Rapid Implementation of Test Design Using Python

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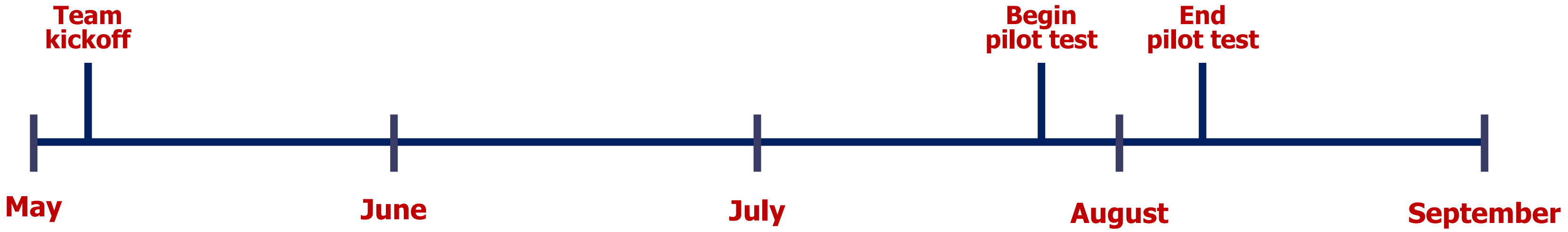
GASP Workshop
September 17, 2019

Background

- Machine learning (ML) prototype
  - Developed in early 2019
  - Used Occupational Requirements Survey (ORS) and other supplemental datasets to train the model
  - Predicts the top-five most likely Standard Occupational Classification (SOC) codes

Pilot Test

- Computer-Assisted Review (CAR) Pilot
  - A small team formed in May, 2019
  - Test the feasibility of implementing the ML algorithm into the production cycle, specifically in the review process
  - Three weeks of testing in the actual ORS production environment
    - From late July to early August



