YAYASAN MEMAJUKAN ILMU DAN KEBUDAYAAN
UNIVERSITAS SIBER ASIA
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LEMBAR JAWABAN
UJIAN AKHIR SEMESTER
SEMESTER GENAP TAHUN AJARAN 2024/2025

Mata Kuliah	: Data Science
Kelas	: IF405
Prodi	: PJJ Informatika
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# Student Performance Analysis


# 1. Import Library
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression
from sklearn.cluster import KMeans
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import classification_report, confusion_matrix
from sklearn.preprocessing import StandardScaler

# 2. Load Dataset
df = pd.read_csv("student-mat.csv", sep=";")

# 3. EDA (Exploratory Data Analysis)
print("Jumlah baris dan kolom:", df.shape)
print("\nInformasi dataset:")
print(df.info())
print("\nStatistik deskriptif:")
print(df.describe())
print("\nKolom-kolom:", df.columns.tolist())

# Penjelasan kolom
column_descriptions = {
    'school': 'Sekolah tempat siswa belajar (GP atau MS)',
    'sex': 'Jenis kelamin siswa (F atau M)',
    'age': 'Usia siswa',
    'address': 'Alamat siswa (U untuk urban, R untuk rural)',
    'famsize': 'Ukuran keluarga (LE3 untuk keluarga kecil, GT3 untuk
keluarga besar)',
    'Pstatus': 'Status orang tua (T untuk tinggal bersama, A untuk tinggal
terpisah)',
    'medu': 'Pendidikan ibu (0-4, di mana 4 adalah pendidikan tertinggi)',
    'fedu': 'Pendidikan ayah (0-4, di mana 4 adalah pendidikan
tertinggi)',
    'Mjob': 'Pekerjaan ibu (teacher, health, services, at_home, other)',
    'Fjob': 'Pekerjaan ayah (teacher, health, services, at_home, other)',
    'reason': 'Alasan memilih sekolah (home, reputation, course, other)',
    'guardian': 'Wali siswa (mother, father, other)',
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    'traveltime': 'Waktu perjalanan ke sekolah (1-4, di mana 4 adalah
waktu terlama)',
    'studytime': 'Waktu belajar per minggu (1-4, di mana 4 adalah waktu
belajar terlama)',
    'failures': 'Jumlah kegagalan dalam mata pelajaran (0-3)',
    'absences': 'Jumlah ketidakhadiran',
    'G1': 'Nilai pertama (1-20)',
    'G2': 'Nilai kedua (1-20)',
    'G3': 'Nilai akhir (1-20)'
}

for column, description in column_descriptions.items():
    print(f"{column}: {description}")

# Visualisasi distribusi nilai akhir (G3)
sns.histplot(df['G3'], bins=15, kde=True)
plt.title("Distribusi Nilai Akhir (G3)")
plt.xlabel("Nilai G3")
plt.ylabel("Frekuensi")
plt.show()

# 4. Regresi Linear (studytime vs G3)
X = df[['studytime']]
y = df['G3']
model = LinearRegression()
model.fit(X, y)

df['G3_pred'] = model.predict(X)
sns.scatterplot(x='studytime', y='G3', data=df)
sns.lineplot(x='studytime', y='G3_pred', data=df, color='red')
plt.title("Regresi Linear: Studytime vs G3")
plt.show()

print("Koefisien regresi:", model.coef_)
print("Intercept:", model.intercept_)

# 5. Clustering (absences & studytime)
cluster_data = df[['absences', 'studytime']]
scaler = StandardScaler()
cluster_scaled = scaler.fit_transform(cluster_data)

kmeans = KMeans(n_clusters=3, random_state=42, n_init=10)
df['cluster'] = kmeans.fit_predict(cluster_scaled)

sns.scatterplot(x='absences', y='studytime', hue='cluster', data=df,
palette='viridis')
plt.title("Cluster Absensi dan Waktu Belajar")
plt.show()

# 6. Klasifikasi G3 (Low, Medium, High)
def label_g3(g3):
    if g3 <= 10:
        return 'Low'
    elif g3 <= 15:
        return 'Medium'
    else:
        return 'High'
```

```
df['G3_label'] = df['G3'].apply(label_g3)

X = df[['studytime', 'failures', 'absences']]
y = df['G3_label']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3,
random_state=42)

clf = DecisionTreeClassifier(max_depth=4, random_state=42)
clf.fit(X_train, y_train)
y_pred = clf.predict(X_test)

print("\nClassification Report:")
print(classification_report(y_test, y_pred))

conf_matrix = confusion_matrix(y_test, y_pred)
sns.heatmap(conf_matrix, annot=True, fmt="d", cmap="Blues",
xticklabels=clf.classes_, yticklabels=clf.classes_)
plt.title("Confusion Matrix")
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.show()
```

