**QUAID-E-AZAM UNIVERSITY, ISLAMABAD**



**Assignment 2**

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**Analysis of Results**

( Initialization Methods and Learning Rates in Neural Networks )

**1. Introduction:**

The goal of this study is to explore the impact of weight initialization methods and learning rates on the training of Neural Networks using the Titanic dataset. Two weight initialization methods were considered - initializing weights with zero values and initializing weights with small random values.

**2. Dataset:**

The Titanic dataset was used for this study, containing information about passengers such as class, sex, age, siblings/spouses, parents/children, fare, and survival status. The dataset was preprocessed, including handling missing values and converting categorical variables into numerical form.

**3. Weight Initialization Methods:**

Two weight initialization methods were employed:

- Zero Initialization: Weights are set to zero initially.

- Random Initialization: Weights are initialized with small random values.

**4. Learning Rates:**

The impact of different learning rates (0.1, 0.05, 0.01, 0.005, 0.001) was also investigated for each weight initialization method.

**5. Results:**

Weight Initialization:

* For the Titanic dataset, initializing weights with small random values outperformed initializing with zero values.
* The random initialization allows the model to break symmetry and learn more effectively.

**Learning Rates:**

The experiment showed that a learning rate of 0.01 generally performed well for both weight initialization methods.

Higher learning rates (0.1) resulted in oscillations and slower convergence, while lower learning rates (0.001) led to slow convergence and the risk of getting stuck in local minima.

**Early Stopping:**

* To avoid overfitting, early stopping was implemented with patience of 10 epochs and monitoring validation accuracy.
* This strategy prevented the model from training too long and capturing noise in the data.

**6. Conclusion:**

In conclusion, initializing weights with small random values and using a learning rate of 0.01 produced favorable results for the Titanic dataset.

Additionally, early stopping proved effective in preventing overfitting.

**7. Recommendations:**

Further experimentation with different datasets and architectures provided additional insights. I considered it essential to consider the characteristics of the Titanic specific problem and data when choosing initialization methods and learning rates.

Graphs for KNN

