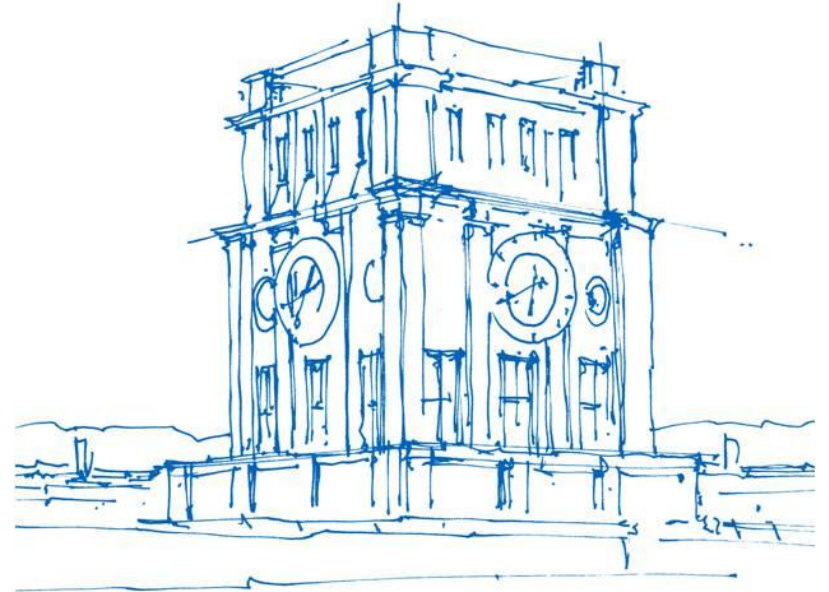


Second Update – Connectome Informed Attention

Andres Zapata | Mohamed Said Derbel | Niklas Bühler

Munich, November 2022



Uhrenturm der TUM

Second Update – Connectome Informed Attention



Overview

1. Recap

- Sequence Dataset

2. Progress and Findings

- Forecasting
 - MLP
 - LSTM for Forecasting
 - Transformer for Forecasting
- Overview of the Training Results