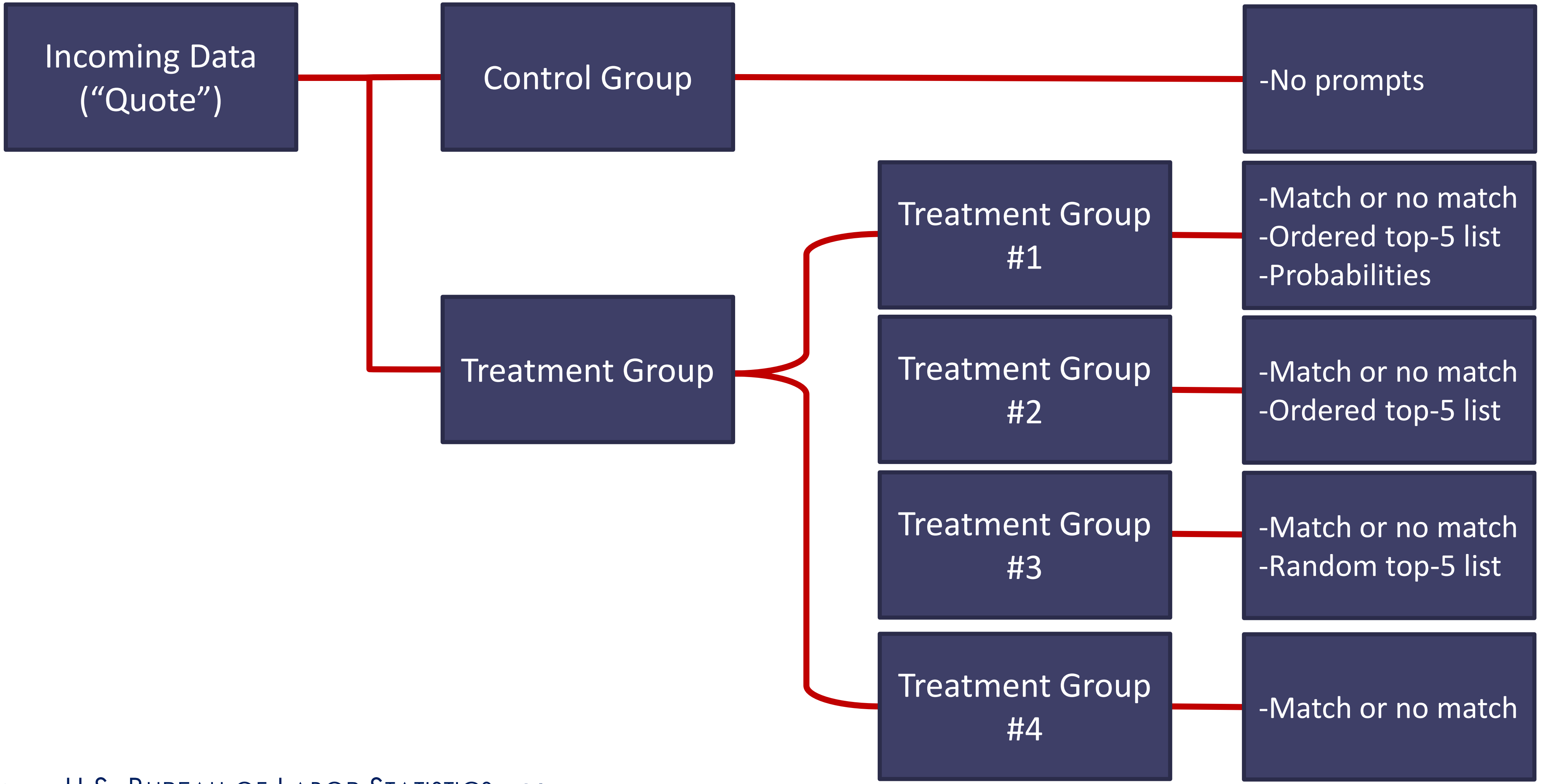
Questions to Answer

- The effects of CAR on SOC code review
  - Its effects on the time spent reviewing the SOC code
  - Its effects on the number of questions being sent out
  - Its effects on the review resulting in a positive change
- The effects of CAR on reviewer bias
  - Do exposures to ML algorithm's outputs result in reviewers favoring (or not favoring) specific SOC codes?

Test Design

- Randomized, controlled crossover trial
  - Eight participants from the microdata review staff
  - Each participant expected to review approximately 150 incoming data
  - Every incoming data reviewed by a participant gets randomly assigned to a control/treatment group

Test Design



Incoming Data (“Quote”)

Control Group

-No prompts

Treatment Group

Treatment Group #1

-Match or no match
-Ordered top-5 list
-Probabilities

Treatment Group #2

-Match or no match
-Ordered top-5 list

Treatment Group #3

-Match or no match
-Random top-5 list

Treatment Group #4

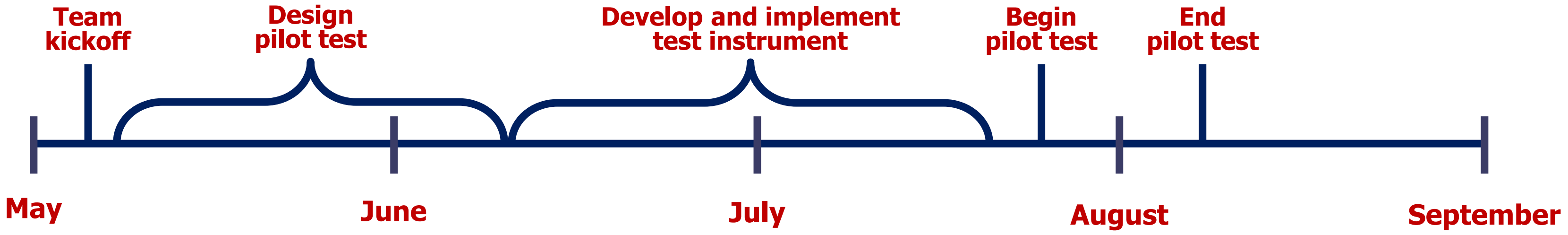
-Match or no match

Challenges and Constraints

- Some information are readily captured by the existing production/review system
  - SOC codes
  - Questions sent
- Other information are not available
  - Time spent on reviewing a SOC code
  - Reviewer's expected SOC code

