

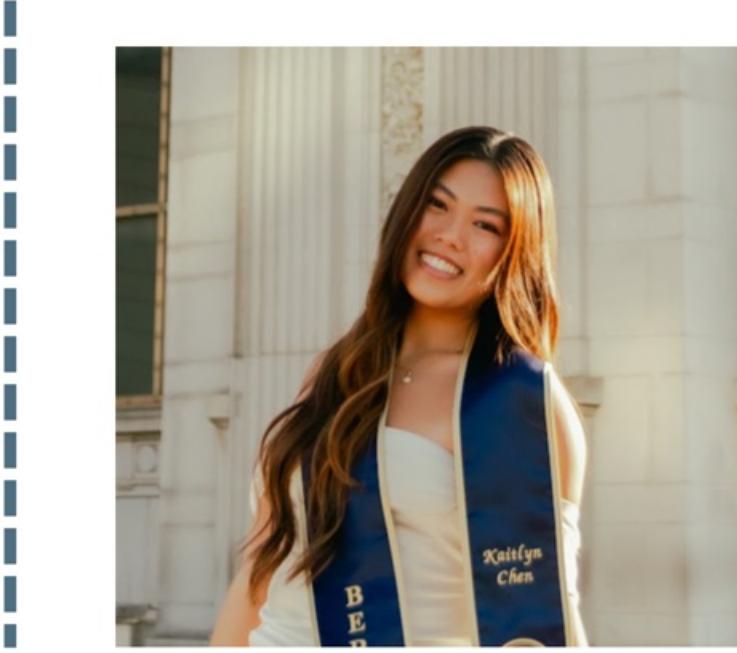


PROJECT PRESENTATION

-KAITLYN CHEN-

FEDEX → UPS CONTRACT SWITCH: DATA-DRIVEN COST-SAVINGS AT TESLA

13 June, 2025



ABOUT KAITLYN



Berkeley
UNIVERSITY OF CALIFORNIA



Aug 2021-
May 2025

- Graduated May 2025!
- Majors: Data Science & Computer Science, Emphasis: Industrial Engineering and Operations Research



June -
Sept
2022

- Data Analytics Intern
- Developed API for monitoring ~7k atrial fibrillation socal inpatients
- Projects I owned: Created API's patient data anonymization ability, Created API's patient ranking with vitals, Optimized API by 11.6%



Aug -
Dec
2024

- Logistics Analyst Intern - Inbound Adhoc team
 - Coordinated all adhoc logistics from U.S. to China
 - Created & owned Tableau dashboards for logistics analysis:
 - Discovered/proposed \$5.4M/month savings in domestic shipping fees
- ★ Proposed business case to switch contracts from Fedex to UPS- using historical data and predictive models (projected 38% in cost savings)

NEXT? continue with data science, supply chain, & project management!
IN 5 YRS? manage a small team! and be doing a part time masters program!



FEDEX → UPS CONTRACT SWITCH PROJECT: DATA-DRIVEN COST-SAVINGS AT TESLA

Why I chose this project to present:

- Proud to have had full autonomy of an end-to-end business proposal
- Had a direct impact and added long term value to the company

Note: under Tesla NDA so financial stats are hidden

BACKGROUND



While coordinating shipments, I was told not to tender to UPS, but I noticed UPS consistently appeared cheaper than the alternative, FedEx, in our Transportation Management System (TMS). I brought this to my manager, and told me the inbound account manager had been seeking a “proof of value” to switch contracts over to UPS. He gave me full autonomy to investigate and build the case.

Challenges:

- Lots of management and priority changes
- Relying on historical data, so need to model prediction

Timeline:

- 2 weeks - data prepping and modeling
- 1.5 weeks - tableau dashboard build out and refinement
- 2 weeks - meeting with stakeholder and operations teams to discuss and propose next steps

My Work:

- Everything! Worked Solo



WORKFLOW

01

PROJECT SCOPE & APPROACH

02

DATA EXTRACTION AND
CLEANING

03

FEATURE ENGINEERING & VARIABLE
SELECTION

04

PREDICTIVE MODELING &
VALIDATION

05

MODEL APPLICATION

06

TABLEAU DASHBOARDING &
VISUALIZATION

07

RESULTS & ACTION

08

NEXT STEPS, FAILURES,
LESSONS

PROJECT SCOPE

01

PROBLEM STATEMENT

- Our TMS auto-tenders domestic 'self-serve' shipments to FedEx by default
- ~185 self serve shipments/day

02

REQUIREMENTS & CONSTRAINTS

- Stakeholders: Account Manager, Operations Coordinators
- Confidential carrier contracts
- Missing TMS API data
- Evolving priorities

03

HYPOTHESES

1. UPS yields lower cost on average for all comparable service levels
2. UPS on-time-in-full (OTIF) is superior

APPROACH

Show how much we would have saved if we used UPS instead of Fedex for all self serve shipments?

Known Shipments:

Fedex:

- Hawthorne → Austin: \$20
- Hawthorne → Cape Canaveral: \$50

UPS:

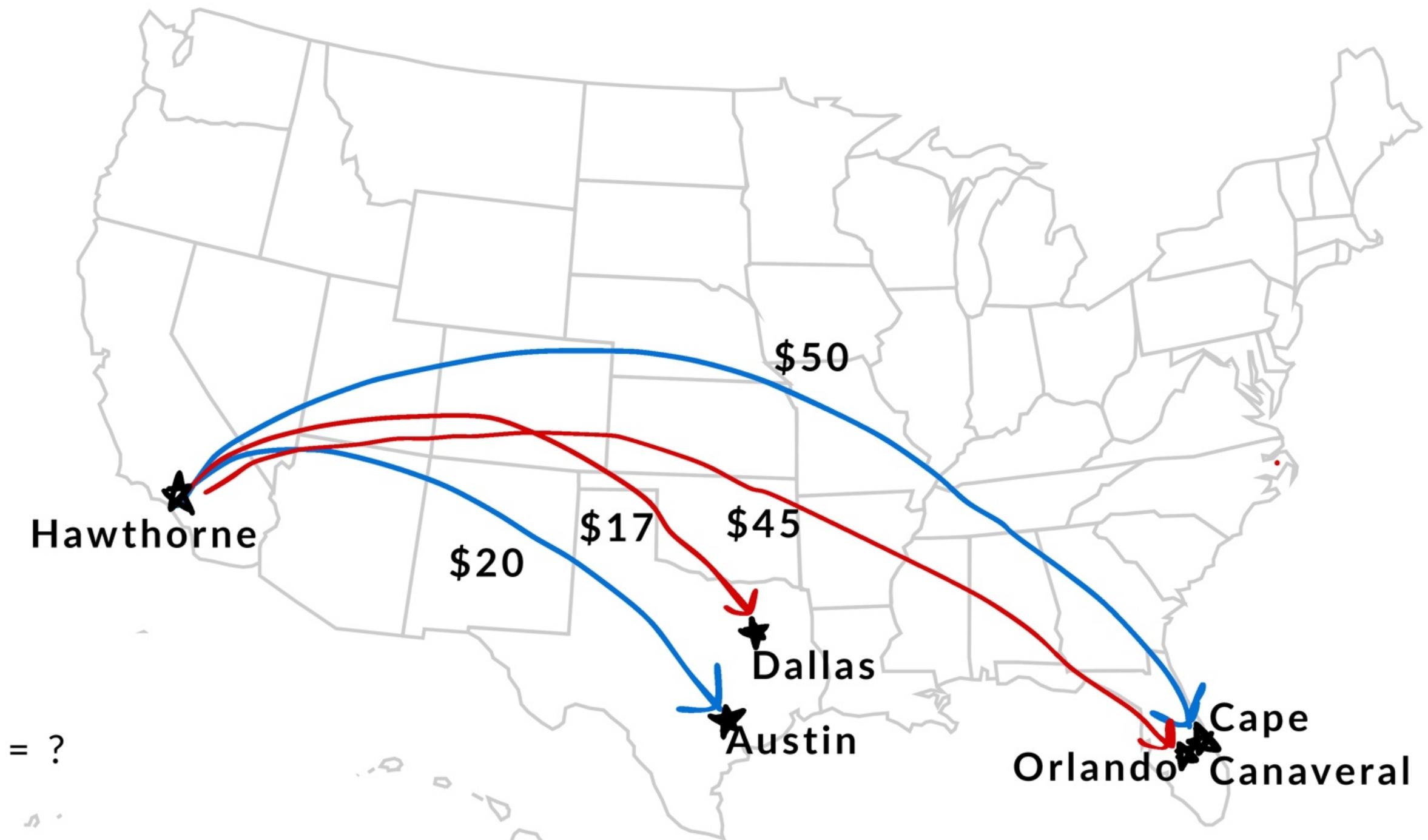
- Hawthorne → Dallas: \$17
- Hawthorne → Orlando: \$45

