Query Clarification in Voice Search

The case of ambiguous terms and false memories

Master's Thesis by Arefeh Bahrami

Refrees:
Prof. Dr. Benno Stein
Prof. Dr. Matthias Hagen

Advisor:
Johannes Kiesel

Clarification in text-based search

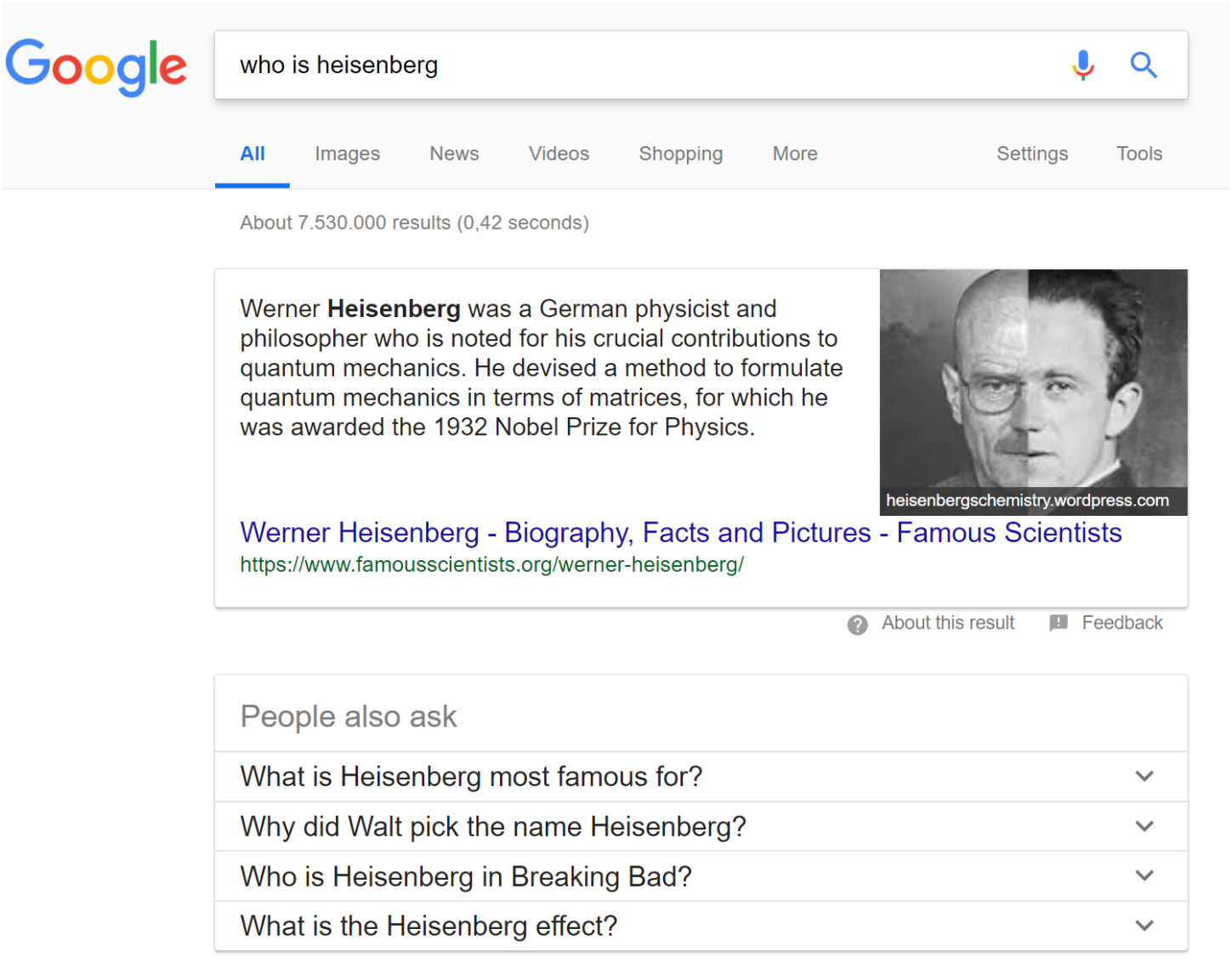
who is heisenberg

who is heisenberg
who is heisenberg **based on**
who is heisenberg **in breaking bad**
who is heisenberg **and what did he do**
who is heisenberg **seeking alpha**
who is heisenberg **and what did he determine**
who is heisenberg **report**
who is heisenberg **yahoo**
who **was** heisenberg **and schrodinger**
who is **werner** heisenberg

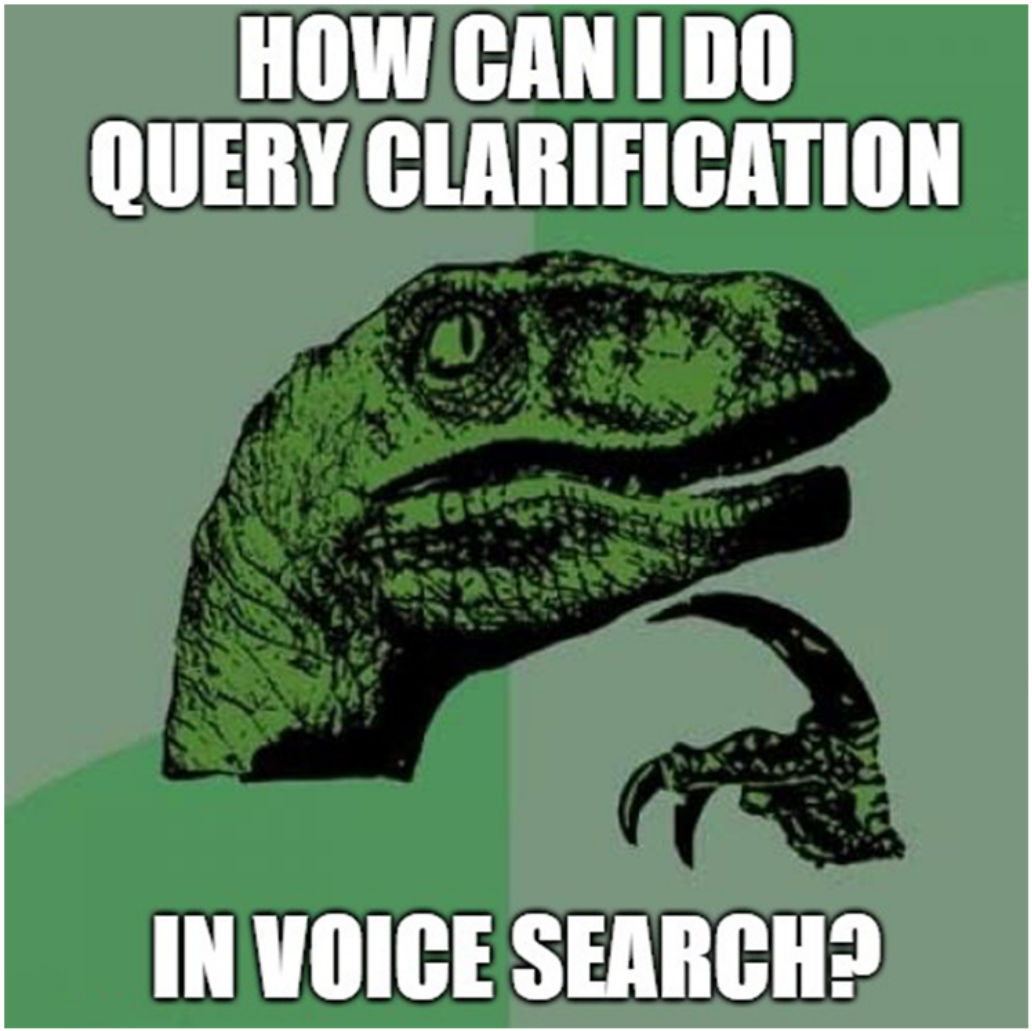
Searches related to who is heisenberg

heisenberg **principle**
heisenberg **breaking bad**
werner heisenberg
werner heisenberg **experiment**
heisenberg **theory**
heisenberg **meaning**
heisenberg **atomic theory**
elisabeth heisenberg