Challenges and Constraints

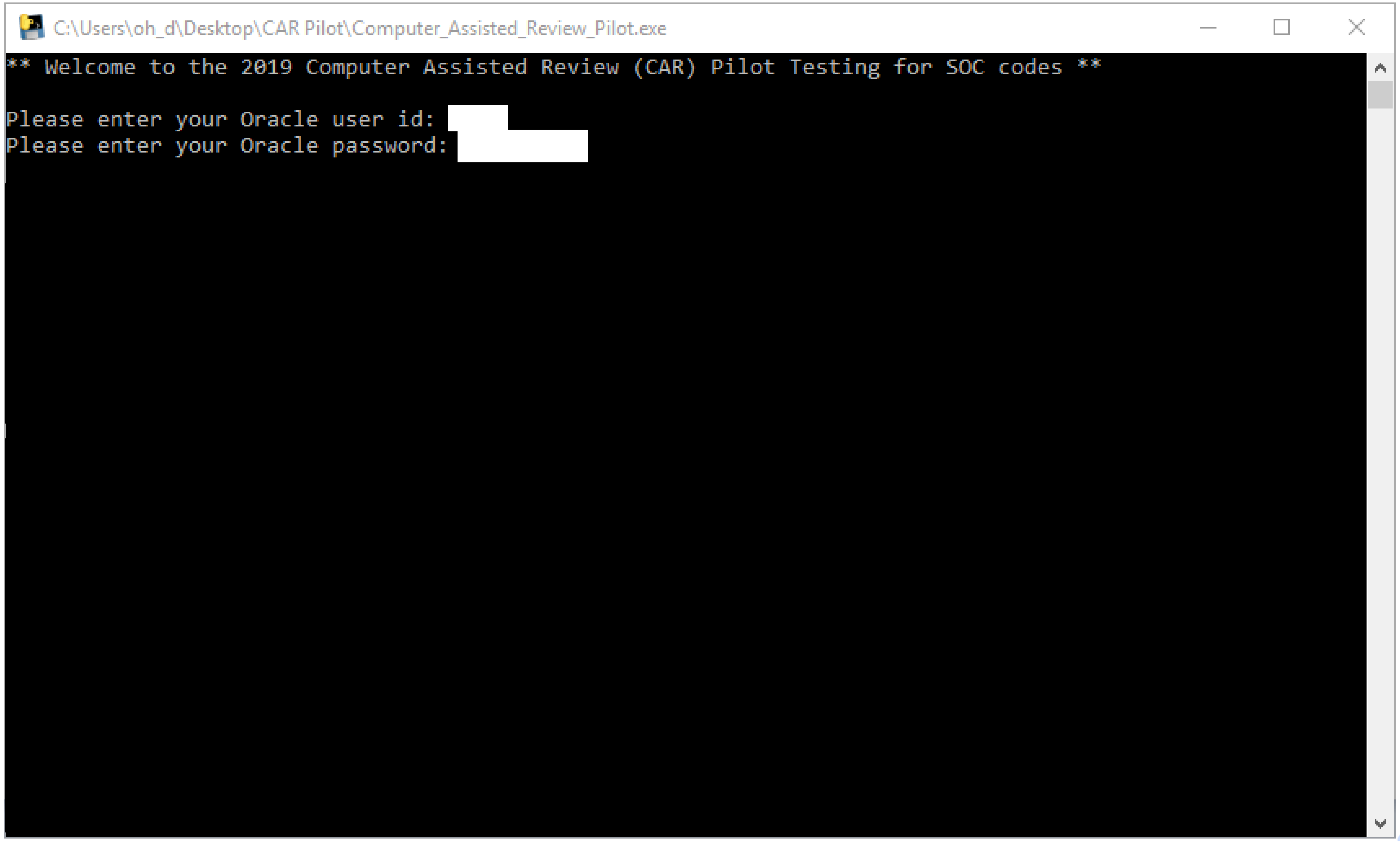
- Random assignment
  - Test instrument must be able to perform random assignments
- Resource constraint
  - Minimal disturbance on the actual production
- Time constraint
  - A little over a month to develop and implement the test instrument



