

# Midterm Exam

**Exam Duration:** 3 Hours

**Course:** Neural Networks & Deep Learning (AML 3104)

## Problem Statement:

The objective of the dataset is to diagnostically predict whether a patient has diabetes, based on certain diagnostic measurements included in the dataset based on certain diagnostic measurements included in the dataset.

Several constraints were placed on the selection of these instances from a larger database. In particular:

1. All patients here are females
2. at least 21 years old
3. of Pima Indian heritage.

From the data set in the (.csv) File We can find several variables, some of them are independent (several medical predictor variables) and only one target dependent variable (Outcome).

Columns	Description
Pregnancies	To express the Number of pregnancies
Glucose	To express the Glucose level in blood
BloodPressure	To express the Blood pressure measurement
SkinThickness	To express the thickness of the skin
Insulin	To express the Insulin level in blood
BMI	To express the Body mass index
DiabetesPedigreeFunction	To express the Diabetes percentage
Age	To express the age
Outcome	To express the final result 1 is Yes and 0 is No

## Questions:

Follow the following 5 stages of on the data set and express your results:

1. Preliminary Data Analysis (10%)
2. Data Processing & Feature Engineering (20%)
3. Modelling (45%)
  - a. Conventional ML Model (25%)
  - b. Deep Network (15%)
  - c. Wide & Deep Network (5%)
4. Evaluation (15%)
5. Discussion (10%)

### Guiding Principles:

- **Preliminary Data Analysis:** Understanding behavior of features against one another (Multi collinearity) , ranges of the inputs, etc.
- **Data Processing & Feature Engineering:** Potential normalization, development/removing features affecting the overall performance of the model, encoding if applicable
- **Modeling:** On the modeling section, you are required to deliver:
  1. Conventional Machine Learning model of your choice fine-tuned using grid-search techniques to yield best results
  2. One Deep Sequential Neural network with dimensions of your choice
  3. One wide and deep neural network architecture with dimensions of your choice
- **Evaluation:** Thought process on your approach on improving individual models (How you improved individual models by fine-tuning relevant hyper parameters)
- **Discussion:** How were the 3 models compared with one another?