**Simple work summary**

**Business approach and Summary of Methods**

* Analyzed past ticket sales and redemptions to discover patterns related to seasons, holidays, and special events.
* Built two predictive models:
  + One for forecasting future ticket sales.
  + One for predicting how many tickets will actually be redeemed or scanned.
* Developed a redemption model to explore trends across multiple seasons and to analyze customer engagement and turnout.
* Used trends and seasonal spikes in historical redemption data, along with additional time-based features, to predict recurring sales increases.
* Transitioned from simple statistical methods to advanced machine learning approaches to better capture long-term trends and busy periods.
* Cleaned and enhanced the dataset by removing outliers , extracting additional indicators and focusing on learning from past seasonal patterns, holidays, and special events.

**Why this approach is better**

* Machine learning methods improved empiricial forecast accuracy by:
  + **44–50%** for the Sales Model, supporting better resource optimization (e.g., ferry scheduling, seat allocation).
  + **57–57.84%** for the Redemption Model, aiding in smarter promotions and improved customer satisfaction by understanding customer behavior.
* Smarter forecasting leads to better planning, happier customers, and more efficient operations.

**Others**

**Detailed technical summary**

A more detailed description in standard prose titled "Technical Summary" is available in Microsoft word format. Please review that detailed summary for in-depth understanding of the work.

**Code structure**

* **Sales model**
  + Model.py (main model)
  + EnsembleModelSales.py (Ensemble of tree-based models)
  + Modeling-v7.0 Sales model-Final.ipynb
* **Redemption model**
  + SalesModel.py (main model)
  + EnsembleModelRedemption.py (Ensemble of tree-based models)
  + Modeling-v7.0 Redemption model-Final.ipynb

**Environment**

You will need to install several packages to run the existing code

pip install pandas numpy scikit-learn matplotlib xgboost lightgbm pmdarima prophet