Predict:

Hawthorne → Austin UPS cost = ?

Hawthorne → Cape Canaveral UPS cost = ?

SIMPLE EXAMPLE



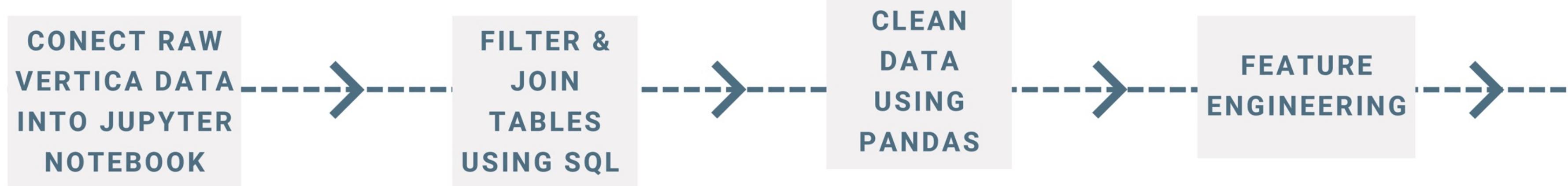
DATA EXTRACTION & CLEANING

DATA SOURCE

- Vertica database
 - >60 tables
 - very messy
 - needed data:
 - all past UPS shipments' data
 - all past self serve Fedex shipments' data

DATA CHALLENGES

- No explicit “self-serve” flag → interview operations to reverse-engineer logic
- Disparate schemas: different column formats, unreasonable values, missing values



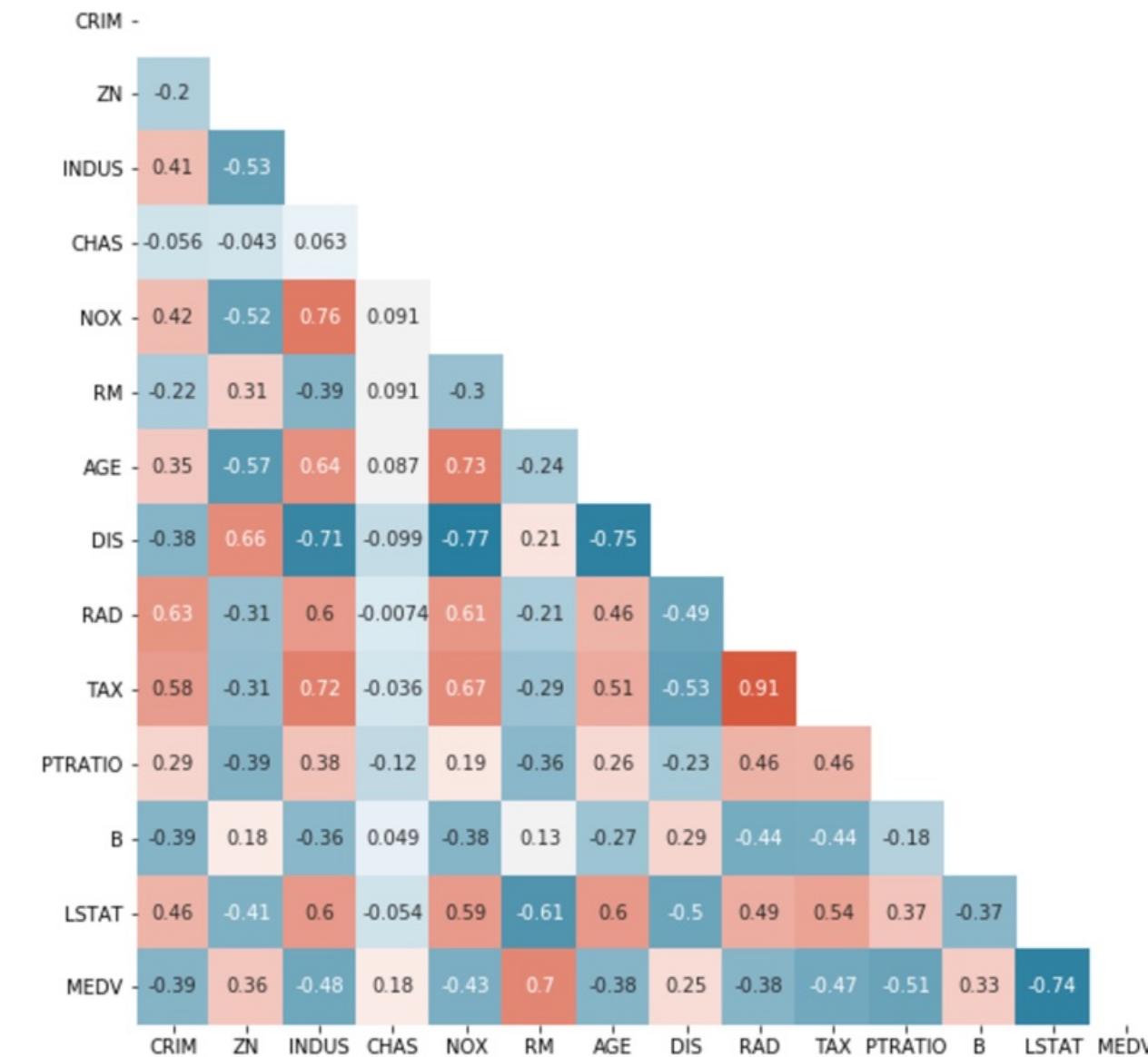
FEATURE ENGINEERING

GOAL

Predict "What would UPS have charged for each self-serve FedEx shipment in 2024 thus far (Jan - Oct; ~46k shipments)?"

