

# Supporting **Experiential** **Goals** in Route Planning



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HUMAN-COMPUTER INTERACTION

**WHCI+D**

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# Study Overview

# Research Question

- How do we support users in creating driving routes that are aligned with user-experience goals?
  - Can our interaction architecture provide this capability?

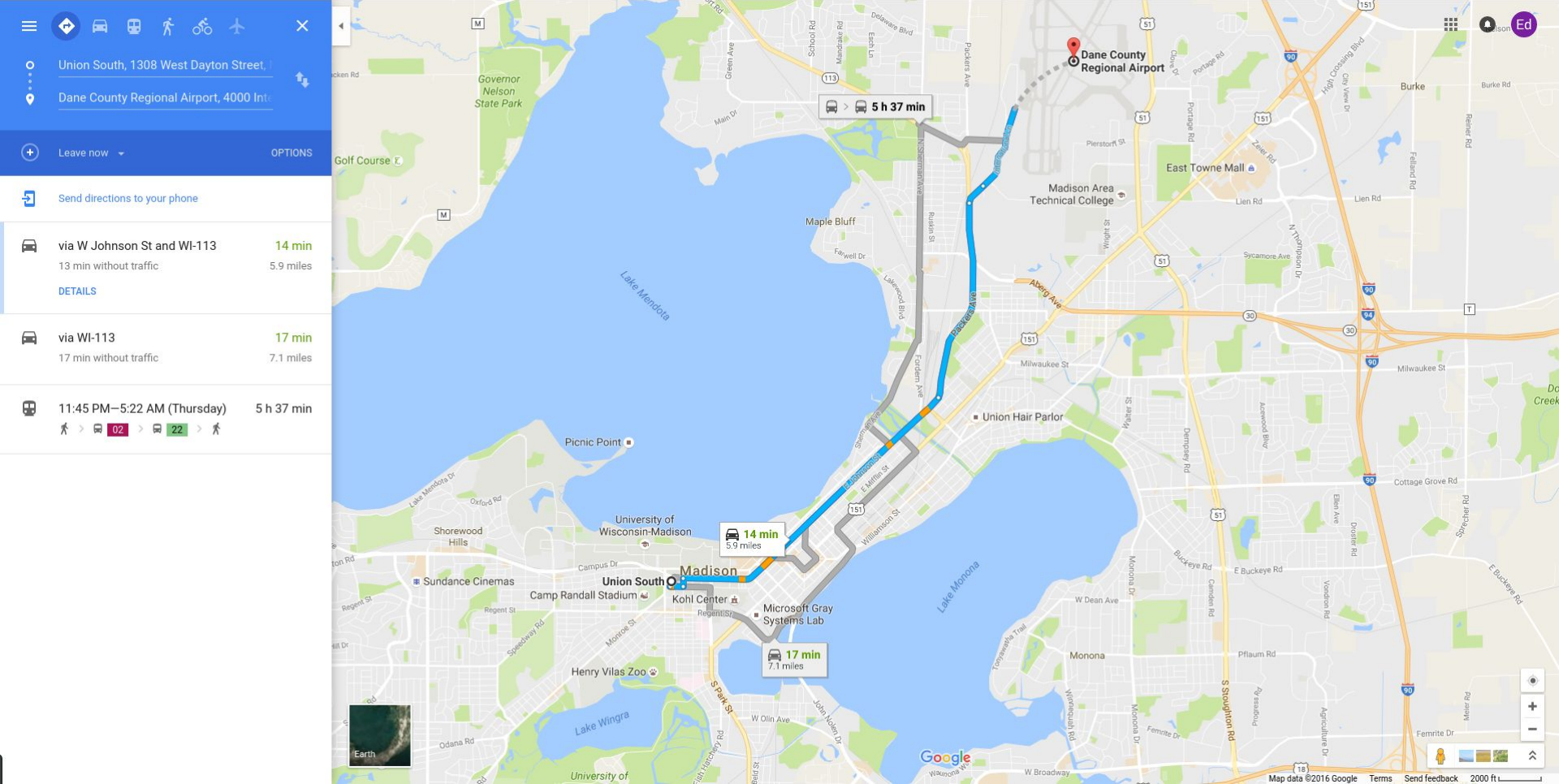
# Design

- 2 x 1 within-participants design
- Each participant uses both our interface and Google Maps, in a random order

