



Pak Austria Fachhochschule: Institute of Applied Sciences and Technology (PAF-IAS)

Subject: Machine Learning

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Practical Lab Quiz 01

Instructions:

- Complete each of the following programming tasks. Write a standalone Python script for each question, importing the specified modules. Name your files as **quiz1.py**.
- **Include comments explaining each major step.**
- Submit all scripts in a single zipped folder.

1. Quiz 1: Python Libraries Setup

Import NumPy, SciPy, Pandas, and Matplotlib. Create a 3×3 NumPy array of random integers (0–10), convert it to a Pandas DataFrame, compute and print its mean and standard deviation.

Use SciPy to compute and display the array's eigenvalues.

Plot a histogram of the DataFrame values using Matplotlib.

2. Quiz 2: Simple Linear Regression

Load the **Diabetes CSV** dataset with Pandas and drop any missing values. Split 'Glucose' as the feature and 'Outcome' as the label into 80% train and 20% test sets. Train a scikit-learn LinearRegression model, then print the Mean Squared Error (MSE) and R^2 score.

Plot actual vs. predicted outcomes with Matplotlib.

3. Quiz 3: Gradient Descent & Cost Function

Implement linear regression manually using NumPy. Define functions `compute_cost(X, y, θ , b)` and `gradient_descent(X, y, θ , b, α , epochs)`. Load and standardize the Diabetes data.

Run gradient descent for 500 epochs, printing cost every 100 epochs, and plot cost vs. epochs.

4. Quiz 4: Multivariate Regression with Feature Scaling

Using the Student Performance dataset, encode the 'Extracurricular Activities' column with LabelEncoder, then scale all features with StandardScaler.

Build a Ridge regression model using a scikit-learn Pipeline. Report the MSE and R^2 score, and display feature coefficients in a bar chart.

5. Quiz 5: Logistic Regression Classification

On the Social_Network_Ads.csv data, load 'Age' and 'Estimated Salary' as features and 'Purchased' as the label. Scale features with StandardScaler, fit a LogisticRegression model, and print the confusion matrix, accuracy, precision, recall, and F1-score.

Plot the ROC curve with AUC and show decision boundary scatter plots for training and test sets.

“Embrace challenges—they sharpen your skills.”