Lab Assignment 7 : Titanic Classification with Backpropagation

Date: 09-04-2025 **Duration: 2 hours**

Objective: Use the Titanic dataset to build a classification model with backpropagation to predict survival.

Dataset: titanic

➔ Instructions:

➔ Load and Preprocess the Dataset (20 minutes):

- ◆ Load the dataset from the provided file.
- ◆ Perform basic data cleaning:
  - ● Handle missing values (e.g., filling or dropping missing values).
  - ● Encode categorical features like *Sex, Embarked*, etc.
  - ● Normalize or scale numeric features such as *Age* and *Fare*.
- ◆ Split the data into training and testing sets (e.g., 80% training, 20% testing).

➔ Define and Implement the Model (1 hour):

- ◆ Use Python with TensorFlow/Keras or PyTorch.
- ◆ Design a neural network with at least one hidden layer using the following structure as a guide:
  - ● **Input Layer:** Corresponding to the number of features.
  - ● **Hidden Layers:** 1-2 layers with 32-64 units and a suitable activation function (e.g., ReLU).
  - ● **Output Layer:** A single neuron with a sigmoid activation function for binary classification (Survived/Not Survived).
- ◆ Use backpropagation for training:
  - ● Select an appropriate loss function, such as Binary Cross-Entropy.
  - ● Use an optimizer like Adam.
- ◆ Train the model for a suitable number of epochs (e.g., 50-100 epochs) and monitor loss and accuracy.

➔ Evaluate Model Performance (20 minutes):

- ◆ Evaluate the model on the test set and calculate the following metrics:
  - ● **Accuracy**
  - ● **Precision**
  - ● **Recall**
  - ● **F1 Score**
- ◆ Summarize and display the performance metrics.

➔ Report Findings (10 minutes):

- ◆ Briefly summarize your findings, including:
  - ● Insights from the evaluation metrics.

- Observations on model performance.
- Challenges faced, if any, and potential areas for model improvement.

Submission Requirements:

- **Code File:** Submit the Python script or notebook (.py or .ipynb) with explanations in comments.
- **Report:** A short report (about 200 words) summarizing your process, results, and any challenges encountered.

Note: Comment your code to explain the logic behind each step.