2018
NHTS
Workshop

Online shopping behavior of US travelers: The roles of internet usage and lifestyle

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Introduction

Previous Research:

- In-store shopping: 20% of all trips.
- On-line shopping:
  - Complements in-store shopping?
  - Supplements in-store shopping?
  - Modifies in-store shopping? (e.g., induces trips that are otherwise unmade).
- Who are online-shoppers?
  - Younger people
  - Highly educated
  - Higher income
  - Tech savvy
  - Active transport users

Past studies:

- Smaller scales.
- Non-probability samples.
- Older surveys, did not show the current trends.

Research Questions:

- Can internet and technology usage predict the demand for online shopping?
- What are the other predictors of the online shopping tendency?

Methods

Split into training set (80%) and test set (20%).

Applied random forest and gradient boosting (classification).

Procedure:

- Growed 5,000 decision trees from subsamples of the training sets.
- Averaged the probability (or took the major vote) to get the final results.
- Performed cross validation.

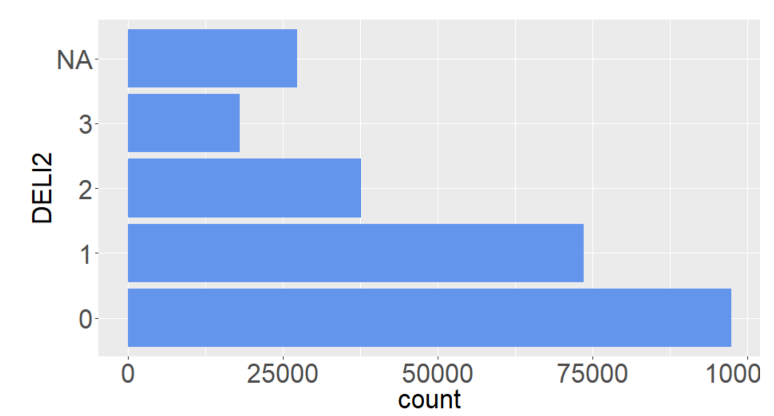
Outcome variable: DELIVER (regroup, discrete)

Predictor variables:

- Internet usage (through PC, web, smartphone, tablet)
- Travel patterns and lifestyle (e.g., physically activeness, mode use, trips by modes, car and bike share membership, vehicle ownership).
- Socio-demographic and other variables.

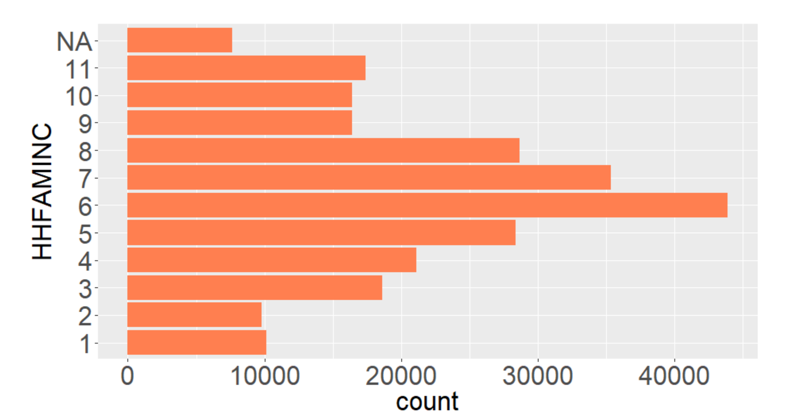
Results

Online purchasing



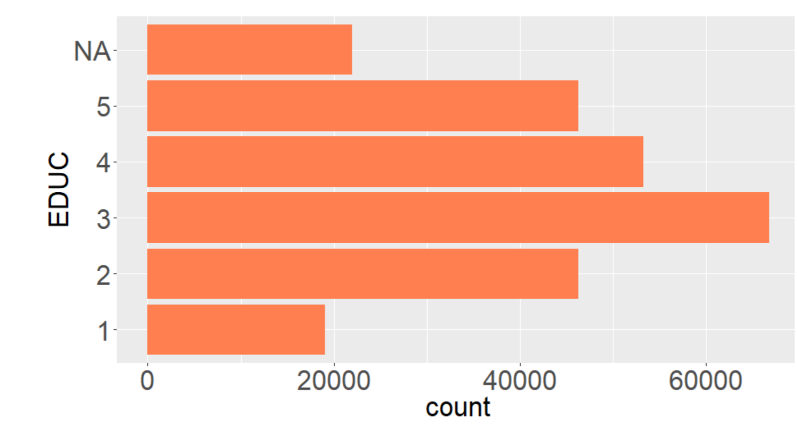
0: Not at all; 1: less than once a week; 2: less than twice a week, 3: more than twice a week.

