Health and Vehicle Insurance: Cross-sell Insights

Team Members

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Constituents:

Introduction

We have worked up upon this dashboard using Power BI and did the modelling using orange.

- Key features to put emphasis on.
- What are we aiming to achieve?
- What type of problem are we working on ?
- What are the evaluation metrics that can be helpful in such cases ?

Introduction and Problem Statement

Our client is an Insurance company that has provided Health Insurance to its customers now they need your help in building a model to predict whether the policyholders (customers) from past year will also be interested in Vehicle Insurance provided by the company.

- Key features to put emphasis on.
- What are we aiming to achieve?
- What type of problem are we working on ?
- What are the evaluation metrics that can be helpful in such cases ?

Business Use Case

S (Strengths)	W (Weaknesses)	O (Opportunities)	T (Threats)
• Target customer identification gets easier. • Scalability gets a boost, as the health insurance company can grow by cross-selling vehicle insurance.	• Some constraints do exist, on as there are a lot of features and parameters to be taken care of. That may increase the	• Business Growth • To have a better customer retention as they can stay more longer connected with the company.	• Customer privacy and consent risk. • Working more with past patterns and data could lead to overfitting. • Customer Eligibility conflicts.

Getting One With Data

Data Description

1. ***Train Data***

- id Unique ID for the customer
- Gender Gender of the customer
- Age Age of the customer
- Driving_License 0 : Customer does not have DL, 1 : Customer already has DL
- Region_Code Unique code for the region of the customer
- Previously_Insured 1 : Customer already has Vehicle Insurance, 0 : Customer doesn't have Vehicle Insurance
- Vehicle_Age Age of the Vehicle
- Vehicle_Damage 1 : Customer got his/her vehicle damaged in the past. 0 : Customer didn't get his/her vehicle damaged in the past.
- Annual_Premium The amount customer needs to pay as premium in the year
- Policy_Sales_Channel Anonymized Code for the channel of outreaching to the customer ie. Different Agents, Over Mail, Over Phone, In Person, etc.
- Vintage Number of Days, Customer has been associated with the company
- Response 1 : Customer is interested, 0 : Customer is not interested

