Sneak Attack! Internal Market Research for Demand Prediction
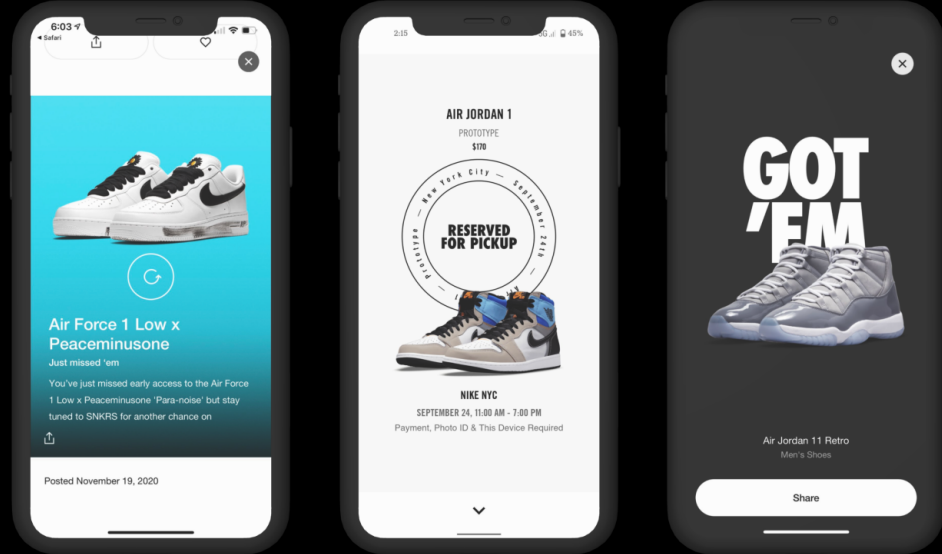
Nike Manager:
Kevin Turner

MIT Advisor:
Vivek Farias
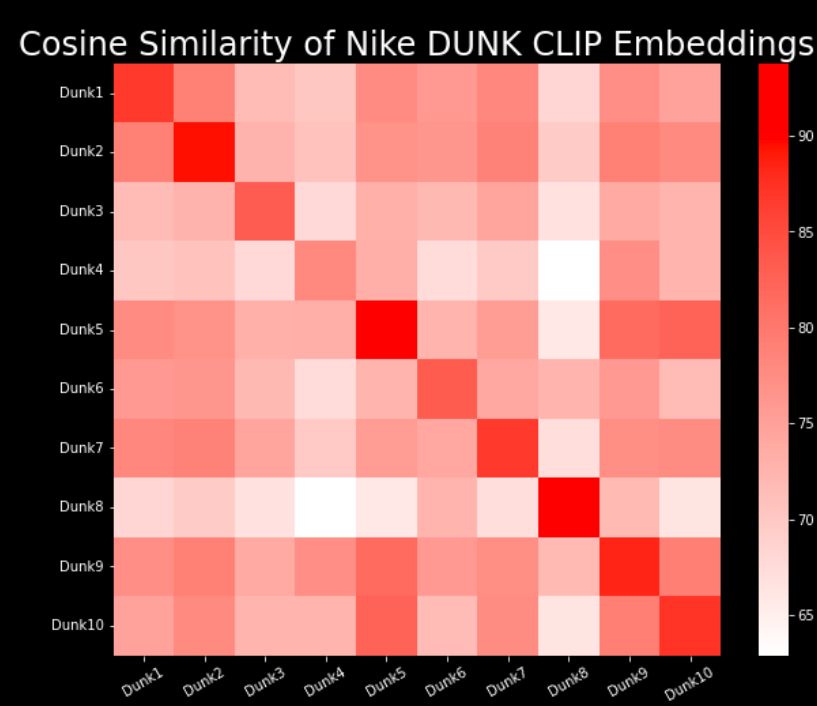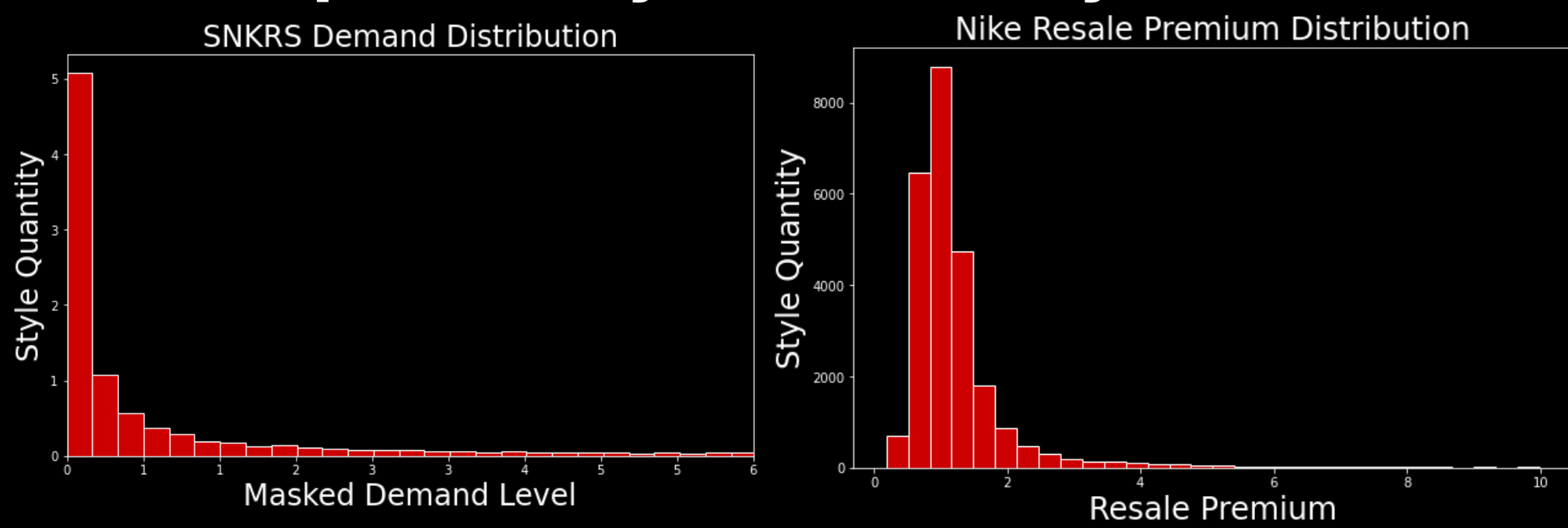
Student:
Paula Pieper