Income



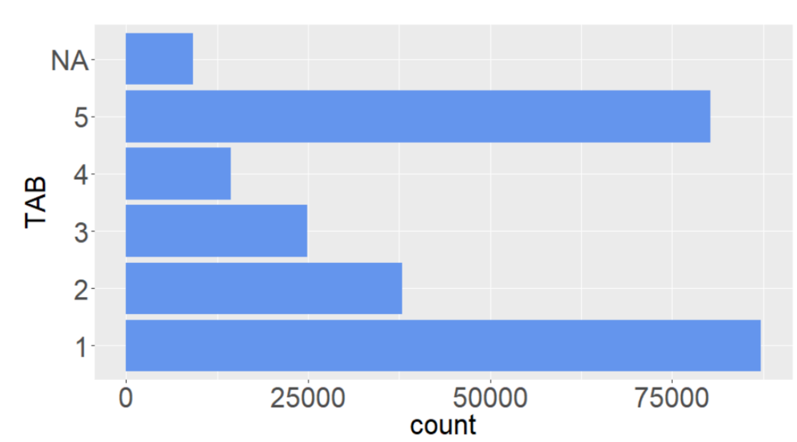
(1) <$10K; (2) $10-14K; (3) $15-24K; (4) $24-35K; (5)$35-50K; (6) $50-75K; … (11): >200K

Education

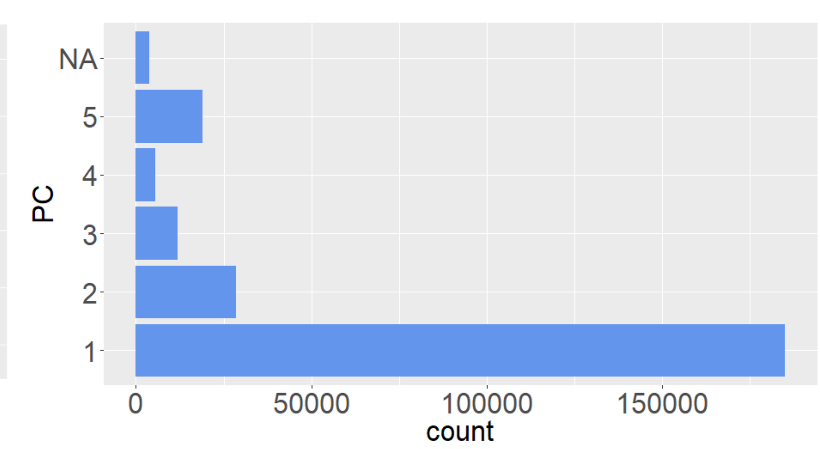


(1) Less than high school; (2) High school/GED; (3) Some college/Assoc.; (4) Bachelor's; (5) Grad. /Prof. degree