Benefits of Using Python

- Same language as the one used to develop the ML algorithm
  - Can easily import the ML algorithm that has been *Pickle*-ed
- Can create a standalone application that is easily distributable
- Can take user inputs
- Can access database
- Can output varying prompts based on random assignments
- Can write to a centralized dataset

Test Instrument



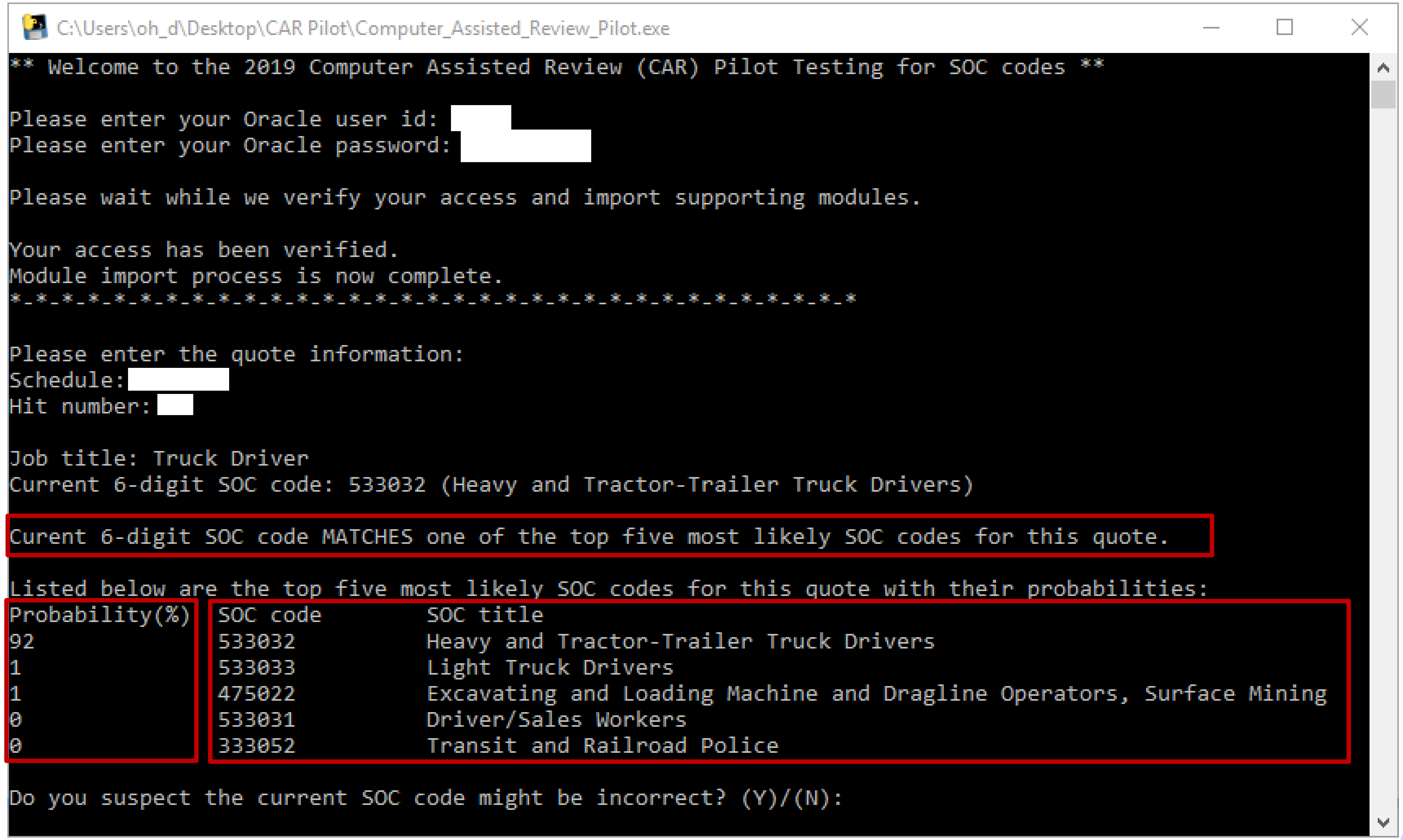
C:\Users\oh_d\Desktop\CAR Pilot\Computer_Assisted_Review_Pilot.exe

```
** Welcome to the 2019 Computer Assisted Review (CAR) Pilot Testing for SOC codes **

Please enter your Oracle user id: [redacted]
Please enter your Oracle password: [redacted]
```