VARIABLE ANALYSIS

- Correlation matrix - find variables correlated strongly with cost
- T-testing/hypothesis testing - eliminate low predictive power variables
- **Variable selection results:**
 - origin-destination (OD) coordinates
 - weight
 - service level
 - some unexpected variables



Correlation matrix example:
not real data, for demonstration purposes only

PREDICTIVE MODELING - CLUSTERING & VALIDATION

Choosing a modeling approach:

- Regression vs Clustering? → Clustering (cost volatility stability)
- Which clustering model? → K-Means Mini Batch (simple & fast)

Model Parameters:

- # clusters
- batch size
- variables selection



clustering example: not real data, for demonstration purposes only

Training & Testing Steps:

For every service level:

Split UPS data
into training &
testing sets

Perform k means
mini batch
on the training &
calculate avg cost
of each cluster

Assign
testing set
to clusters

Evaluate accuracy
by comparing the
predicted avg
costs w/ the true
costs in the
testing set

Refine
parameters
& reevaluate
model if
necessary

Model Results (all service levels):

- Mean Absolute Error (MAE): within 13% of true average costs
- Mean Squared Error (MSE): within 35% (not robust to outliers)

Training & Testing Steps:

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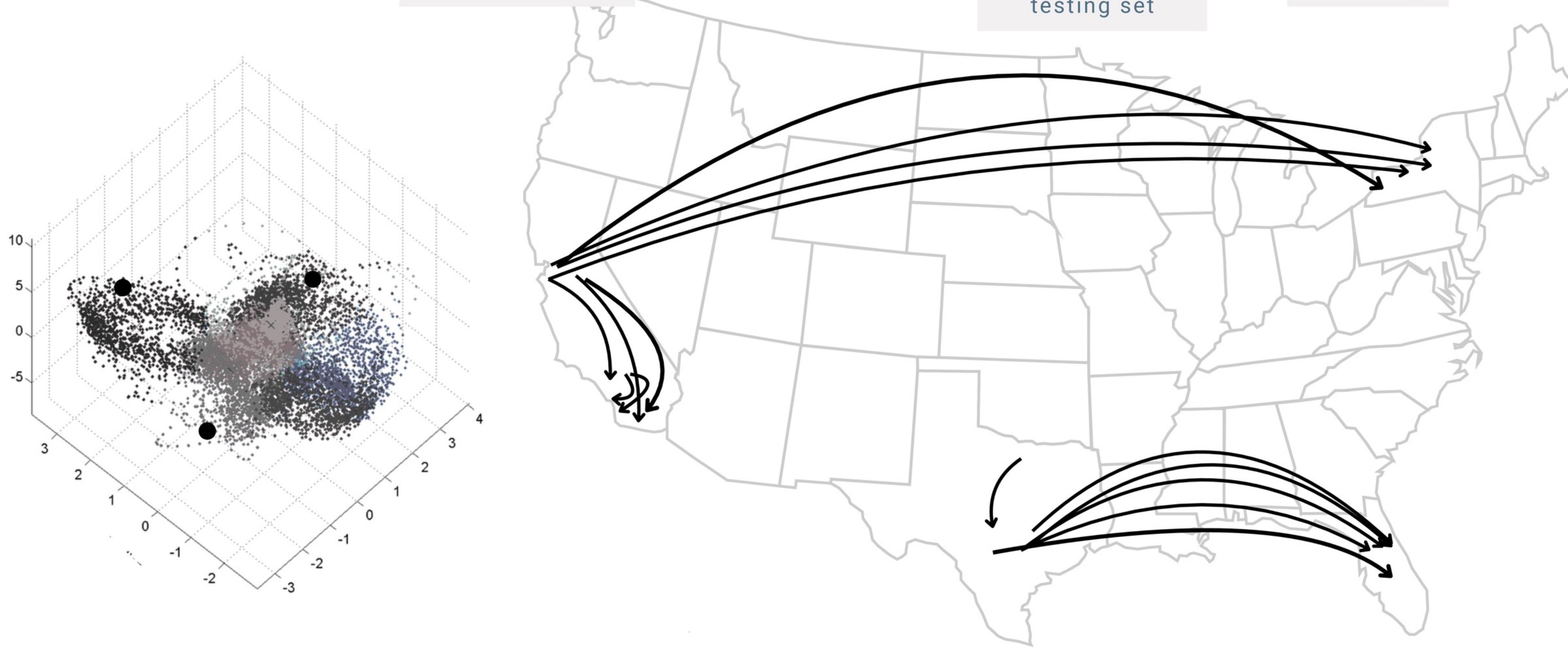
