Forecasting Food Vendor Sales at Amusement Parks

- Forecast food and beverage sales in amusement parks
- Reduce waste and optimize vendor inventory planning
- Evaluate existing ML models for sales forecasting
- Reproduce public solutions using real-world data

Literature Review

Key Research Reviewed:

- **A Stacking Ensemble Model for Food Demand Forecasting (Karaoglan et al.)**
  - Used Random Forest, XGBoost, Gradient Boosting
- **Machine Learning Based Restaurant Sales Forecasting (Jamal et al.)**
  - Used weather, time, and RNN-based models
- **Demand Forecasting in the Food Industry (Barata et al.)**
  - Time-series models applied to delicatessen operations

Models Reproduced

Prophet Model

- Dataset: Corporación Favorita (Store 1, Beverages)
- Forecast Horizon: 90 days
- Captured seasonality, trend, and general sales patterns

LSTM Model

- Dataset: Food Demand Forecasting Kaggle Dataset
- Used TensorFlow 2.x, adapted from public GitHub repo
- Better performance on non-linear and irregular sales patterns

Evaluation Metrics

Model	RMSE	MAE	MAPE
Prophet	408.87	304.65	24.95%
LSTM	~321	~270	~15%

Insights & Next Steps

Key Learnings:

- Prophet is fast and interpretable but struggles with demand spikes.
- LSTM handles non-linear patterns better but requires more tuning.
- Public models serve as strong baselines but lack park-specific context.

Planned Improvements:

- Add weather API data and event schedules
- Segment vendors by product type (snacks, beverages, meals)
- Explore hybrid models (Prophet + XGBoost / LightGBM)
- Improve forecasting accuracy with additional features