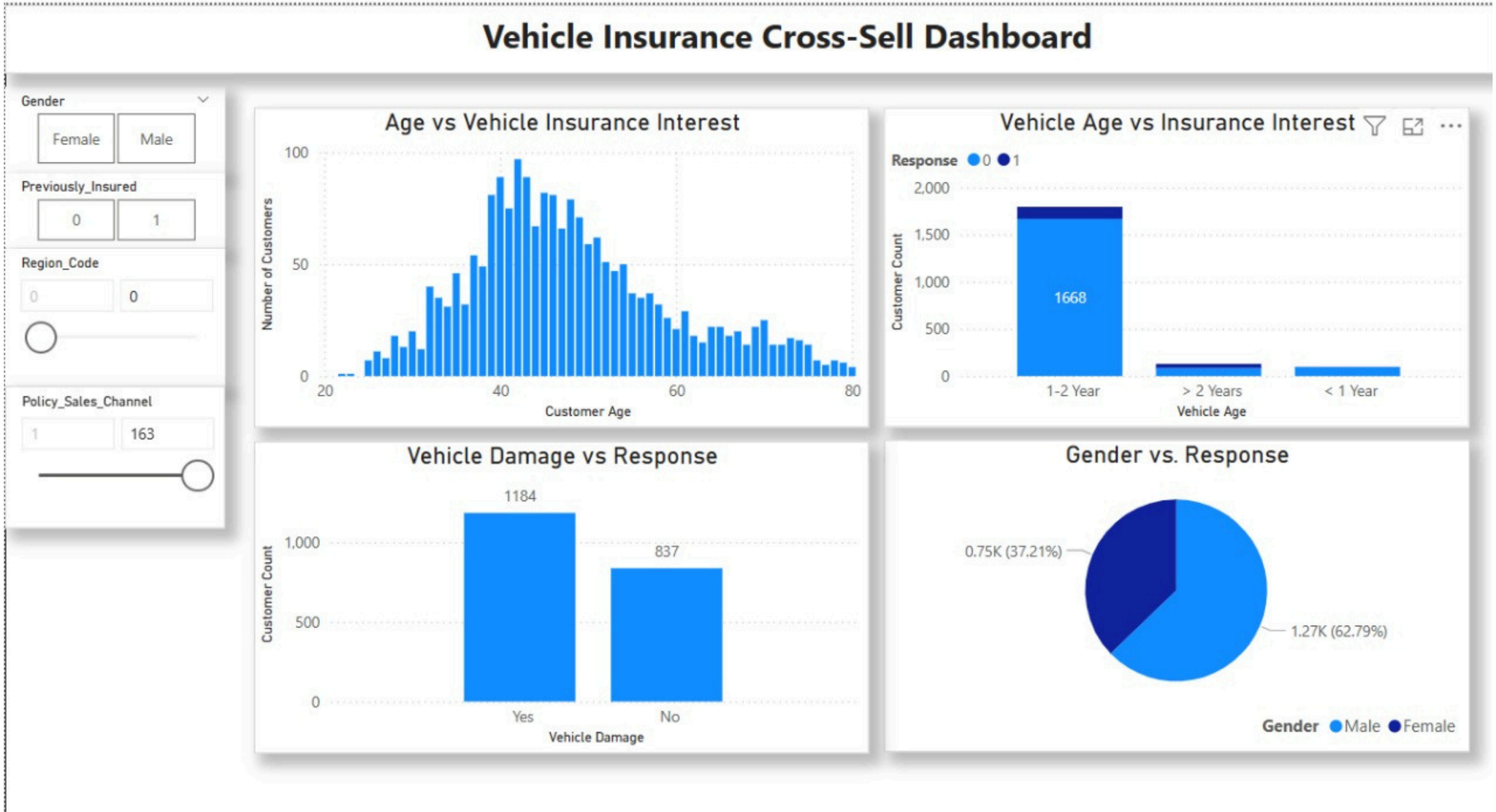
Getting One With Data

Data Description

2. Test Data

- id : Unique ID for the customer
- Gender : Gender of the customer
- Age : Age of the customer
- Driving_License 0 : Customer does not have DL, 1 : Customer already has DL
- Region_Code : Unique code for the region of the customer
- Previously_Insured 1 : Customer already has Vehicle Insurance, 0 : Customer doesn't have Vehicle Insurance
- Vehicle_Age : Age of the Vehicle
- Vehicle_Damage 1 : Customer got his/her vehicle damaged in the past. 0 : Customer didn't get his/her vehicle damaged in the past.
- Annual_Premium : The amount customer needs to pay as premium in the year
- Policy_Sales_Channel : Anonymised Code for the channel of outreaching to the customer ie. Different Agents, Over Mail, Over Phone, In Person, etc.
- Vintage : Number of Days, Customer has been associated with the company
- Submission
- Variable Definition
- id : Unique ID for the customer
- Response 1 : Customer is interested, 0 : Customer is not interested

Power BI Dashboard (Visualization)