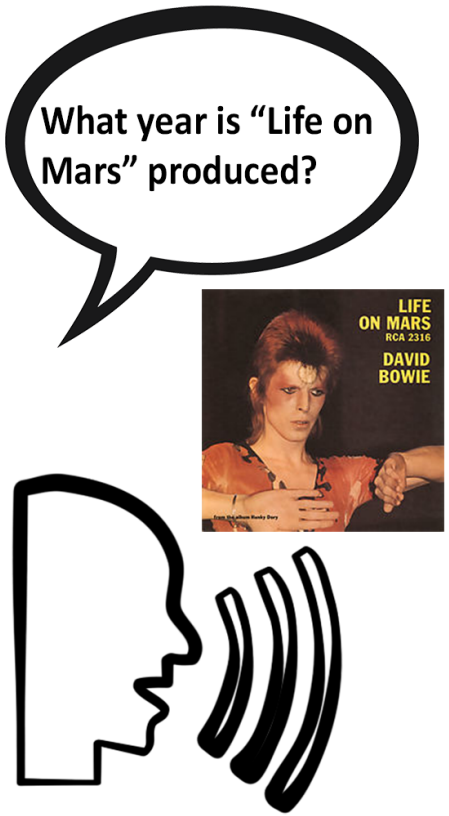
Clarification in text-based search



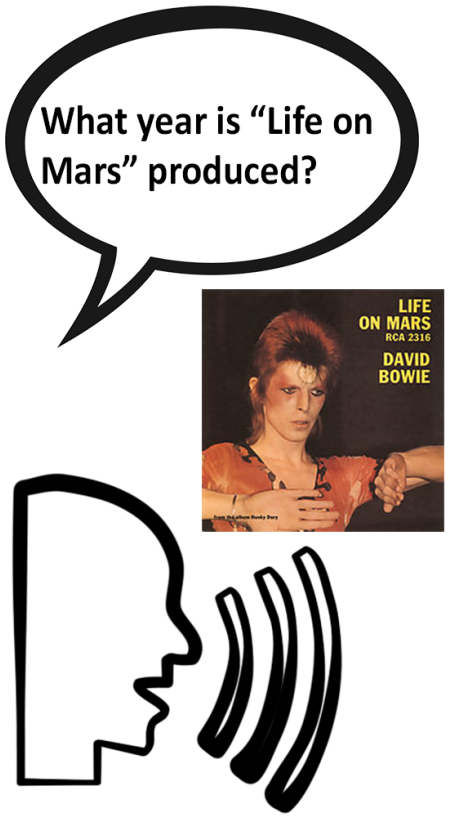
How about voice-based search?