Retrieve information from the database

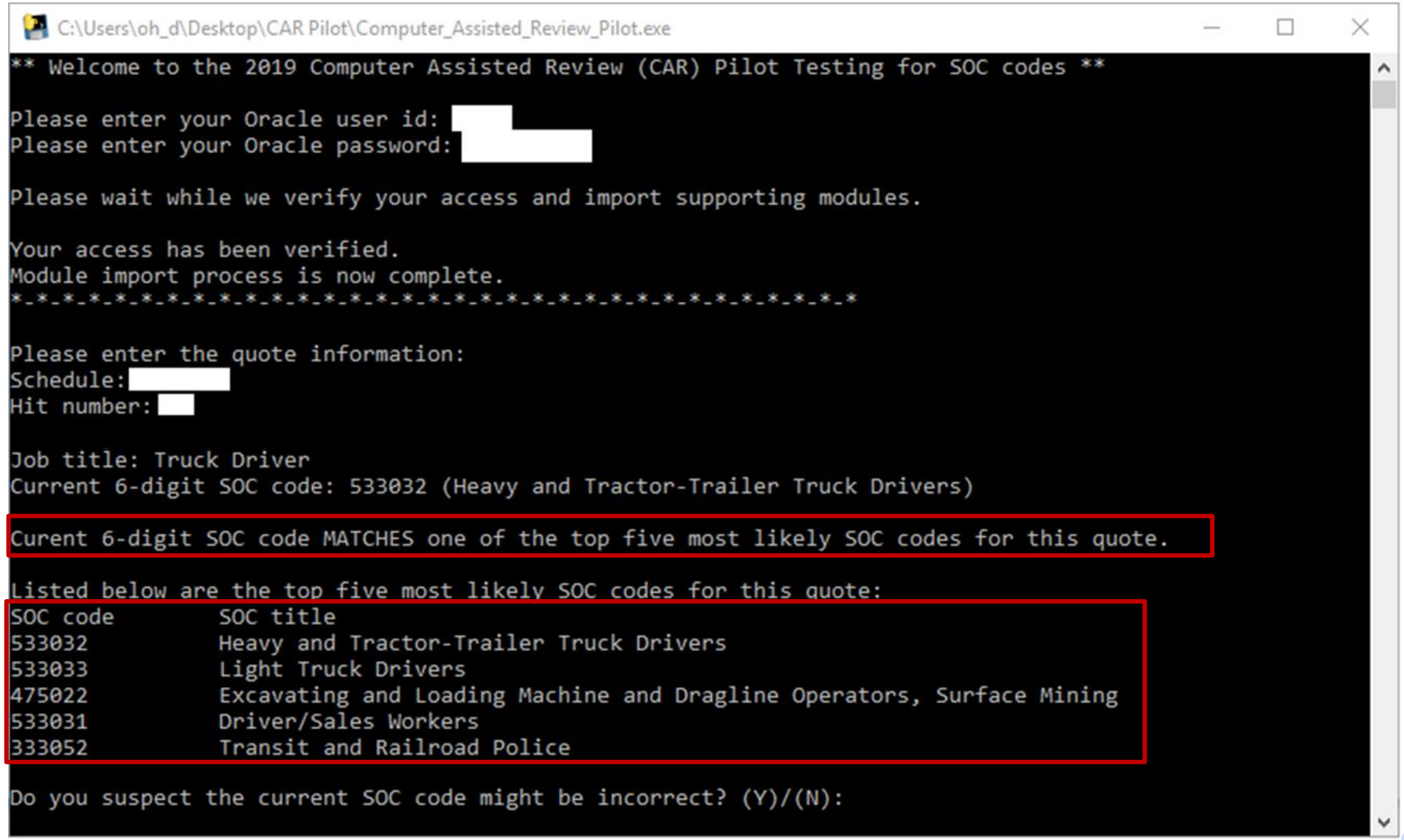
Show varying prompts based on random assignment

