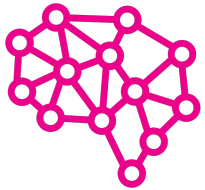

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Team GroupBy

Toyosi Bamidele , Uchenna Mgbaja

Outline

- Problem
- Solution
- Data + Model
- Demo
- MLE Stack
- Conclusions (and lessons learned)
- Future Work

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Problem

Understanding customer behavior in the e-commerce space, a business area altered during the pandemic due to increased demand for online purchases, improving the customer experience, to ensure customer retention and product monetization is critical. The main goal is optimizing the customer journey and shopping experience using a predictive model and recommendation system

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Solution

1.Predictive Model:Uplift model(One and Two model approach)

- What customers are likely to convert?
- Who should we target primarily?

2.Recommendation System

- What products should we recommend to our users based on their purchase history?
- What products should we recommend to users based on items pairs from past basket purchases

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Uplift modeling

Uplift models helps in identifying **users that are more likely to take action or respond positively after treatment exposure** like a marketing campaign or promotional offer

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Classic Uplift Segments

Persuadables

Jane will take action if treated

Sure things

Lily will always take action

Sleeping Dogs

Treating **James** will cause adverse effects

Lost Causes

Stan will never take action

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Classic Uplift Segments

Persuadables

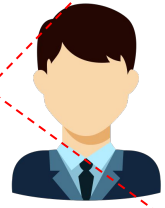
The goal is to find “Jane”

Jane will take action if treated

Sure things

Lily will always take action

Sleeping Dogs



Exempt “Lily”, “James”, and “Stan” from treatment

Treating **James** will cause adverse effects

Lost Causes

Stan will never take action

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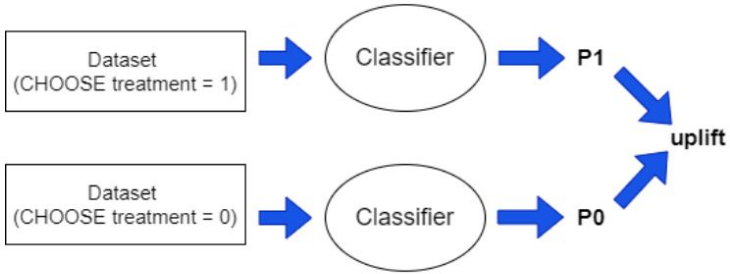
Uplift Model

Two Model



The training process:

$$model^T = fit\begin{pmatrix} x_{11} & \cdots & x_{1k} \\ \vdots & \ddots & \vdots \\ x_{p1} & \cdots & x_{pk} \end{pmatrix}, \begin{matrix} y_1 \\ \cdots \\ y_p \end{pmatrix}, \quad model^C = fit\begin{pmatrix} x_{11} & \cdots & x_{1k} \\ \vdots & \ddots & \vdots \\ x_{q1} & \cdots & x_{qk} \end{pmatrix}, \begin{matrix} y_1 \\ \cdots \\ y_q \end{pmatrix}$$

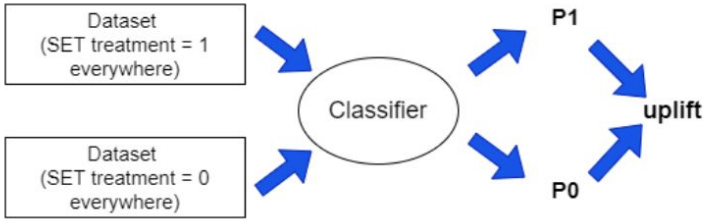
X_{train_treat} Y_{train_treat} $X_{train\_control}$ $Y_{train\_control}$

The process of applying the model:

$$\begin{matrix} model^T \\ predict \\ proba \end{matrix}\begin{pmatrix} x_{11} & \cdots & x_{1k} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mk} \end{pmatrix} - \begin{matrix} model^C \\ predict \\ proba \end{matrix}\begin{pmatrix} x_{11} & \cdots & x_{1k} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mk} \end{pmatrix} = \begin{pmatrix} u_1 \\ \vdots \\ u_m \end{pmatrix}$$

X_{test} X_{test} $uplift$

One Model



The training process:

$$fit\begin{pmatrix} x_{11} & \cdots & x_{1k} & w_1 \\ \vdots & \ddots & \vdots & \cdots \\ x_{n1} & \cdots & x_{nk} & w_n \end{pmatrix}, \begin{matrix} y_1 \\ \cdots \\ y_n \end{pmatrix}$$

