# Coding Assignment: Linear Regressor

Due 2014/10/08 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.

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- Specification
  - Follow the OOP (Object-Oriented Programming) paradigm in Matlab.
  - Implement a class "LinearRegressor" (in package "model/regression") 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/regression") 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 $\tau$
    - 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* (see http://www.mathworks.com/help/matlab/map containers.html) containing at least the key 'tau'

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

- Submission Requirements
  - A report (README.*) describing
    * How you implement the regressors
    * Plot the data and your fitted line of all regressors
    * Discuss what happens when $\tau$ 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
  - Pack your work (in a directory named LinearRegressor) with your assignment 1