Test Instrument – Treatment #1 Prompt


C:\Users\oh_d\Desktop\CAR Pilot\Computer_Assisted_Review_Pilot.exe

```
** Welcome to the 2019 Computer Assisted Review (CAR) Pilot Testing for SOC codes **

Please enter your Oracle user id: [redacted]
Please enter your Oracle password: [redacted]

Please wait while we verify your access and import supporting modules.

Your access has been verified.
Module import process is now complete.
*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*

Please enter the quote information:
Schedule: [redacted]
Hit number: [redacted]

Job title: Truck Driver
Current 6-digit SOC code: 533032 (Heavy and Tractor-Trailer Truck Drivers)

Curent 6-digit SOC code MATCHES one of the top five most likely SOC codes for this quote.

Listed below are the top five most likely SOC codes for this quote with their probabilities:
Probability(%)  SOC code        SOC title
92              533032          Heavy and Tractor-Trailer Truck Drivers
1               533033          Light Truck Drivers
1               475022          Excavating and Loading Machine and Dragline Operators, Surface Mining
0               533031          Driver/Sales Workers
0               333052          Transit and Railroad Police

Do you suspect the current SOC code might be incorrect? (Y)/(N):
```

Test Instrument – Treatment #2 Prompt



C:\Users\oh_d\Desktop\CAR Pilot\Computer_Assisted_Review_Pilot.exe

```
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Please enter your Oracle user id: [redacted]
Please enter your Oracle password: [redacted]

Please wait while we verify your access and import supporting modules.

Your access has been verified.
Module import process is now complete.
*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*

Please enter the quote information:
Schedule:[redacted]