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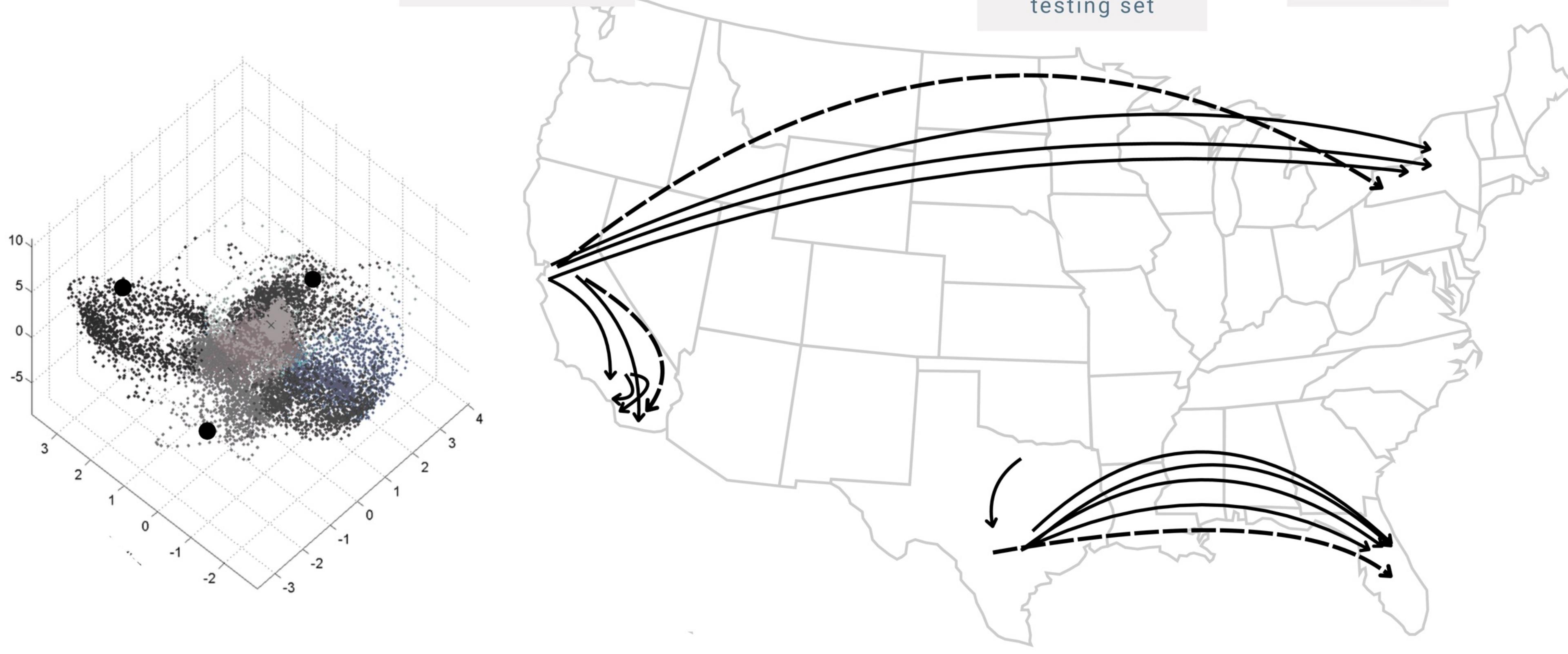
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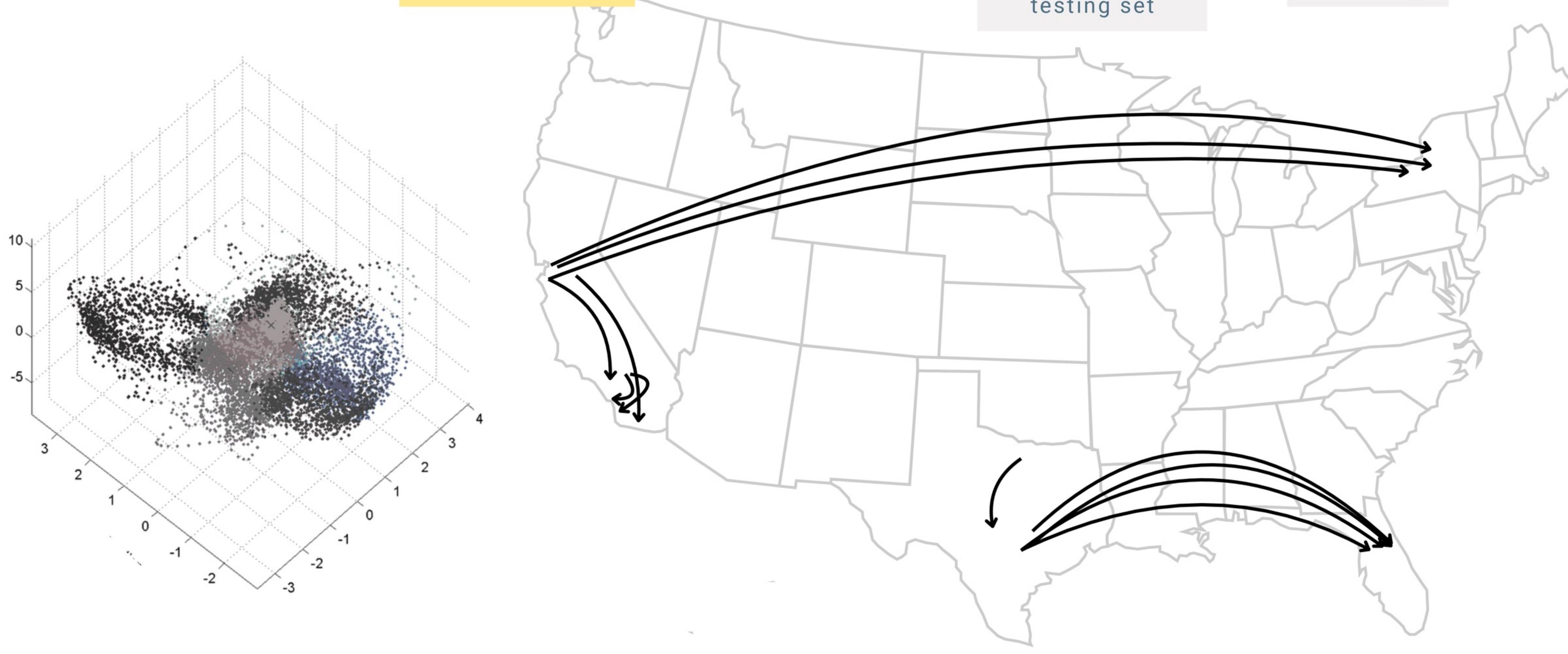
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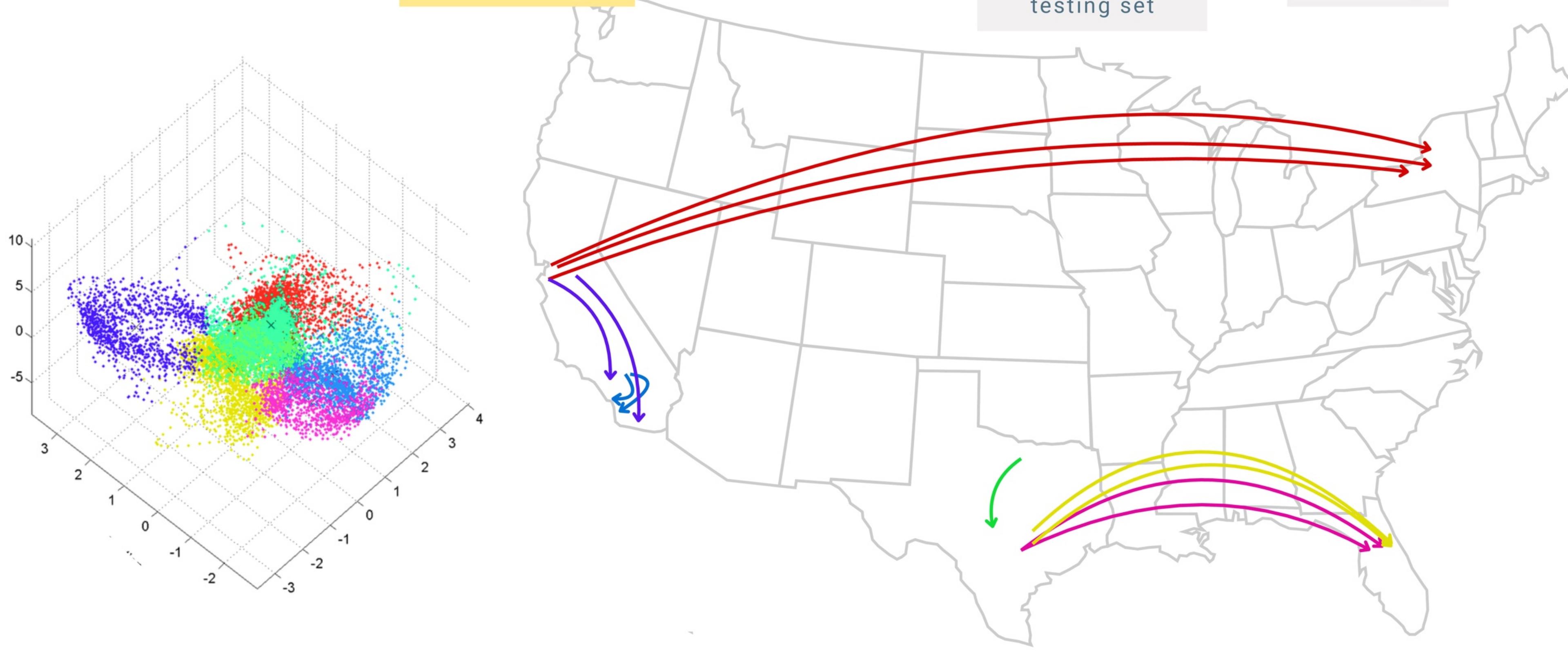
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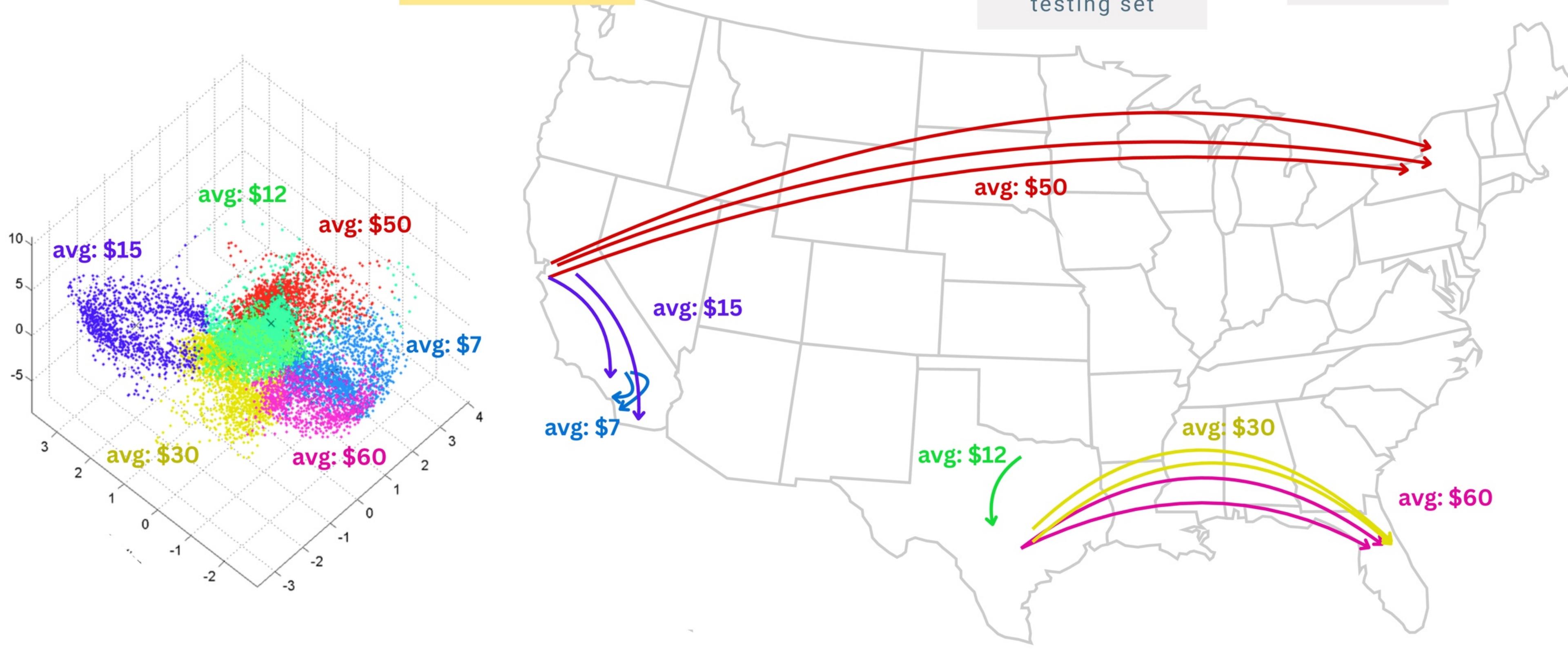
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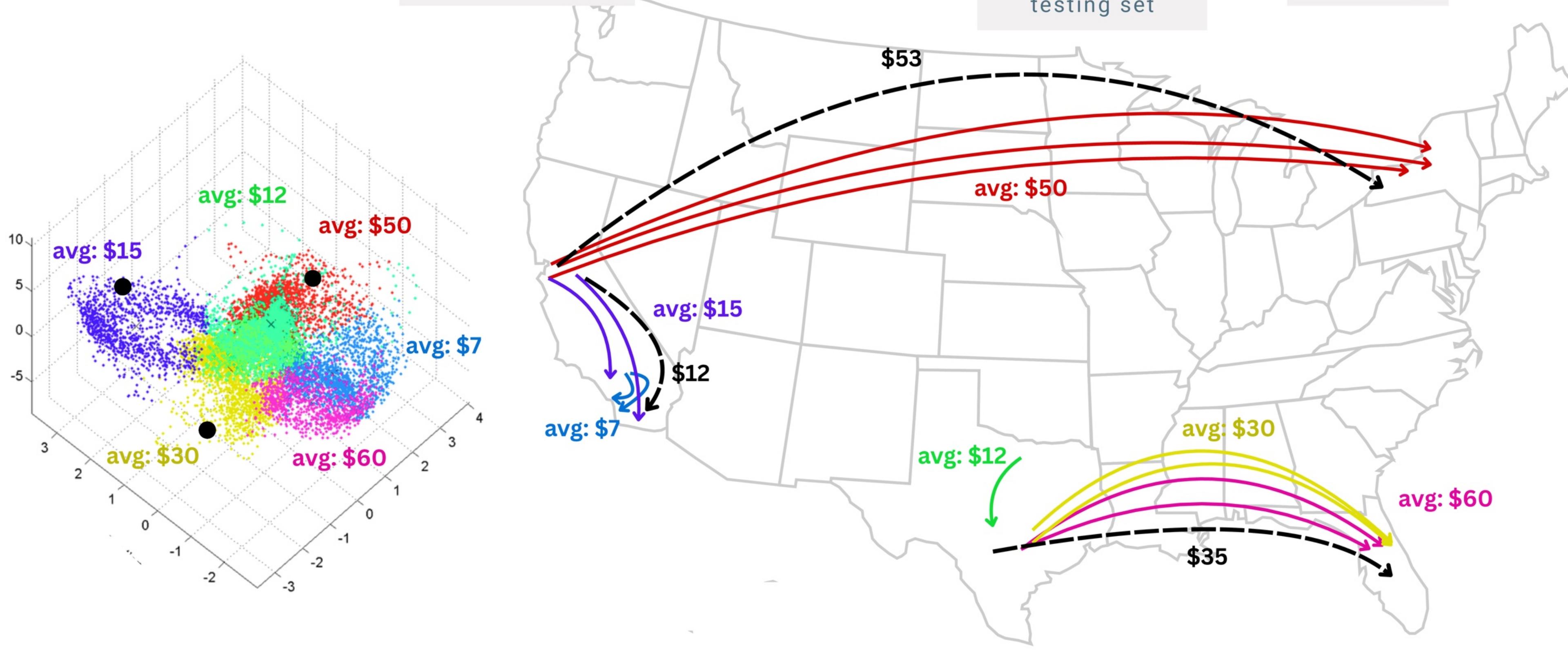
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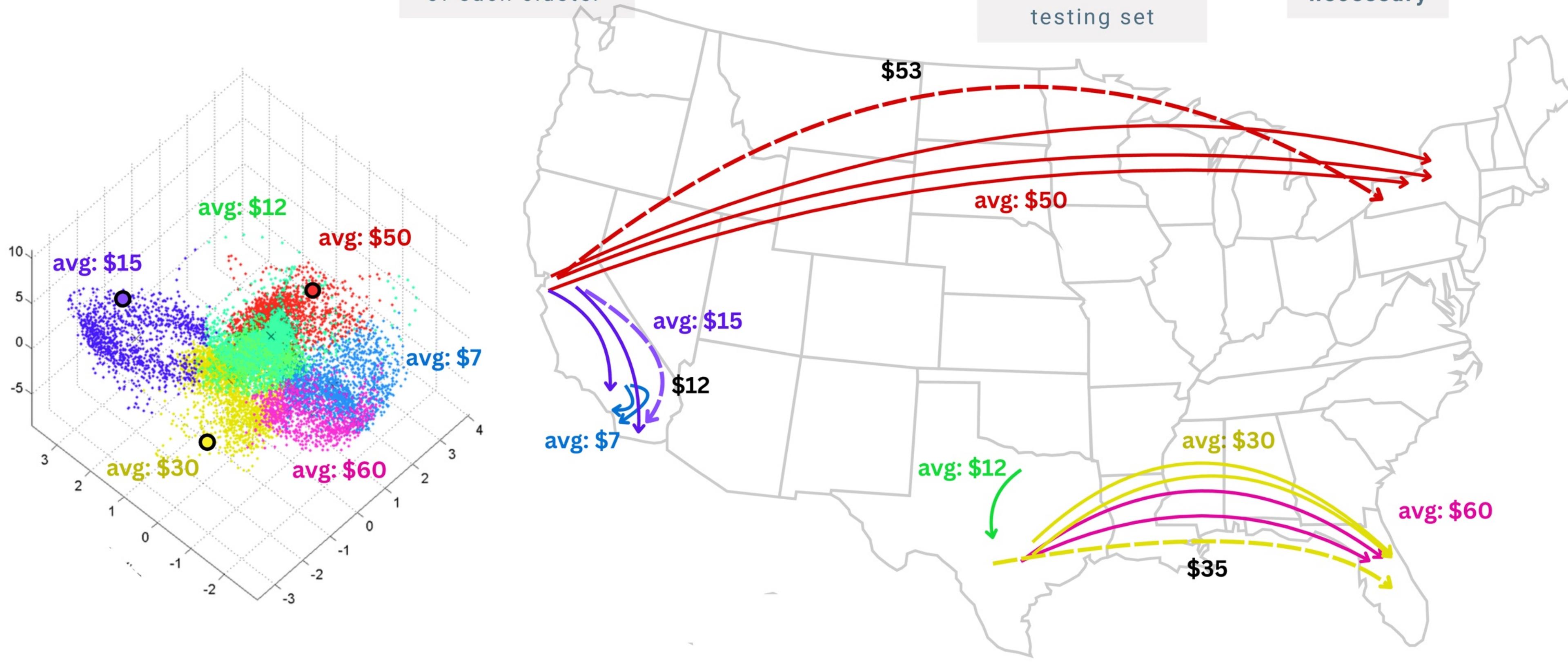
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\$53

