

# MICROPHYSICS

## Aim

**Emulate the warm rain processes  
within the Tel Aviv University (TAU)  
spectral bin microphysics scheme  
for use within the Community  
Atmosphere Model**

## Team 59

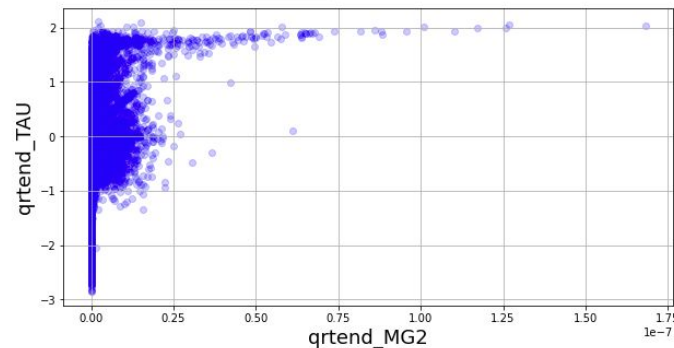
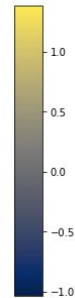
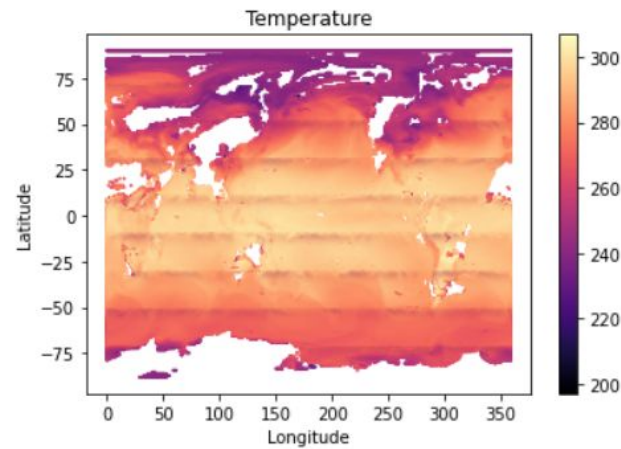
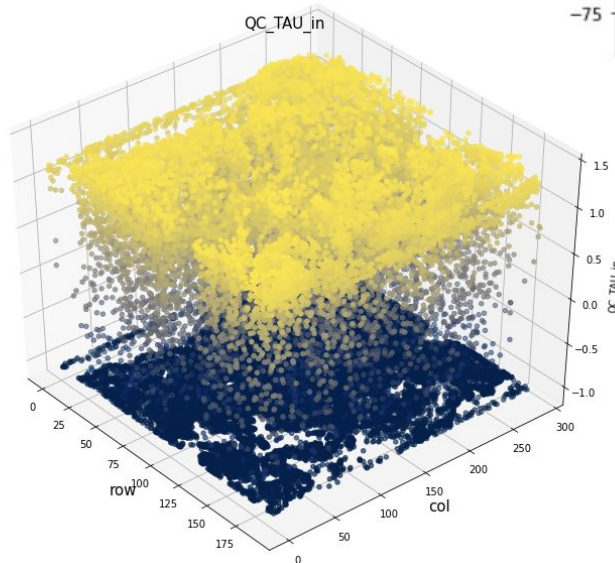
**Najib El Goumi  
Ksenia Lepikhina  
Liv Herdman  
Yiwen Zhang  
Mikhail Sarafanov**

# Exploratory visualizations

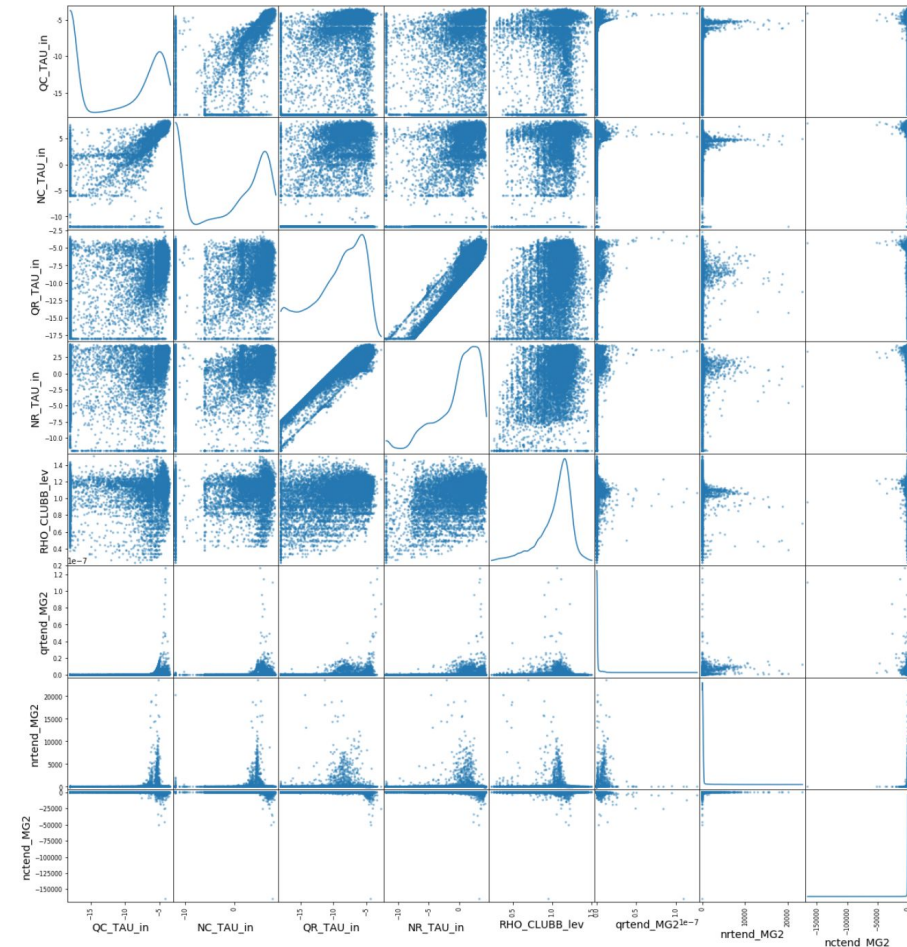
For the preliminary analysis were made:

