John Paul Helveston, Ph.D.

Eng. Management & Systems Eng.

June 15, 2023

Target audience

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You are familiar with:

- Conjoint analysis / discrete choice experiments

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- R / programming in general

Install Software!

https://jhelvy.github.io/2023-qux-conf-conjoint/software

Hello World!

John Helveston, Ph.D.

Assistant Professor, Engineering Management & Systems Engineering

- 2016-2018 Postdoc at Institute for Sustainable Energy, Boston University
- 2016 PhD in Engineering & Public Policy at Carnegie Mellon University
- 2015 MS in Engineering & Public Policy at Carnegie Mellon University
- 2010 BS in Engineering Science & Mechanics at Virginia Tech
- Website: www.jhelvy.com

Technology Change Lab

I study how consumers, firms, markets, and policy affect technological change, with a focus on accelerating the transition to low-carbon technologies

Electric & Sustainable Vehicle Technologies

Market & Policy Analysis

How can you find out know what people want?

Directly asking people what they want isn't always helpful

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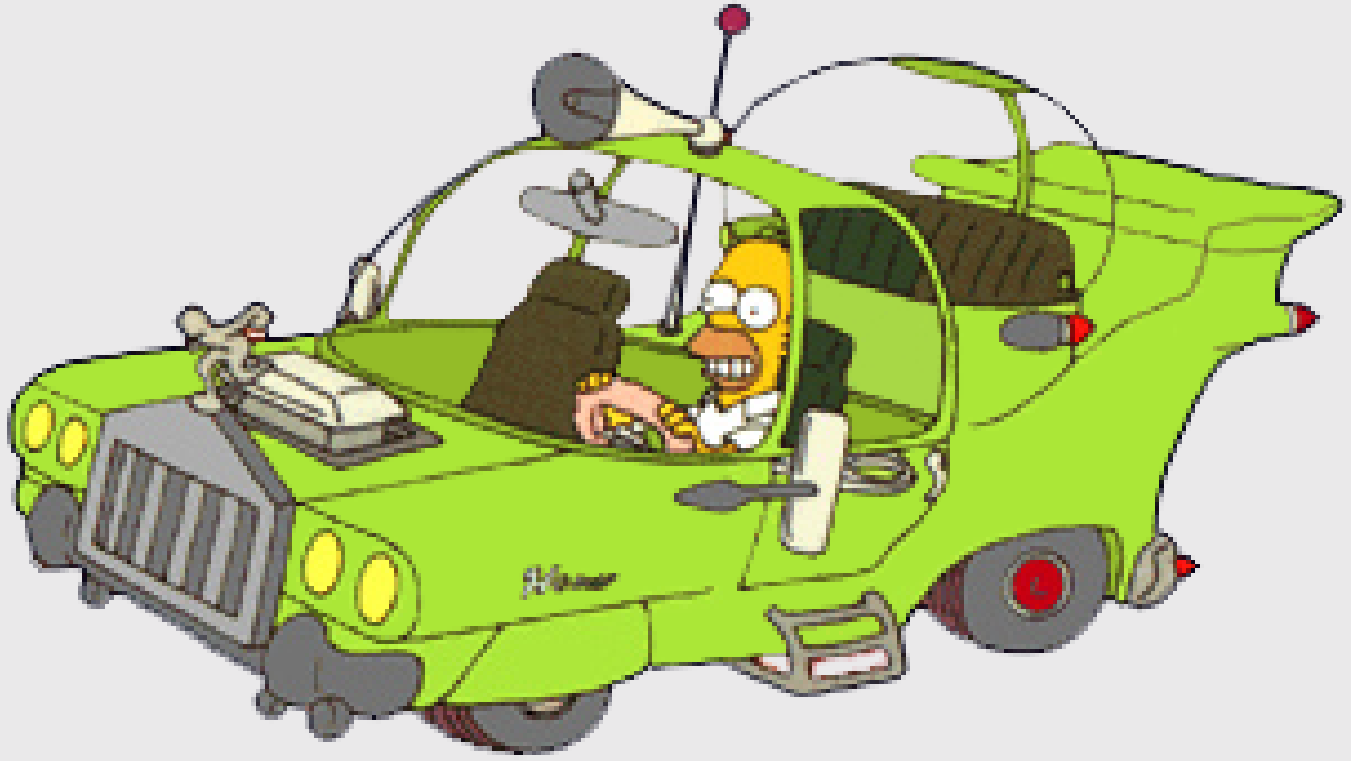
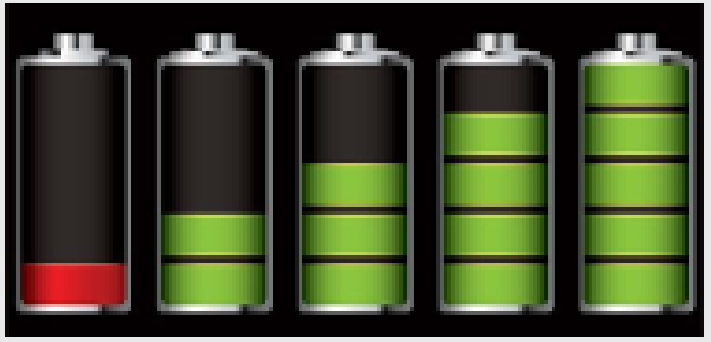
(People want everything)



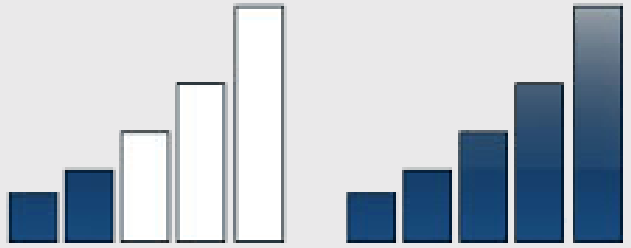
Which feature do you care more about?