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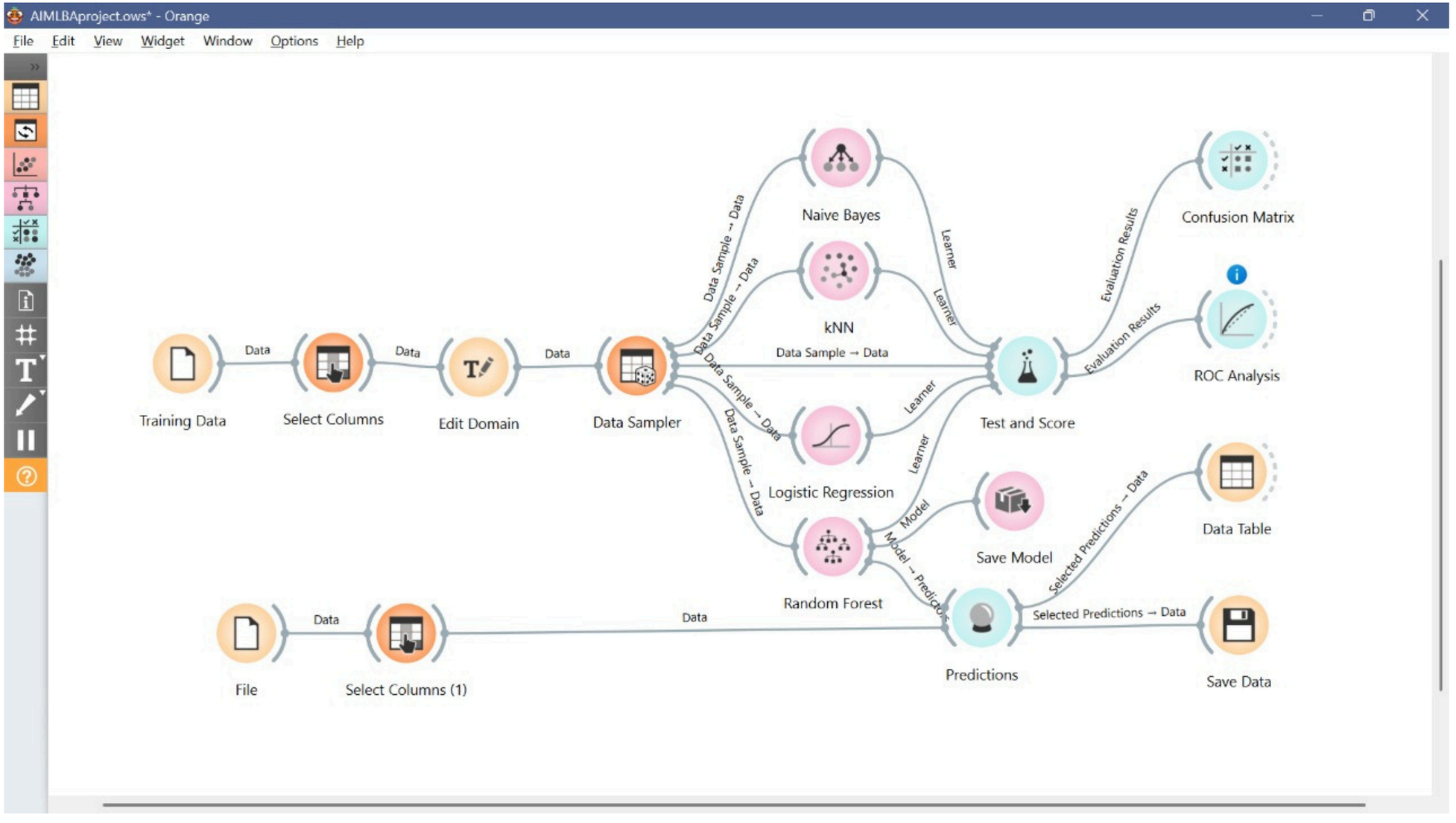
The Orange Modelling