Hit number:[redacted]

Job title: Truck Driver
Current 6-digit SOC code: 533032 (Heavy and Tractor-Trailer Truck Drivers)

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Do you suspect the current SOC code might be incorrect? (Y)/(N):
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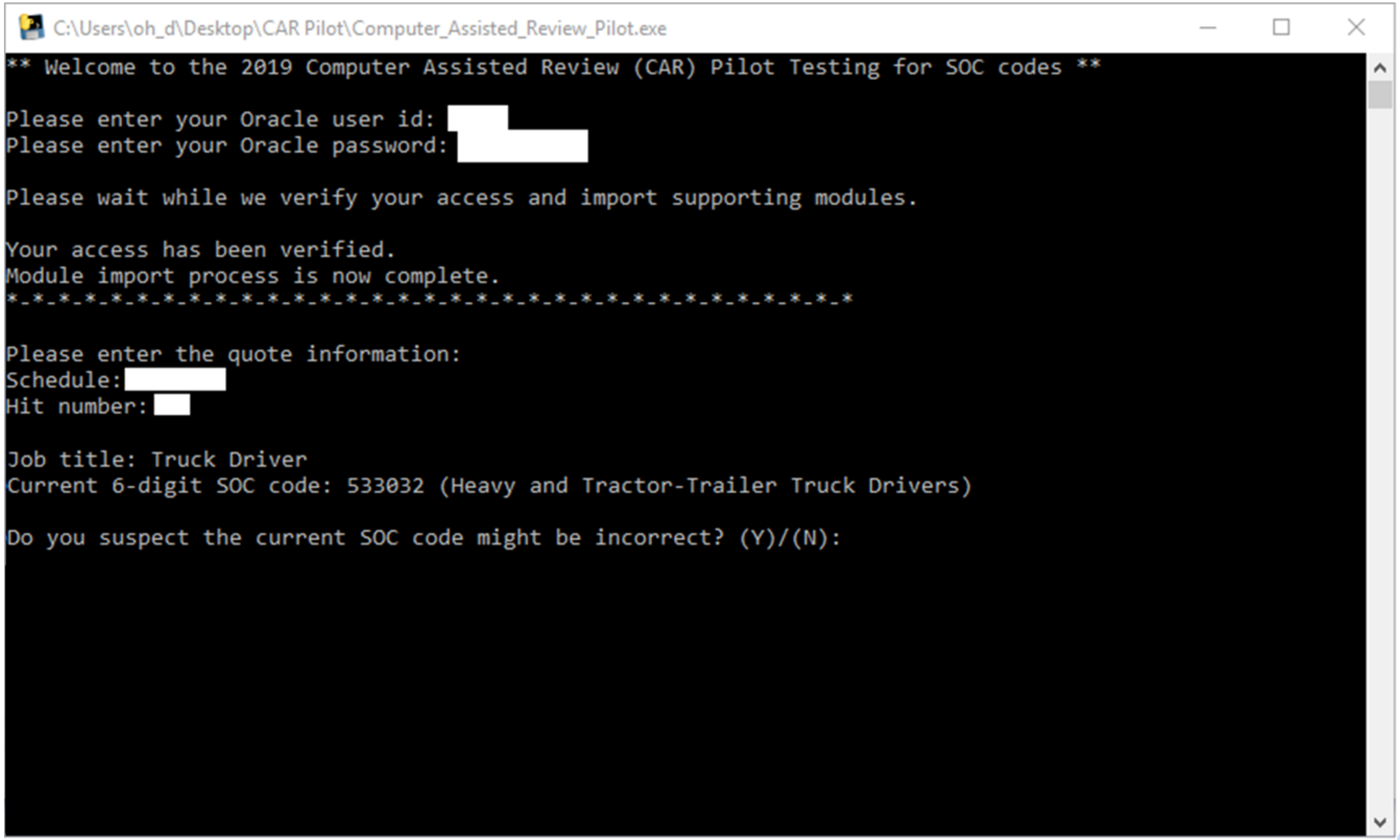
Test Instrument – Control Prompt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Please enter the quote information:
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Hit number:[redacted]

Job title: Truck Driver
Current 6-digit SOC code: 533032 (Heavy and Tractor-Trailer Truck Drivers)

Do you suspect the current SOC code might be incorrect? (Y)/(N):
```

Test Instrument – Follow-up Questions

- Whether the participant suspects the entered SOC code to be incorrect
  - If yes, a follow-up question on what the correct SOC code would be
- Participant's familiarity with the entered SOC code
  - On a scale from 1 to 5
- Duration (in seconds) collected in the background
  - From the time the random assignment was made to the time participant moved on to the next quote

Lessons for Future Iterations

- Create a more robust centralized database structure for collecting information
  - Few instances of application crashing on the users due to multiple users writing to the central dataset at the same time
- Develop a web-based application to improve user experience

Conclusion

- Pilot test ended in early August with almost 1,500 quotes reviewed using the test instrument
- The flexibility of Python language and its various applicability enabled the rapid implementation of a randomized, controlled crossover trial
- Results from the pilot test?
  - Currently being analyzed

Contact Information

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