X_{train} W_{train} Y_{train}

The process of applying the model:

$$\begin{matrix} predict \\ proba \end{matrix}\begin{pmatrix} x_{11} & \cdots & x_{1k} & 1 \\ \vdots & \ddots & \vdots & \vdots \\ x_{m1} & \cdots & x_{mk} & 1 \end{pmatrix} - \begin{matrix} predict \\ proba \end{matrix}\begin{pmatrix} x_{11} & \cdots & x_{1k} & 0 \\ \vdots & \ddots & \vdots & \vdots \\ x_{m1} & \cdots & x_{mk} & 0 \end{pmatrix} = \begin{pmatrix} u_1 \\ \vdots \\ u_m \end{pmatrix}$$

X_{test} W_1 X_{test} W_0 $uplift$

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Implementation

- Example features that can be used to predict conversion rate
- Traffic sources, Device usage, User behavior, Customer segments
- A/B testing/ Multivariate testing
- Dataset provided not ideal for uplift modeling
- New Dataset includes an “offer” feature (Offer: BOGO, Discount)

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Data + Model (1 min)

- Uplift model (Single Model, 2- model, 4-quadrant, Pylift- T-learner, Causal ML- R Learner, Causal ML- X Learner)
- ML Model (XGBoost Classifier)
- Evaluation metric: Qini Coefficient (Treatment effect between 0-1)

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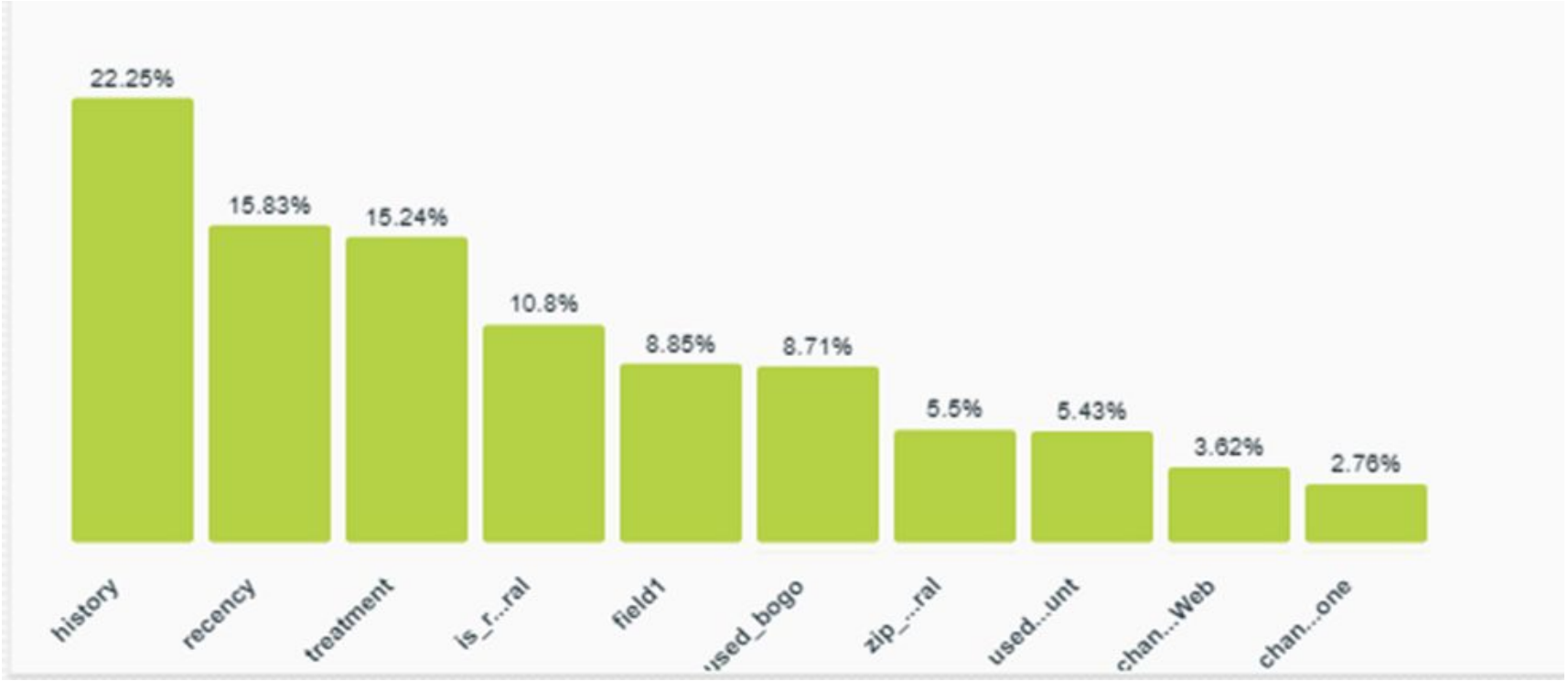
Feature Importance

