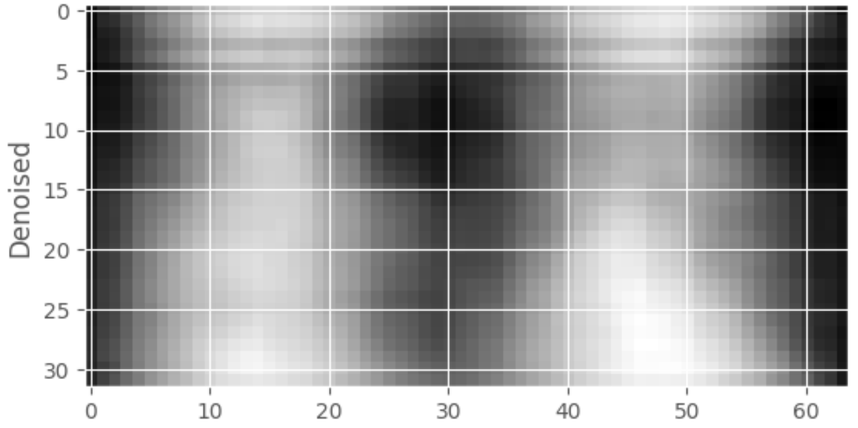


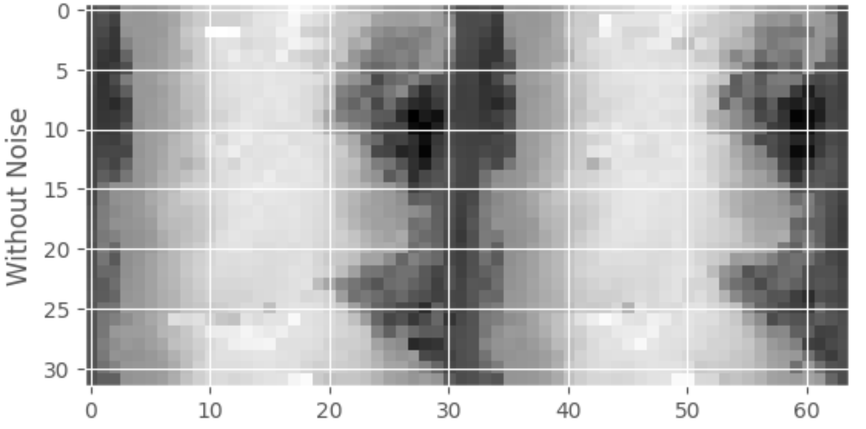


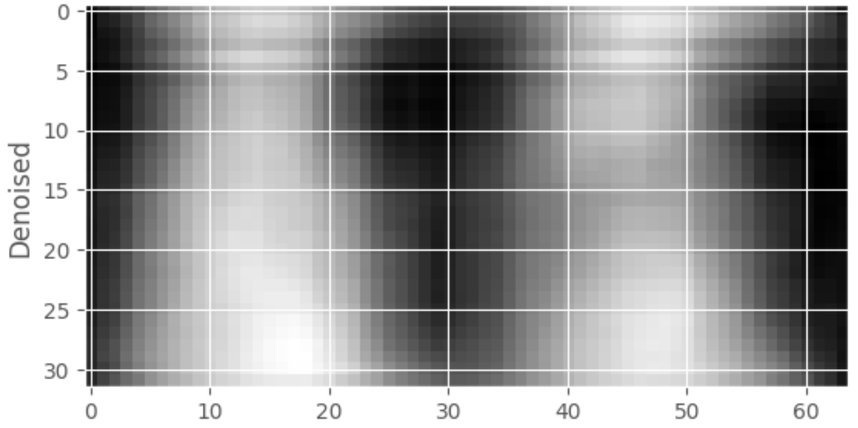
2018-01-10 10:00:00



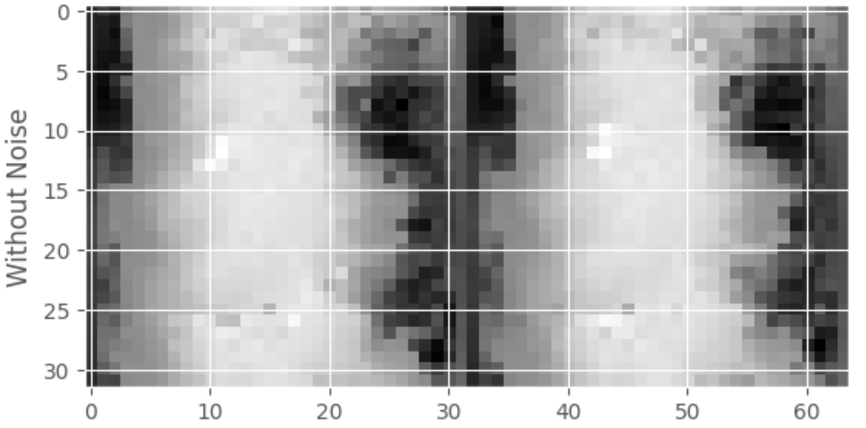


2018-01-16 16:00:00