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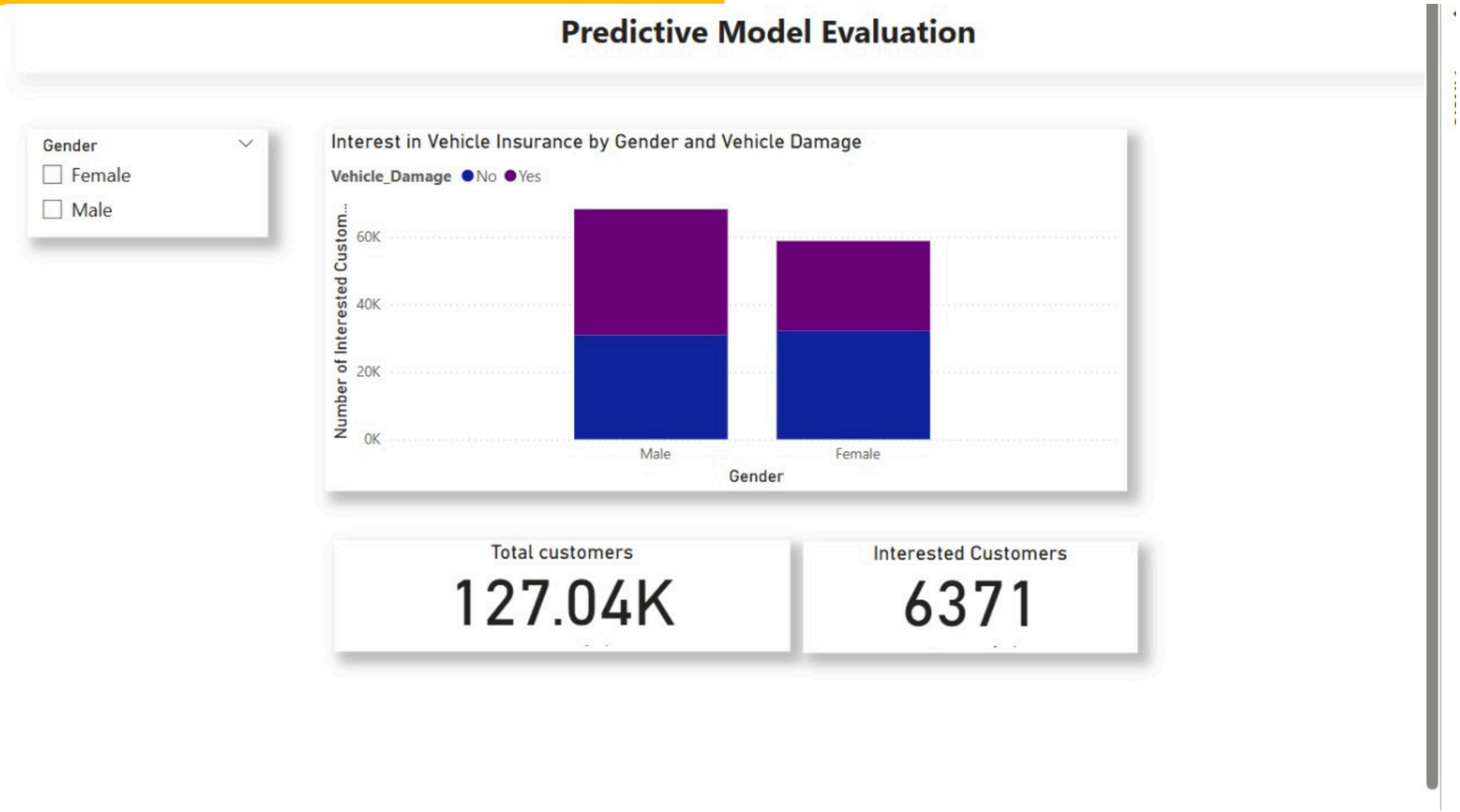