- Joined datasets have been prepared for training and testing;
- Interactive visualizations using the ipywidgets module;
- Correlation plots;
- Maps.

columnX	row	▼
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Correlation plots between the inputs and the outputs (subsamped to 1000 data points)



**NCAR**

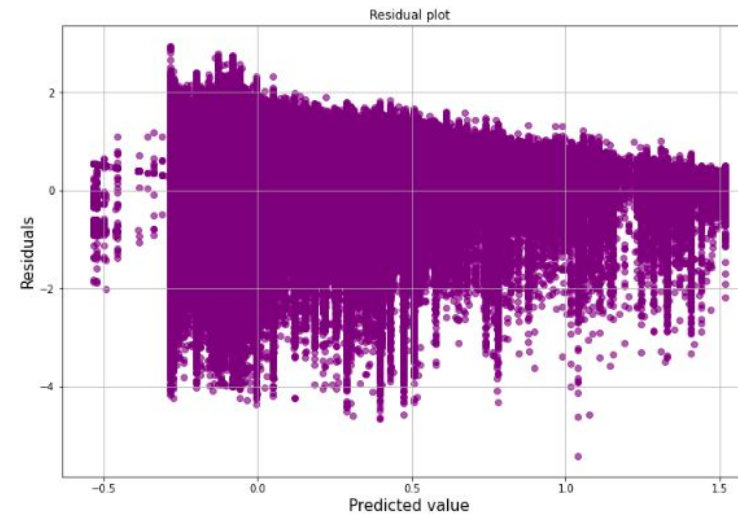
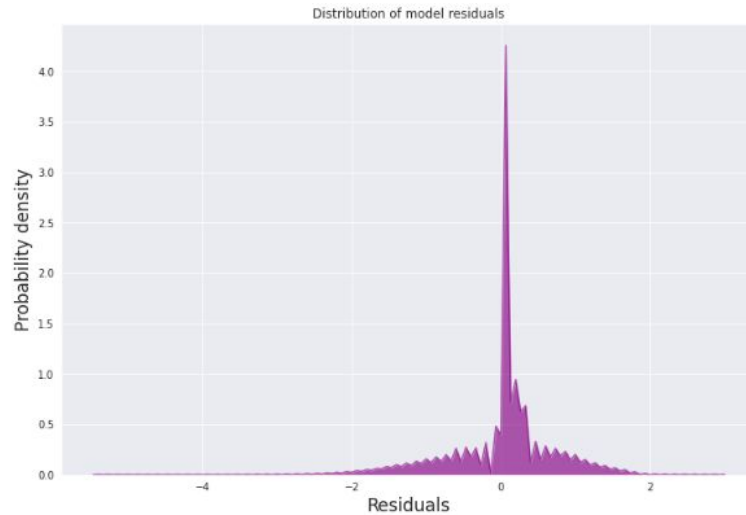
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# Implemented models