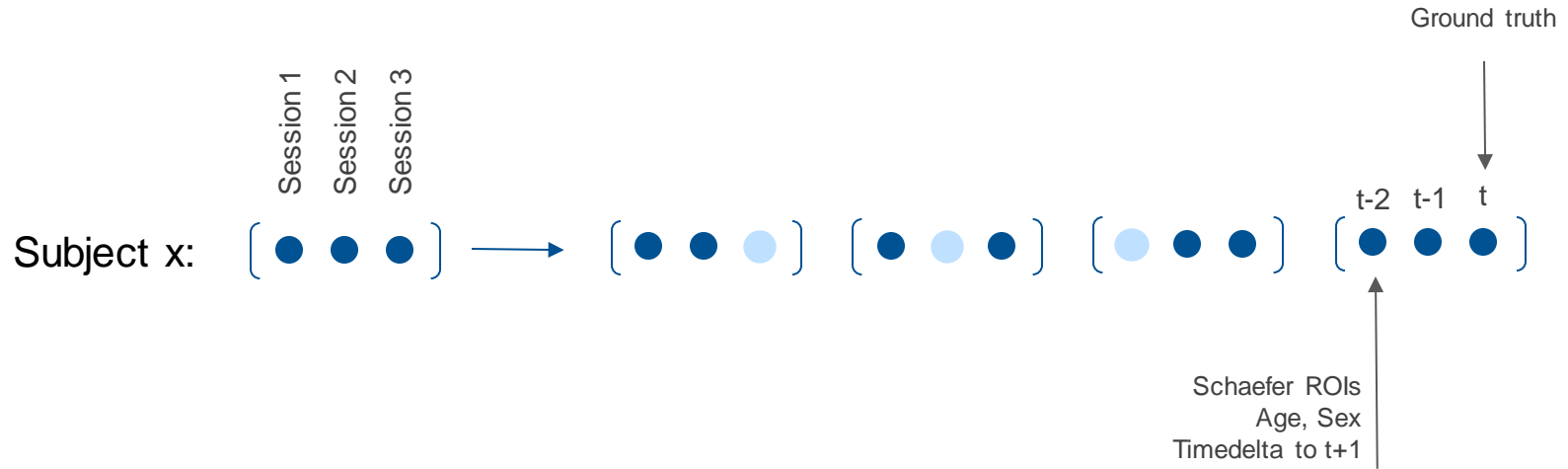
3. Next steps

- Connectivity Informed Attention
- Long-Range Spatiotemporal Transformer

1. Recap

- **Sequence Dataset**

Sequence Dataset



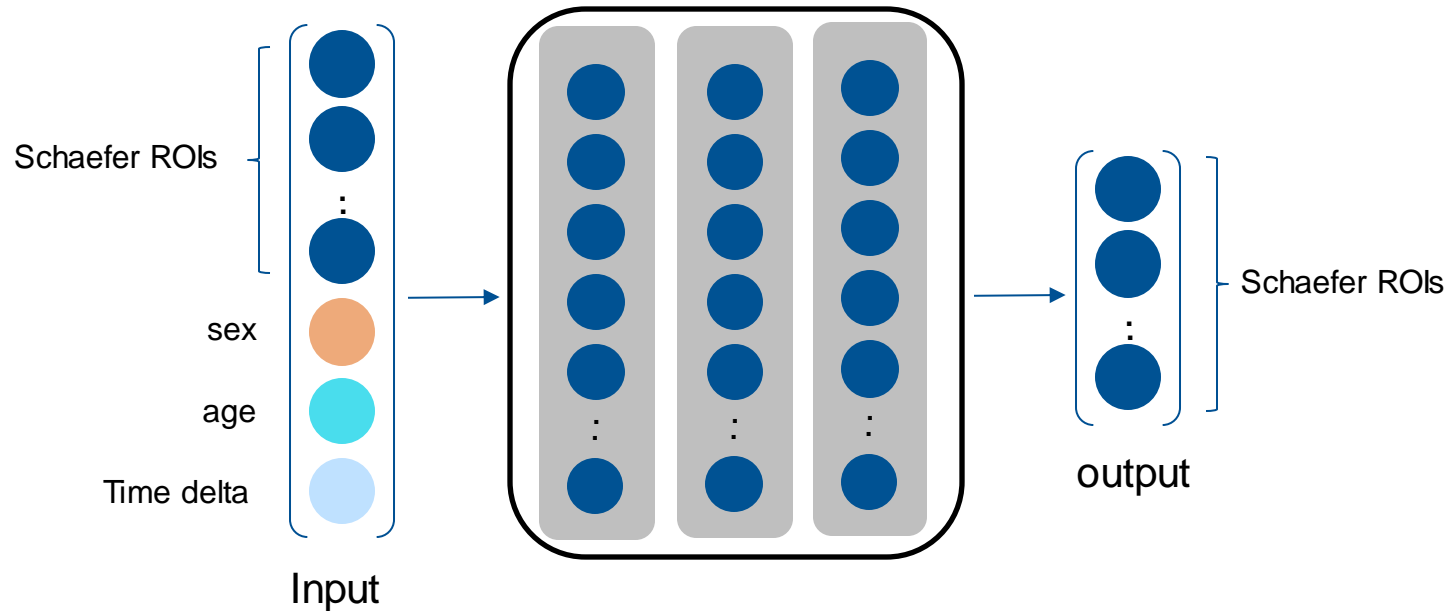
2. Progress and Findings

- Forecasting
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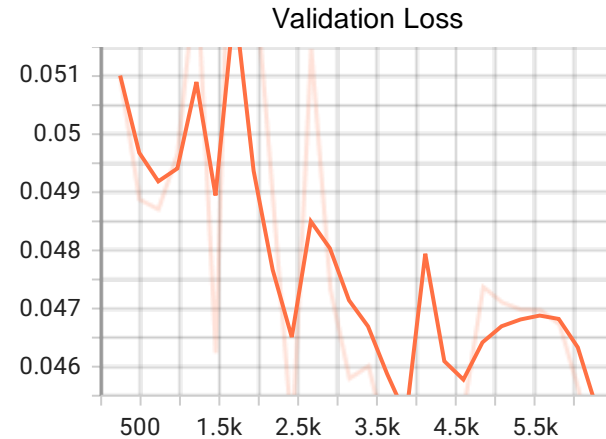
2. Progress and Findings

- Forecasting
 - **MLP**
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MLP Architecture