1 Sneaker Culture

- In the past two decades, there has been a stark increase in trading, collecting, and reselling sneakers
- In response to extreme demand, Nike created the SNKRS App for highly coveted releases

2 Problem Overview

- **Problem Statement:** How can SNKRS improve its demand prediction?
- **Business Impact:** Allows SNKRS business team to properly allocate marketing resources
- **Business Impact:** Aid SNKRS data science team in understanding consumer behavior and market trends
- **Business Impact:** Give insight to assortment planning team for future product releases to balance fairness and scarcity
- **Challenge:** The sneaker market is complex and volatile

3 Exploratory Data Analysis

SNKRS Demand Distribution

Nike Resale Premium Distribution

Cosine Similarity of Nike DUNK CLIP Embeddings

- Most SNKRS demand is driven by a small number of SKUS on the right end of demand distribution
- Resale premiums of Nike (including Jordan) products have a wide range
- Images of the same franchise (Dunk) have higher correlation which can decrease comparison difficulty in survey
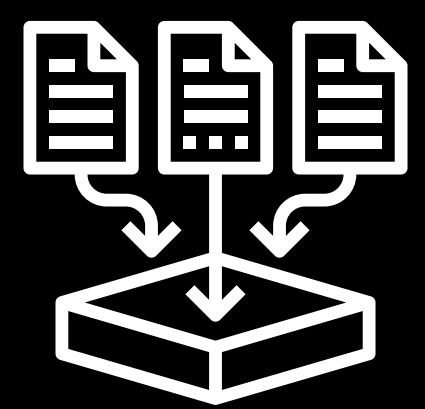
4 Method Overview

