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## Project Timeline

Sep '22	Oct '22	Nov '22	Dec '22
Project Scope, EDA	Methodology & Baseline	Clustering, Tree based models	Handover

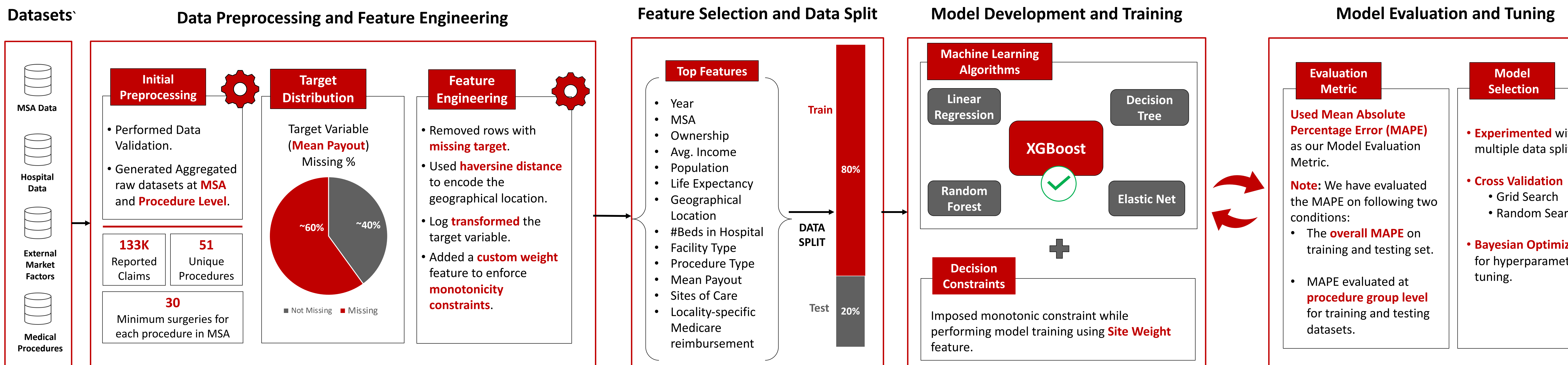
## Problem

- Understanding the dynamics** of the commercial insurance payouts are **key to price** the Johnson & Johnson's (J&J) **Medical Devices** and **increase sales**.
- These predictive tasks can be leveraged via **patients' geographical location** and **claims data**.
- However, **predicting** for each surgical procedures and Metropolitan Statistical Area(MSA) is **time consuming**, **complex** and **often inviable** due to low frequency of occurrences.

## Objective

- Predict insurance payout for multiple surgery procedures at MSA level and save development time.**
- Showcase the **procedure-level** performance (MAPE) and **eliminate** the **dependency** on **DataRobot**, an AutoML tool, to **save revenue**.
- Enforce** the **business requirement** – payout for **ASC site** should be **lower** than that of **Inpatient care facility** at MSA and procedure level.

## Data & Modeling

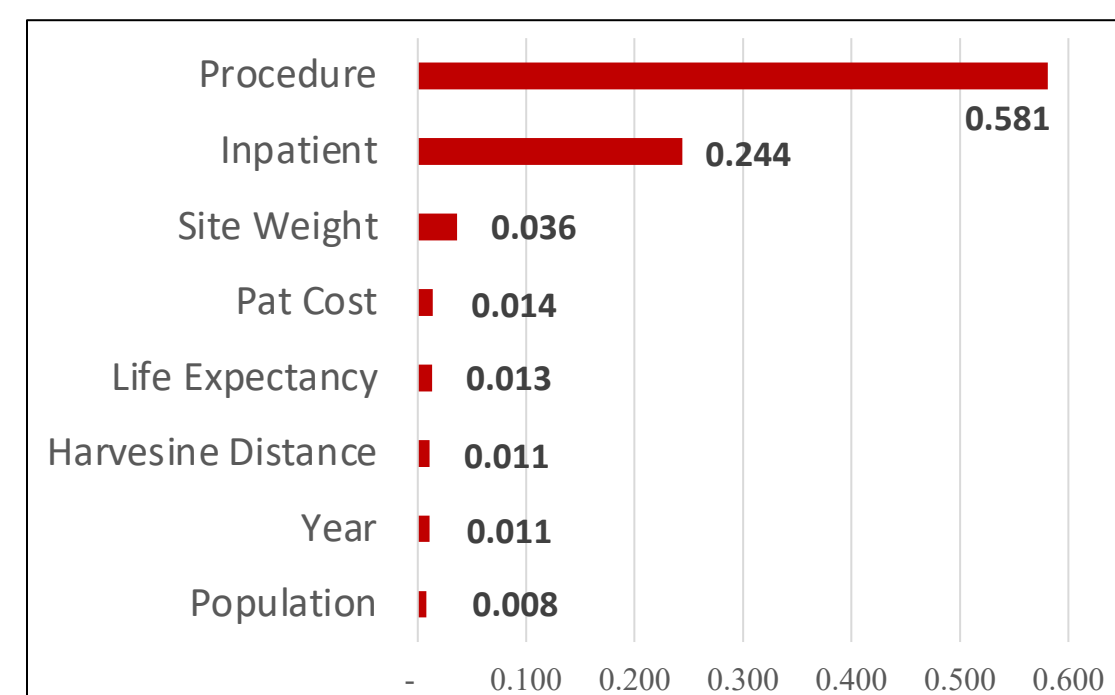


## Results

### Performance of Models on Test Data

Models	MAPE
Linear Regression	30.86%
Elastic Net	28.94%
Decision Tree	24.04%
Random Forest	21.34%
<b>XGBoost</b>	<b>14.02%</b>

### Top 8 Important Features



### Performance of XGBoost vs DataRobot\*

Models	MAPE	Time
DataRobot	16.11%	~300 sec
<b>XGBoost</b>	<b>14.02%</b>	<b>~120 sec</b>

~15% improvement in MAPE  
~2.5x reduction in Training Time

## Business Impact

- Highly robust model **eliminates** the **dependency** on DataRobot, **saving license costs**.
- Results and improved predictions from the model can result in **enhanced revenue from sales**.
- The end-to-end pipeline is **highly scalable** and can be **easily adapted** across multiple verticals within J&J.
- Expected to **impact** J&J Data Scientists, medical devices pricing team, patients, and broader J&J group.

## Acknowledgments

We would like to thank our industry mentors Cindy Tong, Kade Etter and Ziyu Tan and our faculty advisor Adam Kelleher who offered this great opportunity to work on this interesting project. We would also like to thank them of their guidance and valuable support throughout the project.

## Future Scope

- Exploring** the model **explainability** using **LIME** and **SHAP**.
- Deployment** to the production and **monitor** for **drifts**.
- Backtesting** the model using **iterations** as the test size is too small for analysis.
- Developing **optimal pricing** and **product penetration** strategies to **boost sales**.