



👤 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



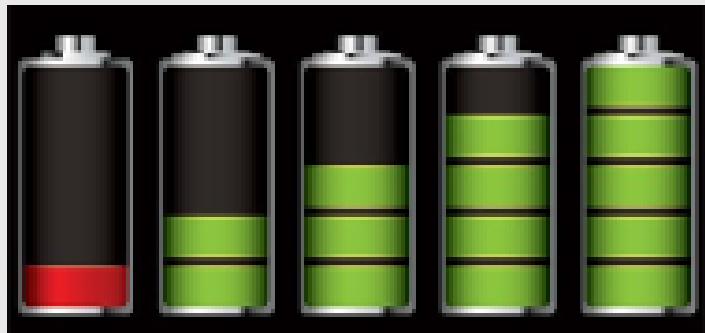
How can you find out know what people want?



Which feature do you care more about?



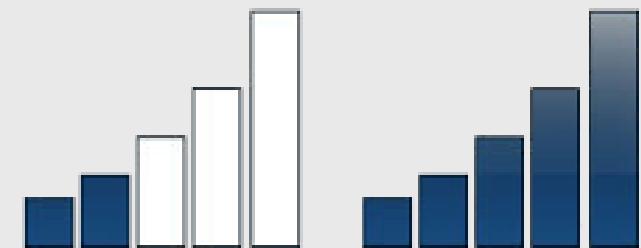
Battery Life?



Brand?

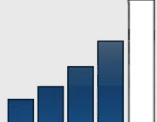
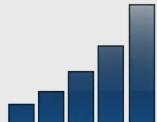
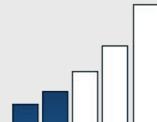


Signal quality?



Conjoint Analysis:

Use choice data to model preferences

<u>Attribute</u>	<u>Phone 1</u>	<u>Phone 2</u>	<u>Phone 3</u>
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. $u_j = \beta_1 \text{price}_j + \beta_2 \text{brand}_j + \beta_3 \text{battery}_j + \beta_4 \text{signal}_j + \varepsilon_j$

Use random utility framework to predict probability of choosing phone j

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

2. Assume $\varepsilon_j \sim \text{iid Gumbel distribution}$

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2. Assume $\varepsilon_j \sim \text{iid Gumbel distribution}$
3. Probability of choosing phone j : $P_j = \frac{e^{\beta' x_j}}{\sum_k^J e^{\beta' x_k}}$

Use random utility framework to predict probability of choosing phone j

1. $u_j = \beta_1 \text{price}_j + \beta_2 \text{brand}_j + \beta_3 \text{battery}_j + \beta_4 \text{signal}_j + \varepsilon_j$
2. Assume $\varepsilon_j \sim \text{iid Gumbel distribution}$
3. Probability of choosing phone j : $P_j = \frac{e^{\beta' x_j}}{\sum_k^J e^{\beta' x_k}}$
4. Estimate $\beta_1, \beta_2, \beta_3, \beta_4$ via maximum likelihood estimation

Willingness to Pay

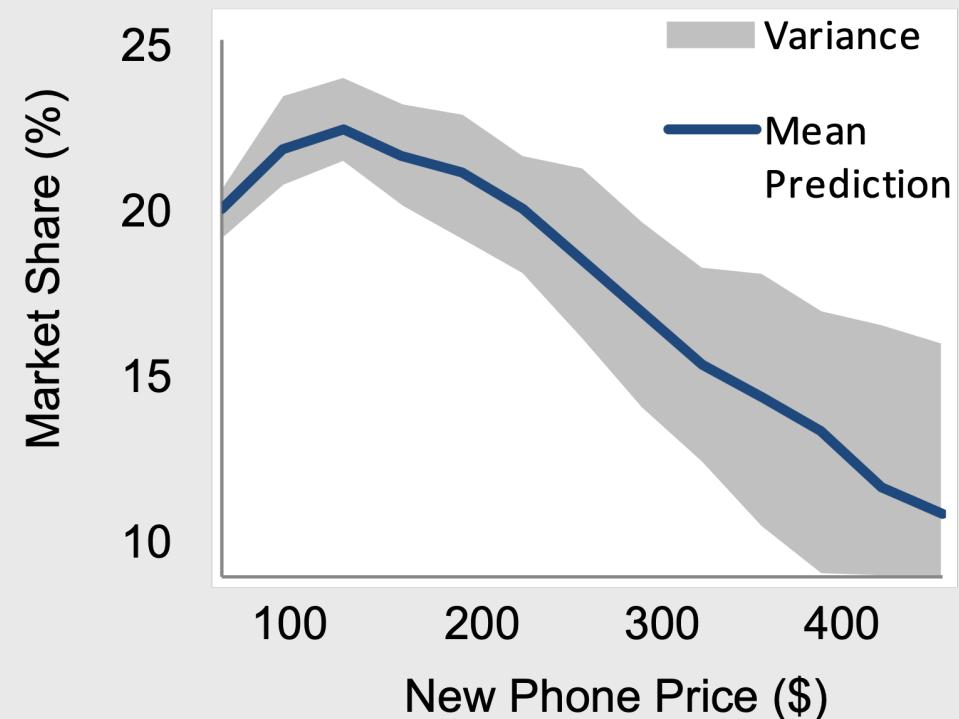
Respondents on average are
willing to pay \$XX to improve
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Willingness to Pay

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

Make predictions

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



Choice-Based Conjoint **Software**

Choice-Based Conjoint **Software**

Back to workshop website: <https://jhelvy.github.io/2023-qux-conf-conjoint/>

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