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DeepT Project

Machine Learning with TreeNet Data

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Project summary

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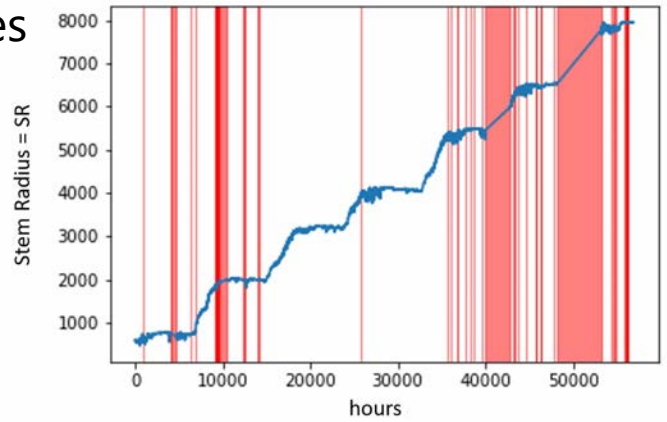
- **DeepT** project between WSL (Roman Zweifel) and Empa (Mirko Lukovic).
- **Objective** - investigate time series of stem radius changes with deep neural networks
- **Data used**
  - **Multi-channel time series** from the TreeNet dataset
  - Each time series is divided into **segments**
- **Results so far**
  - **Gap-filling** of missing data in the time series
    - Standard regression techniques
    - Inpainting with LSTM
  - **Classification** of time-series segments
    - Convolutional neural networks



Gap-filling results - Old

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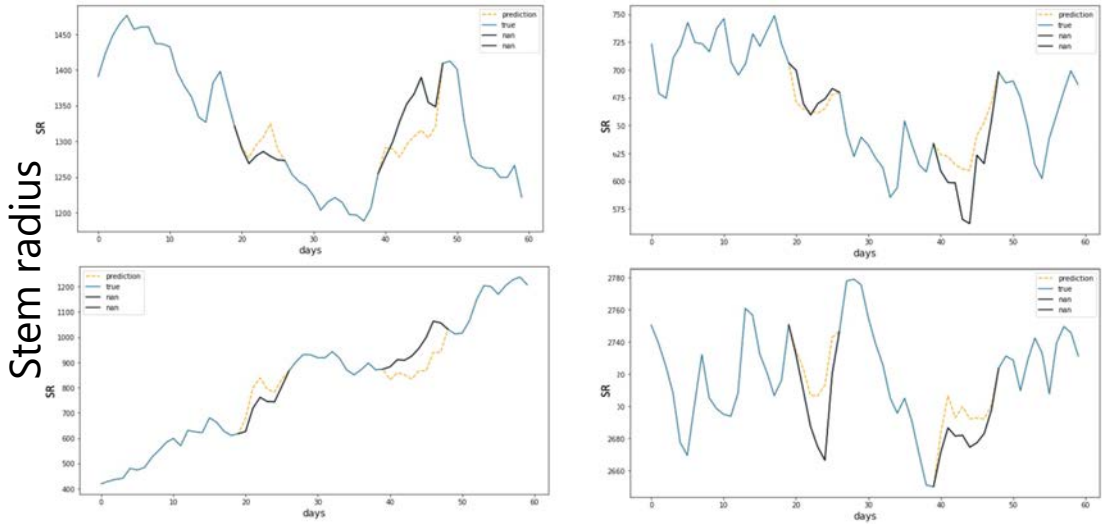
	RMSE train	RMSE val
LinearRegression	0.21	0.22
RandomForest	**0.06**	0.18
XGBoost	0.07	**0.12**

XGBoost: Regularizing gradient boosting framework

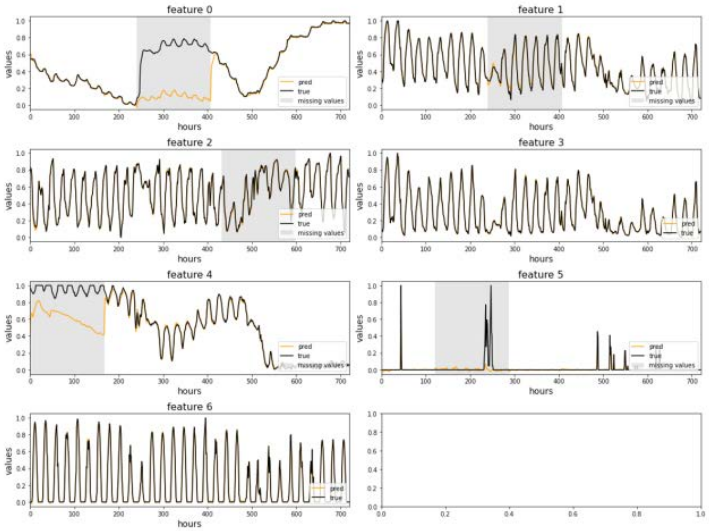
XG Boost predictions on several 60-day time-series
Black: True values, Orange: XGB values