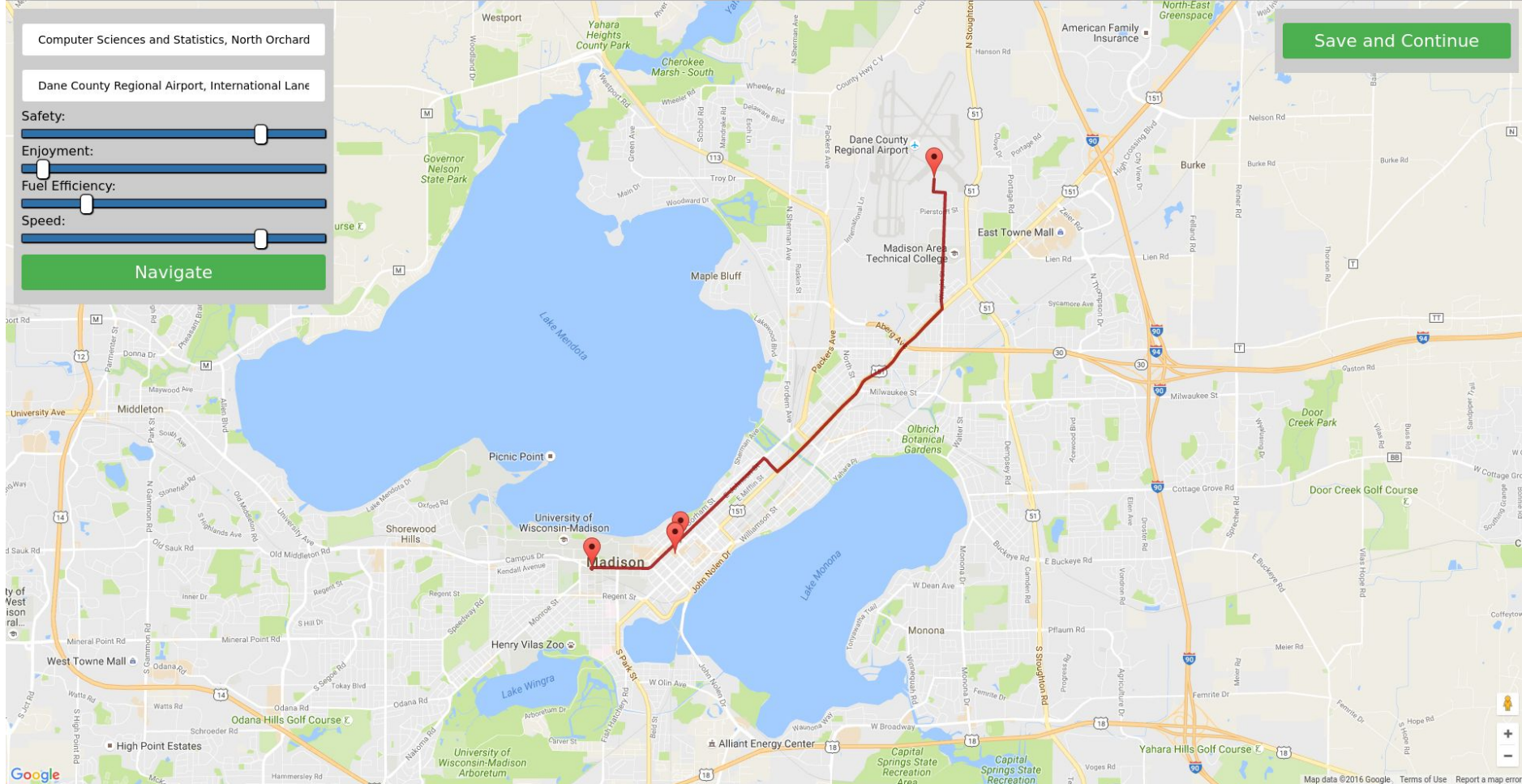
# Experimental Task

- Participants were given a set of 5 tasks for each interface and asked to craft routes for each task

Start	End	Scenario
Fitchburg City Hall	Woodman's (S Gammon Rd)	You just finished with a meeting that ran late and you still need to stop at the store before heading home for dinner. You're in a hurry to get there on time, but you just got a new car so you want to drive safely.
Union South	Dane County Regional Airport	Your grandparents were in town visiting you at school, and now you're taking them to the airport to catch their flight. Your grandma has requested that you take the safest route, but your grandpa is worried about missing their flight.



Google Maps Interface



# Collaborative Interface

# Objective Measures

- Number of operations it takes for the participant to create a “satisfactory” route
  - Defined by number of clicks and text entries
- Length of time it takes for the participants to create a “satisfactory” route
- Third-party ratings of the created route\*
  - How well does it fit the scenario?

\* Analysis is ongoing...

