Coding Assignment: Linear Regressor

Due 2015/10/13 23:59:59

- Given a 1D dataset with 200 instances, your assignment is to implement

  - A linear regressor
  - 4 locally weighted linear regressors with $\tau = 0.1$, 1, 10, and 100 repestuvely

  We will test your regressor with another dataset and grade your program based on your results and discussions.

- Specification

  - Follow the OOP (Object-Oriented Programming) paradigm in Matlab.

  - Implement a class "LinearRegressor" (in package "model/regressor") that has
    * Public instance properties: $\boldsymbol{w}$
    * A static method: $train(\boldsymbol{X}, \boldsymbol{y})$:*handle of a new instance of LinearRegressor*
      · $\boldsymbol{X} \in \mathbb{R}^{n \times d}$ is a matrix of training instances, where n is the number of instances and d is the number of features
      · $\boldsymbol{y} \in \mathbb{R}^{n \times 1}$ is the label vector
      · Returns the handle of a new instance of LinearRegressor with the trained $\boldsymbol{w}$. Note that the class LinearRegressor should be a handle class.
    * An instance method: $predict\,(\boldsymbol{X}) : \boldsymbol{y}$
      · $\boldsymbol{X} \in \mathbb{R}^{r \times d}$ is a matrix of testing instances, where r is the number of instances and d is the number of features
      · Returns a vector $\boldsymbol{y} \in \mathbb{R}^{r \times 1}$ of the label predictions
  - Implement a class "LinearRegressorLocalWeight" (in package "model/regressor") that **inherits** (is a subclass of) class "LinearRegressor" that simply "remembers" $\boldsymbol{X}$ and $\boldsymbol{y}$ in the training phase and build model right before prediction

    * Public instance properties: $\boldsymbol{X}$, $\boldsymbol{y}$, and τ
    * A static method: $train(\boldsymbol{X}, \boldsymbol{y})$:*handle of a new instance of LinearRegressorLocalWeight*
    * An instance method: $predict\,(\boldsymbol{X}, cfg) : \boldsymbol{y}$
      · cfg is a configuration object of type *containers.Map* containing at least the key 'tau' (see http://www.mathworks.com/help/matlab/map-containers.html).

* For more details about Matlab subclasses, please refer to
  http://www.mathworks.com/help/matlab/matlab_oop/creating-subclasses–syntax-and-techniques.html

- Submission Requirements

  - A report (REPORT.*) describing:
    * How you implement the regressors
    * Plot the data and your fitted line of all regressors
    * Discuss what happens when τ is too small or large
    * Anything else worth mentioning

  - The code:
    * LinearRegressor.m, LinearRegressorLocalWeight.m
    * You have to follow the specs (as described above) strictly

  - Put your work under package "model/regressor" (i.e. under directory "+model/+regressor").

  - Follow the submission guide (see "README.md" for details).