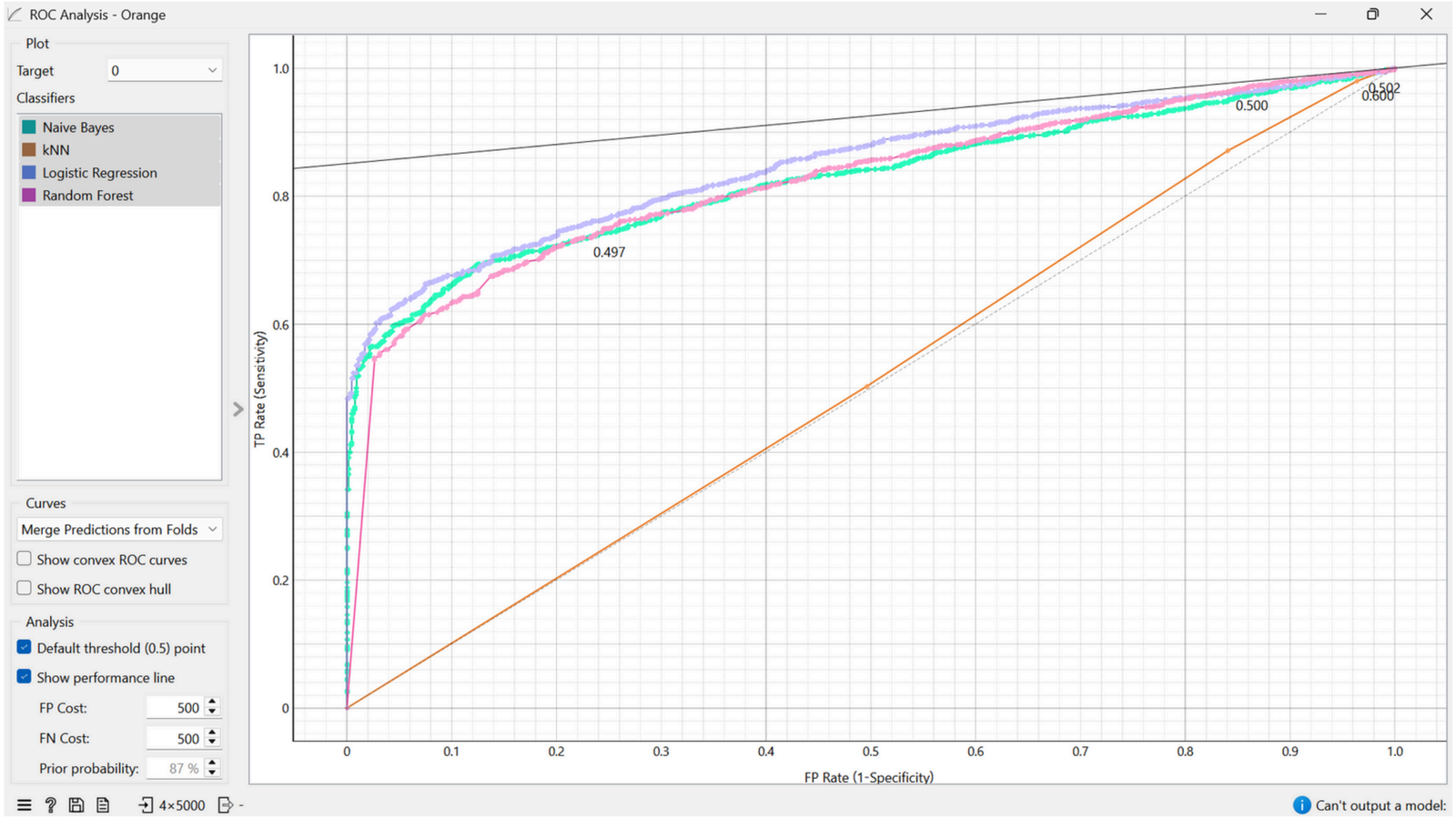
Results and Interpretation



