**Assignment 7**

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**Problem Statement**

Build a Decision Tree classifier to predict graduate school admissions based on GRE scores and academic performance.

**Objective**

1. Preprocess and prepare admission data.
2. Train a Decision Tree model.
3. Evaluate performance using key metrics.

**Resources Used**

* **Dataset:** [Graduate Admissions](https://www.kaggle.com/mohansacharya/graduate-admissions) (admission.csv).
* **Libraries:**
  + Pandas, NumPy (Data Handling)
  + Scikit-learn (Modeling & Evaluation)
  + Matplotlib (Visualization)

**Methodology**

**1. Data Loading & Exploration**

* **Features Used:**
  + GRE Score (Independent)
  + CGPA (Independent)
  + Chance of Admit (Target, binarized to 0/1).
* **Dataset Stats:**
  + 500 entries, no missing values.
  + Mean GRE: 316.5, Mean CGPA: 8.58.

**2. Data Preprocessing**

* **Binarized Target:** Converted Chance of Admit to binary (1 if ≥0.5, else 0).
* **Train-Test Split:** 80% training, 20% testing.

**3. Model Training**

* **Algorithm:** DecisionTreeClassifier with max\_depth=3.
* **Visualized Tree:** To interpret decision rules.

**4. Model Evaluation**

* **Accuracy:** 94%
* **Precision:** 94.7%
* **Recall:** 98.9%
* **F1-Score:** 96.8%

**Key Metrics**

1. **High Recall (98.9%):**
   * Captures almost all actual admitted students.
2. **Good Precision (94.7%):**
   * Low false positives (only 2 students wrongly predicted as admitted).
3. **F1-Score (96.8%):**
   * Balanced measure of precision and recall.

**Conclusion**

1. The Decision Tree model **effectively predicts admissions** with 94% accuracy.
2. **Critical Features:**
   * **CGPA > 8.85** and **GRE > 316** are key admission drivers.
3. **Recommendations:**
   * Counselors can use this model to shortlist high-potential students.
   * Future work: Include more features (e.g., TOEFL, Research).