School of Computer Science and Applied Mathematics
University of the Witwatersrand, Johannesburg

ADAPTIVE COMPUTATION AND MACHINE LEARNING (COMS4030A/COMS7047A)

Assignment I

March 11, 2022

1 Assignment Scope:

Assignment 1 will assess all the topics covered in Week 1 and Week 2. Topics include:

1. Intro to machine learning
2. Linear regression
3. Gradient descent and its variants
4. Closed form and normal equation
5. Improved learning strategies

2 Assignment Structure:

Assignment 1 will consists of two components:

1A. Theoretical questions
1B. Programming exercise

2.1 1A: Theoretical questions

This part of the assignment is scheduled for **18th March, 11h00 to 12h30 at the Mathematical Sciences Labs (MSL)**. This is a closed book, invigilated assessment and will count **5%** towards the final mark. The assessment will be administrated via Ulwazi.

2.2 1B : Programming exercise

In this part, you will implement linear regression and see it work on a simple dataset of your choice. Do note that Assignment 1B has to be done individually and will count **5%** towards the final mark. **Deadline : 25th March, 2022, 17:00**

2.2.1 Python Installation:

It is recommended that you use Anaconda distribution for installing python notebooks and other essential libraries. Use the following link to go to Anaconda's download page :

https://docs.anaconda.com/anaconda/install/

Make sure to download Python 3.6 or higher version.

2.2.2 Submissions:

1. jupyter python notebook containing your code and visualizations
2. your sample dataset

Submission links will be posted on Ulwazi.

2.2.3 Grading:

Grading for programming part will be based on the following exercises:

1. Basic implementation of linear regression (using first principles) - 15 points
2. Exploring the effect of different learning rates on convergence - 10 points
3. Implementation of feature scaling, feature standardization and regularization for improved learning - 10 points
4. Data visualization to understand the working of algorithm and other steps (applicable to all the above stages) - 15 points