- 

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Demo

1. Base Model

2. Bogo Model
   Discount Model

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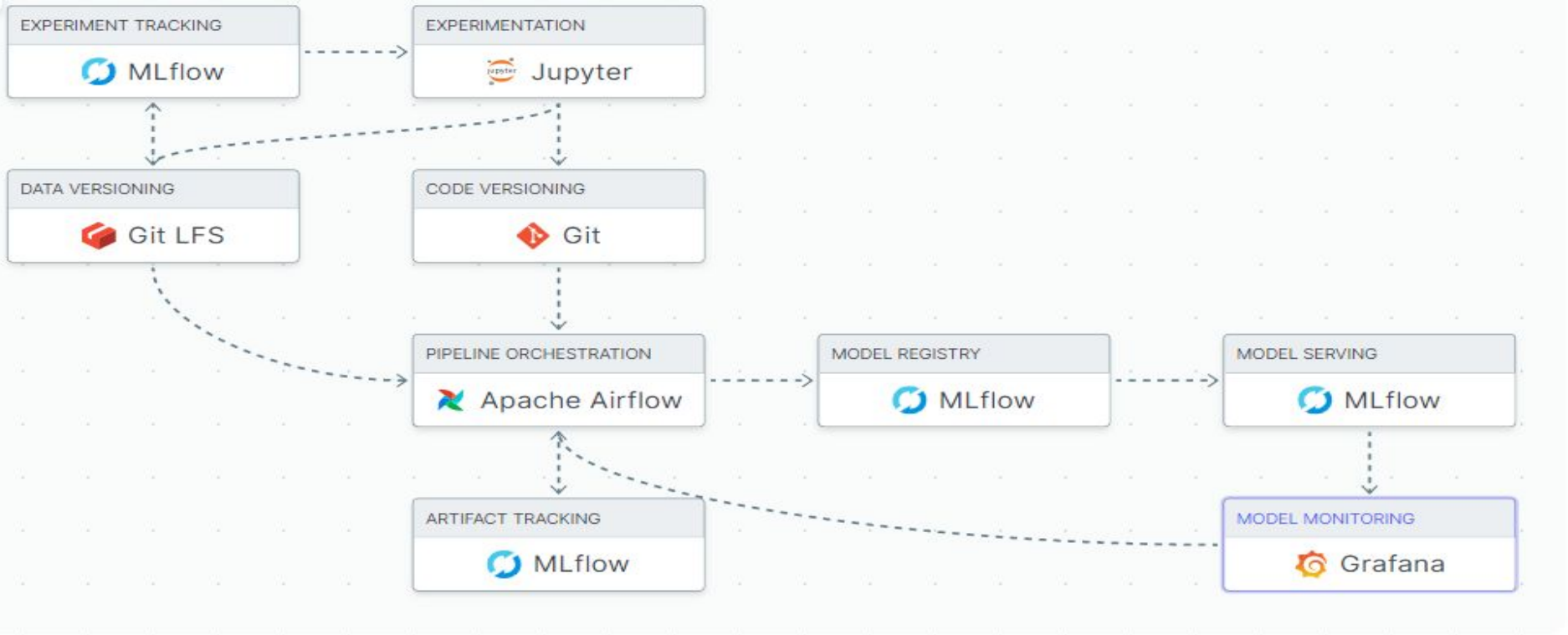
MLE Stack



