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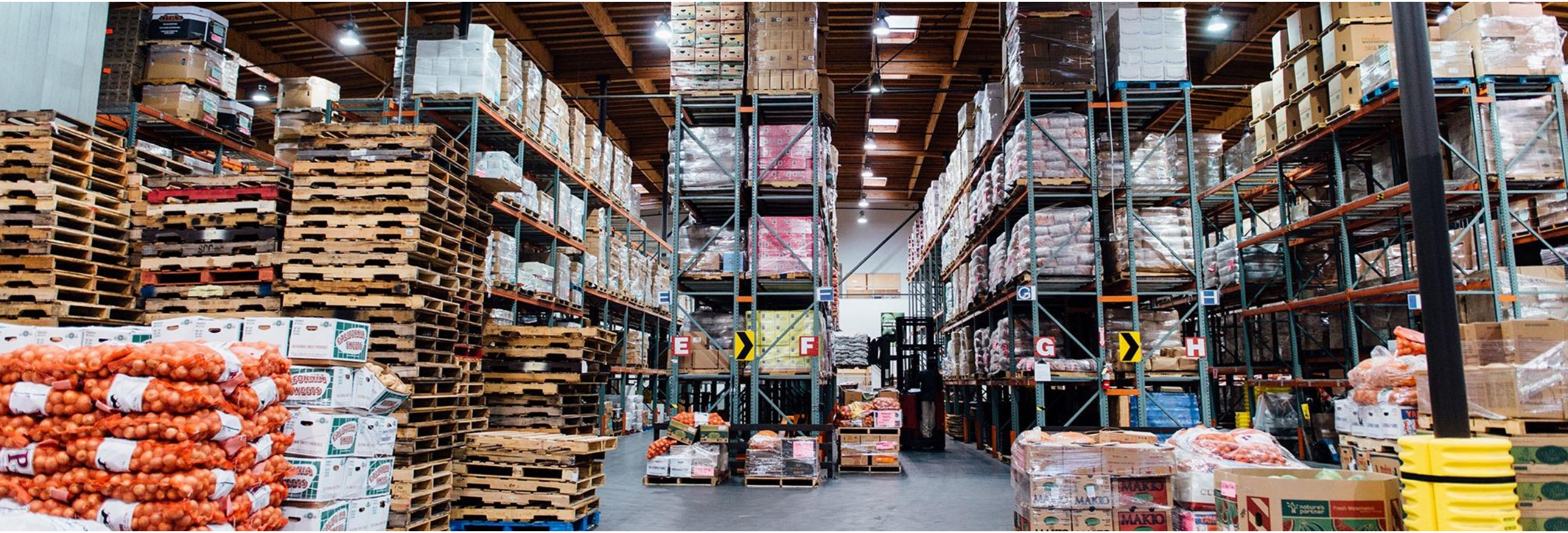

Household Participation Model

Analytics and Evaluation - February 2024

About the San Francisco-Marin Food Bank

The San Francisco-Marin Food Bank aims to end hunger in the communities we serve through supplemental food distribution, food stamp enrollment, and advocating for a stronger social safety net.

Our FY23 numbers at a glance:

50,000+

HOUSEHOLDS SERVED EVERY WEEK

250+

COMMUNITY PARTNERS

60M Lbs.+

FOOD DISTRIBUTED

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Project Team

The Analytics and Transformation team is the central analytics service group of the SF-Marin Food Bank. We provide insights to the organization by development of statistical models, dashboards, and by maintaining and enhancing our data warehouse.

Shaheen Eshghipour
Title: Senior Data Analyst
Project Role: Data Science, Model Development
Favorite Dessert: Lava Cake
GitHub: @seshghip

Maxwell Titsworth
Title: Director of Analytics and Transformation
Project Role: Use Case Development, Project Support
Favorite Dessert: Apple Pie
GitHub: @mtworth

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The Real-World Problem Space

- We aspire to design our program services to maximize use and remove barriers to attendance.

- As we phase down our COVID-era programming, we are thinking about how we ought to design equitable and financially sustainable community programming.

- Initial exploratory analysis suggests that program participation (defined as enrolled participants attending a distribution at least once in a 30-day period) varies across neighborhood, race, age, and other household demographics.