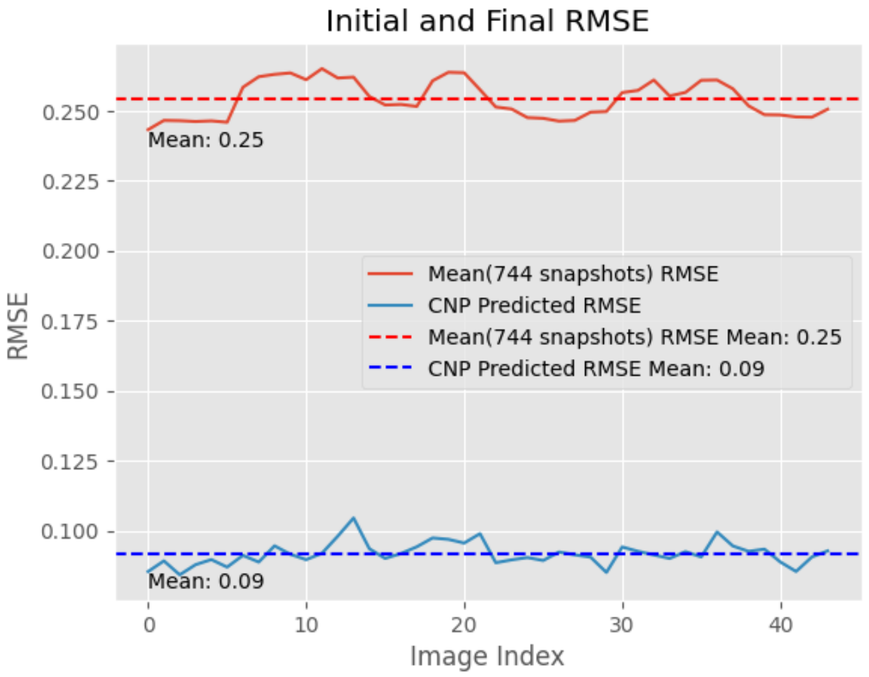


2018-01-23 23:00:00



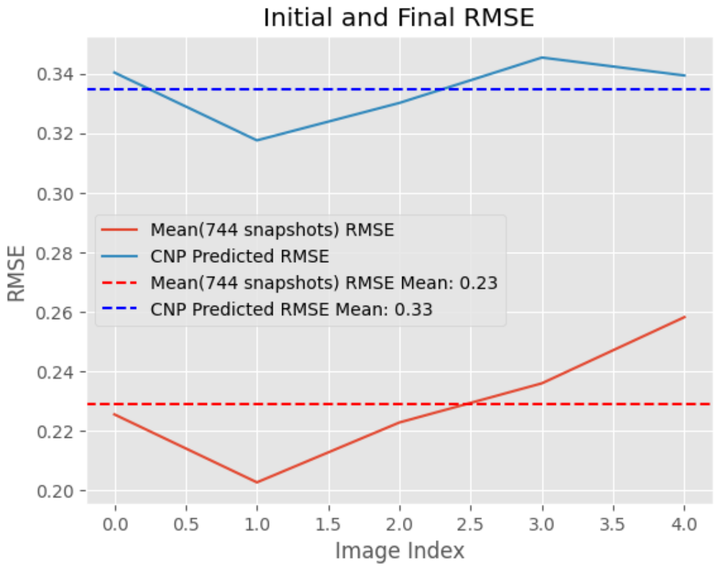
Validation Set

Random 43 Snapshots



Test Set

Random Points



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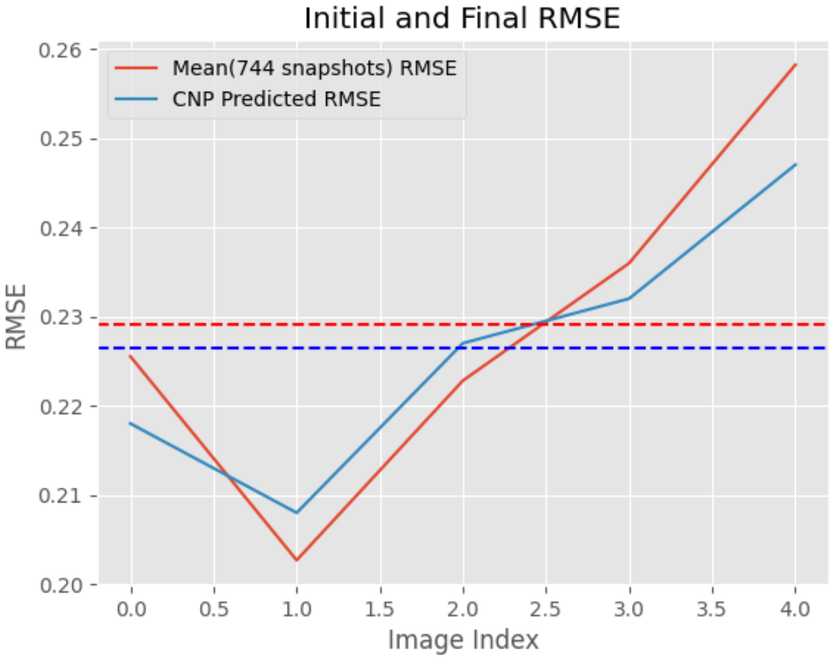