$$\text{MAE} = \frac{1}{n} \sum_{i=1}^n |x_i - \bar{x}|$$

\$15

\$50

\$12

\$30

$$\text{MAE} = \frac{1}{3} (|12 - 15| + |12 - 30| + |12 - 50|)$$

\$35

Model Parameters:

- # clusters
- batch size
- variables selection

■ PREDICTIVE MODELING - CLUSTERING & VALIDATION

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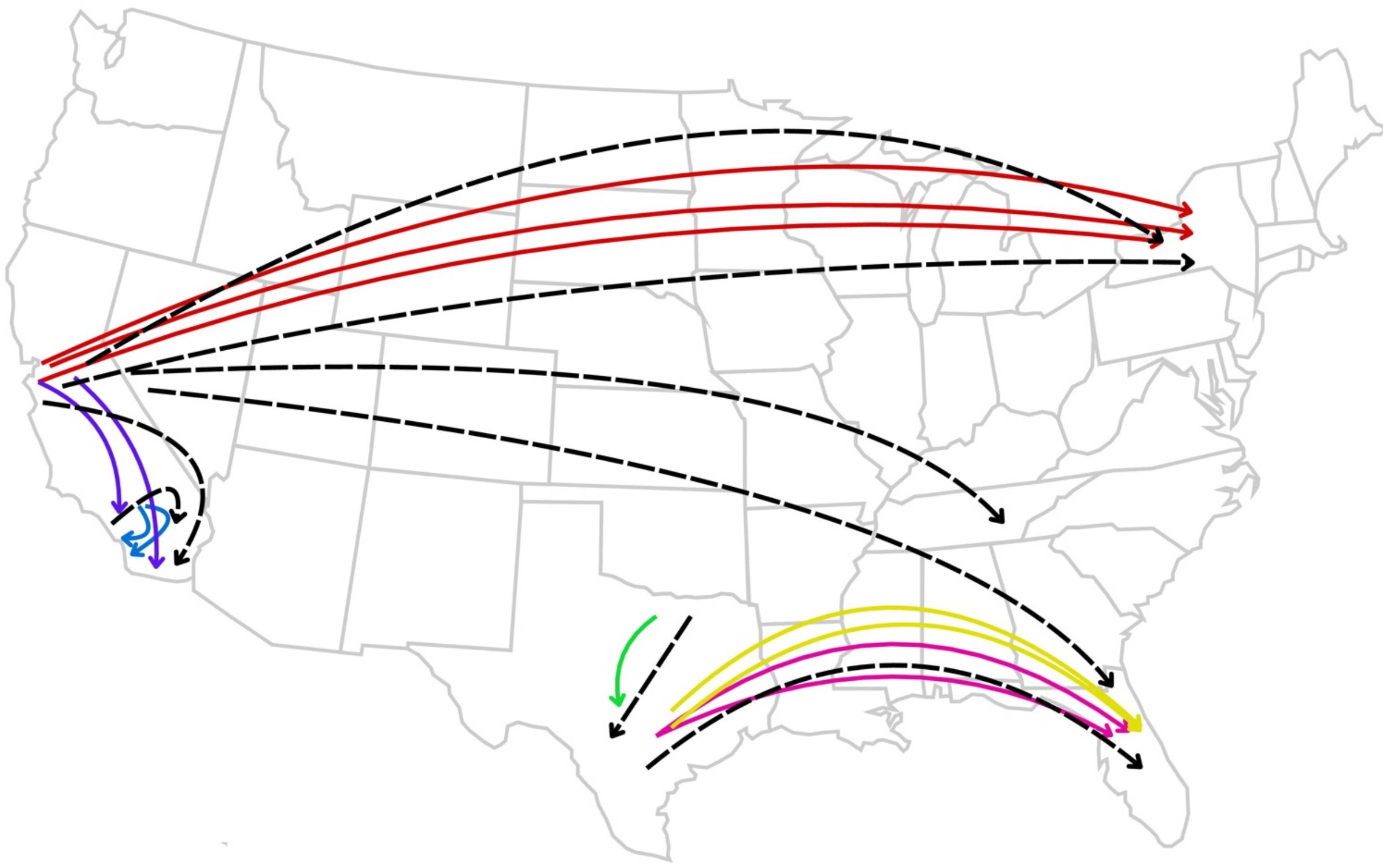
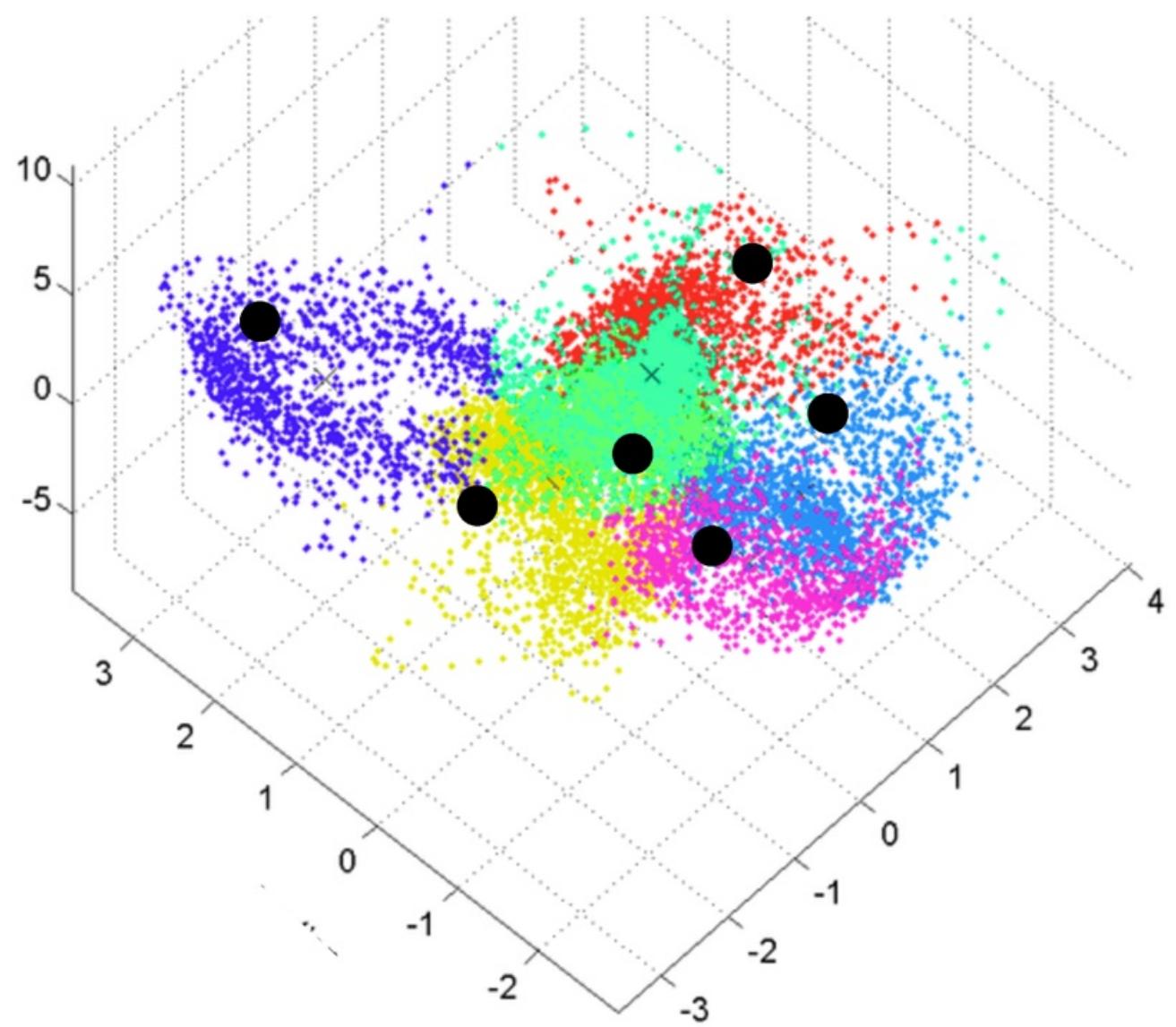