```
Jumlah baris dan kolom: (395, 33)

Informasi dataset:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 395 entries, 0 to 394
Data columns (total 33 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   school      395 non-null    object
 1   sex         395 non-null    object
 2   age         395 non-null    int64
 3   address     395 non-null    object
 4   famsize     395 non-null    object
 5   Pstatus     395 non-null    object
 6   Medu        395 non-null    int64
 7   Fedu        395 non-null    int64
 8   Mjob        395 non-null    object
 9   Fjob        395 non-null    object
 10  reason      395 non-null    object
 11  guardian    395 non-null    object
 12  traveltime  395 non-null    int64
 13  studytime   395 non-null    int64
 14  failures    395 non-null    int64
 15  schoolsup   395 non-null    object
 16  famsup      395 non-null    object
 17  paid        395 non-null    object
 18  activities  395 non-null    object
 19  nursery     395 non-null    object
 20  higher      395 non-null    object
 21  internet    395 non-null    object
 22  romantic    395 non-null    object
 23  famrel      395 non-null    int64
 24  freetime    395 non-null    int64
 25  goout       395 non-null    int64
 26  Dalc        395 non-null    int64
 27  Walc        395 non-null    int64
 28  health      395 non-null    int64
 29  absences    395 non-null    int64
 30  G1          395 non-null    int64
 31  G2          395 non-null    int64
```

```
 32  G3          395 non-null    int64
dtypes: int64(16), object(17)
memory usage: 102.0+ KB
None

Statistik deskriptif:
              age        Medu        Fedu  traveltime   studytime    failures
\
count  395.000000  395.000000  395.000000  395.000000  395.000000  395.000000
mean    16.696203    2.749367    2.521519    1.448101    2.035443    0.334177
std      1.276043    1.094735    1.088201    0.697505    0.839240    0.743651
min     15.000000    0.000000    0.000000    1.000000    1.000000    0.000000
25%     16.000000    2.000000    2.000000    1.000000    1.000000    0.000000
50%     17.000000    3.000000    2.000000    1.000000    2.000000    0.000000
75%     18.000000    4.000000    3.000000    2.000000    2.000000    0.000000
max     22.000000    4.000000    4.000000    4.000000    4.000000    3.000000

           famrel    freetime       goout        Dalc        Walc      health
\
count  395.000000  395.000000  395.000000  395.000000  395.000000  395.000000
mean     3.944304    3.235443    3.108861    1.481013    2.291139    3.554430
std      0.896659    0.998862    1.113278    0.890741    1.287897    1.390303
min      1.000000    1.000000    1.000000    1.000000    1.000000    1.000000
25%      4.000000    3.000000    2.000000    1.000000    1.000000    3.000000
50%      4.000000    3.000000    3.000000    1.000000    2.000000    4.000000
75%      5.000000    4.000000    4.000000    2.000000    3.000000    5.000000
max      5.000000    5.000000    5.000000    5.000000    5.000000    5.000000

         absences          G1          G2          G3
count  395.000000  395.000000  395.000000  395.000000
mean     5.708861   10.908861   10.713924   10.415190
std      8.003096    3.319195    3.761505    4.581443
min      0.000000    3.000000    0.000000    0.000000
25%      0.000000    8.000000    9.000000    8.000000
50%      4.000000   11.000000   11.000000   11.000000
75%      8.000000   13.000000   13.000000   14.000000
max     75.000000   19.000000   19.000000   20.000000

