Faculty of computers and artificial intelligence Helwan University

Cover sheet

AI330 Machine Learning Project

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Project Description Document

Model 1: [Linear Regression]

General Information on Numerical Dataset:

- **Project Description Document Model 1:** Linear Regression for California Housing
- **Dataset Name:** California Housing Dataset
- **Number of Classes:** Regression task (predicting median house value)
- **Total Number of Samples:** 8025
- **Training Samples:** 6420
- **Testing Samples:** 1605

Implementation Details:

Feature Extraction Phase:

Number of Features Extracted: All features in the dataset

Feature Names:

- MedInc (median income in block)
- HouseAge (median house age in block)
- AveRooms (average rooms)
- AveBedrms (average bedrooms)
- Population (block population)
- AveOccup (average house occupancy)
- Latitude (house block latitude)
- Longitude (house block longitude)

Dimension of Resulted Features: 8 features

Cross-Validation:

- **Used**: No

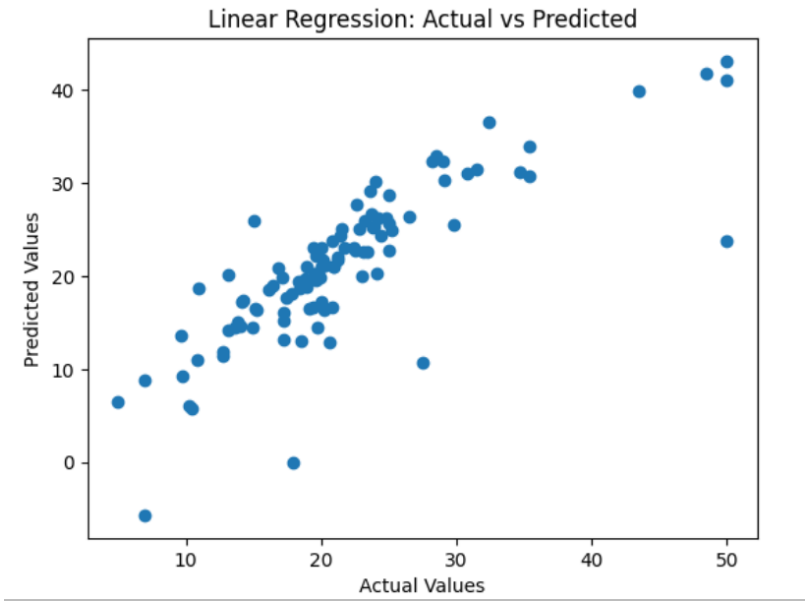
Hyperparameters:

- **Initial Learning Rate:** Not applicable (linear regression)
- **Optimizer:** Not applicable (linear regression)
- **Regularization:** Not applicable (linear regression)
- **Batch Size:** Not applicable (linear regression)
- **Number of Epochs:** Not applicable (linear regression)

Results Details:

Testing Data:

- **Loss Curve:** Not applicable (linear regression)
- **Accuracy:** Not applicable (regression task)
- **Evaluation Metric:** Mean Squared Error (MSE) , R^2 Score
- **MSE on Testing Data:** [25.017672023842596]
- **R^2 Score on Testing Data**: [0.6588520195508154]



Model 2: [KNN Regression]

General Information on Numerical Dataset:

- **Project Description Document Model 2:** KNN Regression for California Housing
- **Dataset Name:** California Housing Dataset
- **Number of Classes:** Regression task (predicting median house value)
- **Total Number of Samples:** 8025
- **Training Samples:** 6420
- **Testing Samples:** 1605

Implementation Details:

Feature Extraction Phase:

Number of Features Extracted: All features in the dataset

Feature Names:

- MedInc (median income in block)
- HouseAge (median house age in block)
- AveRooms (average rooms)
- AveBedrms (average bedrooms)
- Population (block population)
- AveOccup (average house occupancy)
- Latitude (house block latitude)
- Longitude (house block longitude)

Dimension of Resulted Features: 8 features

Cross-Validation:

- **Used**: Yes
- **Number of folds :** 5
- **Training/Validation Ratio/Testing :** 60% / 20% / 20%

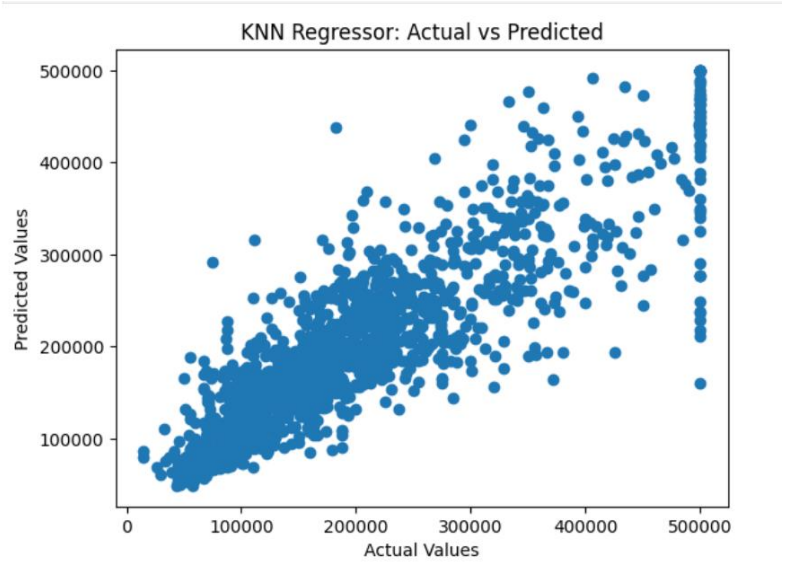
Hyperparameters:

- **Number of Neighbors (k):** [9]
- **Distance Metric:** Euclidean distance (default)

Results Details:

Testing Data:

- **Loss Curve:** Not applicable (KNN regression)
- **Evaluation Metric:** Mean Squared Error (MSE) , R^2 Score
- **`RMSE on Testing Data:`** [56438.011742719355]
- **R^2 Score on Testing Data**: [0.7545223381157126]
- **Mean MSE:** [3185249169.471328]
- **Standard Deviation MSE:** [262635941.85936466]



Model 1 : [Logistic Regression for UTKFace Dataset]

General Information on Image Dataset:

- **Project Description Document Model 1:** Logistic Regression for UTKFace Dataset
- **Dataset Name:** UTKFace Dataset
- **Number of Classes:** Gender Prediction (Regression task)
- **Total Number of Samples:** 3252
- **Training Samples:** 2602
- **Testing Samples:** 650

Implementation Details:

Feature Extraction Phase:

Number of Features Extracted: All features in the dataset

Feature Names :

- Age , index[0]
- Race , index[2]
- Date&time , index[3]

Target :

- Gender (Classify humans into 0 Male | 1 Female) , index[1]

Dimension of Resulted Features: 3 features

Cross-Validation:

- **Used**: No (Logistic Regression doesn't typically involve cross-validation during training)

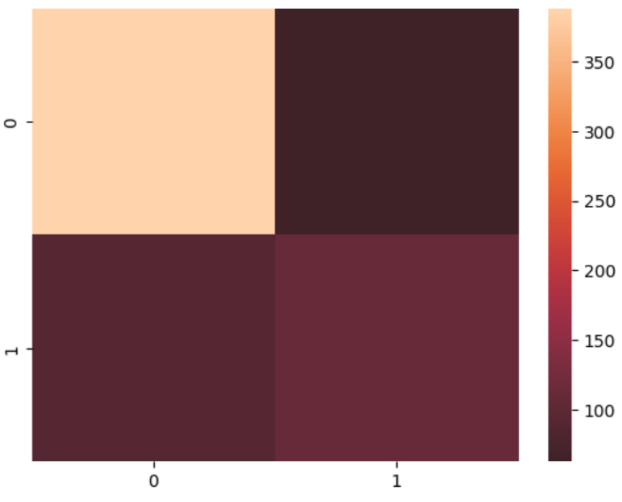
Hyperparameters:

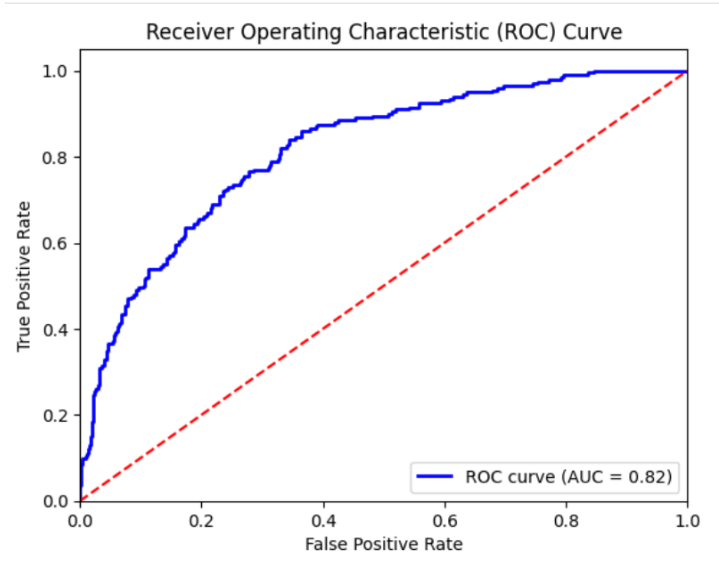
- **Regularization parameter (C) :** [1.0]
- **Solver:** ‘Saga’
- **Maximum iterations:** [100]
- **Penalty:** l2

Results Details:

Testing Data:

- **Loss Curve:** Not applicable (logistic regression)
- **Accuracy Score:** 0.7649
- **Evaluation Metric:** Mean Squared Error (MSE) , Confusion Matrix
- **Confusion Matrix :** [[388 63]
  [90 110]]
-
- **ROC AUC Score**: [0.705155]
- **ROC Curve** :





Model 2 : [K-Means Clustering for UTKFace Dataset]

General Information on Image Dataset:

- **Project Description Document Model 2 :** K-means Clustering for UTKFace Dataset
- **Dataset Name:** UTKFace Dataset
- **Number of Classes:** Unsupervised (Clustering task)
- **Total Number of Samples:** 3252
- **Training Samples:** 2602
- **Testing Samples:** 650

Implementation Details:

Feature Extraction Phase:

Number of Features Extracted: All features in the dataset

Feature Names :

- Age , index[0]
- Race , index[2]
- Date&time , index[3]

Target :

- Gender (Classify humans into 0 Male | 1 Female) , index[1]

Dimension of Resulted Features: 3 features

Cross-Validation:

- **Used**: No (K-means is unsupervised and does not involve cross-validation during training)

Hyperparameters:

- **Number of clusters (K) :** [2]

Results Details:

Testing Data:

- **Inertia:** 1120.2396
- **Silhouette:** 0.750
- **Visualize the cluster :**
- **Select K randomly and loop from 2 to 11 , in each iteration save inertia in the list after end the loop then compare all inertias and plot Elbow to select the right K**