■ APPLYING THE MODEL

For every service level:

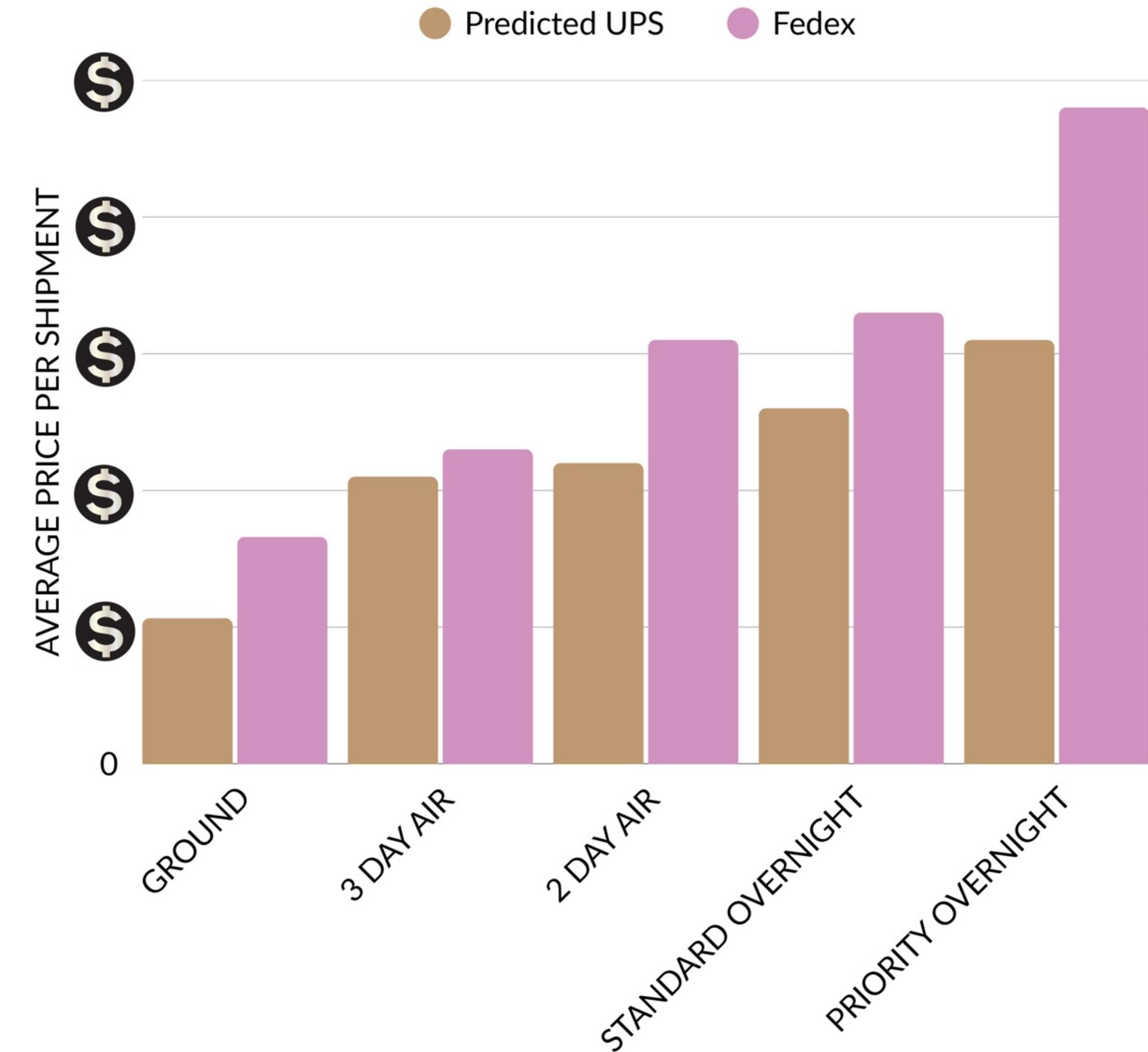
1. Map FedEx shipments to nearest centroid
2. Use centroid's avg cost as predicted UPS cost

