# ITP 359, Fall 2024

# Homework 7 20 points Time series forecasting

**Use a feed forward neural network to forecast a time series.**

**20 points (1 point each, except as noted)**

*Please submit the Python (from colab) notebook.*

1. Download global temperature anomaly from 1850 to the present. Temperatures should be monthly. <https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/global/time-series/globe/land/1/8/1850-2023>
2. Import the temperature data into a python notebook.
3. Convert the Year column into datetime (from pandas)
4. Plot the temperature anomaly vs year.

A graph showing the time of a year

Description automatically generated with medium confidence

1. Save only the temperature anomaly into a 2D numpy array.

A screenshot of a computer code

Description automatically generated

1. Scale the temperature using *minmaxscaler*.

A screenshot of a computer code

Description automatically generated

1. Convert the temperature array into sequences of *n* monthly temperatures that are shifted by one month in each row of the array. Call this array *X*. *y* is the next month’s temperature (1D array). The length of the *sequence n* is your choice (e.g. 24).

A number and numbers on a white background

Description automatically generated

1. Build a dense feedforward neural network with sequences of temperature as input and y as the output.
2. Use *mean squared error* as the loss function.
3. Train the network.
4. *Predict* the next month’s temperature for all sequences in X. Inverse scale the temperature.
5. *Score* the model.
6. Now plot the *predicted* temperatures and the *actual* temperatures.

A graph showing the growth of a number of years

Description automatically generated with medium confidence

1. Now predict the temperature for the next 24 months into the future (after the end of the available temperature data).
   1. For every month in the future, you will predict the temperature.
   2. Each month’s predicted temperature should be stored back into the sequence for predicting the following month. So, each y value becomes part of X. (7 points)

A graph with blue and orange lines

Description automatically generated