# SPF\_93

SPF\_93 is a deep learning model developed for prediction of solar power production factors from Global Climate Model estimates. The name is derived from the quantity projected (the solar production factor) and the number of years over which predictions were generated (93, from 2006 to 2099).

# Installation

This project was run using Anaconda 2.5.1, which can be installed from Anaconda.Org.

The anaconda environment used is made available in the Tensorflow\_GPU YAML file, which contains all the python packages necessary to reproduce the results presented in this paper.

# Operation

This project requires execution of 4 Jupyter notebooks, which are included in this GitHub repository.

SPF\_93\_Model\_training, described in the data and methods section of the article. Produces the trained model saved as Solar V2.0.h5.

SPF\_93 - GCM Projections – Generates projections for MACA GCM data from 2006 to 2099. Imports Solar V2.0.h5 and Saves projections as Conus\_Predictions\_Final.csv in each GCM model folder (1-17). The Conus\_Predictions.csv files are available on Box.

Dissecting Daily Solar Projections – Opens projection file Conus\_Predctions\_Final.csv in each of 17 GCM model folders, calculates slope of change in monthly average power and saves as slope\_final.csv. Exports maps of change in monthly average production factors over CONUS. The slope\_final.csv files are available on Box.

Conus Correlation – Combines exported slope files from all 17 models, calculates average, performs T-Test, and exports filtered results.

# Data Dependencies

Training data is housed in the file Rainfall\_2.csv. Importing the trained model circumvents the need for training data, but it is included here to allow for replication of the training methods.

The GCM data used for projections is too large to host on GitHub, and can be accessed here: <https://app.box.com/s/h01umwu7gym5hujabs1ys7fwwezwr7xa>, through Box. The files contained in Full\_Domain.zip will need to be extracted prior to running the corresponding code in SPF\_93 – GCM Projections.