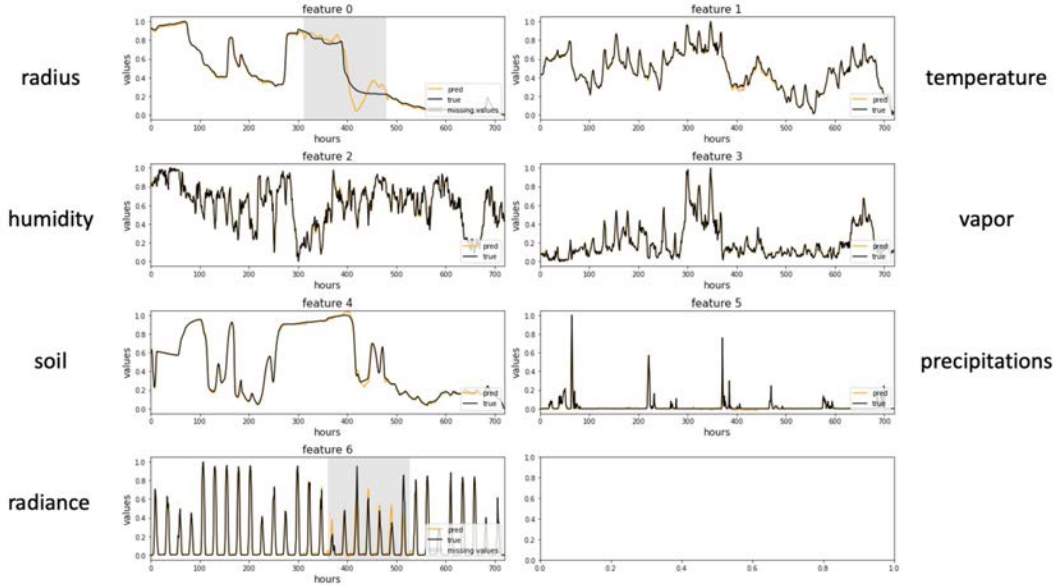
Gap-filling results - New

RMSE on val	LSTM	Ridge	MLP
all features	**0.032**	0.042	0.099
radius only	**0.049**	0.054	0.104

LSTM: Long short-term memory
Ridge: Ridge regression
MLP: Multi-layer Perceptron



Example of very poor prediction



Example of very good prediction

Inpainting technique

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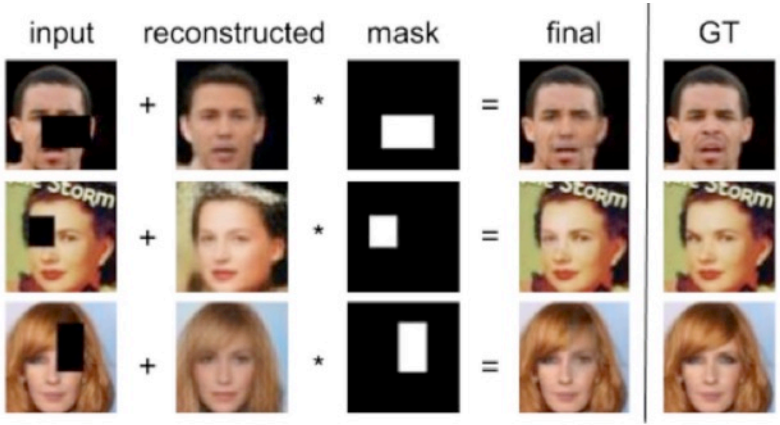

