

Hotel Performance & Analytics Dashboard - Consolidated Version

A comprehensive single-file Streamlit application for hotel performance analysis, machine learning forecasting, and revenue optimization.

✅ What's New in This Version:

Single File Architecture

- ✅ All functionality consolidated into one `hotel_app.py` file
- ✅ Dynamic navigation using radio buttons in the sidebar
- ✅ No separate page files needed - everything runs from one file
- ✅ Simplified deployment and maintenance

Enhanced Navigation

- ✅ Sidebar radio button navigation between three main sections
- ✅ Global filters that apply to all pages
- ✅ "Select All" functionality for all filter categories
- ✅ Session state management for data persistence



Features Overview

Main Dashboard

- **Data Overview:** Total records, date range, countries, room types
- **Quick Performance Stats:** Revenue, room nights, ADR, RevPAR, bookings
- **Navigation Guide:** Clear instructions for using each section

- **Data Preview:** Expandable section to examine filtered dataset



Hotel Performance Analysis

- **Key Performance Indicators (KPIs):** Comprehensive metrics display
- **Geographic Analysis:** Country performance, local vs international markets
- **Temporal Analysis:** Monthly trends, year-over-year comparisons, ADR over time
- **Room & Agent Analysis:** Room type performance, travel agent revenue
- **Revenue Analysis:** Monthly trends with growth rates, market segment analysis
- **Performance Summary Tables:** Top performers by country, agent, and month



Forecast and Prediction (ML Machine Learning)

- **Machine Learning Models:** Random Forest, Gradient Boosting, Linear Regression
- **Model Performance Comparison:** RMSE, MAE, R^2 metrics with visualization
- **Prediction Examples:** Sample predictions with actual vs predicted comparisons
- **Model Performance Visualization:** Scatter plots, residuals distribution
- **Monthly Forecast Visualization:** Time series forecasting by month
- **Prophet Time Series Forecasting:** Advanced forecasting with confidence intervals
- **Monthly Model Comparison:** Comprehensive model performance analysis
- **Feature Importance Analysis:** Understanding key prediction factors



Optimize Revenue

- **Dynamic Price Optimization:** Interactive pricing tools with multiple factors
- **Demand Forecasting & Capacity Planning:** Historical demand analysis
- **Room Mix Optimization:** Performance analysis by room types

- **Performance Analytics & Benchmarking:** Competitive analysis and recommendations

Installation & Usage

Quick Start

Bash

```
# Install dependencies  
pip install streamlit pandas numpy plotly matplotlib seaborn scikit-learn  
prophet  
  
# Run the application  
streamlit run hotel_app.py
```

Data Requirements

Your CSV file should include these columns:

- **Arrival date** : Date of arrival (YYYY-MM-DD format)
- **ADR** : Average Daily Rate
- **Room night** : Number of room nights
- **total rate net** : Total revenue
- **Country** : Guest country
- **Travel Agent** : Travel agent name
- **Room Type** : Type of room booked

Navigation Instructions

1. **Upload Data:** Use the sidebar to upload your hotel booking CSV file
2. **Apply Global Filters:** Use "Select All" checkboxes or individual selections
3. **Navigate Pages:** Use the radio buttons in the sidebar:

- **Hotel Performance:** KPIs and comprehensive analysis
- **Forecast and Prediction:** ML models and forecasting
- **Optimize Revenue:** Revenue optimization tools

4. **Interactive Features:** All charts are interactive with hover, zoom, and click functionality



Key Improvements

User Experience

- ☒ Single file means easier deployment and sharing
- ☒ Persistent navigation state across sections
- ☒ Global filters apply to all analysis sections
- ☒ Clear visual indicators for active page selection

Technical Enhancements




- ☒ Session state management for data persistence
- ☒ Optimized data loading and filtering
- ☒ Consolidated imports and dependencies
- ☒ Streamlined code structure

Machine Learning Features

- ☒ All requested ML visualizations included:
 - Actual vs Predicted ADR scatter plots
 - Residuals distribution histograms
 - Monthly forecast visualization by arrival_month_year
 - Monthly model comparison charts

- Feature importance analysis

Filter Enhancements

-  "Select All" functionality for all filter categories
-  Real-time filtering with immediate updates
-  Filter state persistence across page navigation



Technical Details

File Structure

Plain Text

```
hotel_app.py           # Single consolidated application file
requirements.txt        # Python dependencies
README_consolidated.md # This documentation
Cleaned_Hotel_Booking.csv # Sample data file
```

Dependencies

- streamlit: Web application framework
- pandas: Data manipulation and analysis
- numpy: Numerical computing
- plotly: Interactive visualizations
- matplotlib: Static plotting
- seaborn: Statistical visualizations
- scikit-learn: Machine learning algorithms
- prophet: Time series forecasting

Usage Examples

Running the Application

Bash

```
# Standard run
streamlit run hotel_app.py

# Custom port
streamlit run hotel_app.py --server.port 8502

# External access
streamlit run hotel_app.py --server.address 0.0.0.0
```

Navigation Flow

1. Start application → Main dashboard loads
2. Upload data via sidebar → Data overview updates
3. Apply filters → All sections update automatically
4. Navigate between sections → State persists
5. Interact with charts → Explore data insights

Troubleshooting

Common Issues

- **Data not loading:** Ensure CSV has required columns
- **Charts not displaying:** Check data types and missing values
- **Navigation not working:** Refresh page and re-upload data
- **Performance issues:** Reduce data size or apply more specific filters

Performance Tips

- Use filters to reduce dataset size for faster processing
- Upload clean data with proper date formats
- Ensure numeric columns don't contain text values
- Use reasonable date ranges for time series analysis



Future Enhancements

Planned Features

- Export functionality for charts and reports
- Additional ML models and algorithms
- Real-time data connection capabilities
- Advanced forecasting scenarios
- Custom dashboard themes

Customization Options

- Modify color schemes in the plotly charts
- Add new KPI metrics in the performance section
- Extend ML models with additional algorithms
- Customize filter options based on your data



Support

For issues or questions:

1. Check the troubleshooting section above
2. Verify your data format matches requirements

3. Ensure all dependencies are installed correctly
4. Review the console output for error messages



Version History

v2.0 - Consolidated Version

- Single file architecture
- Dynamic navigation system
- Enhanced global filtering
- All ML features integrated
- Improved user experience

v1.0 - Multi-page Version

- Multi-page Streamlit application
- Separate files for each analysis section
- Basic navigation between pages
- Core ML and analytics features



Hotel Performance & Analytics Dashboard | Consolidated Single-File Version

Built with Streamlit, Machine Learning, and Interactive Visualizations