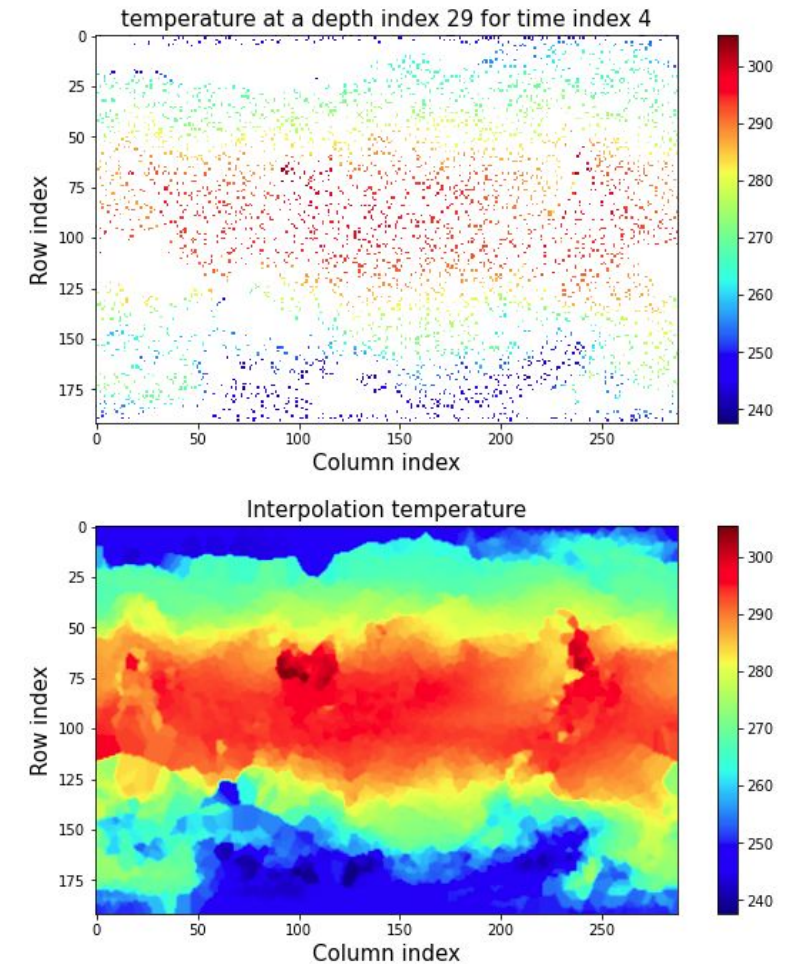
Baseline models for predict `qrtend_TAU`, `nrtend_TAU` and `nctend_TAU`:

- Linear regression;
- Decision tree;
- Random forest regression.



**Different architectures of artificial neural networks:**

- Densely connected neural network;
- Convolutional Neural Network.



# Conclusion

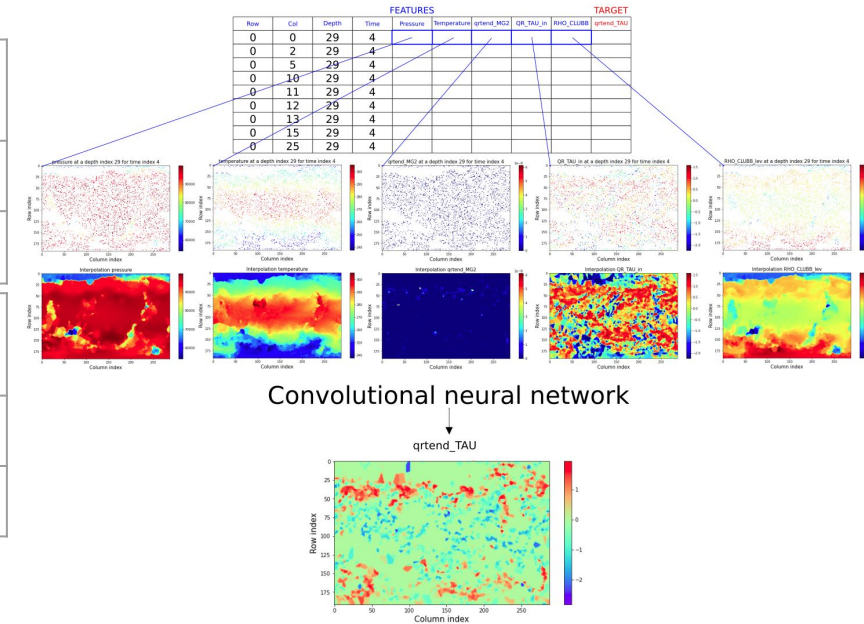
Metrics of models for test sample:

Linear Regression	qrtend_TAU	nrtend_TAU	nctend_TAU
<b>MAE</b>	0.43	0.51	0.50
<b>RMSE</b>	0.61	0.72	0.68

Random Forest	qrtend_TAU	nrtend_TAU	nctend_TAU
<b>MAE</b>	0.06	0.08	0.04
<b>RMSE</b>	0.18	0.20	0.13

Decision Tree	qrtend_TAU	nrtend_TAU	nctend_TAU
<b>MAE</b>	0.06	0.09	0.04
<b>RMSE</b>	0.24	0.27	0.17

Dense Neural Network	qrtend_TAU	nrtend_TAU	nctend_TAU
<b>MAE</b>	0.36	0.43	0.22
<b>RMSE</b>	0.66	0.7	0.66



Main conclusions:

- A CNN based model can emulate the behavior of a model on incomplete data, but the accuracy of the model is not very high at the moment (MAE for qrtend\_TAU - 0.36, RMSE - 0.66);
- The most accurate model was Random Forest with mean absolute error 0.06 in the test sample.



A close-up, high-speed photograph of rain falling onto a body of water. The water is a deep teal color, and the raindrops are captured mid-fall, creating a dense pattern of vertical lines. The surface of the water is covered in small, shimmering ripples and bubbles. The overall lighting is soft, with some highlights on the water's surface.

**Thanks for your attention!**