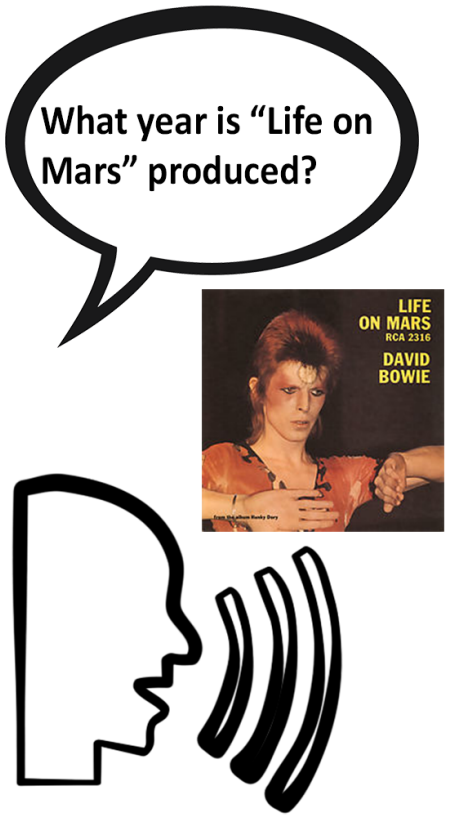
The Scenario

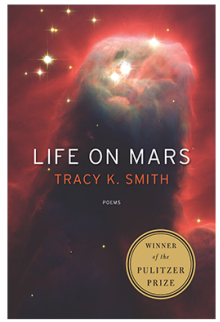


The Scenario

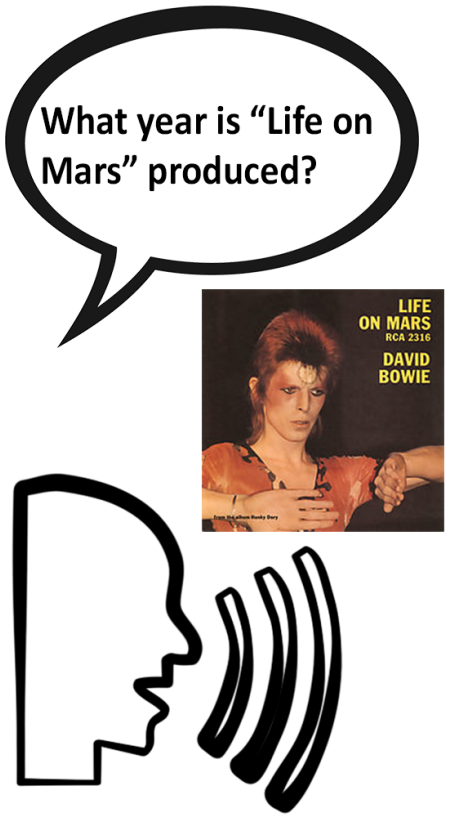


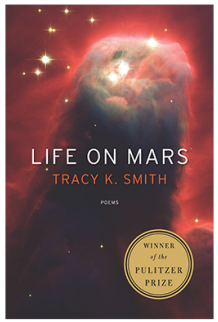
The Scenario



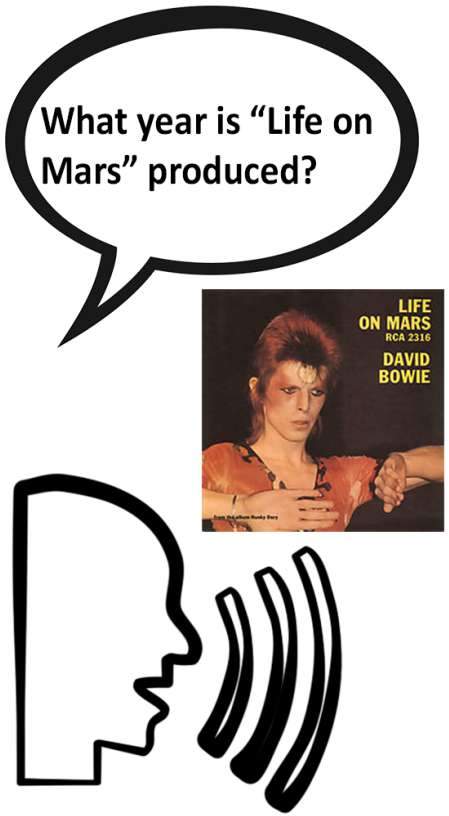


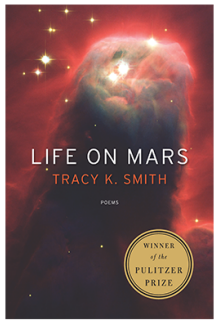
The Scenario



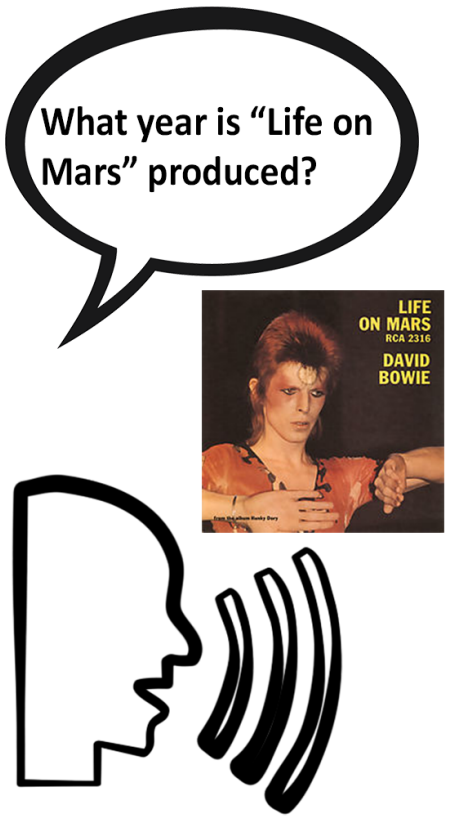


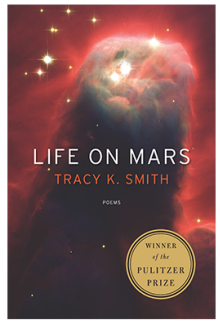
The Scenario

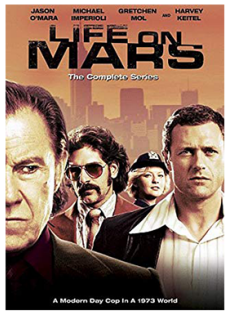




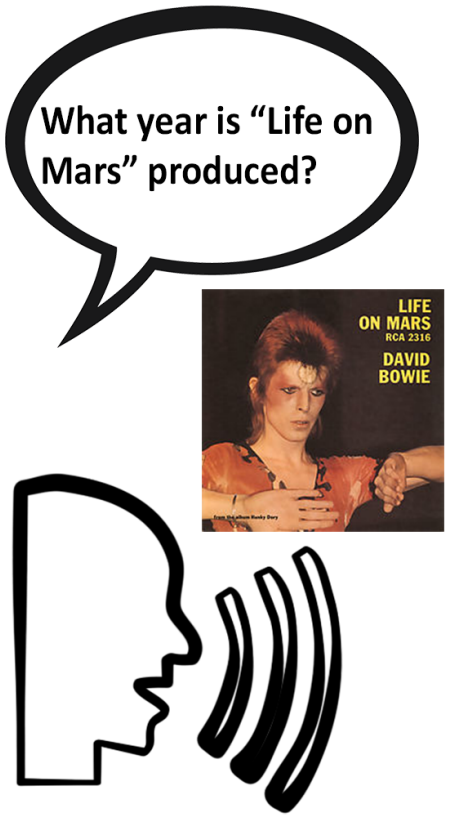
The Scenario

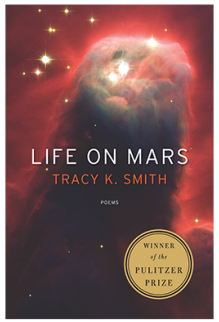


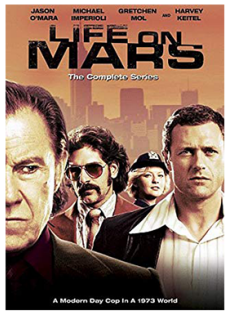




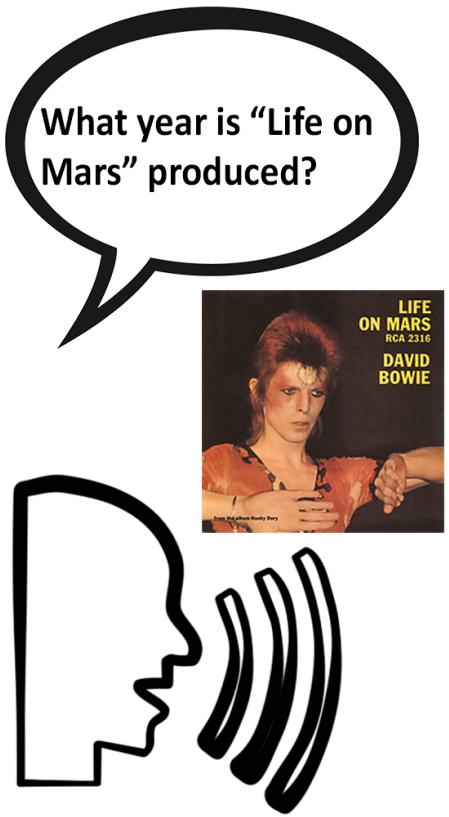
The Scenario

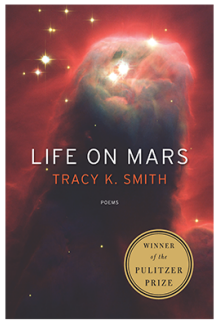


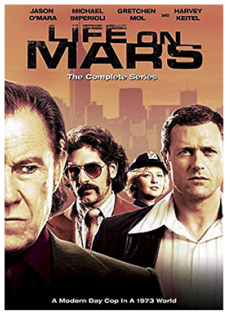




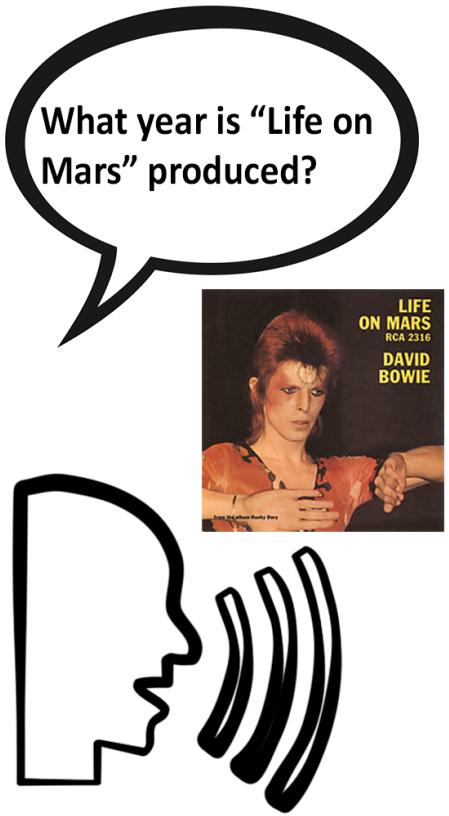
The Scenario



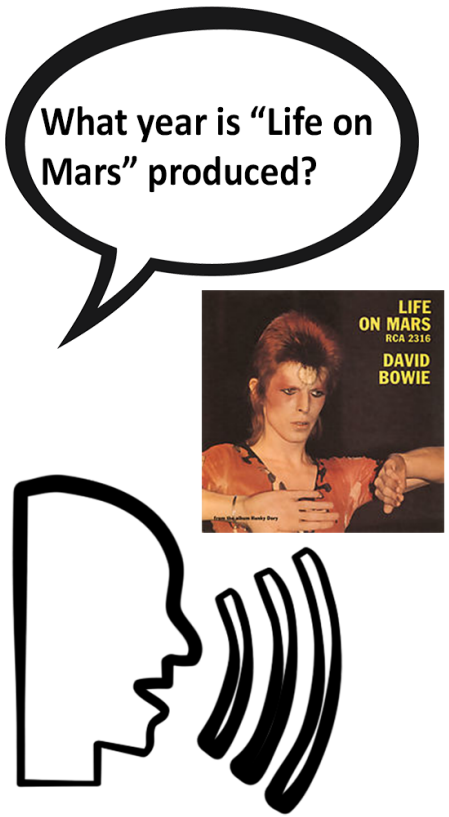




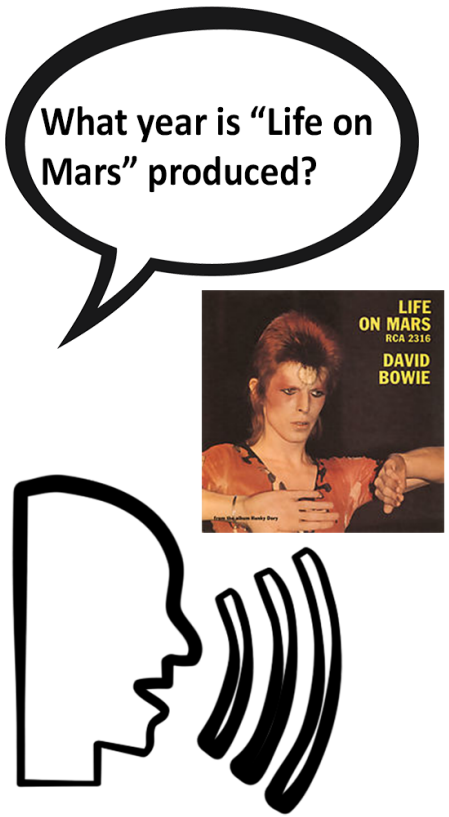
The Scenario



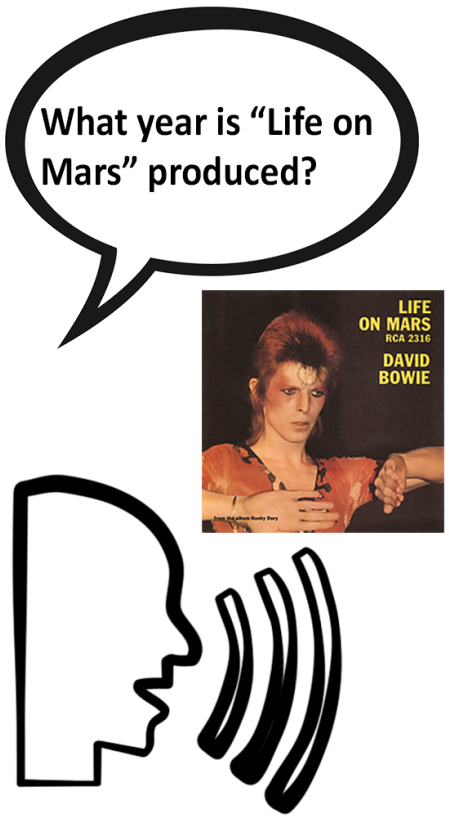
The Scenario



The Scenario



The Scenario



What was the first option?

