WEB SCRAPING FOR E-COMMERCE VALIDATION

Economics Indicator Division / New Product R&D

U.S. Census Bureau

Rebecca Weaver — New Products & Support Team Lead

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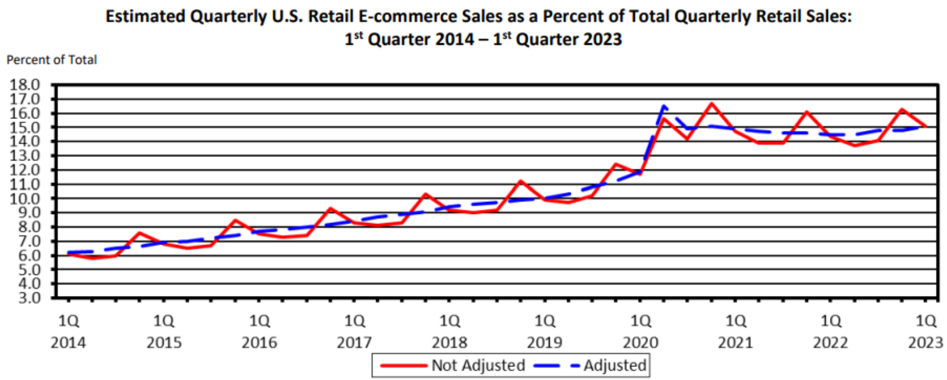
CORRINA CALANOC
Georgetown University
Data Science & Analytics

INTRODUCTION & MOTIVATION

- **E-commerce** is a key component of the retail sector and is reported by the EID in the **Quarterly Retail E-Commerce** report

- These numbers are speculated to be **underestimates** due to **missing or inaccurate data**
  - 6,400 retailers unresponsive or report no e-commerce



Estimated Quarterly U.S. Retail E-commerce Sales as a Percent of Total Quarterly Retail Sales: 1st Quarter 2014 – 1st Quarter 2023

GOAL: Given a set of retailers and their websites, use web scraping to indicate whether that retailer has e-commerce. This process will then be used to update the retailers’ e-commerce status in the Census database.

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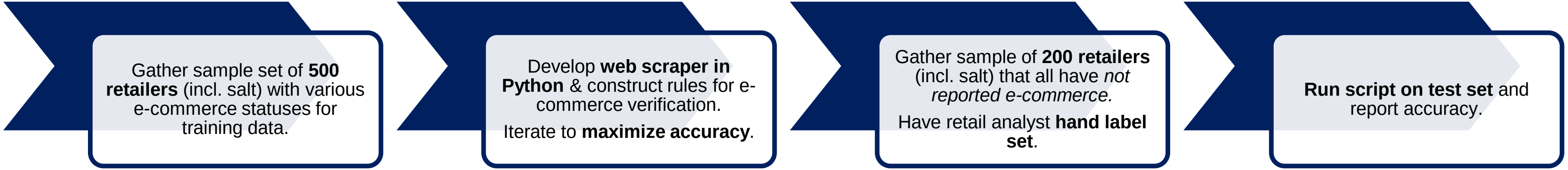
PROJECT DETAILS & PROCESS



Gather sample set of **500 retailers** (incl. salt) with various e-commerce statuses for training data.

Develop **web scraper in Python** & construct rules for e-commerce verification.

Iterate to **maximize accuracy**.

Gather sample of **200 retailers** (incl. salt) that all have *not reported e-commerce.*

Have retail analyst **hand label set**.

Run script on test set and report accuracy.

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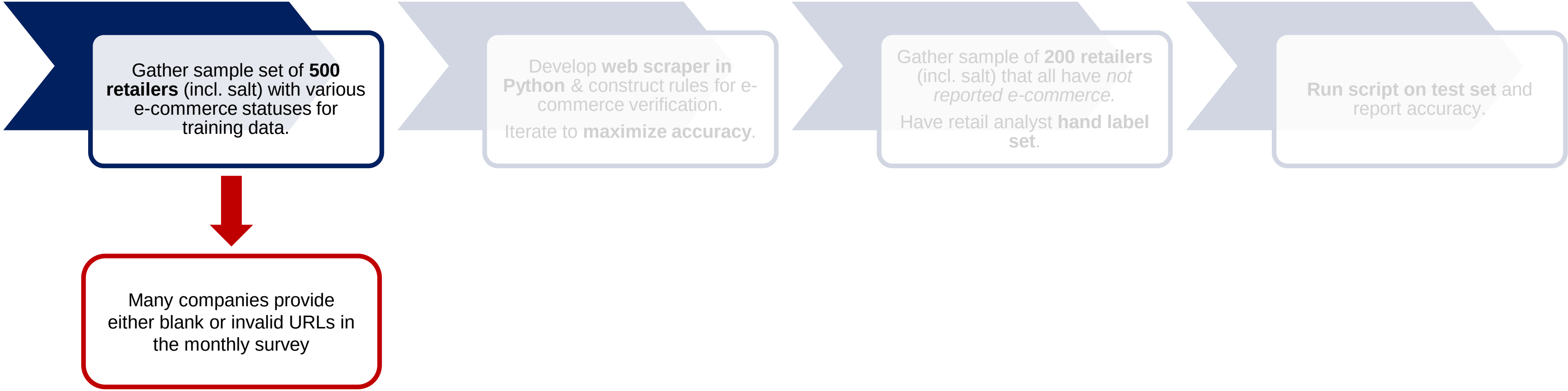
CHALLENGES



