📊 Student Performance Prediction using TensorFlow:

📌 Overview

This project uses a neural network model built with **TensorFlow and Keras** to predict the final grade (G3) of students based on their demographic, social, and academic attributes. The model is trained on the **Portuguese student performance dataset** from the UCI Machine Learning Repository.

🧠 Objective

To develop a regression model that accurately predicts student final grades (G3) and provides insights into the factors affecting academic performance.

📁 Dataset

- **Source:** UCI Student Performance Data
- **File:** student-mat.csv
- **Target Variable:** G3 (final year grade)

🔧 Technologies Used

- Python
- TensorFlow / Keras
- Scikit-learn
- Pandas, NumPy
- Matplotlib & Seaborn

🛠️ Steps Performed

1. **Data Preprocessing**
    - Categorical encoding using pd.get_dummies
    - Dropped irrelevant columns like school, guardian
    - Feature scaling with StandardScaler

2. **Model Building**
    - 3-layer neural network using Sequential API
    - Activation function: ReLU
    - Loss function: Mean Squared Error (MSE)
    - Optimizer: Adam
3. **Model Evaluation**
    - MSE: 7.64
    - MAE: 2.08
    - R^2 Score: 0.63
4. **Visualization**
    - Training & validation loss over epochs
    - Actual vs. Predicted Grade plot

📈 Results

- The model explains approximately **63% of the variance** in student performance.
- On average, the predicted grades are off by **2 points**.
- Performance can be improved with hyperparameter tuning or feature engineering.

📁 Files Included

- student_performance_tensorflow.py: Full code
- student-mat.csv: Dataset
- student_grade_predictor_model.h5: Saved trained model
- README.md: This report
- requirements.txt: Required packages

🚀 Future Improvements

- Add dropout layers to prevent overfitting
- Use cross-validation for better performance estimation
- Try other regression models (e.g., Random Forest, XGBoost)

🙋‍♀️ Author

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