Research questions

- **RQ I:** Does the user background affect user satisfaction when experiencing query clarification?
- **RQ II:** Do the length and the number of the clarifying options affect the user satisfaction?
- **RQ III:** What is the best way of clarifying the user's intent?

Section 2

Study 1: Clarifying Ambiguous Queries

Response types & Topics

- Direct
- 3-meanings
- 3-categories
- Many meanings (5-meanings)
- Longer explanations (3-long-meanings)
- Verify

Response types & Topics

- Direct
- 3-meanings
- 3-categories
- Many meanings (5-meanings)
- Longer explanations (3-long-meanings)
- Verify

Webis-Ambient-15 +

Study setup

Create mock-up skill for Amazon Alexa

- Natural set-up
- Real-time answer

Study setup

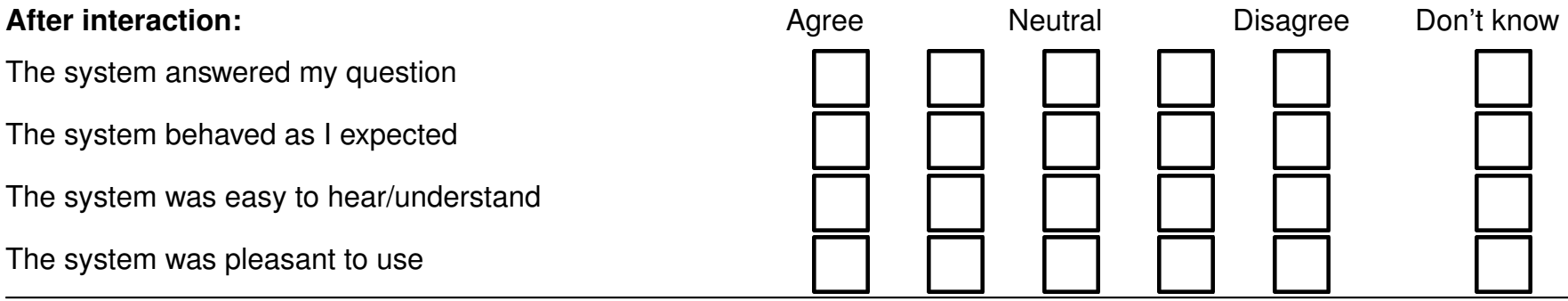
Task example:

Scenario: You want to surprise your Irish partner with an Irish cocktail called B-52, but you don't know how to make it.

Interaction start:

- Alexa. Find!
- How to do a B-52?

After interaction:



Study setup

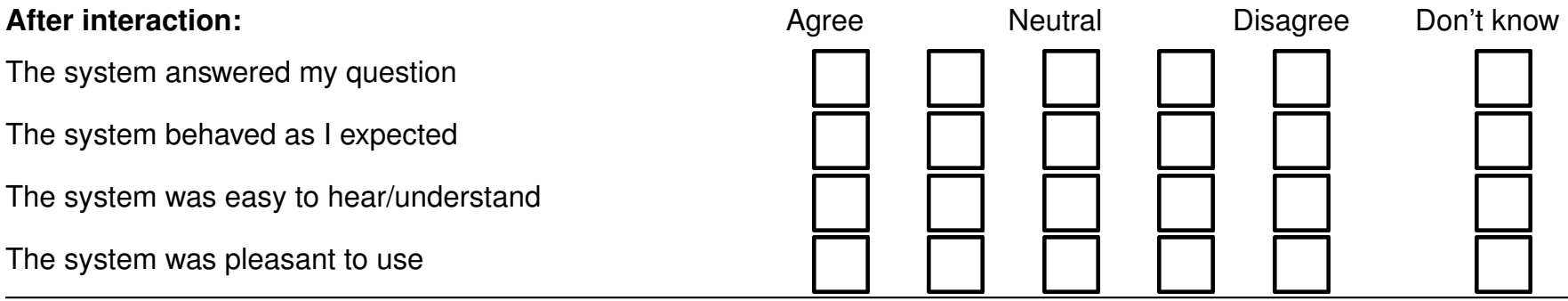
Task example:

Scenario: You want to surprise your Irish partner with an Irish cocktail called B-52, but you don't know how to make it.

Interaction start:

- Alexa. Find!
- How to do a B-52?

After interaction:



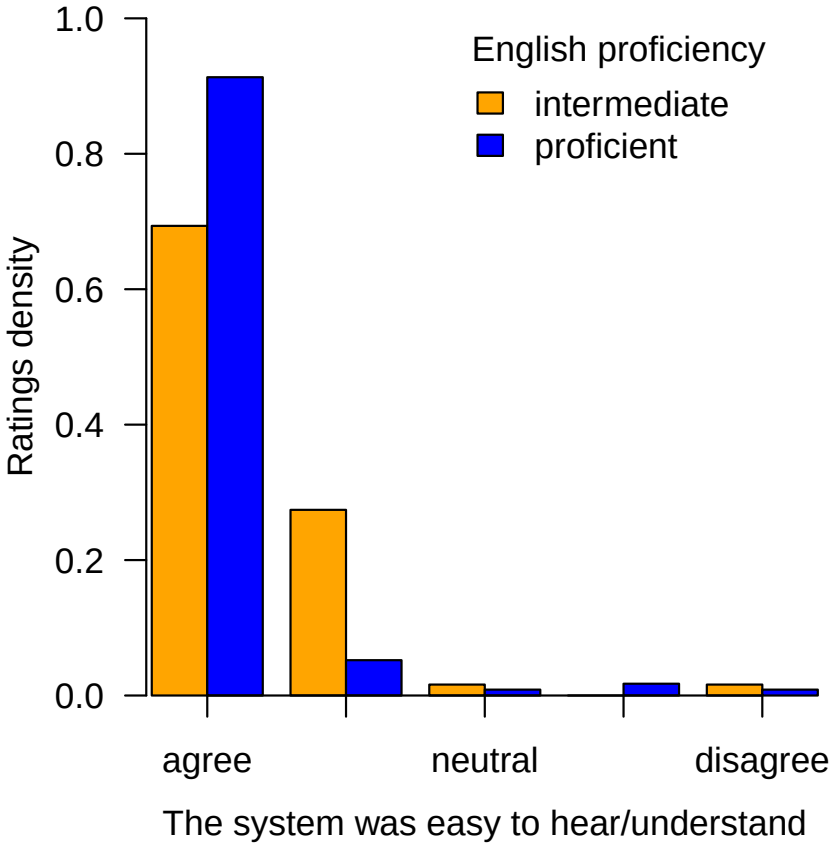
- 14 participants (9 proficient, 5 intermediate), 13 main tasks
- 182 interaction phases
- 728 ratings

