# Coding Project (Refactored collaboration)

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**1) Assigned Tasks**

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- **Issam Laradji:** ***matlearn_classificaiton_CV.m***
- **Matthew Dirks:** ***matlearn_regression_CV.m***

**2) Refactored Collaboration**

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This is a refactoring collaboration. Matt Dirks and I combined the cross-validation for classification and regression into ***matlearn_CV.m.***

It has a parameter option **'loss'** which defines the loss function to be used,

- **'square error'** and **'absolute error'** for regression problems
- **'zero-one loss'** for classification problems

**3) Four added values (First two are major, second two are minor) for the cross-validation algorithm:**

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• **Leave-one-out:** Boolean option, if true each sample is used once as a validation set (singleton) while the remaining samples make up the training set. This is equivalent to setting the number of folds to the number of samples in the dataset.

• **Early-stop:** Boolean option, if true: stops the grid search when the error starts increasing after it has decreased at least once.

• **Shuffle data:** Boolean option, if true CV will shuffle the dataset randomly before using it.

• **k-Fold cross-validation:** Integer option 'k' which sets the number of folds to perform.

**4) Additional added value by Issam Laradji for Extreme Learning Machines (ELM):**

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- **Regularized ELM**: added a regularization term to the ELM model, implemented in ***matLearn_classification_ELM_Issam.m***, to achieve bias-variance tradeoff.

# Running the demos

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### 1) Issam Laradji individual demo

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Run ***demo_CV_classification_ELM_issam.m*** in the zip file to execute cross-validation for choosing the best number of hidden neurons for ELM and display their results in a plot. The demo will also illustrate the effect of varying the regularization term for ELM on learning the decision model.

### 2) Matthew Dirks individual demo

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Open ***html_demo_CV_regression_KNN_Dirks/demo.html*** which shows the demo code and explanations including screenshots (created via MATLAB publishing).
Run ***demo_CV_regression_KNN_Dirks.m*** to execute cross-validation for choosing the best value of ‘k’ for regression via KNN. The resulting error over the various values of k will be shown, along with a visualization of the predictions.