Read me

This is the demo for efficient hinging hyperplanes neural networks (EHHNN) for traffic flow (TF) prediction.

Main files

Three categories are mainly included: data, EHHNN as the TF Predictor, and the analysis of variance (ANOVA) decomposition for the predictor.

Data

The traffic data can be accessed online via https://pems.dot.ca.gov/ (PeMS), where the traffic factors of TF, average speed of vehicles (AVS) and road occupancy (OR) are adopted in our work for prediction and also analysis.

The data pre-processing codes to process the raw data (xlsx files) downloaded from (PeMS) are given in 'process_data.py', where 'README.txt' gives the rule explanations. In addition, the pre-processed datasets are uploaded for illustration (see Section IV), where the datasets are named based on the rules in 'README.txt'.

EHHNN for TF prediction

The EHHNN predictor is trained with the traffic inputs formulated in our work, which involves temporal information (with lags of time-series data) and spatial information (e.g., TF, AVS, and RO collected from different detectors locating in different road segments).

Run 'main_demo_single_layer.m' to do the prediction with single-layered EHHNN, where the ANOVA decomposition is done for variable selection and interpretation analysis is also given for an illustration.

Run 'main_demo.m' to do the prediction with the selected variables.

ANOVA decomposition

The EHHNN predictor possesses sparse neuron connections, which make the variables and their interaction decomposable with ANOVA decomposition. With the ANOVA decomposition and its corresponding σ values, the relative importance of different so-called ANOVA function (e.g., traffic variables and their interactions).

See 'anova_ehh.m' applying ANOVA decomposition to the EHHNN predictor, and it is run in 'main_demo_single_layer.m' for varied variable selections and also in 'main_demo.m' after obtaining the predictor. With the ANOVA results, varied analysis can be done, such as spatial-temporal analysis (up to the users), etc. The last block in 'main_demo_single_layer.m' gives an illustration.