# Subjective Measures

- Participants' perceived matching between the intended goals given in the scenarios and the produced routes
- System Usability Scale
- Post-experiment interview\*

	Strongly Disagree 1	2	3	4	Strongly Agree 5
The routes I created matched the "safety" goal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The routes I created matched the "enjoyment" goal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The routes I created matched the "fuel efficiency" goal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The routes I created matched the "speed" goal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The routes I created matched the situations I was provided with overall	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* Analysis is ongoing...



# Findings

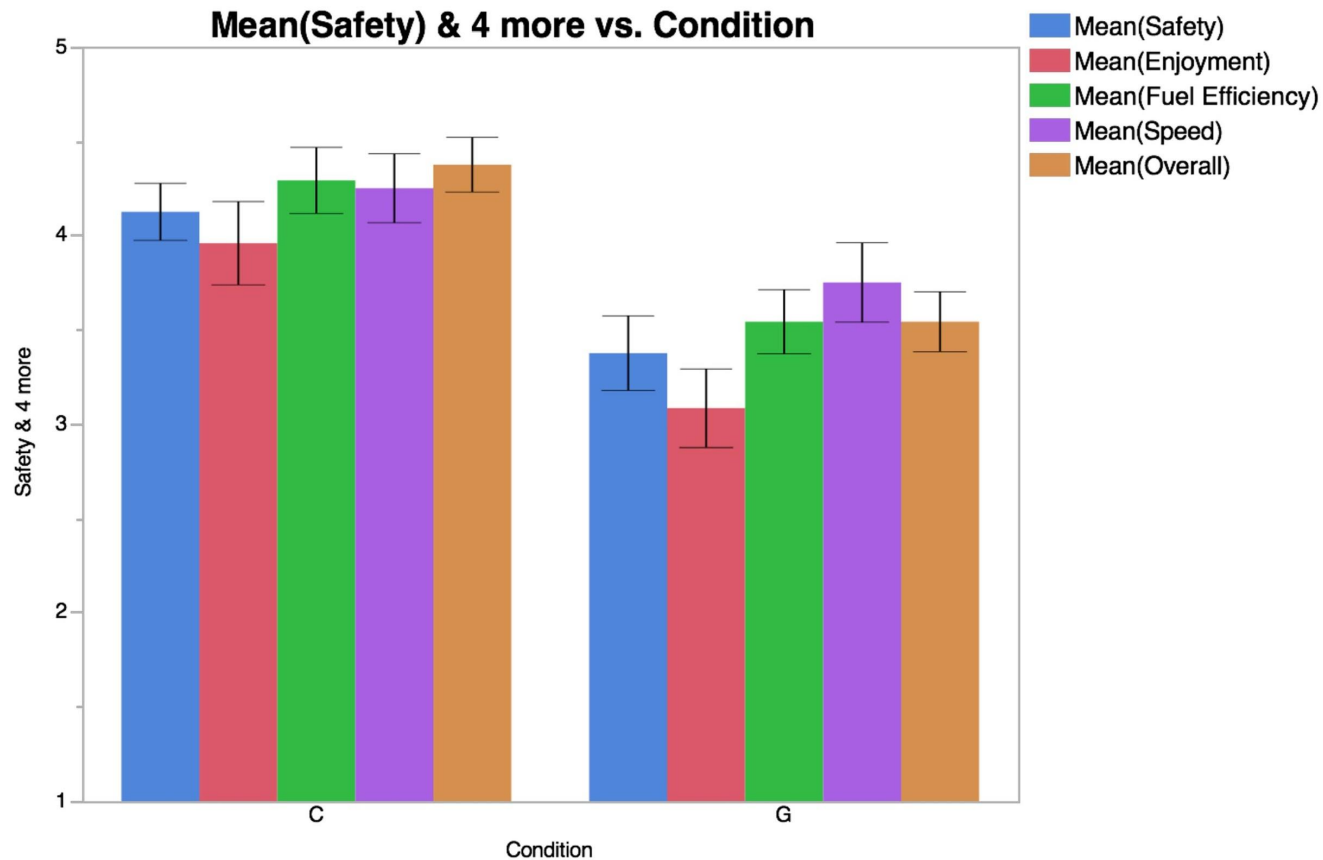
# Demographics

- Recruited 24 participants (12 males; 12 females)
- Ages ranged from 18 to 35:
  - $M=23.29$ ;  $SD=4.57$
- Number of miles driven per week:
  - $M=52.08$ ;  $SD=75.80$
- Years of driving experience:
  - $M=6.98$ ;  $SD=4.87$
- Indicated importance of subjective measures in driving (1-5):
  - $M=3.75$ ;  $SD=1.18$

# Overview of Findings

- Our system results in routes which better match users' experiential goals, while offering similar usability to state of the art systems.
- Users of our system are better supported in exploration, but this does not require more time.

