

SMAI (CSE 471)  
Spring-2019  
Assignment-7 (40 points)  
Posted on: 03/3/2019  
Due on: 10/3/2019, 11:55PM

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- Questions can involve a mix of writing code/scripts and answering questions or analyzing results.
  - Code: Your scripts should be of the form `q-x-y.py` where  $x$  is the main question,  $y$  is the sub-question. For e.g., `q-1-2.py` is Python script for sub-question 2 within question 1. If you are submitting Jupyter notebook file (.ipynb), make sure that it is properly formatted and documented with question part numbers (Part-1, Part-2 etc.).
  - In case you are submitting Jupyter notebook, you MUST submit .py file as well.
  - Your code should accept test file name as command line argument.
  - Ensure that submitted assignment is your original work. Please do not copy any part from any source including your friends, seniors and/or the internet. If any such attempt is caught then serious action will be taken.
  - Numpy, pandas/csvReader(for data processing) are allowed. Inbuilt library function are not allowed.
  - Evaluation will be done based on your understanding, report and accuracy on purely unseen test data (provided at the time of assignment evaluation).
  - Report should contain details of algorithm implementation, results and observations.
1. (40 points) In this assignment you will be working with an already implemented question from Assignment 2 and try to see how over-fitting can be avoided using techniques like k-fold cross validation, leave-one-out cross validation and regularisation. Problem: We are given a dataset containing various criteria important to get admissions into Master's program and probability of getting an admit. Dataset is available at [http://preon.iiit.ac.in/~sanjoy\\_chowdhury/AdmissionDataset.zip](http://preon.iiit.ac.in/~sanjoy_chowdhury/AdmissionDataset.zip) You have already implemented a model using linear regression to predict the probability of getting the admit.
1. Implement Lasso regression also known as L1 regularisation and plot graph between regularisation coefficient  $\lambda$  and error **(10 points)**
  2. Implement Ridge regression also known as L2 regularisation and plot graph between regularisation coefficient  $\lambda$  and error **(10 points)**

3. Analyse how the hyper-parameter  $\lambda$  plays a role in deciding between bias and variance. **(5 points)**
4. Analyse how the two different regularisation techniques affect regression weights in terms of their values and what are the differences between the two. **(5 points)**
5. In this part implement regression with k-fold cross validation. Analyse how behavior changes with different values of k. Also implement a variant of this which is the leave-one-out cross validation. **(10 points)**

Note: The assignment would be evaluated by laying more focus on the report you submit. Include all the observations and graphs you obtain along-with proper reasoning wherever applicable.