Insights

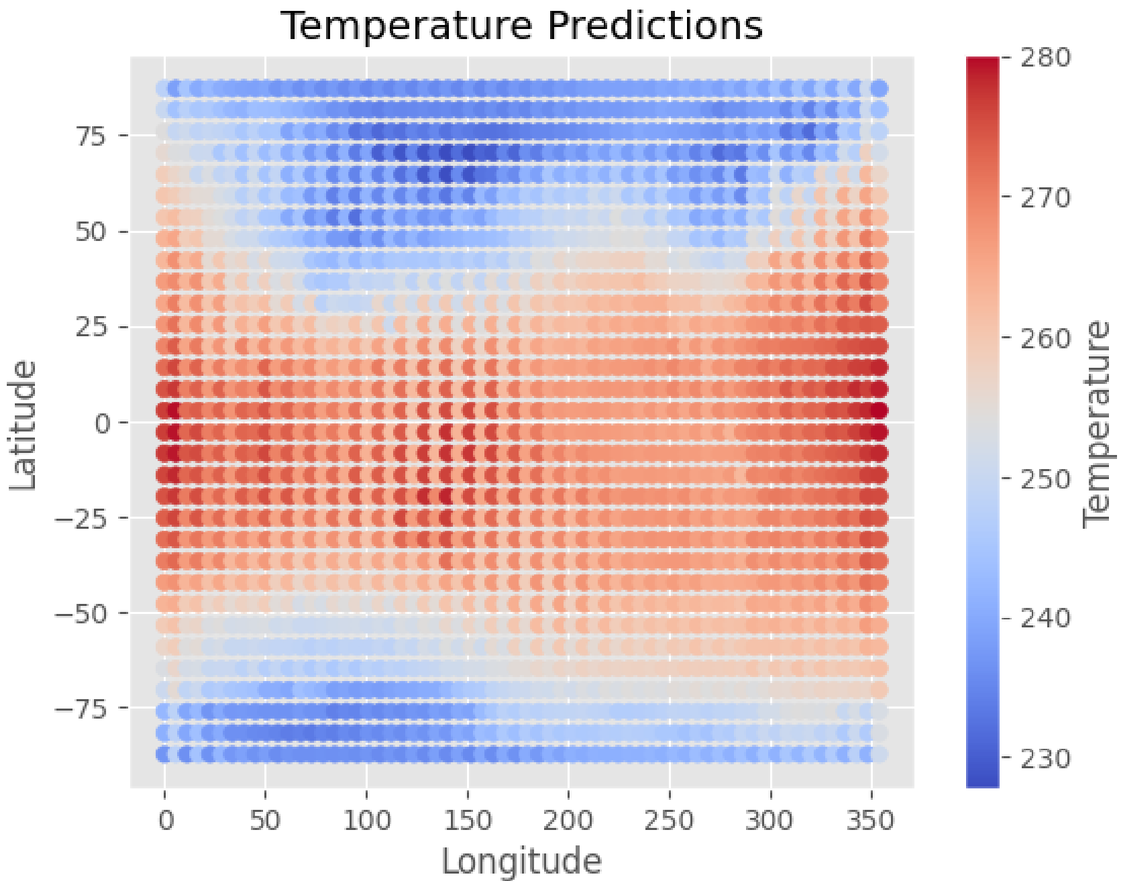
- The CNP model and the mean model demonstrate **comparable** performance in this scenario, highlighting the effectiveness of the CNP model.