ROC Curve



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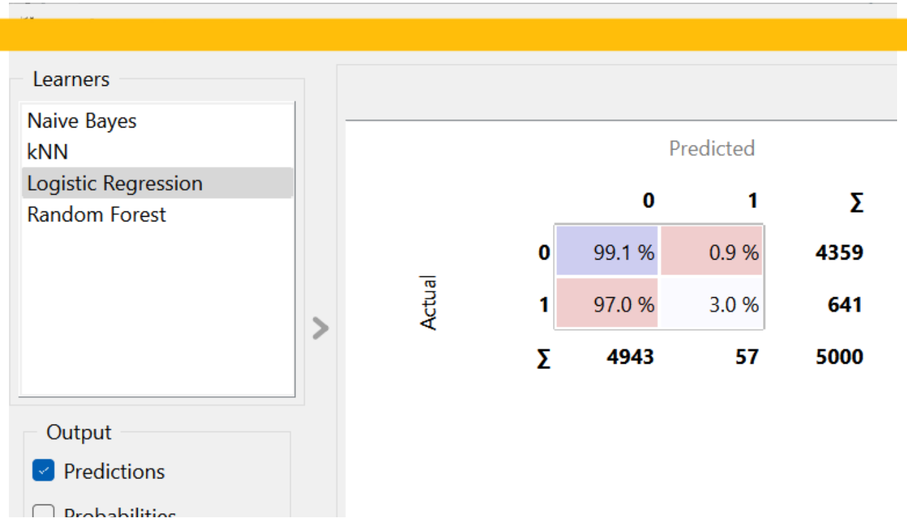
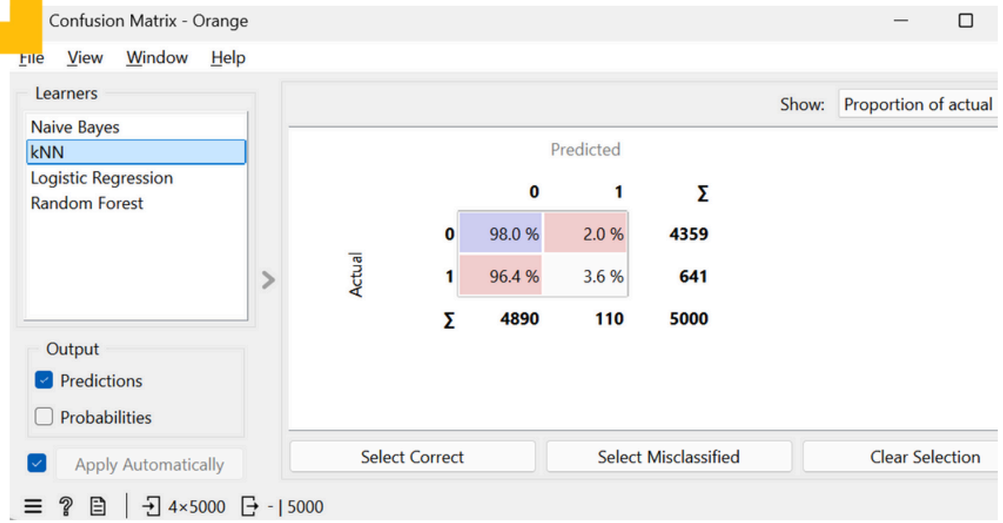
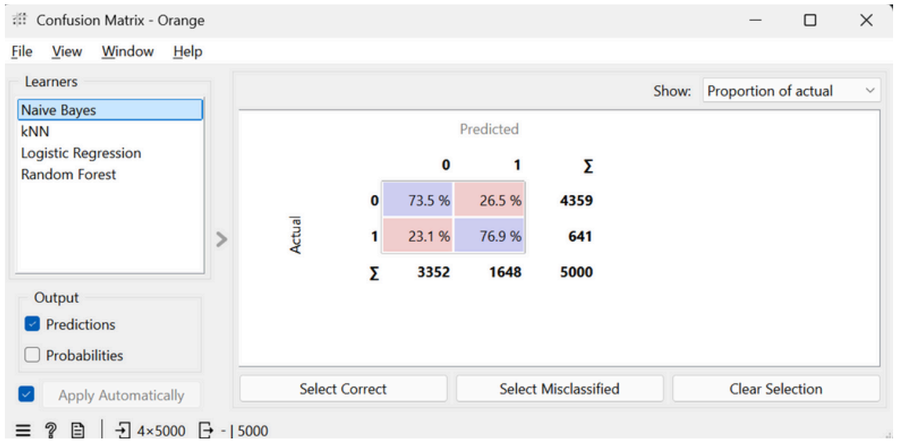
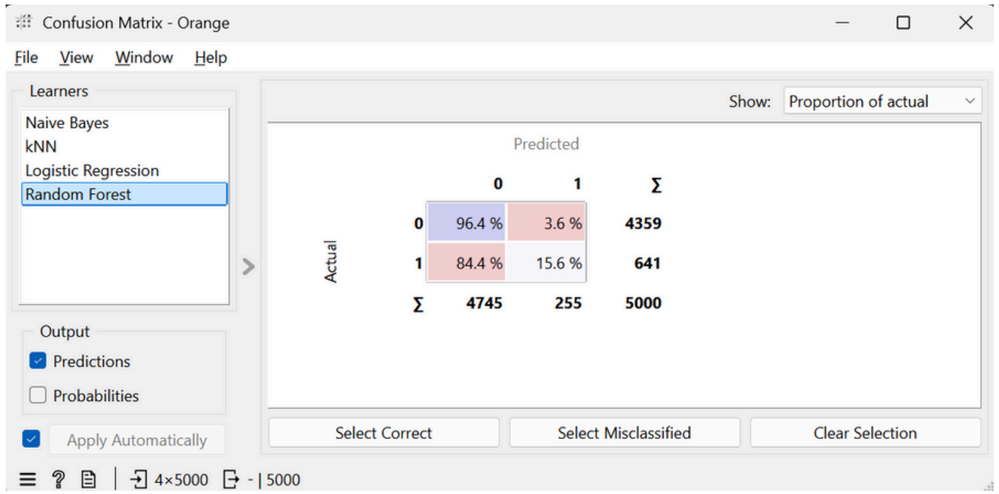
Analyzing the confusion matrix