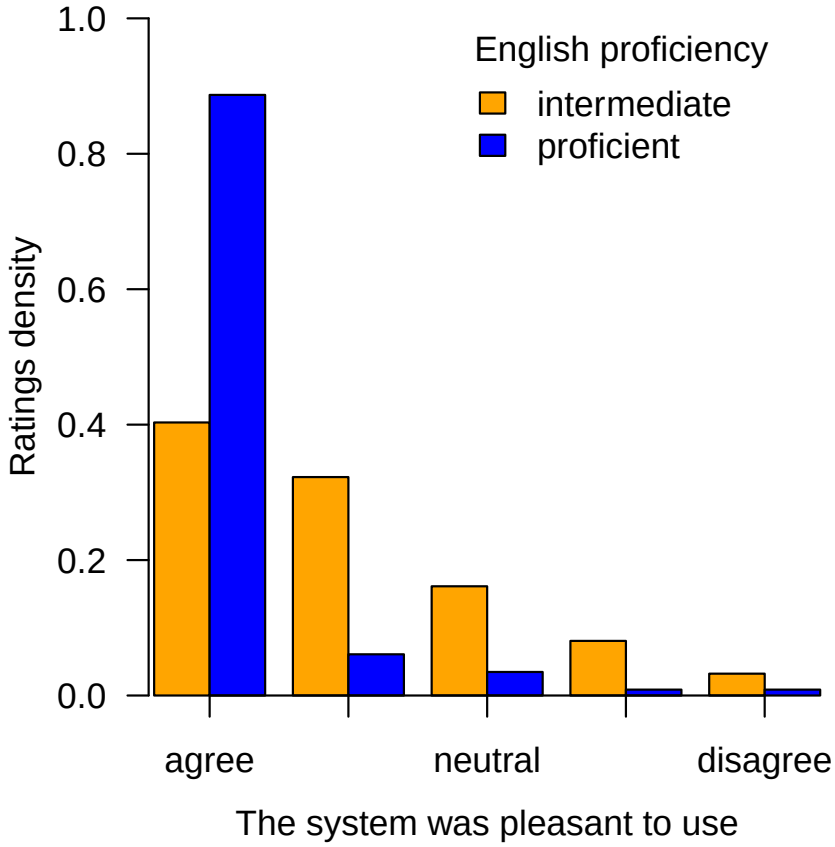
Research questions

- **RQ I:** Does the user background affect user satisfaction when experiencing query clarification?
- **RQ II:** Do the length and the number of the clarifying options affect the user satisfaction?
- **RQ III:** Does the user satisfaction decrease when the system ask for clarification?

Results

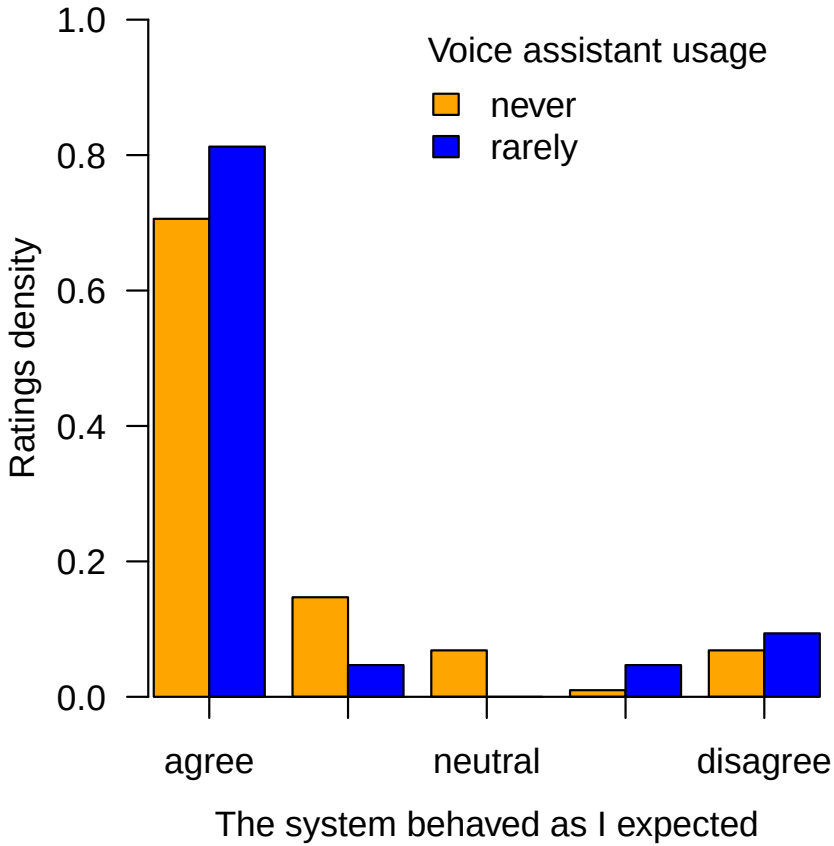
Understandability and pleasantness by English fluency level

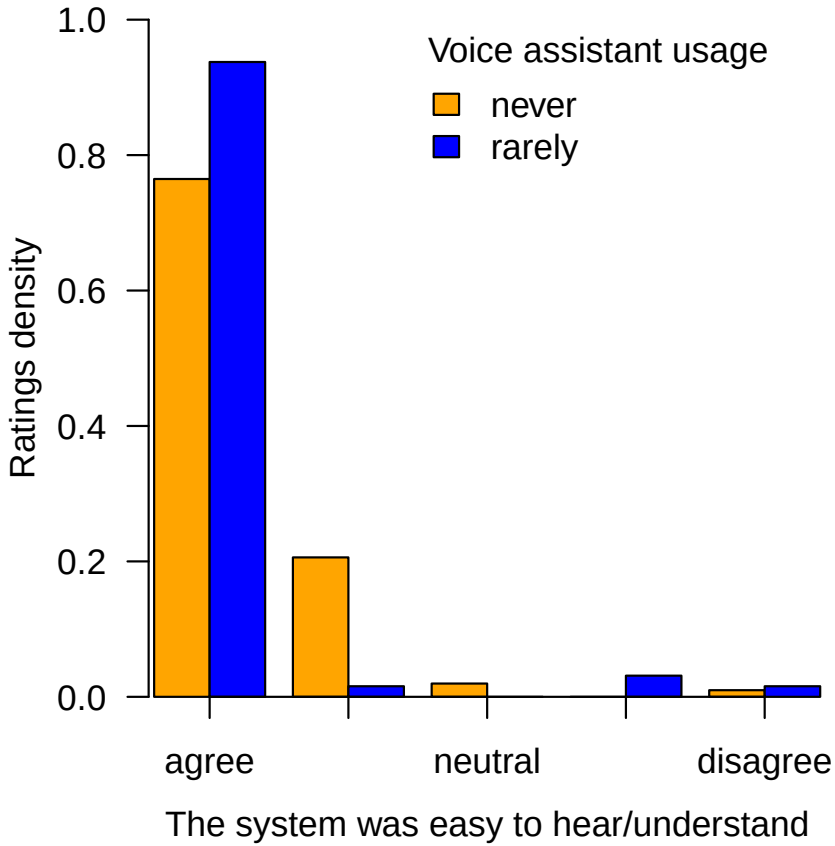




Results

Predictability and understandability by frequency of a participant's voice interface usage:



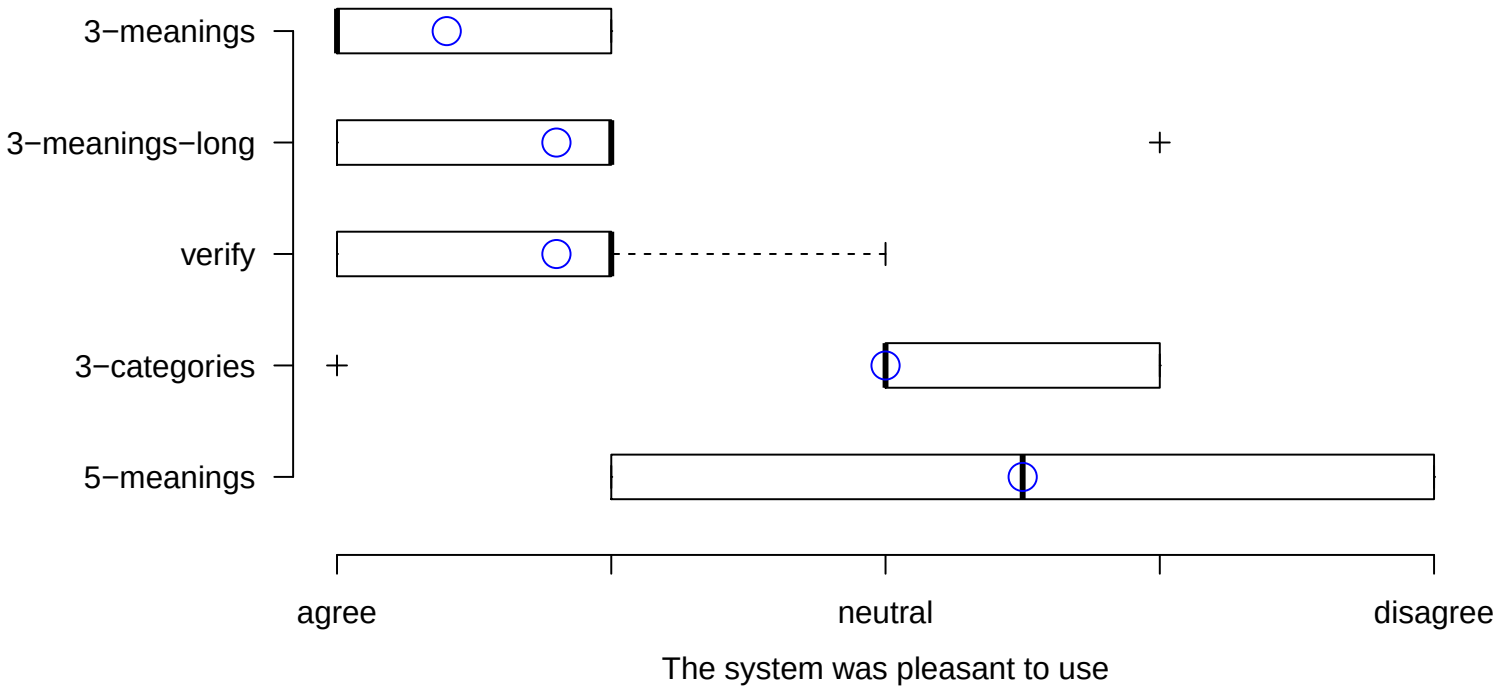


Research questions

- **RQ I:** Does the user background affect user satisfaction when experiencing query clarification?
- **RQ II:** Do the length and the number of the clarifying options affect the user satisfaction?
- **RQ III:** Does the user satisfaction decrease when the system ask for clarification?

Results

Distribution and mean (∘) of pleasantness for participants with intermediate English level by response method:



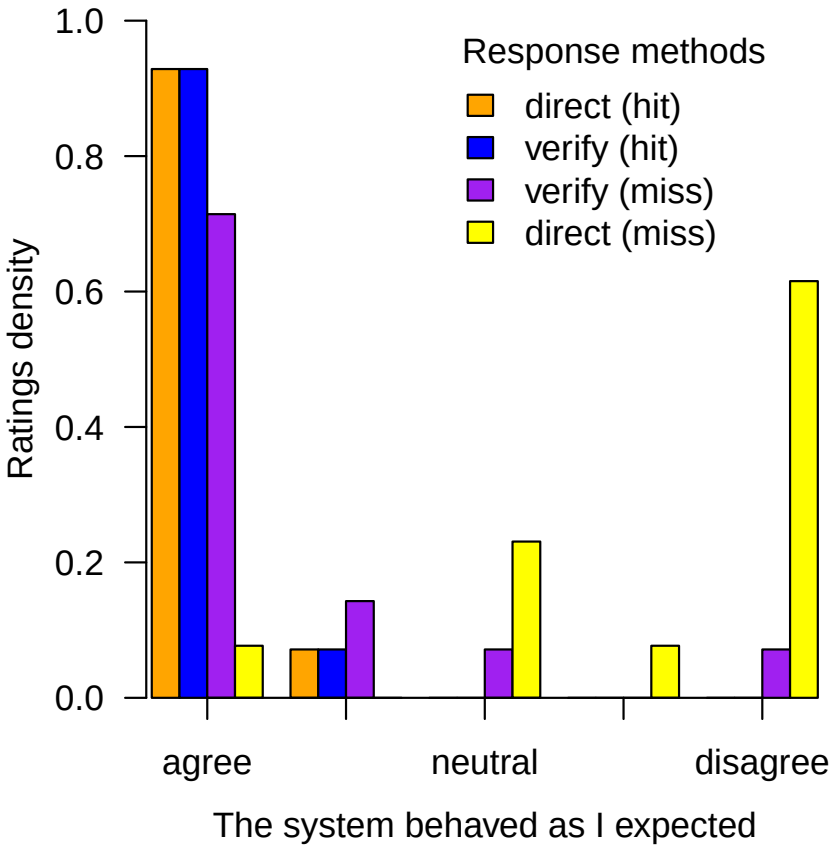
3-meaning response method (μ_p = 1.4)

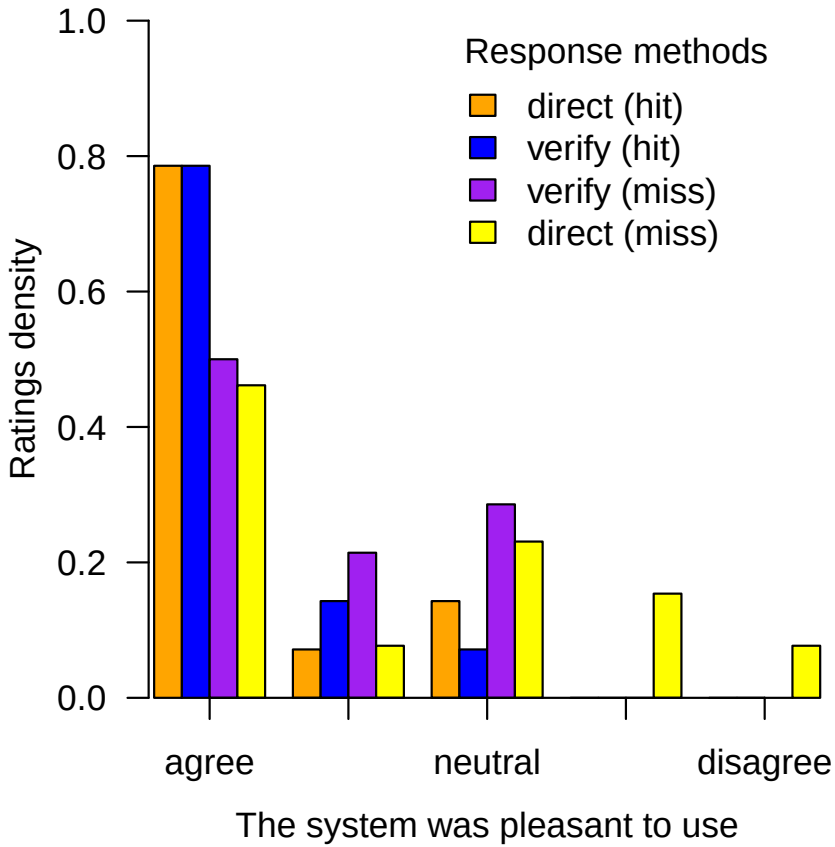
Research questions

- **RQ I:** Does the user background affect user satisfaction when experiencing query clarification?
- **RQ II:** Do the length and the number of the clarifying options affect the user satisfaction?
- **RQ III:** Does the user satisfaction decrease when the system ask for clarification?

Results

Response-specific ratings for predictability and pleasantness:





Section 3

Study 2: Clarifying Queries with False Memories

Known-item search

Re-finding previously seen/heard items is not that easy!

False memories in question

Entertainment & Music Movies

What is this film with Maggie Smith?

Ok I watched this ages ago but forgot what its called, ok so there's this teacher and she has an affair with a student and gets into trouble and Maggie Smith plays a creepy woman trying to take care of her any ideas?

Update: Okay erm to add more, sorry I can't really remember.
Ok so she ends up hated by everyone because of her sleeping with the student, the student still loves her but everyone hates her except for Maggie Smith who loves her and the girl moves in with Maggie and then at the end finds out that Maggie loves her

Follow 3 answers

Answers Relevance

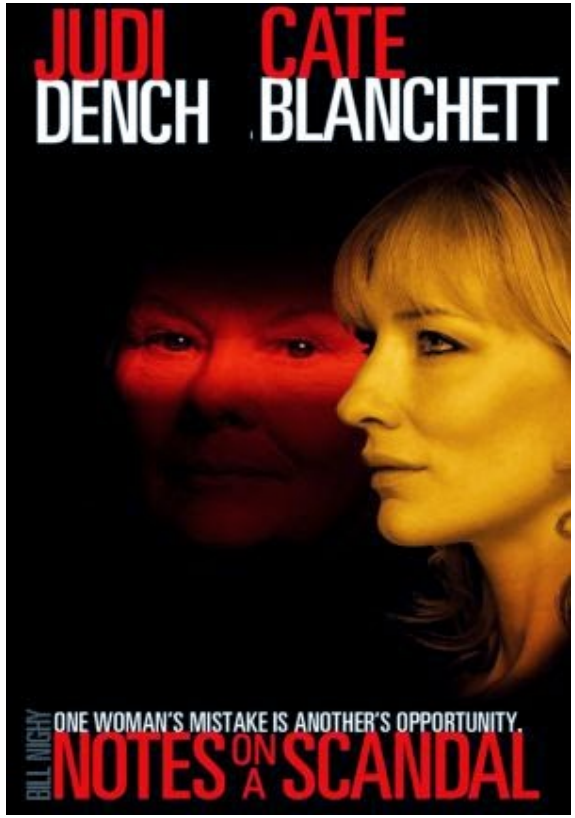
Best Answer: Are you positive it is Maggie Smith because what you described sounds like "Notes on a Scandal" but that stars Judi Dench: http://www.imdb.com/title/tt0465551/

Movie"..Maggie Smith plays a creepy woman..."

