Vidyavardhini's College of Engineering and Technology, Vasai
Department of Computer Science & Engineering (Data Science)

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Subject: AI&ML in Healthcare

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Class/Sem:	BE/VII
Experiment No.:	04
Title:	AI for medical prognosis.
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Aim: To studyAI for medical prognosis.

Objective: To understand how AI can analyze patient data for prognosis and explore techniques like machine learning and deep learning for predicting disease progression. To evaluate the role of AI in personalized treatment and preventive care and to highlight benefits and challenges of AI-driven prognosis in healthcare.

Theory: Medical prognosis refers to predicting the likely outcome or course of a disease. Traditional prognosis depends on doctor's experience, clinical tests, and patient history. However, AI provides **data-driven predictions** by analyzing vast amounts of healthcare data (electronic health records, lab results, genetic data, imaging scans).

How AI Works in Prognosis:

1. **Data Collection:** Patient demographics, medical history, symptoms, test results.
2. **Model Training:** Machine learning/deep learning algorithms identify hidden patterns.
3. **Prediction:** AI predicts disease progression (recovery, risk of recurrence, survival chances).
4. **Decision Support:** Helps doctors design personalized treatment strategies.

Applications:

- **Cancer Prognosis:** Predicting tumor recurrence and survival rates.
- **Cardiology:** Forecasting risk of heart attacks or strokes.
- **Critical Care:** Predicting need for ICU or ventilator support.
- **Chronic Diseases:** Estimating diabetes complications or kidney failure risks.

Benefits:

- Accurate and faster predictions.

- Supports personalized medicine.
- Early risk detection for preventive care.

Challenges:

- Data privacy concerns.
- Possible algorithm bias due to limited datasets.
- Requires human supervision—AI should assist, not replace doctors.

Program and output

```
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score, classification_report
# Simulate patient data
data = {
    'Age': [30, 45, 60, 25, 55, 70, 35, 50, 65, 40],
    'Gender': ['M', 'F', 'M', 'F', 'M', 'F', 'M', 'F', 'M', 'F'],
    'Smoker': [0, 1, 1, 0, 1, 0, 0, 1, 0, 1],
    'Blood_Pressure_Systolic': [120, 140, 160, 110, 150, 170, 125, 145, 165, 130],
    'Cholesterol': [180, 220, 250, 160, 230, 260, 190, 225, 255, 200],
    'Disease_Progression': [0, 1, 1, 0, 1, 1, 0, 1, 1, 0] # 0 for no progression, 1 for progression
```

```
}

df = pd.DataFrame(data)

# Convert categorical features to numerical using one-hot encoding

df = pd.get_dummies(df, columns=['Gender'], drop_first=True)

X = df[['Age', 'Smoker', 'Blood_Pressure_Systolic', 'Cholesterol', 'Gender_M']]

y = df['Disease_Progression']

# Split data into training and testing sets

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=42)

# Train a Decision Tree Classifier model

model = DecisionTreeClassifier(random_state=42)

model.fit(X_train, y_train)

# Make predictions on the test set

y_pred = model.predict(X_test)

print("--- Predicted Output ---")

print("Accuracy:", accuracy_score(y_test, y_pred))

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

# Simulate a new patient for prognosis

new_patient_data = {

    'Age': [58],

    'Smoker': [1],
```

```
    'Blood_Pressure_Systolic': [155],
    'Cholesterol': [240],
    'Gender_M': [1] # Assuming male
}
new_patient_df = pd.DataFrame(new_patient_data)
new_patient_prediction = model.predict(new_patient_df)
print("\n--- New Patient Prognosis ---")
if new_patient_prediction[0] == 1:
    print("Prognosis: High likelihood of disease progression.")
else:
    print("Prognosis: Low likelihood of disease progression.")
```

--- Predicted Output ---
Accuracy: 0.6666666666666666

Classification Report:
precision recall f1-score support 0 0.50 0.50 0.50 2

1 0.75 0.75 0.75 4

accuracy 0.67 6

macro avg 0.62 0.62 0.62 6
weighted avg 0.67 0.67 0.67 6

--- New Patient Prognosis ---
Prognosis: High likelihood of disease progression.

Conclusion:

AI for medical prognosis offers a revolutionary way to predict disease outcomes by analyzing large-scale healthcare data. It enhances diagnostic accuracy, supports preventive healthcare, and enables personalized treatment plans. While challenges such as data privacy and algorithmic bias remain, AI serves as a powerful decision-support tool for doctors, ultimately improving patient care and health outcomes.