# Perceived Matching

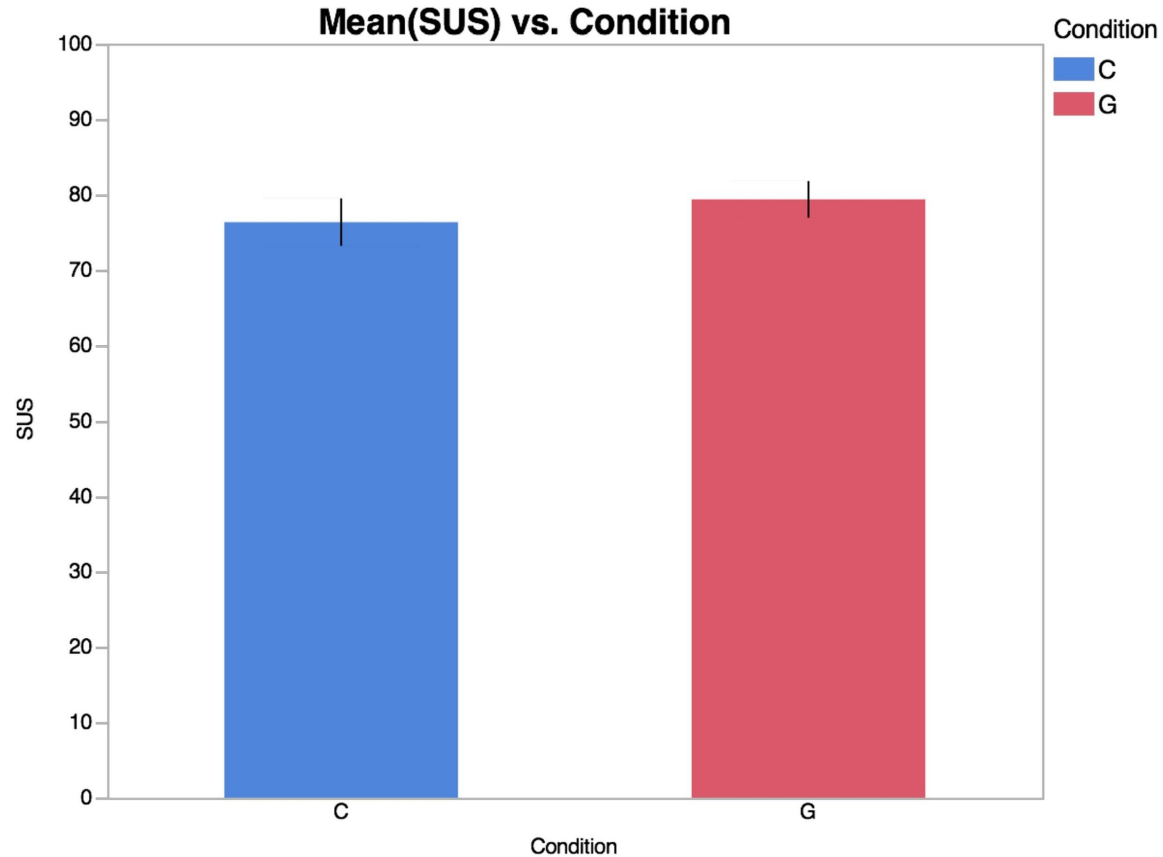


# Perceived Matching

Measure*	Collaborative ( $\mu$ )	Google Maps ( $\mu$ )	p-value
Safety	4.12	3.38	0.0017
Enjoyment	3.96	3.08	0.0002
Fuel Efficiency	4.29	3.54	0.0007
Speed	4.25	3.75	0.0428
Overall	4.38	3.54	<0.0001