Question

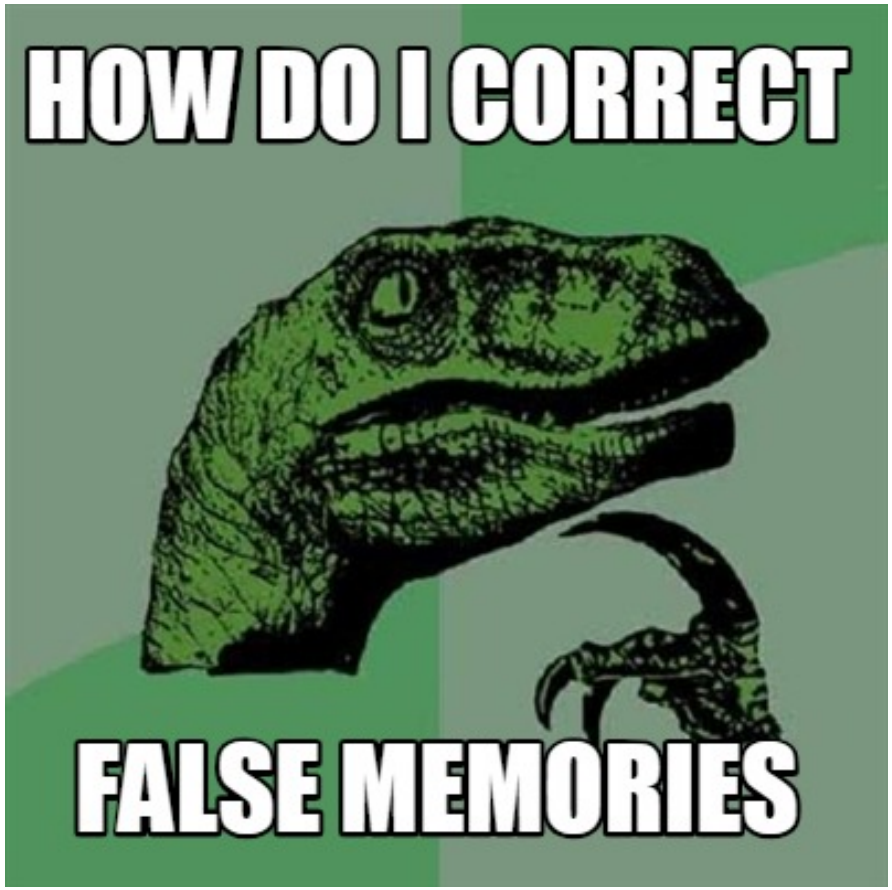
Movie"..Maggie Smith plays a creepy woman..."

Question



Actual known-item

Hmm...



Research questions

- **RQ I:** Does language fluency affect user satisfaction?
- **RQ II:** Do wrong clarifications degrade user satisfaction?
- **RQ III:** How to best clarify false memories?

Response types & Topics

- **None** no clarification (“Sorry, I don’t know that one!”)
- **Direct** answer query for a changed detail without informing users.
- **Negatively Clarified** (”Sorry, I don’t know that one, but...”)
- **Positively Clarified** (“You probably mean...”)

Response types & Topics

- **None** no clarification (“Sorry, I don’t know that one!”)
- **Direct** answer query for a changed detail without informing users.
- **Negatively Clarified** (”Sorry, I don’t know that one, but...”)
- **Positively Clarified** (“You probably mean...”)

Webis-KIQC-13

annotations for 2,755 questions

Study setup

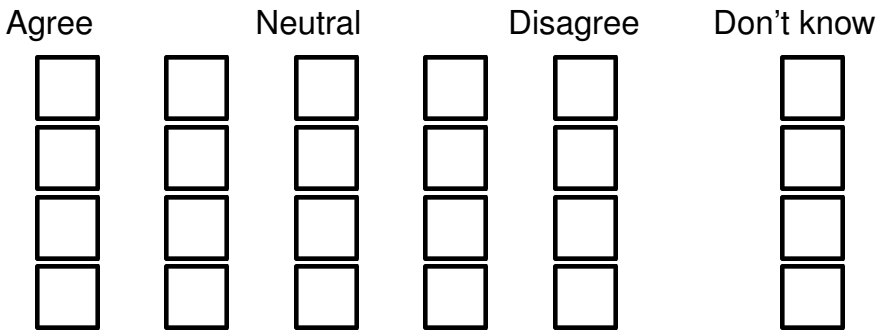
Task example:

Scenario: You try to remember the title of a controversial book that came out back in the 1990s and claimed scientific evidence that whites are genetically superior to blacks. You think it was called something like ”The *something* Factor.”

Interaction start: Alexa. Explore!

What is the title of the book from the 1990s that claimed superiority of Whites and is called ”The *something* Factor” ?

Post-interaction questions:



Study setup

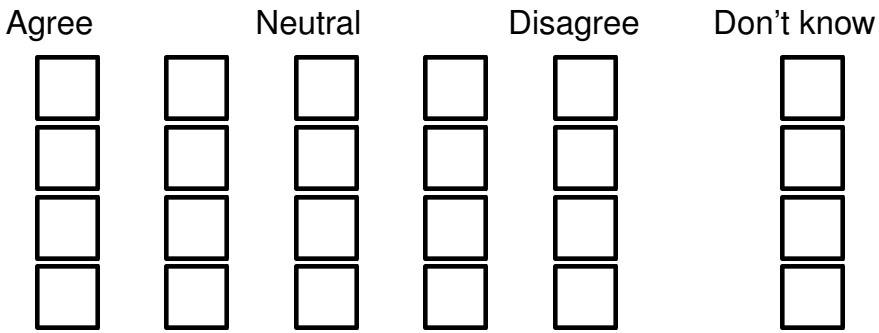
Task example:

Scenario: You try to remember the title of a controversial book that came out back in the 1990s and claimed scientific evidence that whites are genetically superior to blacks. You think it was called something like "The *something* Factor."

Interaction start: Alexa. Explore!

What is the title of the book from the 1990s that claimed superiority of Whites and is called "The *something* Factor" ?

Post-interaction questions:



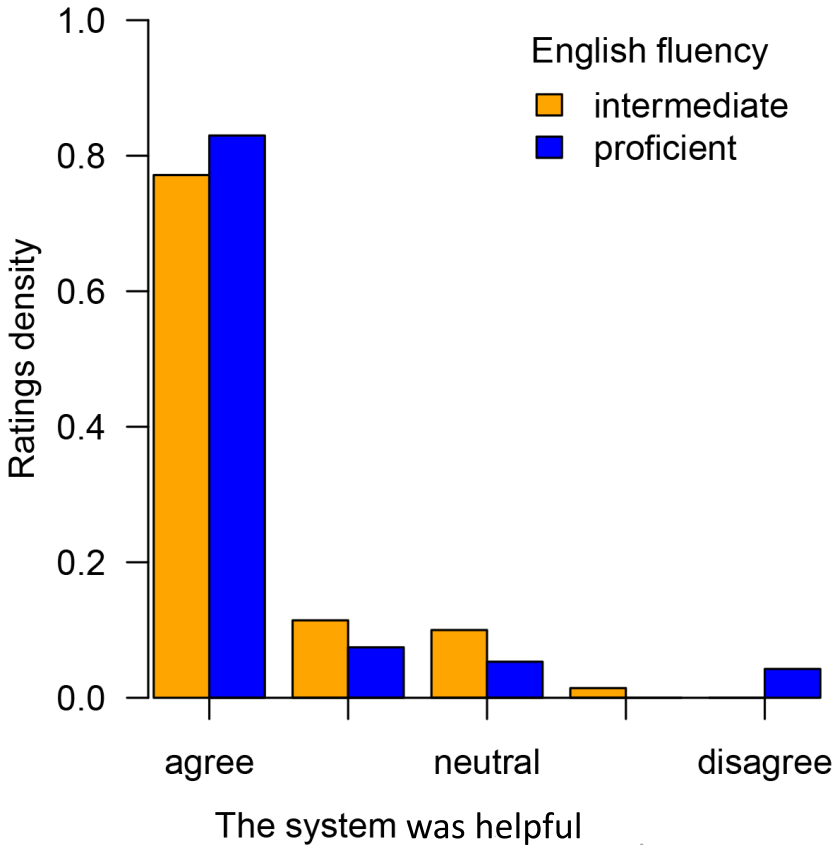
- 12 participants (7 proficient, 5 intermediate), 14 main tasks
- 168 interaction phases
- 672 ratings