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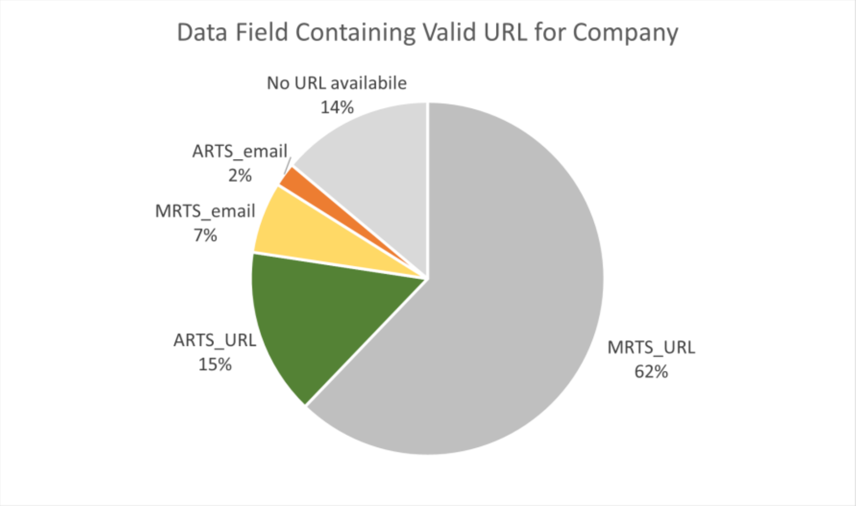
RESULTS – URL VALIDATION

Out of **500 companies** in the Training Set:

- **38% of retailers** had invalid URLs from the monthly survey
- Out of these, the script was able to extract **valid URLs from other sources** for **63% of them**
- URL Validation can be its own standalone process



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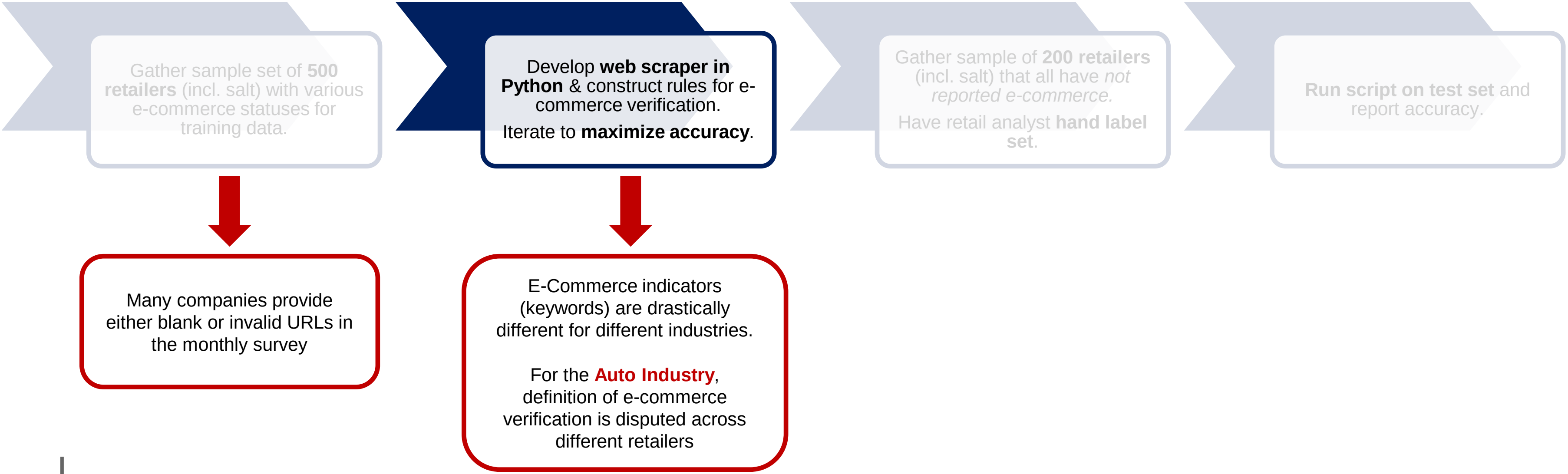

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E-Commerce indicators (keywords) are drastically different for different industries.