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Conclusions & Future Work

- Optimize Uplift Model
- Recommendation System
- MLE Stack Optimization

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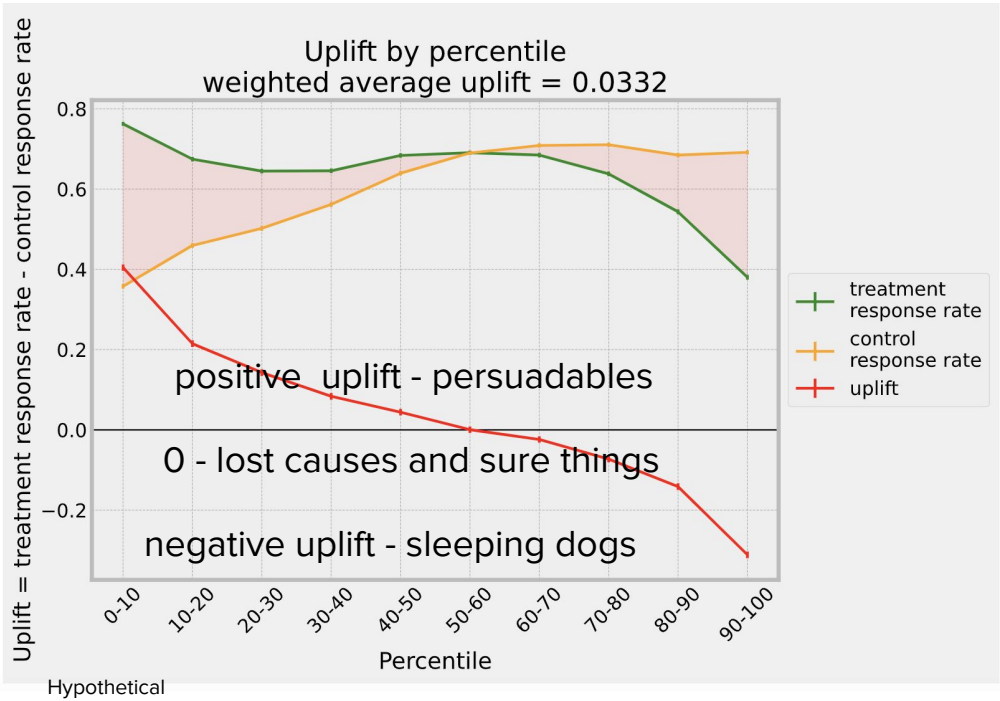
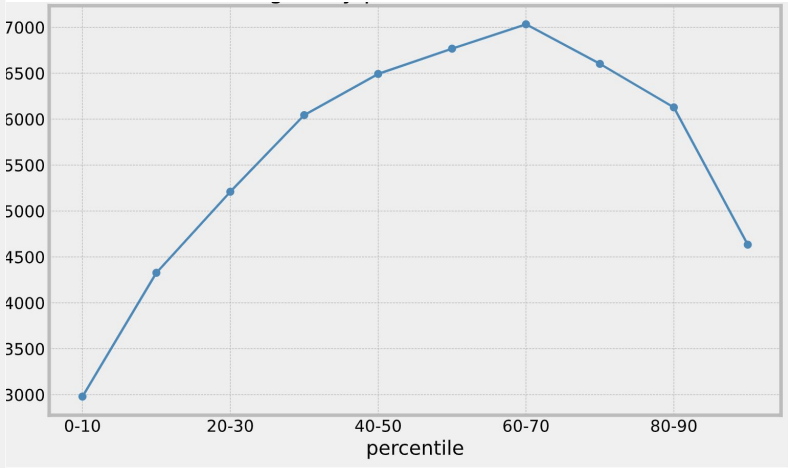
Thank You! Questions?

Uplift model:



Hypothetical



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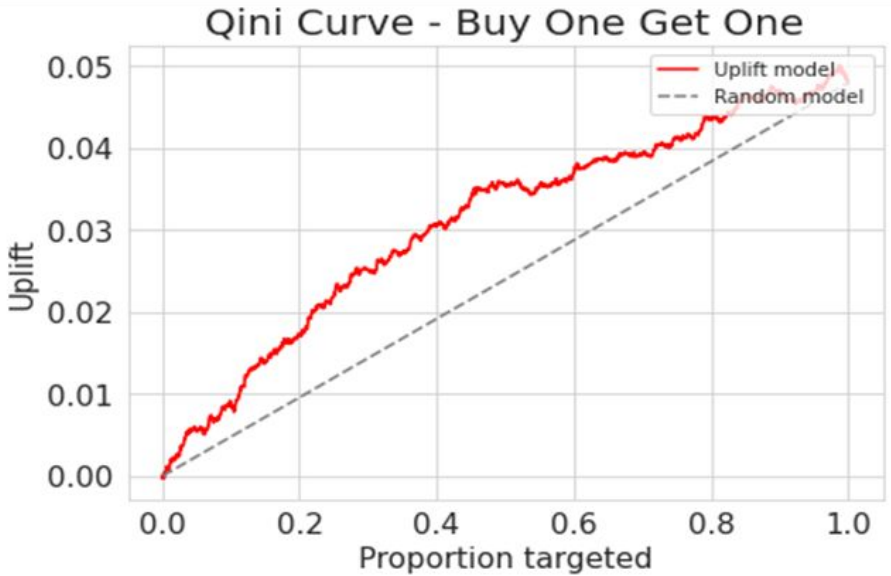
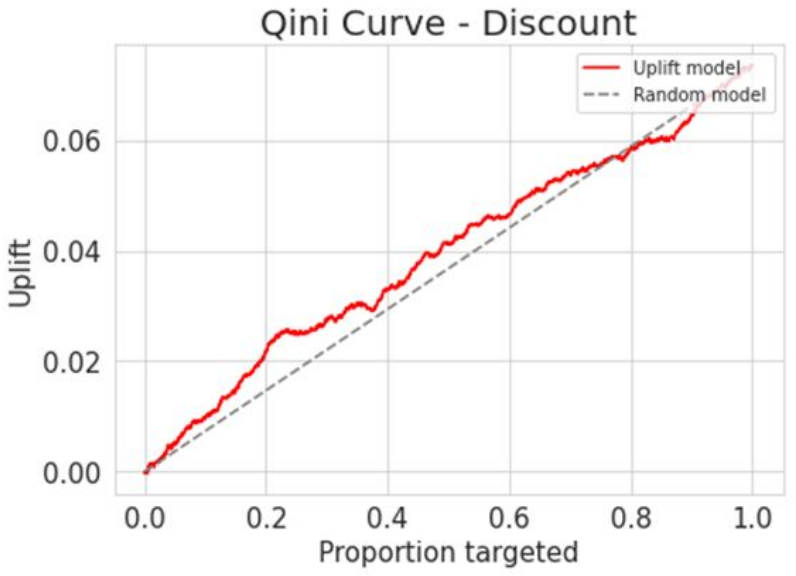
Uplift model





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Success Criteria

Scenario	Cost	Revenue	Profit
Don't apply any treatment	0	49750	49750
Apply treatment to all customers	10000	23900	13900
Apply treatment to persuadable customers only	2471	74460	71989

Hypothetical

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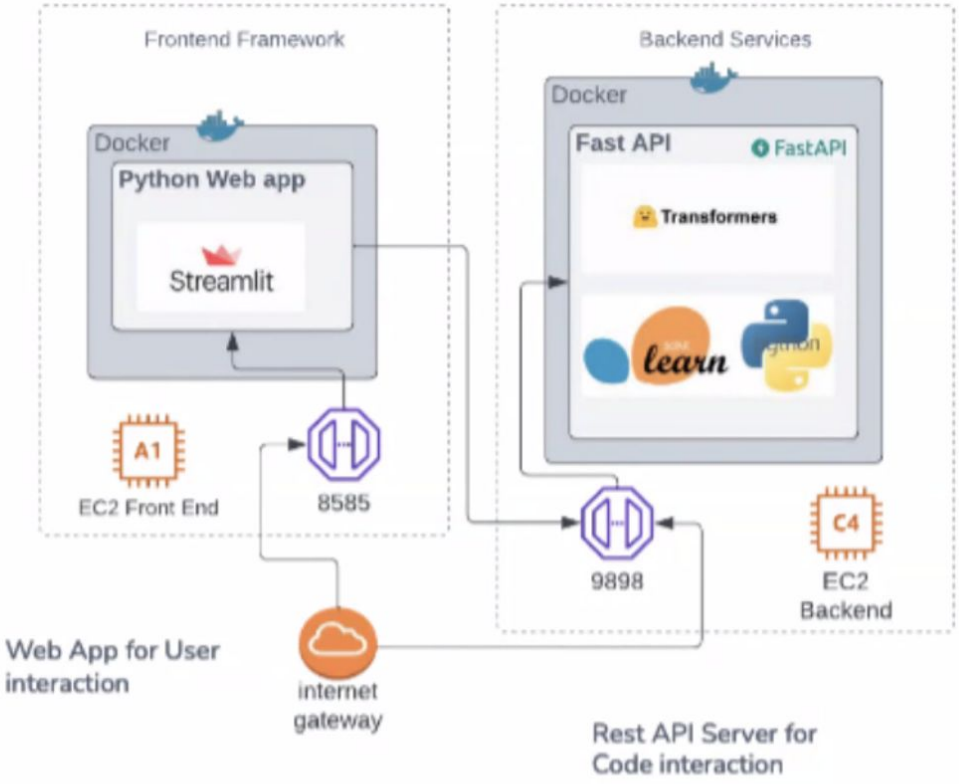
Architecture Diagram Map



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