Kolom-kolom: ['school', 'sex', 'age', 'address', 'famsize', 'Pstatus',
'Medu', 'Fedu', 'Mjob', 'Fjob', 'reason', 'guardian', 'traveltime',
'studytime', 'failures', 'schoolsup', 'famsup', 'paid', 'activities',
'nursery', 'higher', 'internet', 'romantic', 'famrel', 'freetime', 'goout',
'Dalc', 'Walc', 'health', 'absences', 'G1', 'G2', 'G3']
school: Sekolah tempat siswa belajar (GP atau MS)
sex: Jenis kelamin siswa (F atau M)
age: Usia siswa
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Pstatus: Status orang tua (T untuk tinggal bersama, A untuk tinggal terpisah)
medu: Pendidikan ibu (0-4, di mana 4 adalah pendidikan tertinggi)
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reason: Alasan memilih sekolah (home, reputation, course, other)
guardian: Wali siswa (mother, father, other)
traveltime: Waktu perjalanan ke sekolah (1-4, di mana 4 adalah waktu terlama)
studytime: Waktu belajar per minggu (1-4, di mana 4 adalah waktu belajar
terlama)
failures: Jumlah kegagalan dalam mata pelajaran (0-3)
absences: Jumlah ketidakhadiran
G1: Nilai pertama (1-20)
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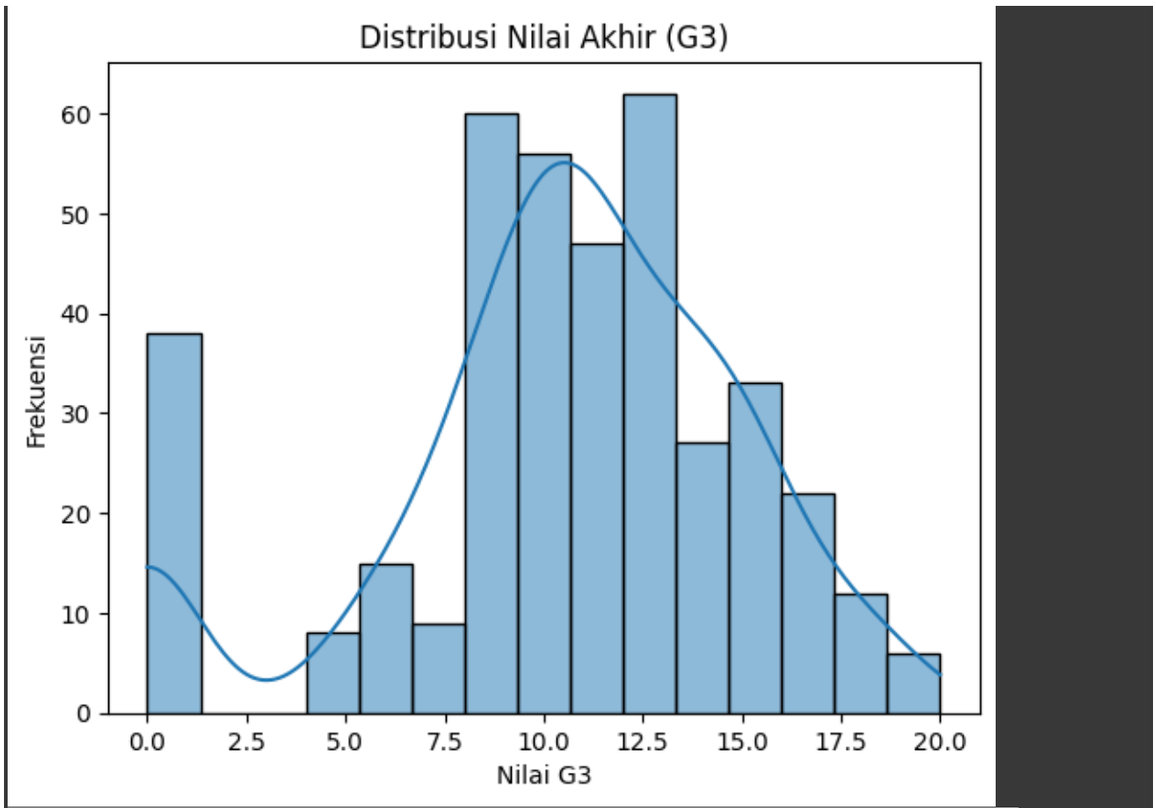
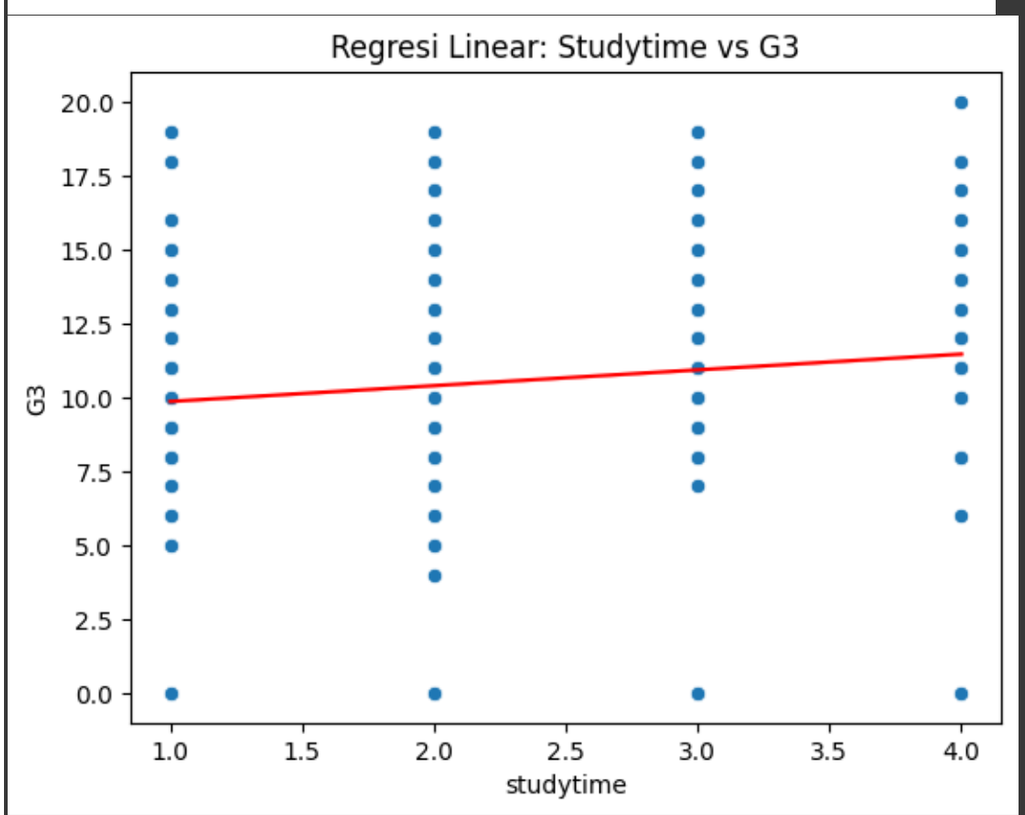
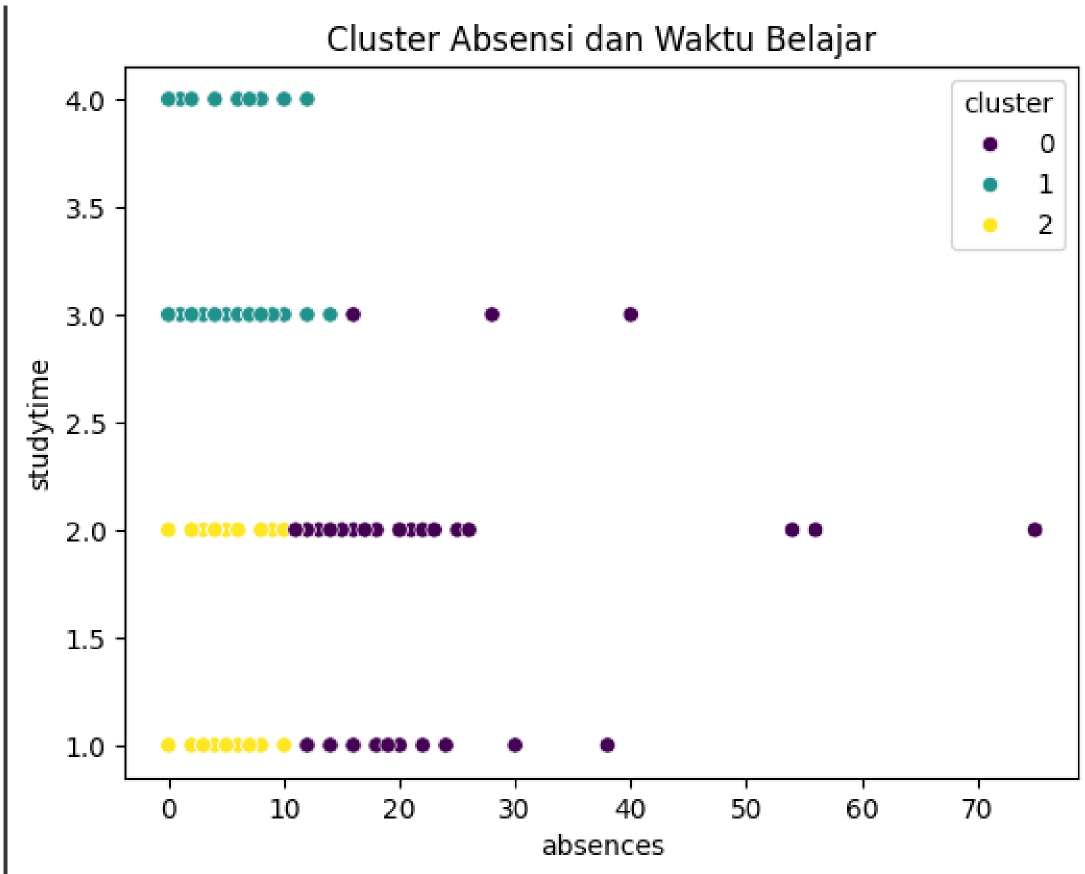
G3: Nilai akhir (1-20)
```






