Task Description

Objective:

Implement an Artificial Neural Network (ANN) for both classification and regression tasks while experimenting with different activation functions and optimizers. Analyze how these choices affect model performance.

Requirements:

1. Activation Functions to Test (5):
    - ReLU
    - Sigmoid
    - Tanh
    - ELU
    - Leaky ReLU
2. Optimizers to Test (5):
    - Adam
    - SGD
    - RMSprop
    - Adagrad
    - Adamax
3. Model Architecture:
    - Any hidden layers
    - Appropriate output layer based on problem type
4. Analysis and Visualization:
    - Compare training/validation loss curves
    - Compare final accuracy/MSE metrics
    - Create heatmaps for performance comparison
    - Plot learning curves for different combinations

Expected Outputs:

1. Performance Metrics:
    - Final accuracy for classification
    - Final MSE for regression
    - Training and validation loss curves
2. Comparative Analysis:
    - Best performing activation-optimizer combinations

- ○ Worst performing combinations
- ○ Stability analysis of different configurations
3. Visualizations:
    - ○ Heatmaps showing performance across combinations
    - ○ Learning curves for different activations
    - ○ Learning curves for different optimizers
    - ○ Box plots for activation/optimizer comparison

Key Insights to Observe:

1. Which activation function works best for each problem type?
2. Which optimizer provides the most stable training?
3. How do different combinations affect convergence speed?
4. Which combinations are prone to overfitting?
5. Overall best configuration for each problem type

This comprehensive experiment will help understand the practical implications of different neural network components and their interactions.