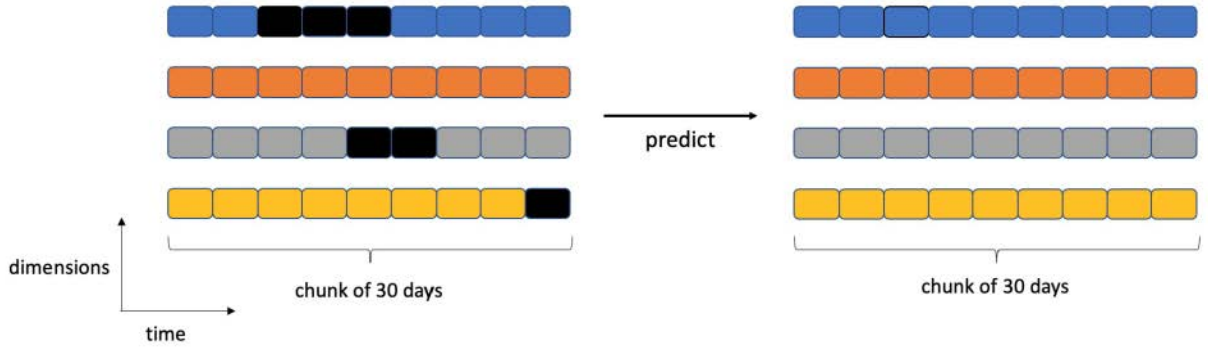

Species classification results

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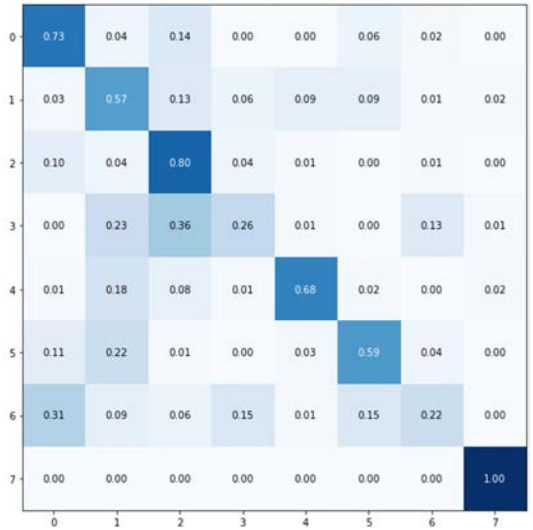
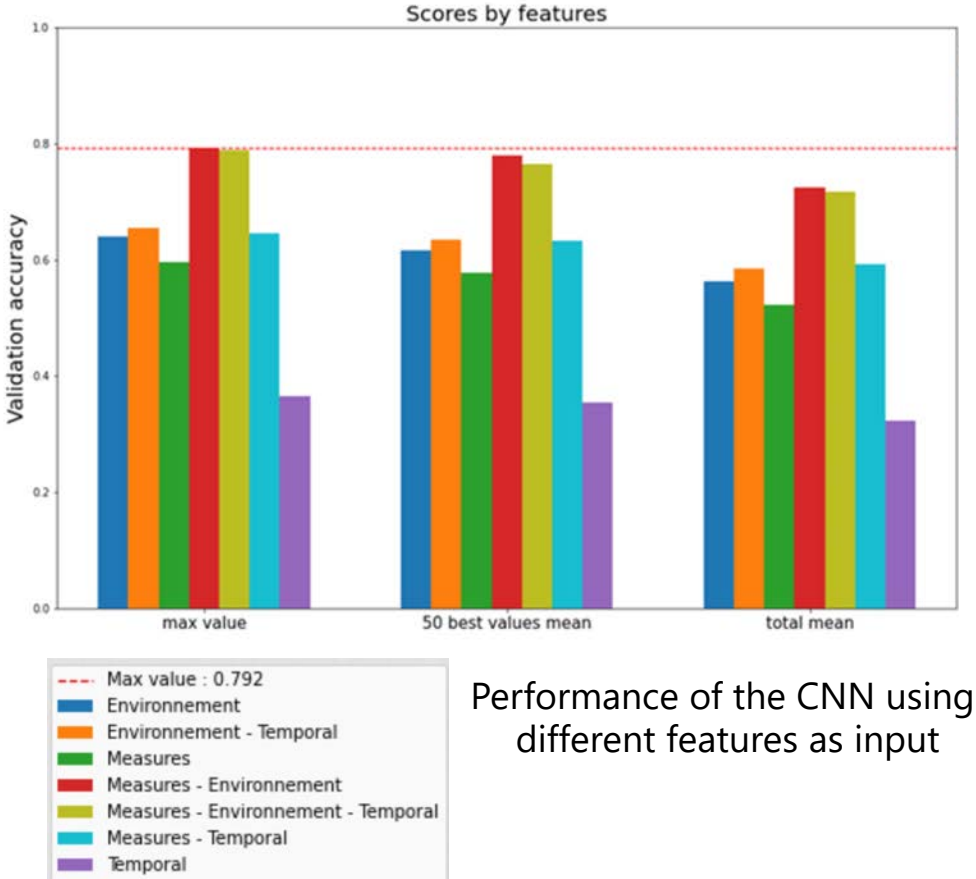
Confusion matrix for species prediction





Performance of the CNN using different features as input

Ongoing work

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- In progress
  - Use the developed gap-filling algorithm with the raw data and then try to classify.
  - Predictions for dendrometer data based only on climate data
- Future
  - Add the gap-filling techniques to the analysis tools used in TreeNet
  - Understand how the algorithm makes it’s decisions; which features it uses

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Thank You!