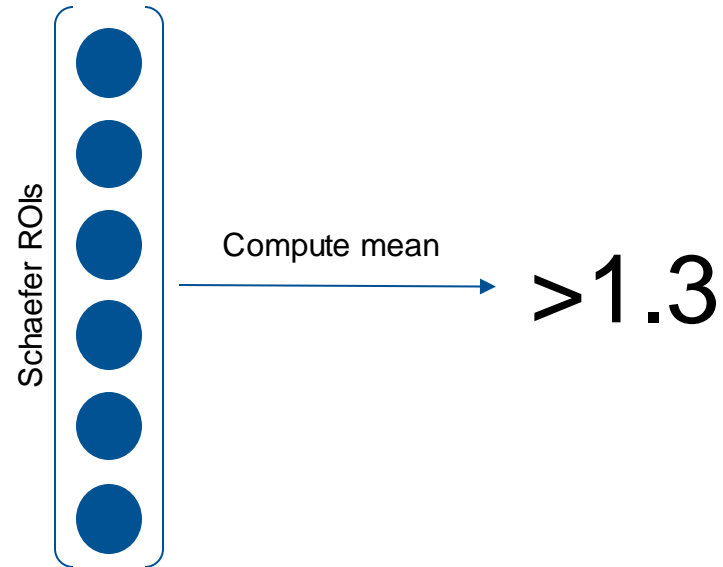


MLP: Results



Test loss	Test Accuracy
0.036	0.898

Biological Accuracy: Tau Positivity



2. Progress and Findings

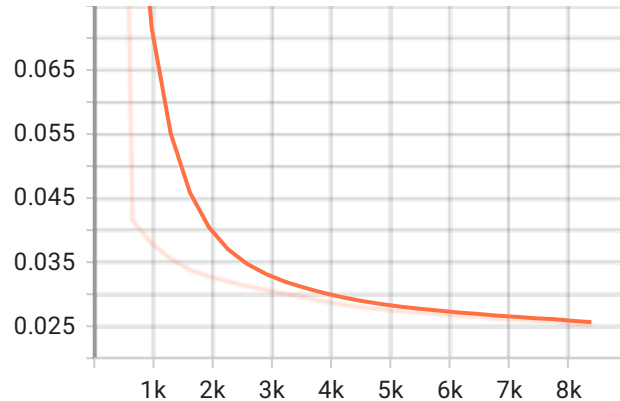
- Forecasting
 - MLP
 - **LSTM**
 - Transformer
- Overview of the Training Results

LSTM Model: Architecture

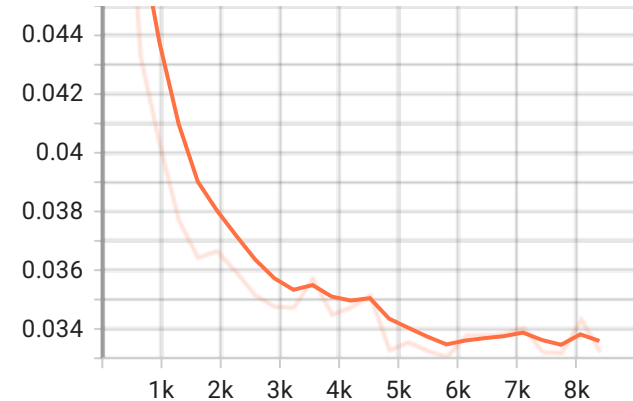


LSTM Model: Results

Training Loss



Validation Loss



Test loss	Test Accuracy
0.0297	0.939

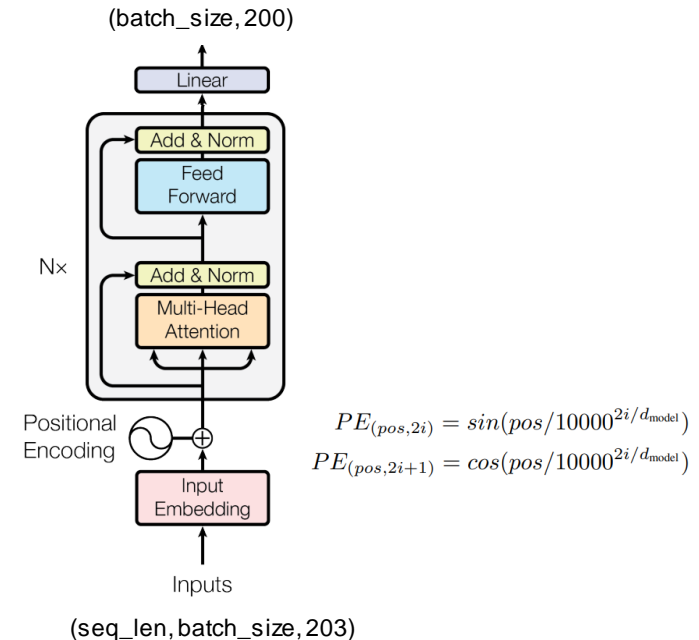
2. Progress and Findings

- Forecasting
 - MLP
 - LSTM
 - **Transformer**
- Overview of the Training Results