- **We do not have good solid data-driven understanding of how and why participation patterns vary. This is an opportunity for <u>inferential modeling</u>.**

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Solution Construction

To better understand the drivers of participant attendance, we propose an inferential model that aims to explain drivers of attendance … Y is a random variable as follows:

$$Y = \begin{cases} 1, & attended \geq 1\ times \\ 0, & attended < 1\ times \end{cases}$$

…using key participant data, including:

- Participant race
- Participant Age
- Pantry Program
- Pantry distribution time
- Participant Gender/Sex
- Participant Distance from pantry

Testing a variety of models, including logistic regression.

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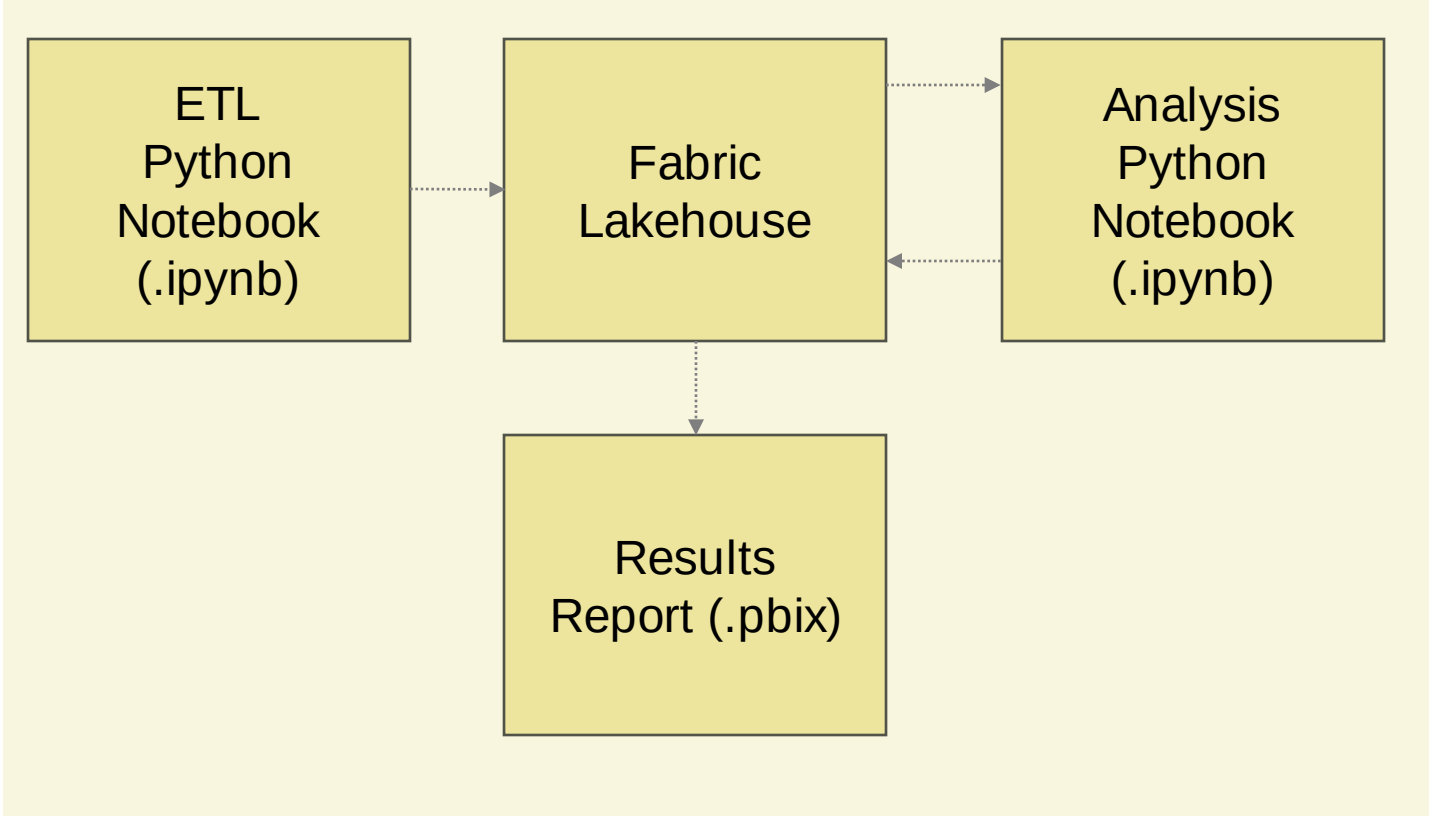
Microsoft Fabric Architecture

