Week 3 - ML Model Report

Objective

Train and evaluate a model to predict energy consumption (kWh) for EV charging sessions using cleaned EV dataset.

Data and Features

- Dataset: `cleaned_ev_dataset.csv`
- Features used: `Hour`, `ChargingDuration`
- Target: `EnergyConsumption`

Models Trained

1. Linear Regression (baseline)
2. Random Forest Regressor (tuned via GridSearchCV)

Evaluation Metrics

- Mean Absolute Error (MAE)
- Root Mean Squared Error (RMSE)
- R^2 Score

(Insert actual values after running the training script)

Key Observations

- Random Forest generally performs better than Linear Regression on non-linear relationships.
- The model captures the relation between charging duration and energy consumed, with hour-of-day providing additional predictive power.

Outputs

- `models/ev_energy_model.pkl` — Saved model file
- `models/predictions.csv` — Predictions vs actuals
- `plots/actual_vs_predicted.png`

- `plots/residuals.png`

Next Steps

- Add more features (vehicle type, charging power) to improve accuracy.
- Deploy model via Streamlit for user interaction.
- Integrate pricing and renewable energy data for cost-aware scheduling.

How to reproduce

1. Ensure `cleaned_ev_dataset.csv` is in the project folder.
2. Run: `python train_model.py`
3. Run: `python ev_model_plots.py`
4. Check `models/` and `plots/` for outputs.