Compute $\Delta = \text{FedEx \$} - \text{UPS Predicted \$}$



▪ COST RESULTS

IN TOTAL UPS IS PREDICTED
TO HAVE BEEN **38.1%**
CHEAPER THAN FEDEX



▪ TRANSIT TIME RESULTS

ON AVERAGE, UPS IS
PREDICTED TO HAVE BEEN
20.6% FASTER THAN FEDEX

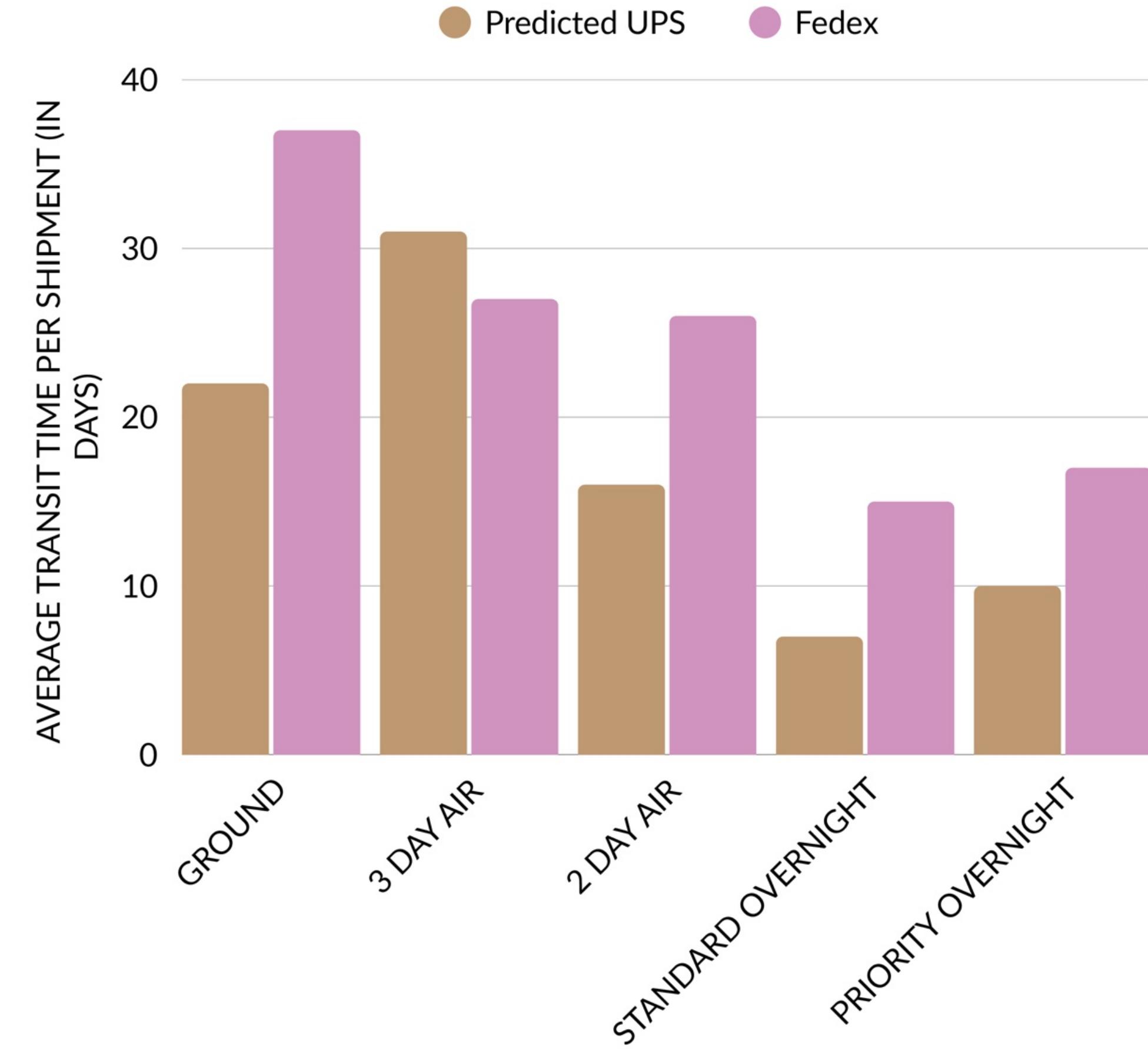


TABLEAU DASHBOARD

- Built with long term vision & adaptability
- Presented to Account Manager to validate findings

Fedex Vs. UPS Domestic Small Parcel Self Serve Shipments

Dashboard Updated: 10/3/2024 9:58:15 AM

Fedex
UPS

Origin City
All

Destination City
All

Fedex Service Level
All

Shipment Mode
All

Requestors Manager
All

Source
1/1/2024

Origin State
All

Destination State
All

UPS Service Level
All

Cost Center Name
All

Requestor Department ..
All

Fedex Self Serve Average Cost Per Shipment:



UPS Estimated Average Cost Per Shipment for Self Serve:



Fedex Self Serve Total Cost:



UPS Estimated Total Cost for Self Serve:

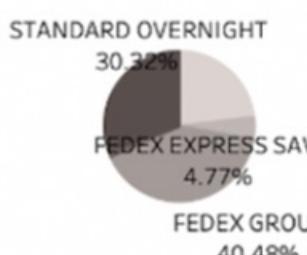


Total Cost Savings If Had Used UPS :



GROUND
40.48%

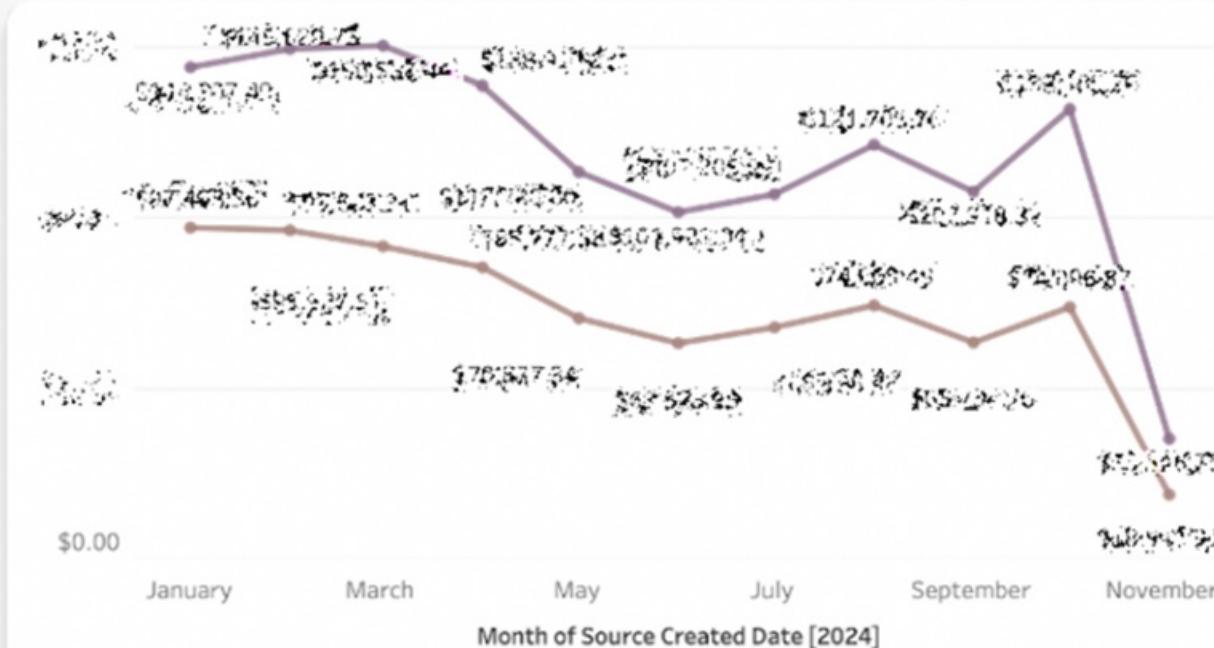
AIR
59.52%



Cost and Transit Time Breakdown by Service Level

| | Fedex | UPS | Fedex: Avg Cost Per Shipment | UPS: Avg Cost Per Shipment Estimate | Fedex: Avg Transit Time | UPS: Avg Transit Time | Total # of Self Serve SHPs |
|---------------------|------------------------|-----|------------------------------|-------------------------------------|-------------------------|-----------------------|----------------------------|
| FEDEX GROUND | UPS GROUND | | | | 3.7 days | 2.2 days | |
| FEDEX 2 DAY | UPS 2ND DAY AIR | | | | 2.6 days | 1.6 days | |
| FEDEX EXPRESS SAVER | UPS 3 DAY SELECT | | | | 2.7 days | 3.1 days | |
| FIRST OVERNIGHT | UPS NEXT DAY AIR EARLY | | | | 1.2 days | 0.5 days | |
| PRIORITY OVERNIGHT | UPS NEXT DAY AIR | | | | 1.7 days | 1.0 days | |
| STANDARD OVERNIGHT | UPS NEXT DAY AIR SAVER | | | | 1.5 days | 0.7 days | |

Total Fedex vs UPS Total Cost by Date



City to City Analysis



Requestor's Manager Analysis



Department and Location Analysis



NEXT STEPS

Deployment Plan:

Pilot low-risk lanes →
biweekly ops sync →
scale by hub →
API self serve automation with
backend team →
dashboard monitoring

Data:

1. **Automate** data cleaning, modeling, and Tableau updates with Python
2. **Account for inflation** using time-adjustment factors (e.g., CPI-based index)
3. **Optimize model** for better accuracy and faster computation
4. **Integrate invoiced costs** to capture fees/surcharges from both carriers

FAILURES

- Initial pushback: I hadn't translated clustering into business terms
- Inflation bias

LESSONS

- Balancing scrappyness and future adaptability
- Stakeholder Framing: Adapt tech jargon for ops/finance audiences.
- Simpler the better!

**THANK YOU
FOR LISTENING!**

KAITLYN CHEN

13 June, 2025