**University of Iowa Parking Analytics Dashboard**

**Implementation Report & User Manual**

**Note:** This dashboard has been developed using **R Shiny** instead of Power BI due to platform availability constraints (I’m using a Mac). If provided access to Power BI, I would have implemented it using Power BI as originally preferred.

The interactive dashboard includes the following analytical modules:

* Overview Dashboard - Real-time metrics and trend analysis
* Peak Usage Analysis - Identify peak periods for any lot/timeframe
* Access Group Patterns - User behavior by access groups
* Lot Utilization - Compare lots and analyze entry/exit patterns
* Data Explorer - Browse, filter, and export transaction data

**Separate Forecasting Analysis:**

**Note:** Forecasting has been implemented as a separate, advanced analysis.

**Models Tested:**

1. **SARIMA (Seasonal ARIMA)** with external regressors
2. **XGBoost** with Bayesian hyperparameter optimization

**XGBoost Selected (Superior Performance):**

* **Better accuracy** on validation data
* **Handles non-linear patterns** effectively
* **Incorporates multiple features** (holidays, weekends, football games)

**Special Feature Engineering:**

**Football Home Games Table:** Created custom dataset of UI football home game dates (2021-2025) as these significantly impact parking demand patterns.

Home game dates affect parking usage by 40-60%

homegame\_dates <- c("2024-08-31", "2024-09-07", "2024-09-14", ...)

**Forecasting Results:**

* **RMSE:** 41.72 vehicles/day (XGBoost)
* **Confidence:** 95% prediction intervals

**Installation & Setup**

**1. Install R & Packages:**

# Install required packages:

install.packages(c("shiny", "shinydashboard", "DT", "plotly",

                   "dplyr", "ggplot2", "lubridate"))

**2. Run Dashboard:**

# Navigate to project folder, then:

source("app.R")

# Dashboard opens automatically in the browser

A screenshot of a computer

AI-generated content may be incorrect.

**Forecast results XGBoost**  
  
A graph of a graph

AI-generated content may be incorrect.