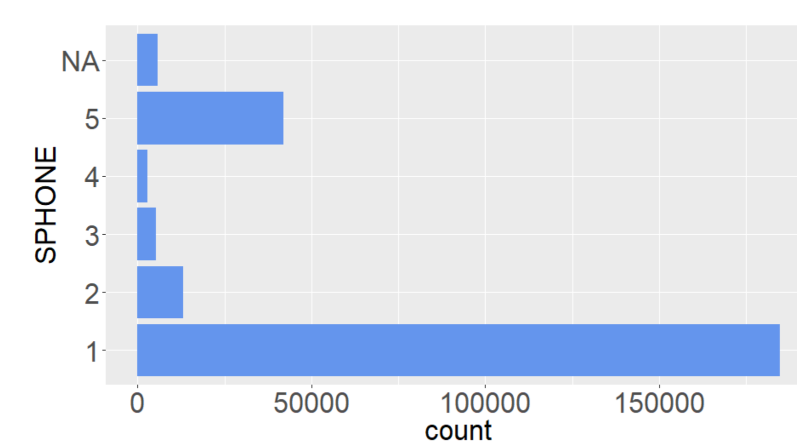
Tablet use



PC use for internet

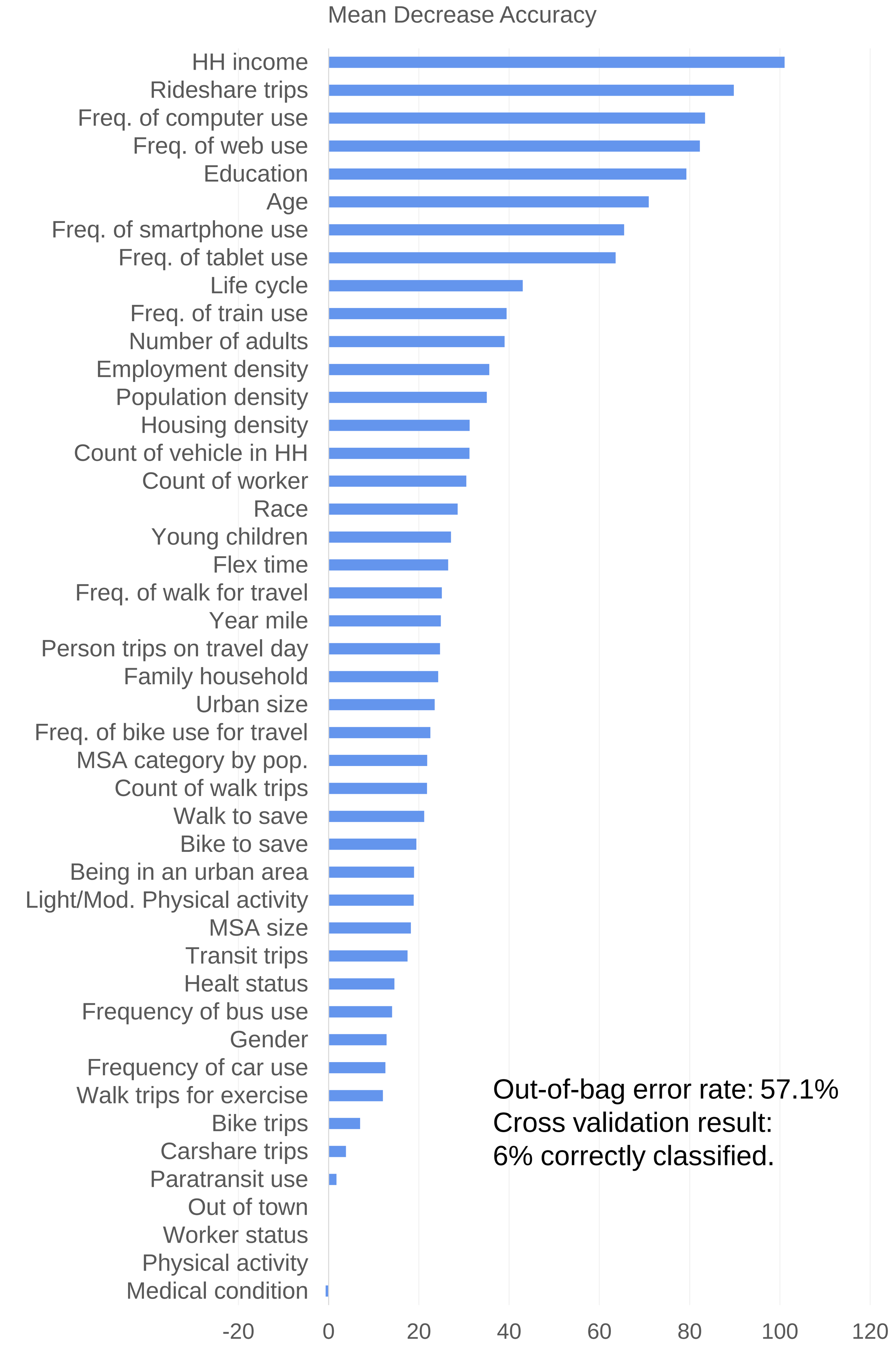


Smartphone use

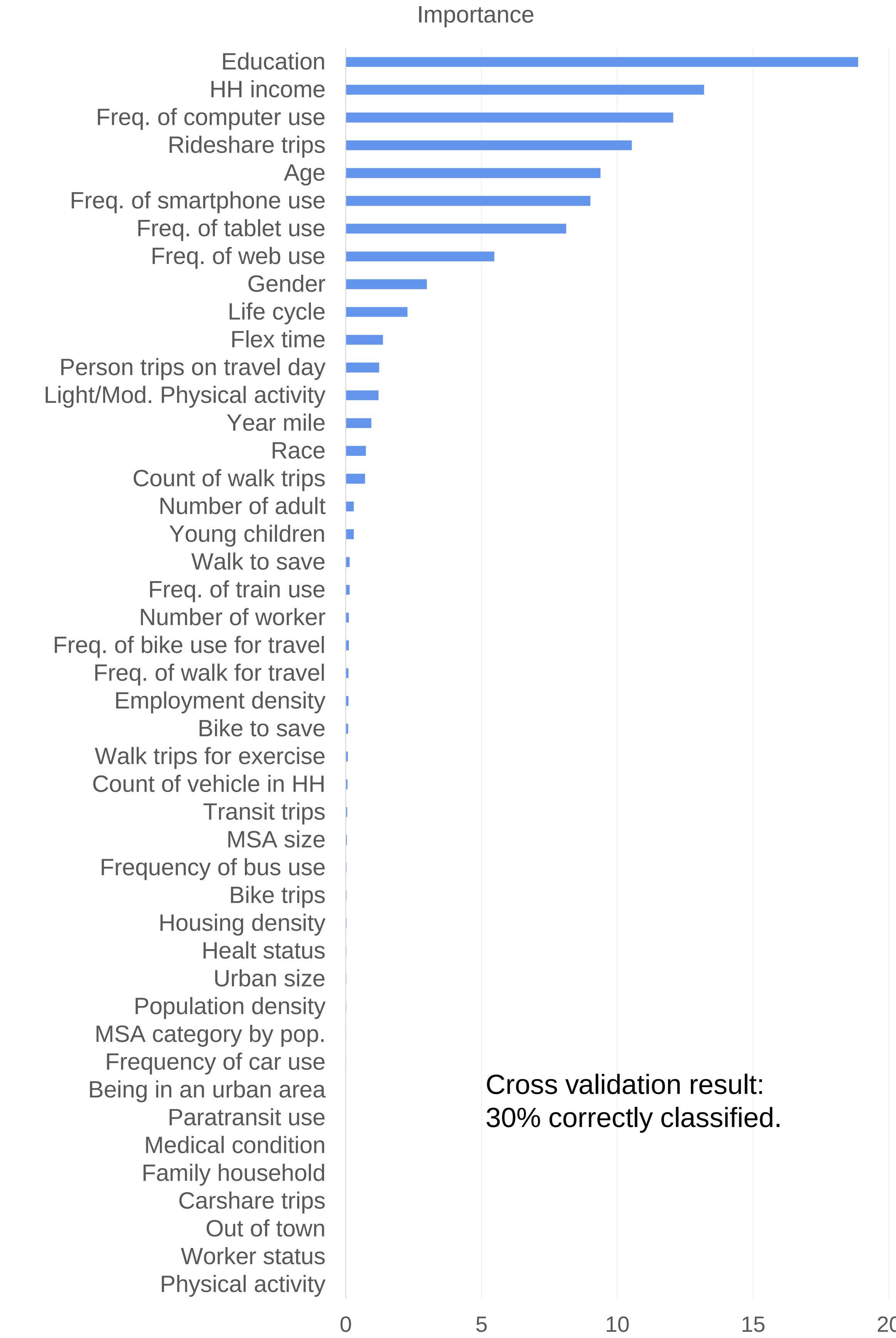


(1) daily, (2) a few times a week; (3) a few times a month; (4) a few times a year; (5) Never

Random Forest



Gradient Boosting



Main Findings

- The use of ridesharing, PC, internet, smartphones, and tablets were among the strongest predictors of online purchasing.
- Household income was the strongest predictor of this tendency in random forest model; education was the strongest predictor in the gradient boosting model.
- Age also played a big role in predicting online shopping frequency.
- Other factors that had smaller effects were gender, life cycle (i.e., household composition), and number of adults in the household.
- Employment density and population density have moderate predictive power, suggesting the role of the built environment on predicting online purchasing.

Implications and Future Directions

- Practitioners can identify a market segmentation of online shoppers in order to predict the online shopping patterns in travel demand models.
- Practitioners can use a predictive online shopping model to estimate potential delivery truck traffic, devise strategies to manage in-store shopping travel demand and modify parking requirement for commercial zones.
- More studies are needed to replicate the results as well as improve the predictive power.
- Other unanswered questions for future studies:
  - The link between online and in-store shopping.
  - Whether online shopping substitutes, complements, or modifies in-store shopping travel and the associated change in VMT.

Selected References

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