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Key Learnings and Challenges Faced

Key Learnings via Power BI

1. Drag-and-Drop Visualizations – Mastered creating charts (bar, line, maps) without writing DAX.
2. Power Query Efficiency – Automated data cleaning (removing duplicates, splitting columns) using the GUI.
3. Dashboard Design Best Practices – Learned layout principles (color contrast, hierarchy) for user-friendly reports.
4. Direct Data Sources – Connected seamlessly to Excel, SQL, and web APIs without manual coding.

Challenges Faced:

- Limited Custom Calculations
- Solution: Used built-in aggregations (sum/avg) and calculated columns in Power Query.
- Slow Refresh Times
- Fix: Reduced data volume with filters at the query level.
- Sharing/ Collaboration Issues
- Workaround: Published to Power BI Service and set up shared workspaces.
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Key Learnings and Challenges Faced

Orange

Key Learnings:

1. No-Code Machine Learning – Built models (e.g., logistic regression) using pre-built widgets.
2. Data Preprocessing – Used Orange's interactive tools for normalization, missing values, and feature selection.
3. Visual Analytics – Explored patterns with heatmaps, box plots, and silhouette analysis.
4. Workflow Automation – Saved and reused workflows for similar datasets.

Challenges Faced:

- Limited Advanced Algorithms
- Solution: Combined Orange with Python scripts for extensions.
- Steep Learning Curve for Widgets
- Fix: Followed official tutorials and sample workflows.
- Handling Large Datasets
- Workaround: Sampled data or upgraded hardware.

References

Power BI

1. Microsoft Power BI Documentation
   - Power Query Transformations
   - Visualization Best Practice .
2. Community/Forums
   - Power BI Community (for sharing/collaboration issues).

Orange

1. Official Orange Documentation
   - Orange Widgets & Workflows
   - Data Preprocessing Guide
2. Academic Papers
   - Demšar, J., et al. (2013). "Orange: Data Mining Toolbox in Python." Journal of Machine Learning Research.
3. Tutorials
   - Orange Data Mining YouTube Channel

Canva Study Materials

https://canvas.nus.edu.sg/