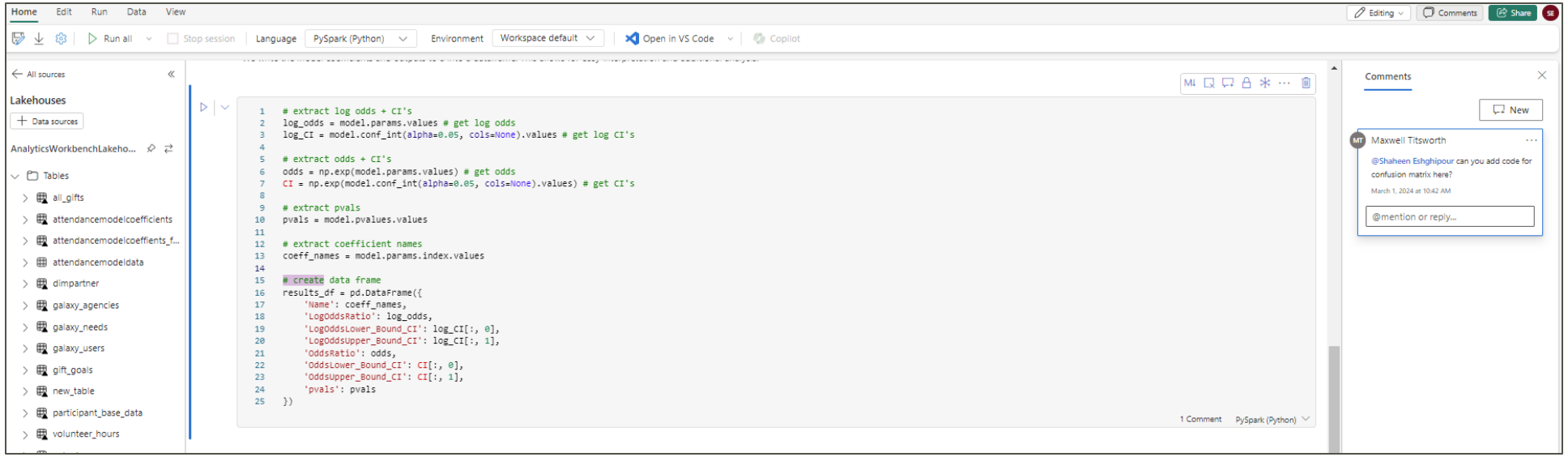
On-Prem Databases



Key Python Libraries
- Pandas
- Statsmodel

Fabric Notebook

We used the Fabric Notebook object to build the model. Using the Fabric Notebook allowed us to embrace an open-source approach to modeling, while using the core infrastructure that Fabric offers us, including the Lakehouse environment. We also used the comment / tagging features for collaboration.