Battery Life?



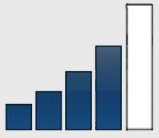
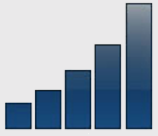
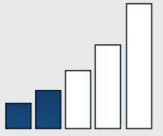
Brand?

Signal quality?



Conjoint Analysis:

Use choice data to model preferences

Attribute	Phone 1	Phone 2	Phone 3
Price	$400	$450	$350
Brand			
Battery Life			
Signal Quality			

Use random utility framework to predict probability of choosing phone *j*

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1. $u_j = \beta_1 \text{price}_j + \beta_2 \text{brand}_j + \beta_3 \text{battery}_j + \beta_4 \text{signal}_j + \varepsilon_j$

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2. Assume $\varepsilon_j \sim$ iid Gumbel distribution

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3. Probability of choosing phone *j*: $P_j = \frac{e^{\beta' x_j}}{\sum_k^J e^{\beta' x_k}}$

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3. Probability of choosing phone *j*: $P_j = \frac{e^{\beta' x_j}}{\sum_k^J e^{\beta' x_k}}$

4. Estimate β_1, β_2, β_3, β_4 via maximum likelihood estimation

Willingness to Pay

Respondents on average are willing to pay $XX to improve battery life by XX%

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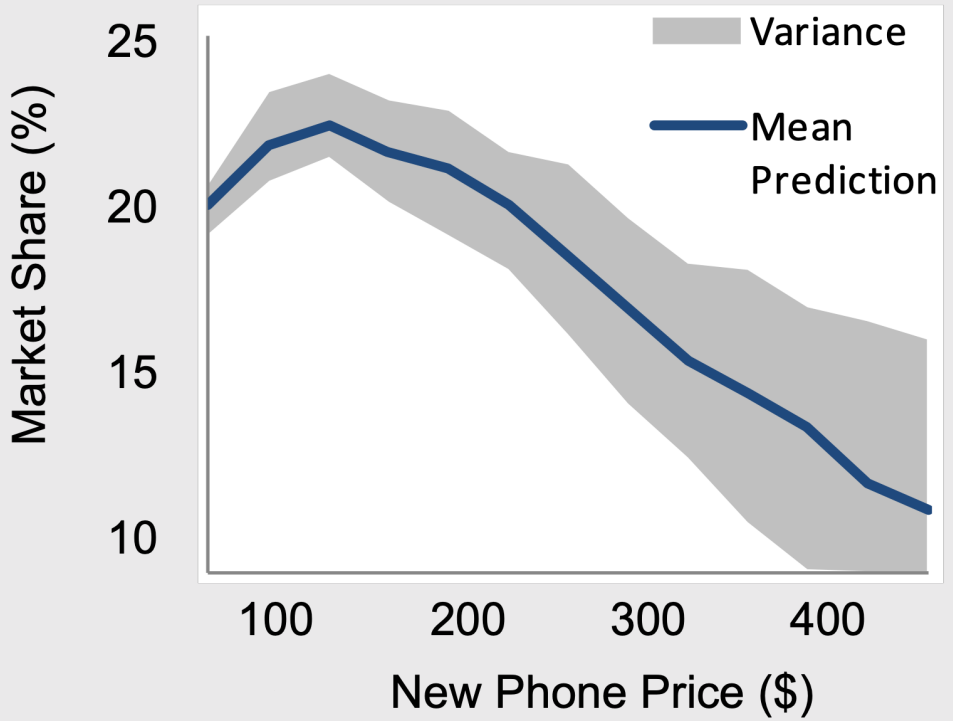
Make predictions

$$P_j = \frac{e^{\hat{\beta}' x_j}}{\sum_k^J e^{\hat{\beta}' x_k}}$$



Choice-Based Conjoint Analysis Steps

1. Design a survey (design of experiment)
2. Implement it online
3. (Collect data) <- not covering this today
4. Estimate models

Software for Choice-Based Conjoint Analysis

	Sawtooth Software	JMP Statistical Discovery	Stata	gene
Experiment Design	✅	✅	✅	✅
Online Surveys	✅			
Model Estimation	✅	✅	✅	

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- **Licenses cost $$$**

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- **Licenses cost $$$**
- **Not reproducible**

FOSS for Choice-Based Conjoint Analysis

Experiment Design

Online Surveys

form{`r}

Model Estimation

Back to workshop website:

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