1. Create a low cognitive load survey for Nike employees for market research on diverse, confidential audience
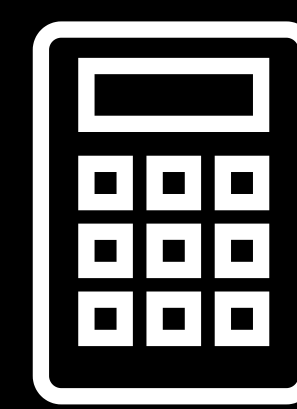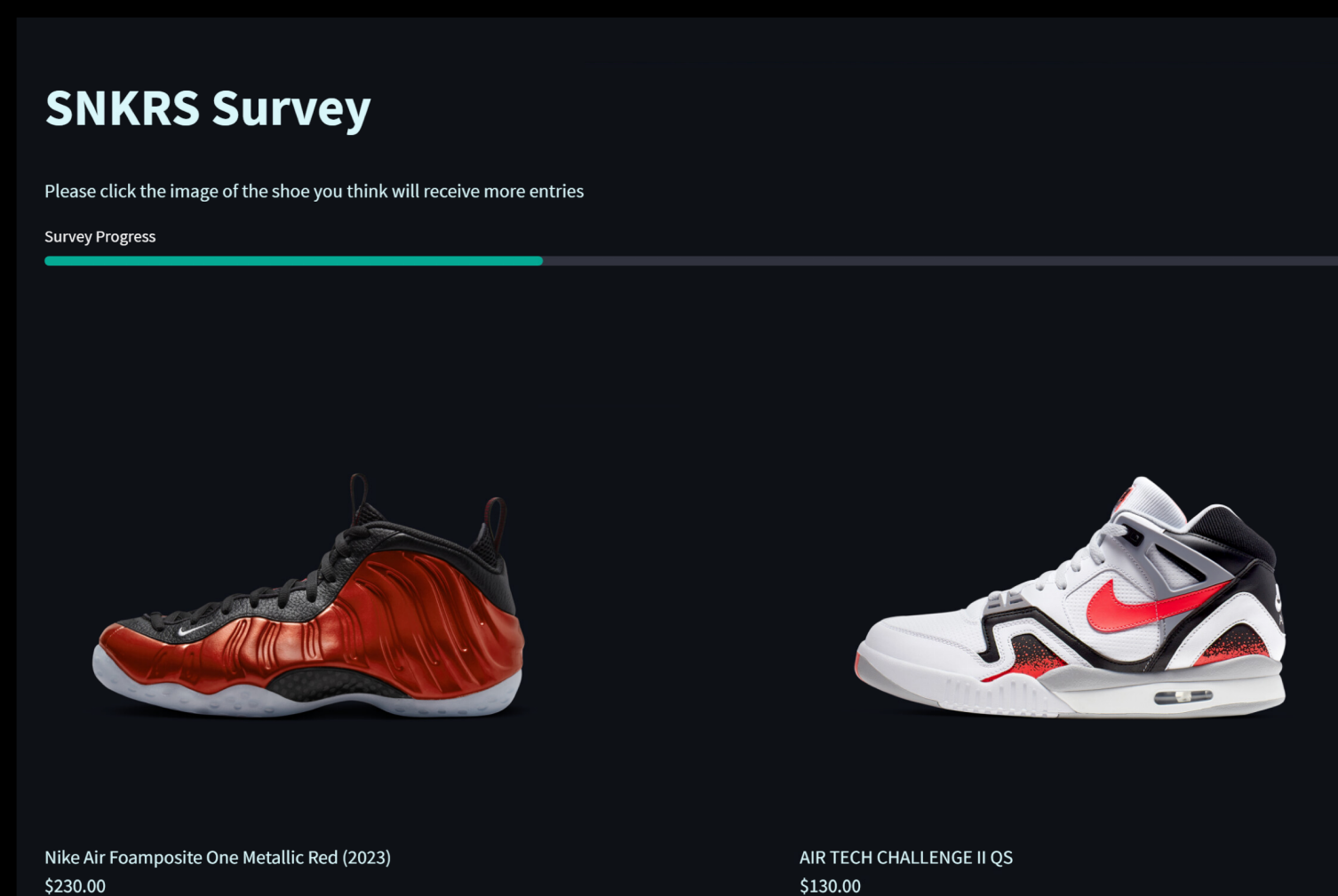
2. From survey results, calculate predicted demand level of upcoming releases using simplified page rank algorithm

3. Feed new orthogonal data source into prediction models maintained by full time data scientists

5 Survey Structure

- Compares an upcoming launch to 5 older releases of varying demand level one at a time through pictorial comparison
- Takes users 2-3 minutes, 5 clicks total

SNKRS Survey

Please click the image of the shoe you think will receive more entries

Survey Progress

Nike Air Foamposite One Metallic Red (2023)
$230.00

AIR TECH CHALLENGE II QS
$130.00

6 Predicted Demand Algorithm

- Creates ranking of shoes based on the quantity and quality of votes received in pictorial comparisons

Graph legend
1. Red circle = new release
2. Shoe on receiving end of arrow received vote over shoe at arrow origin
3. Arrows scaled to demand level of older releases

$$\pi = \frac{e^T}{N} \cdot (I - \alpha P)^{-1}$$

$$D_N = D_O \cdot (I - \alpha P)^{-1}$$

π: probabilistic ranking
e: column vector of 1's
N: # of unique shoes ever seen in survey
I: identity matrix
α: randomness hyperparameter
P: transition matrix representing win probabilities
D_N: new predicted demand vector
D_O: vector of old demand