```
Koefisien regresi: [0.53400113]
Intercept: 9.328260988559856
```




```
Classification Report:
              precision    recall  f1-score   support

        High       0.00      0.00      0.00        14
         Low       0.91      0.32      0.47        63
      Medium       0.41      0.95      0.58        42

    accuracy                           0.50       119
   macro avg       0.44      0.42      0.35       119
weighted avg       0.63      0.50      0.45       119

/usr/local/lib/python3.11/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, f"{metric.capitalize()} is", len(result))
/usr/local/lib/python3.11/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero_division` parameter to control this behavior.
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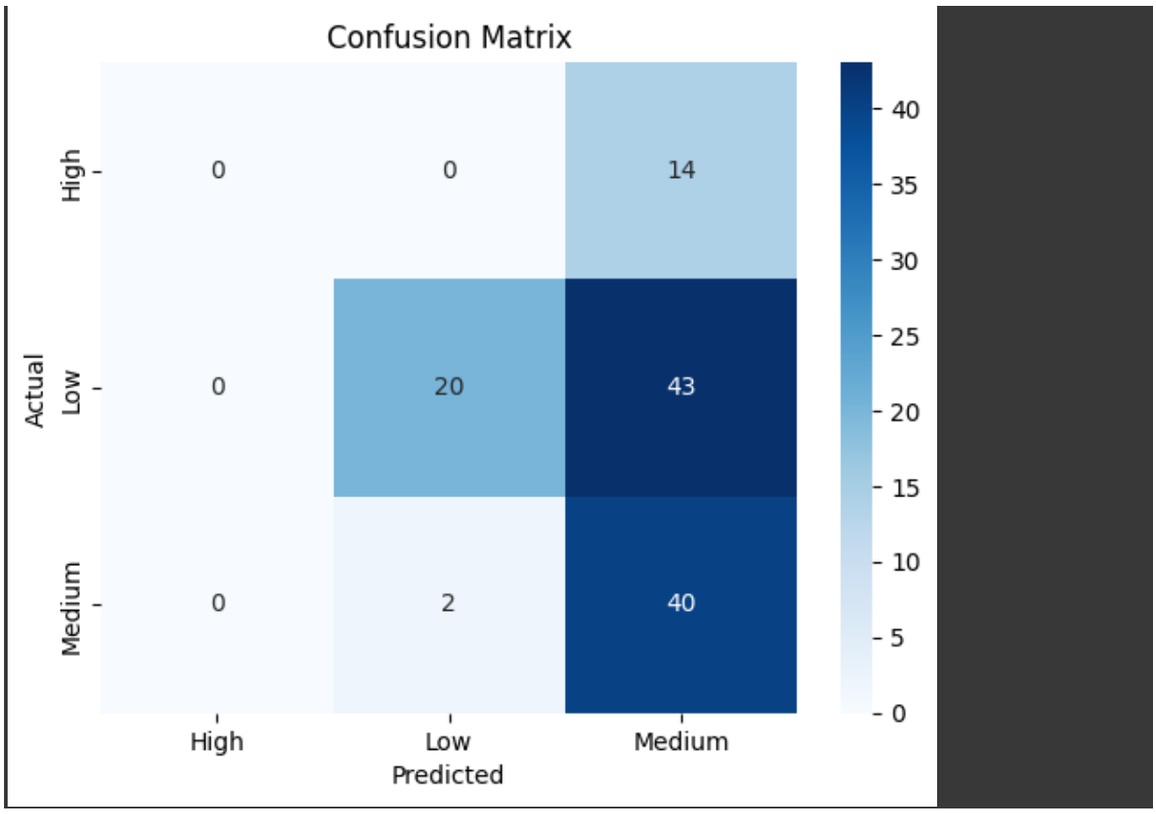
  _warn_prf(average, modifier, f"{metric.capitalize()} is", len(result))
```


Confusion Matrix
Actual
High
Low
Medium
0
0
14
0
20
43
0
2
40
High
Low
Medium
Predicted
40
35
30
25
20
15
10
5
0