

PROJECT DESIDERATA:

MILESTONE 1: (Due 11:59PM EST, Wednesday, March 29th, 2017)

The actual assignment:

The philosophy component of the project: Read the Stanford Encyclopedia of Philosophy article on Functionalism. Then, discuss the following question, “*Machines that make autonomous decisions are functionally equivalent to humans and other sentient beings.*” The discussion should be restricted to a maximum of two pages (in the submitted pdf and with reasonable choices of font and spacing). Each group can use Canvas to hold discussions making it easier for the instructor to participate. (Please let us know if you want us to set up group-wise project discussions in Canvas.) Multiple perspectives can be presented if separated out by group member. The entire group will get the same project grade. Since this component is repeated in the second milestone, the final grade will take *both milestone submissions* into account. Failure to submit milestone 1 will result in a 10% deduction from the final project grade.

Each team needs to turn in ONE pdf of MILESTONE 1. This has to be submitted via Canvas with the title entitled cot4501sp17_project_final_<insert team member last names separated by _>.pdf. Please put each team member's name in the submission. If the file is too big and/or if you'd like to show us demonstrations of your code, please place the entire project on google drive, One Drive, Dropbox, or spideroak and submit a direct link.

FINAL MILESTONE: (Due 11:59PM EST, Wednesday, April 26th, 2017)

The actual assignment:

Download the Iris and Wine datasets available at the [UCI Machine Learning repository](#) in the platform of your choice. Describe the datasets in your final project submission.

Learn how to use the [multi-class support vector machine](#) provided within MATLAB. This is the competing industry strength classifier that y'all will be executing. Write up a description of how this library was executed by your team on the Wine and Iris datasets (and any other datasets you used with further details provided under the extra credit section below). Demonstrate the execution of the SVM classifier on the datasets by first training the classifier on a suitably chosen training set and then testing the classifier on a separate test set (where you know the class labels for each pattern but the machine does not).

Execute a homegrown least-squares classifier on the same datasets with identical choices of training and test set patterns as the SVM. Document the mis-classification errors (and separate out each class errors as well) for both the SVM and the least-squares classifiers. Document the settings of the free parameters in both the SVM and the least-squares classifiers for each dataset. Give a high level summary of your findings based on your interpretation of the results.

For each dataset, the team should first separate out training and testing patterns. The ratios attempted for training and testing should range from 10% training/90% testing to 50% training/50% testing. For

the sake of cross validation, training sets can be further subdivided into training and validation sets as explained in the class notes.

To get maximum credit, attempt two more datasets. Repeat as above and clearly separate this work from the rest. Explain your choices of the additional datasets and document the free parameters, the mis-classification errors and report your findings as above.

The philosophy component of the project: Read the [Stanford Encyclopedia of Philosophy article on Functionalism](#). Then, discuss the following question, “Machines that make autonomous decisions are functionally equivalent to humans and other sentient beings.” The discussion should be restricted to a maximum of two pages (in the submitted pdf and with reasonable choices of font and spacing). Multiple perspectives can be presented if separated out by group member. The entire group will get the same project grade. The final submission on the philosophy component can markedly differ from the first submission in Milestone 1. Both submissions will be taken into account for the final score.

Each team needs to turn in ONE pdf of the FINAL PROJECT MILESTONE. This has to be submitted via Canvas with the title entitled cot4501sp17_project_final_<insert team member last names separated by _>.pdf. Please put each team member's name in the submission. If the file is too big and/or if you'd like to show us demonstrations of your code, please place the entire project on google drive, One Drive, Dropbox, or spideroak and submit a direct link.

PROJECT DELIVERABLES:

1. Multi-class classification using least-squares regression on 4 datasets. Two of the datasets are fixed, namely, Fisher Iris and Wine. The other two datasets should be chosen by each group.
2. Comparison with multi-class support vector machine in MATLAB (or equivalent).
3. Discussion of functionalism question based on Stanford Encyclopedia article.

PROJECT RUBRIC:

1. (40 points) Multi-class classification using least-squares regression on 4 datasets.
 - (10 points) Training
 - You should separate your datasets into training and testing and show results of training with (a) a minimum of 10% of the data and (b) a maximum of 50% of the data. Since there are free parameters that need to be chosen, after selecting, say, 10% of the data, set aside a further percentage for cross-validation.
 - (10 points) Cross-validation
 - Explain how many patterns were set aside for cross-validation and document the setting of the free parameters like the regularization parameter.
 - (10 points) Testing
 - After setting up the machine during training/cross-validation, execute the machine on the remaining test data. Report your performance on all datasets in terms of mis-classification errors per class. It is highly recommended that you show a confusion matrix table showing how many examples from each category were mis-classified into some other category.
 - (10 points) Datasets chosen
 - Explain the process behind choosing the two additional datasets. Document the number of feature dimensions and the number of classes.

2. (30 points) Comparison with multi-class support vector machine in MATLAB (or equivalent).
 - (10 points) Discussion of one-against-one versus one-against-all
 - Read and discuss the one-against-one versus one-against-all approaches.
 - (10 points) Training
 - Document the process by which exactly the same set of training patterns were used in both your own classifier and in the multi-class SVM. If cross-validation was used in the SVM, please document this.
 - (10 points) Testing
 - Report the mis-classification errors for the SVM and compare with your least-squares method.
3. (30 points) Discussion of functionalism question based on Stanford Encyclopedia article.
 - (10 points) Description of functionalism
 - Discuss if functionalism as you understand it captures the essence of autonomous decision making in the world.
 - (10 points) Description of Turing Test
 - Discuss how functionalism intersects with the Turing Test after briefly describing the latter.
 - (10 points) “Functionally equivalent” argument
 - Close by returning to the original question and discuss whether autonomous machines are functionally equivalent to humans (and/or other sentients).