

**ECE421: Introduction to Machine Learning**  
**Programming Assignment 1**  
**Assigned: Jan 16, 2026; Due: Feb 14, 2026 @ 11:59 p.m.**

### General Notes

1. Programming assignments can be done in groups of up to 4 students.
2. **Important:** Each student in the group needs to submit the assignment on Quercus
3. Group members will receive the same grade.
4. Unless permitted, no late submission is accepted.
5. Please post assignment-related questions on Piazza.

### Submission Guidelines

Programming assignments are submitted via Quercus and you can resubmit your assignment as needed up until the submission deadline. After the deadline, further modifications will result in the assignment being marked as late. You need to submit your version of the following folders:

1. `LinearRegressionImp`: includes
  - the Python script `LinearRegressionImp.py`
  - the pdf file `PA1a_qa.pdf` for question-answering.
2. `NeuralNetworks` includes:
  - the Python script `NeuralNetworks.py`
  - the pdf file `PA1b_qa.pdf` for question-answering.
3. The cover file (this file) with their name and student ID filled.

Please pack them into a single folder, compress into a .zip file and name it as `PA1.zip`. Find the general instruction on the next page.

### Group Members

Group Members	
Name (and Name on Quercus)	UTORid

## Objectives

In this assignment, you will be implementing the following algorithms: **Linear Regression** and **Neural Networks**; using two different methods of coding approaches. In the first approach, you will implement these algorithms using Python and functions in the NumPy library only. In the second approach, you will use `scikit-learn` to gauge how well your initial implementation using NumPy functions fares in comparison to off-the-shelf modules available in `scikit-learn`. You will also be asked to answer several questions related to your implementations. **To avoid any potential installation issue, you are encouraged to develop your solution using Google Colab notebooks.**

## Requirements

In your implementations, please use the function prototype provided (i.e. name of the function, inputs and outputs) in the detailed instructions presented in the remainder of this document. We will be testing your code using a test function that which evokes the provided function prototype. If our testing file is unable to recognize the function prototype you have implemented, you can lose significant portion of your marks. There will be two folders `LinearRegressionImp` and `NeuralNetworks`, where you will find further instructions in the `Instruction.pdf` file as well as the associated starter code.

**Important:** Remember to submit a separate `PA1_QA.pdf` file containing your answers to the questions.