Transformer Model: Architecture

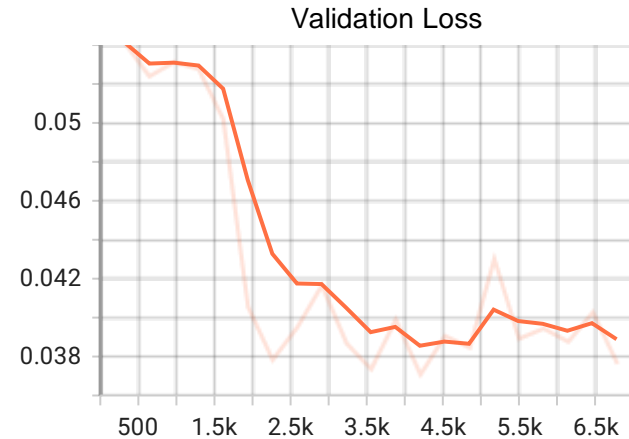
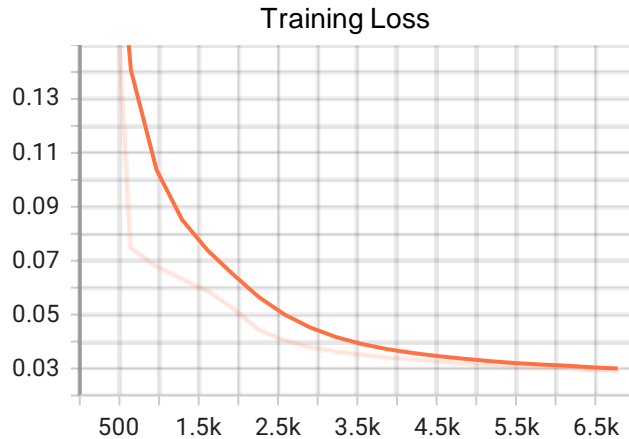
Transformer Encoder Architecture:

1. Input Embedding
2. Addition of Positional Encoding
3. Multi-Head Self-Attention Mechanism
 - Layer Normalization + Residual Connection
4. Fully Connected Feed-Forward Network
 - Layer Normalization + Residual Connection
5. Linear Layer



Vaswani, Ashish, et al. "Attention is all you need." *Advances in neural information processing systems* 30 (2017).

Transformer Model: Results



Test loss	Test Accuracy
0.0319	0.954

2. Progress and Findings

- Forecasting
 - MLP
 - LSTM
 - Transformer
- **Overview of the Training Results**

Overview of the Training Results

	Test loss	Test Accuracy
MLP	0.036	0.898
LSTM	0.0297	0.939
Transformer	0.0319	0.954

3. Next Steps

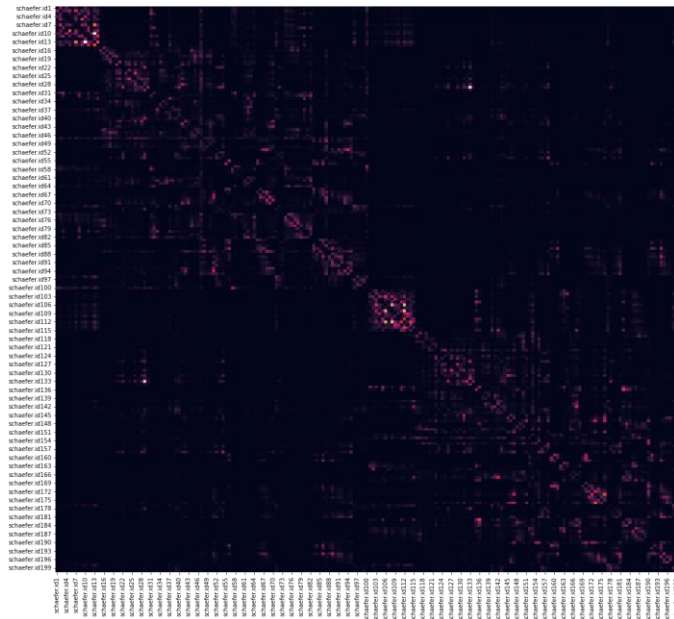
- Connectivity informed Attention
- Long term Spatio-temporal Transformer Architecture

