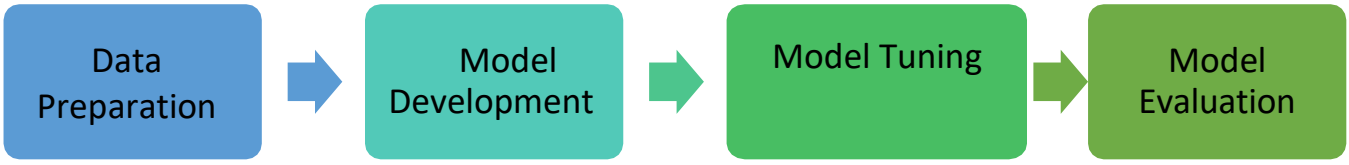
LAB WORK 2 (20 MARKS)

WINE CLASSIFICATION USING NEURAL NETWORK

In this lab work assignment, your task is to perform systematic analysis on the performance of neural network models in classifying the type of wine (red wine / white wine) based on the given features. You will need to prepare the dataset, train, and evaluate different classifiers models, and compare their performance. The dataset for this task is provided, named 'winequality-white.csv' and 'winequality-red.csv'.

The following is the process flow as your reference:



1. **Data Preparation** - Load the given dataset of chemical information about wine. Merge the two datasets and prepare the data for modeling. Split the dataset into training, validation and testing sets for model evaluation.
2. **Model Development** – Design 5 different neural network architectures to be trained. Show the network architecture in figures. Train the neural network models using the training dataset and evaluate the model with validation data. Analyse the training and validation loss curve and report your observations and analysis.
3. **Model Tuning** – Choose the best model architecture based on Step 2 and perform hyperparameter tuning. Justify the reason on how you decide the best model. Identify the hyperparameters you wish to tune (e.g activation function, learning rate, optimizer etc). Perform a systematic analysis to analyse the performance of the identified model with different hyperparameters. Report your results in a table.
4. **Model Evaluation** – Using the best model that you have identified in Step 3, evaluate its performance on testing data. Compare your validation and testing results using appropriate evaluation metrics. Report your observation and discuss the results.

Submission:

Python notebook/code that implements the classifier model for wine type classification.

<u>Deadlines for submission: 1st June 2023</u>