\*Ratings on a scale from 1-5

# System Usability Scale

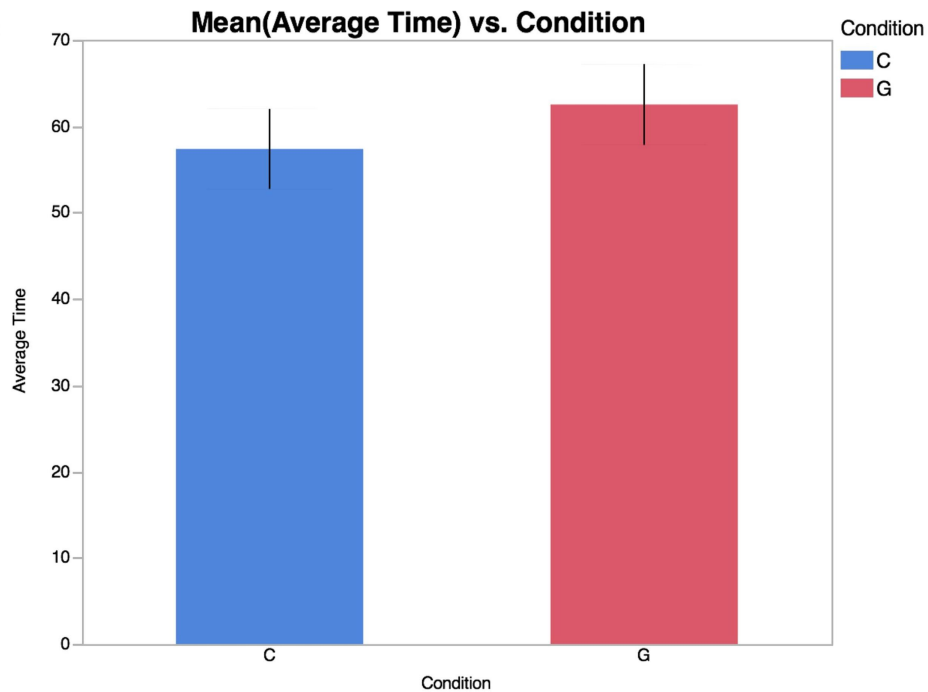
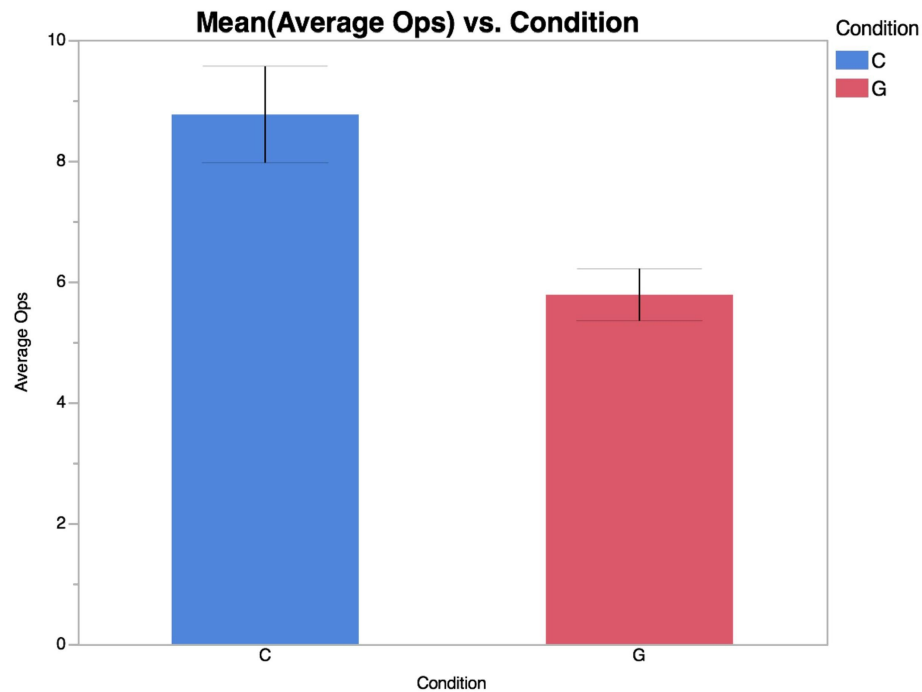


# System Usability Scale

	Collaborative( $\mu$ )	Google Maps( $\mu$ )	p-value
SUS*	76.35	79.38	0.3636

\*Range for SUS is 1-100 (M=68)

# Objective Results





# Objective Results

	Collaborative ( $\mu$ )	Google Maps ( $\mu$ )	p-value
Operations	8.77	5.78	0.0010
Time	57.34	62.53	0.2981

# Evaluator Package

# Package

- Wrapped route generation and evaluation algorithms into a Python package
- Provides parameters and user-defined score functions for experimentation
- Working on documentation, including tutorial and use examples

# Example

```
1 from evaluator import Evaluator, Weights
2
3 api_key = 'google_directions_api_key'
4 e = Evaluator(api_key)
5
6 start = {'lat': 43.0698, 'lng': -89.4126}
7 end = {'lat': 43.0746, 'lng': -89.3840}
8
9 graph = e.generate_graph(start, end)
10
11 weights = Weights(safety=0.5, fuel_eff=0.5, enjoyment=0.5, speed=0.5)
12 routeA = e.evaluate(graph, weights)
13
14 weights.changeWeights(safety=0.7, speed=0.3)
15 routeB = e.evaluate(graph, weights)
```

# Thanks!

Questions? Comments?