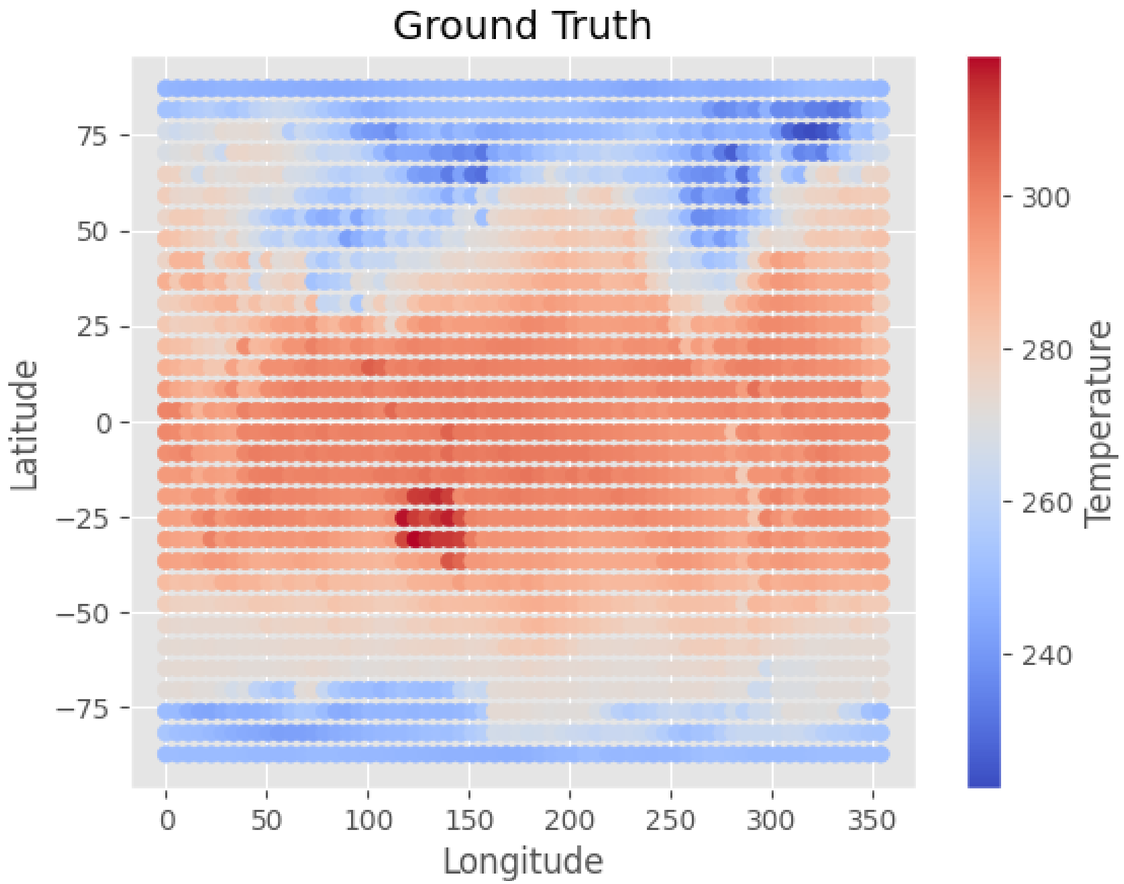
- Notably, at the **fifth timestamp**, there is a noticeable *deviation* from the consistent relationship observed among the other timestamps.

- Consequently, both the CNP model and the mean model exhibit their highest error & lowest at this **specific timestamp**, emphasizing the challenge posed by the deviation in capturing accurate predictions.

The Timestamp (Test) where we get lowest RMSE

2018-01-05 05:00:00





The Timestamp (Test) where we get highest RMSE

2018-01-23 23:00:00