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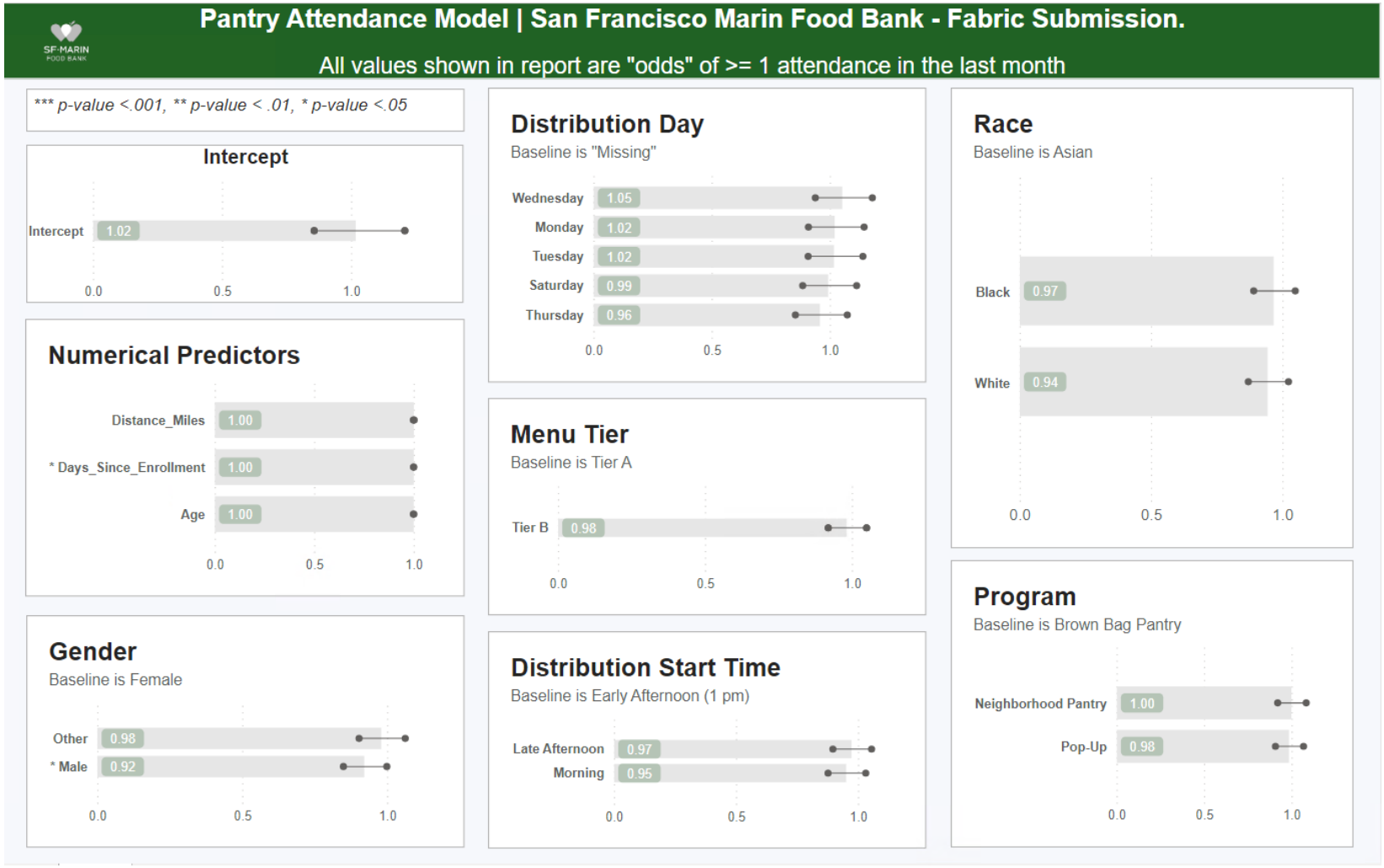
Results Dashboard

Note: all values shown are produced from a dummy data set.



Analysis Summary

Given the sensitivity of our participant data, we are not able to share the direct results of our analysis. We can share some high-level takeaways:

- We ended up with a logistic regression model built with statsmodel, given the ease of interpretation of logistics regression coefficients for the business.
- We found that some demographic groups attend at lower rates than others, even when controlling for program and distance.
- Our model evaluation results are below:

Precision: .94
Recall: .62

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Replication Materials

Given the sensitivity of our participant data, we have produced dummy data that can be used to generate the inferential model. Here are the steps to run it:

1) Open the .ipynb notebook in Microsoft Fabric
2) Click run.
3) The results will save to your Fabric Lakehouse.
4) Connect your Power BI notebook to the Lakehouse.
5) Import the results table into Power BI by connecting the notebook to your Lakehouse.

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Analysis Next Steps

- We aim to iterate on the model by introducing interaction effects and new features.
- The model will be deployed and run on a regular basis to test whether we are meaningfully lowering barriers to entry for select demographic groups.
- We aim to lean into the experiments feature in Fabric to track model runs over time.
- We will embrace mixed methods! Additional qualitative research will be done to unpack specific barriers for select demographic groups.

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Fabric Thoughts

- Easy to set-up and get into, you don't need to be a cloud infrastructure expert or engineer to make progress quickly and safely.
- Easy to transfer desktop .R or .py files.
- Excited about more features to keep our workspaces organized and use true CI/CD approach for our data science work in Fabric.

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