- Substituting in demand of older shoes to the page rank algorithm allows for creation of a weighted probability ranking from survey results
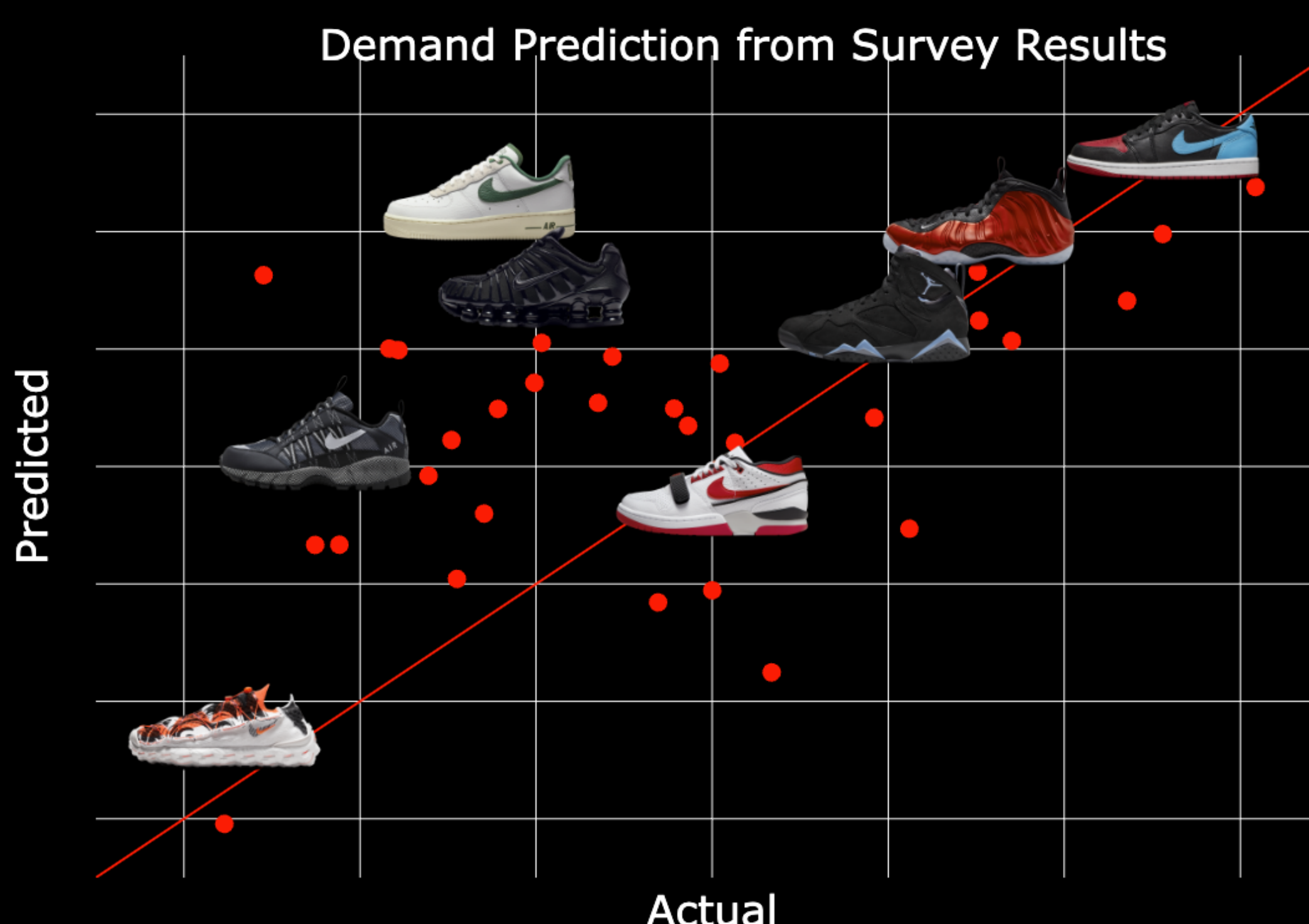
7 Engagement

7x

increased engagement from previous SNKRS survey

1.5

surveys taken per user each week!

8 Demand Predicton Results

Demand Prediction from Survey Results

Predicted

Actual

9 Discussion

- Predicted demand results from survey reflect actual demand to a a good extent!
- Exciting increases in engagement!

> Paula's work demonstrates a rare blend of rigor and creativity, and we are super excited to incorporate it into our forecasting capabilities!

-Kevin Turner, Senior Director SNKRS Data Science