3. Next Steps

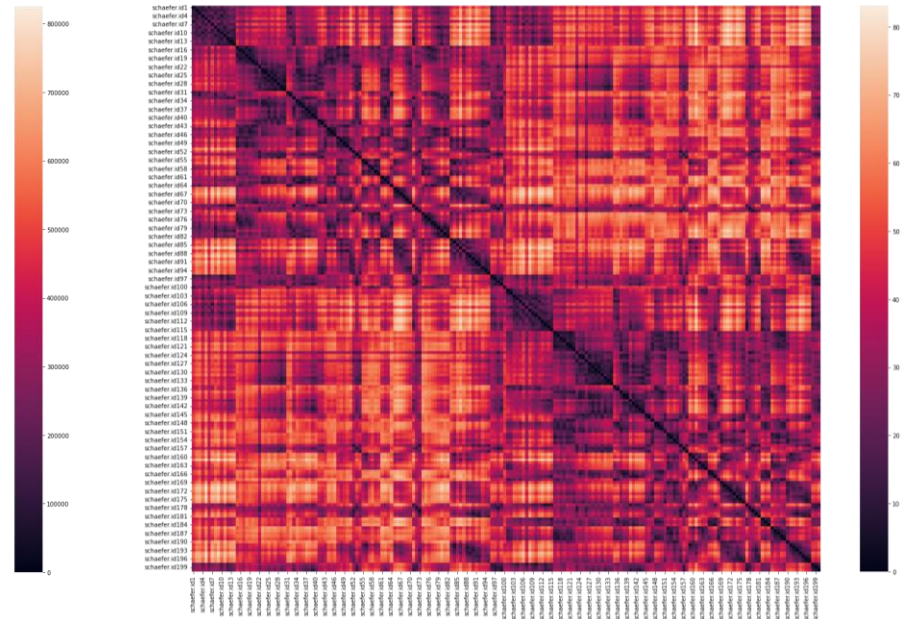
- **Connectivity informed Attention**
- Long term Spatio-temporal Transformer Architecture

Connectivity Informed Attention

Connectome



Euclidean Distance



3. Next Steps

- Connectivity informed Attention
- **Long-Range Spatiotemporal Transformer**

Long-Range Spatiotemporal Transformer Architecture

Long-Range Transformers for Dynamic Spatiotemporal Forecasting

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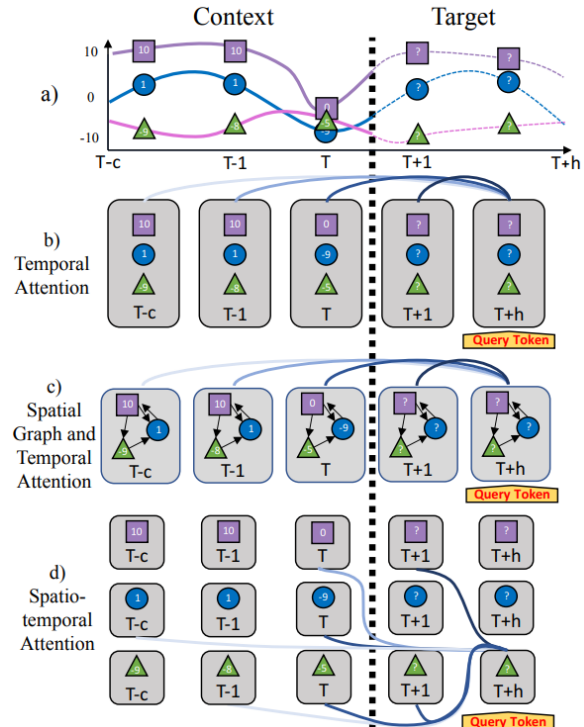
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YanJun Qi
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	Linear AR	LSTNet	LSTM	MTGNN	Temporal	Spacetimeformer
MSE	14.3	15.09	14.35	11.40	14.3	<u>8.96</u>
MAE	2.29	2.08	2.02	1.76	1.85	<u>1.43</u>

Table 5: AL Solar Results.

[arXiv:2109.12218v2](https://arxiv.org/abs/2109.12218v2)



Thank you for your attention!