For the **Auto Industry**, definition of e-commerce verification is disputed across different retailers

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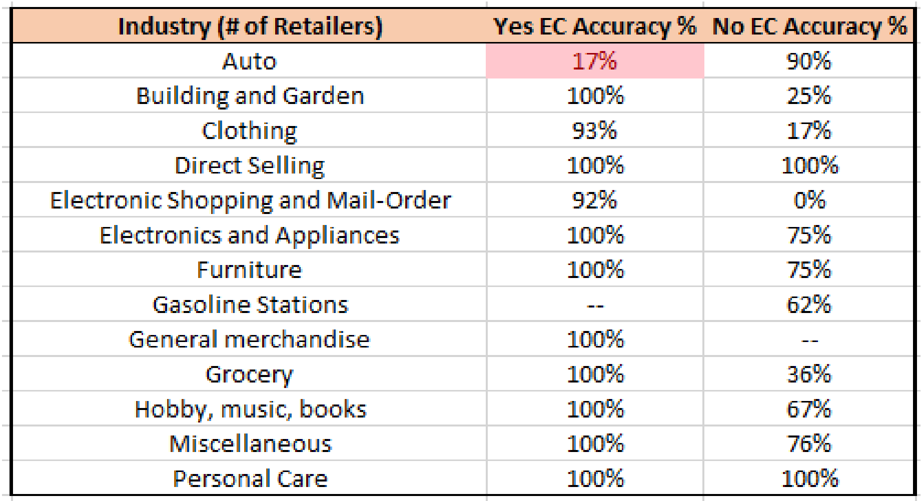
RESULTS – E-COMMERCE INDICATOR



Industry (# of Retailers)	Yes EC Accuracy %	No EC Accuracy %
Auto	17%	90%
Building and Garden	100%	25%
Clothing	93%	17%
Direct Selling	100%	100%
Electronic Shopping and Mail-Order	92%	0%
Electronics and Appliances	100%	75%
Furniture	100%	75%
Gasoline Stations	--	62%
General merchandise	100%	--
Grocery	100%	36%
Hobby, music, books	100%	67%
Miscellaneous	100%	76%
Personal Care	100%	100%

Out of **500 companies** in the Training Set:

- Web scraper had a **74% accuracy**
  - **87%** accuracy for **identifying e-commerce**
  - **63%** accuracy for **identifying No e-commerce**
- Script identified **corrections** to be made
  - **29%** of retailers that **consistently report no e-commerce** were found to have e-commerce
  - **9%** of retailers that are **consistently unresponsive** were found to have e-commerce

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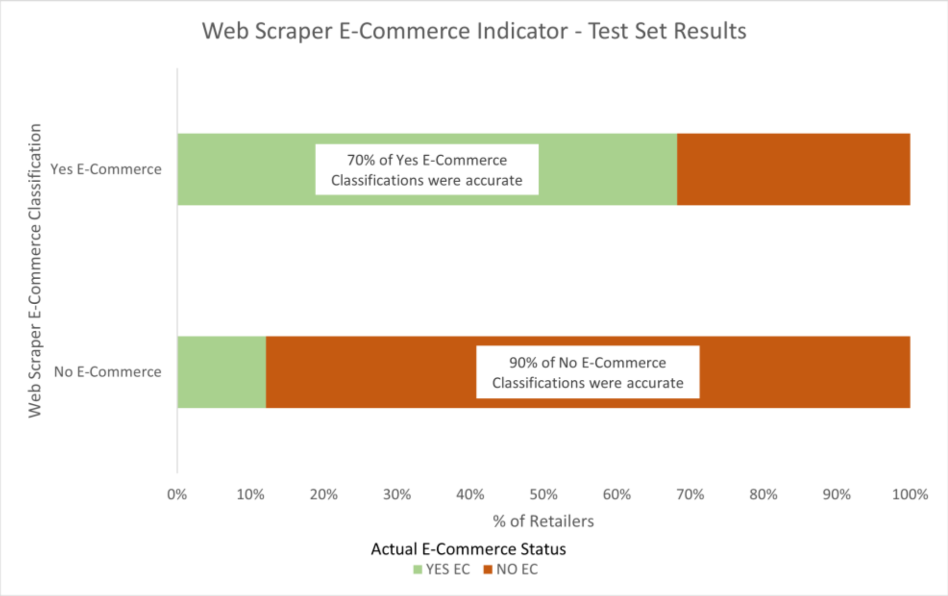
RESULTS – E-COMMERCE INDICATOR

Out of **200 companies** in the Test Dataset, the web scraper had a **80% accuracy**



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NEXT STEPS & CONCLUSION

Next Steps:

- Run script on set of no e-commerce retailers & update database accordingly
- Periodically will run script in order to maintain e-commerce statuses

Future Enhancements:

- Implement parallel processing for get requests to improve on run time
- Utilize machine learning and NLP techniques for better keyword indicators

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