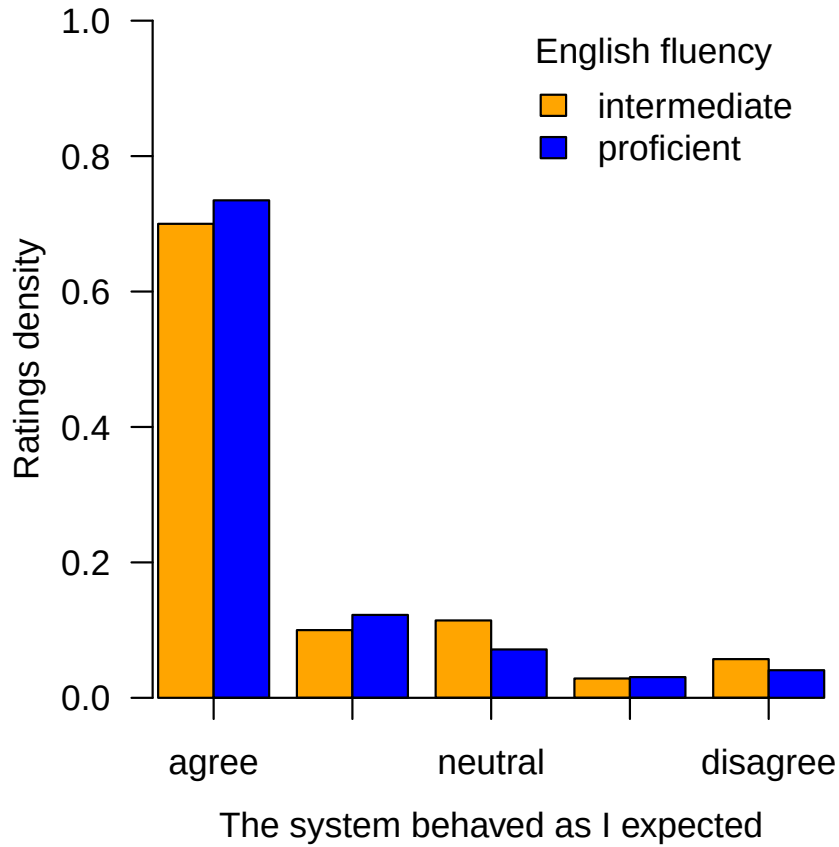
Research questions

- **RQ I:** Does language fluency affect user satisfaction?
- **RQ II:** Do wrong clarifications degrade user satisfaction?
- **RQ III:** How to best clarify false memories?

Results

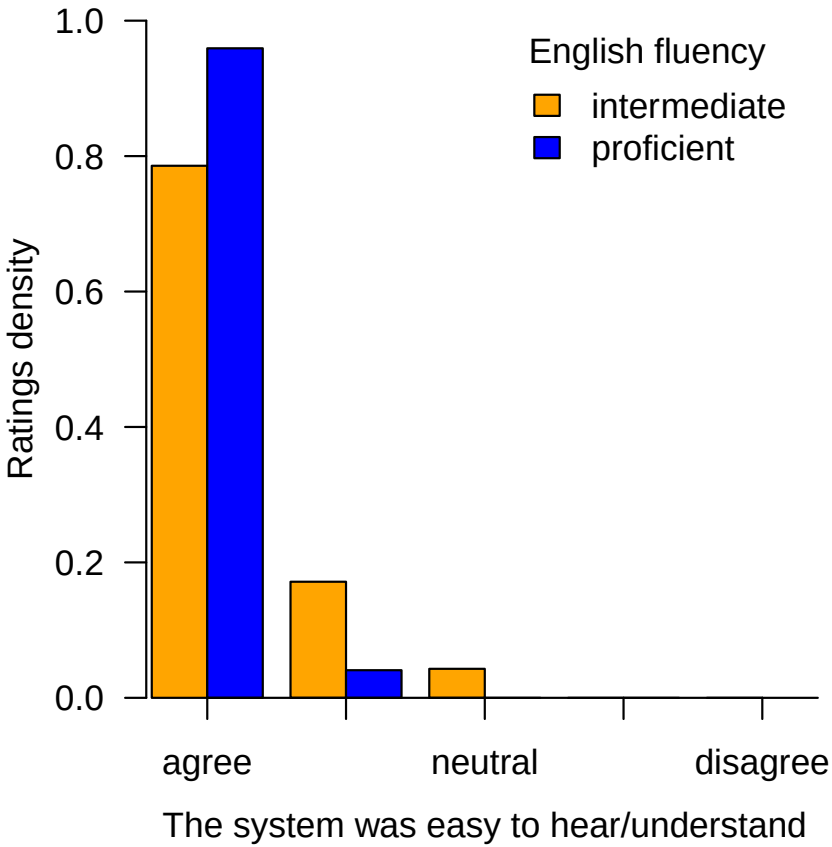
Effectiveness and predictability by English fluency:

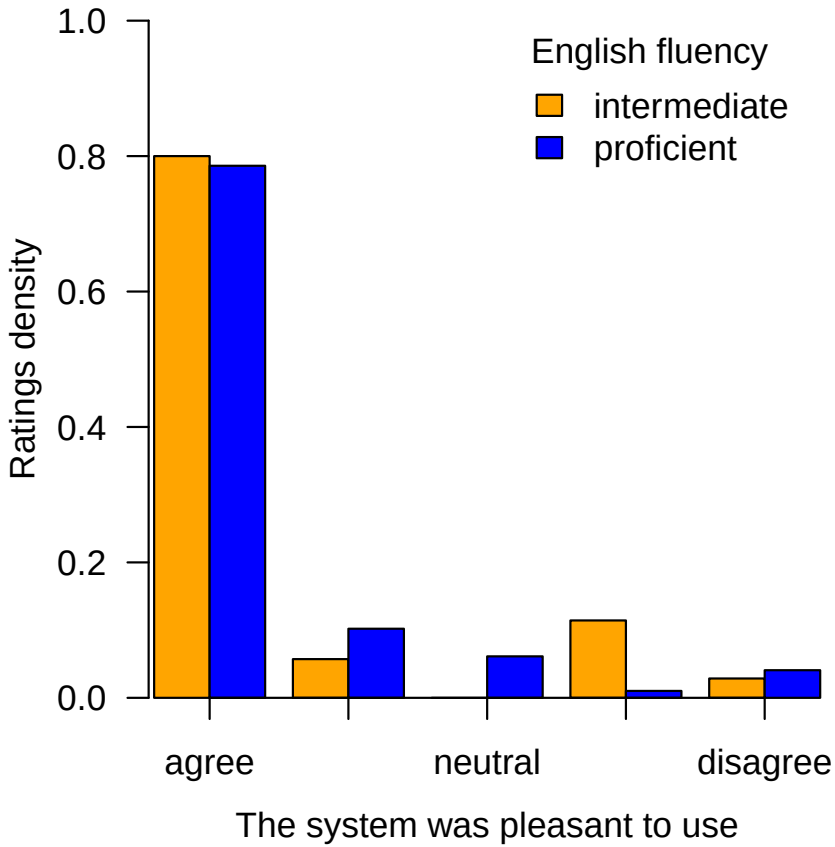




Results

Understandability and pleasantness by English fluency



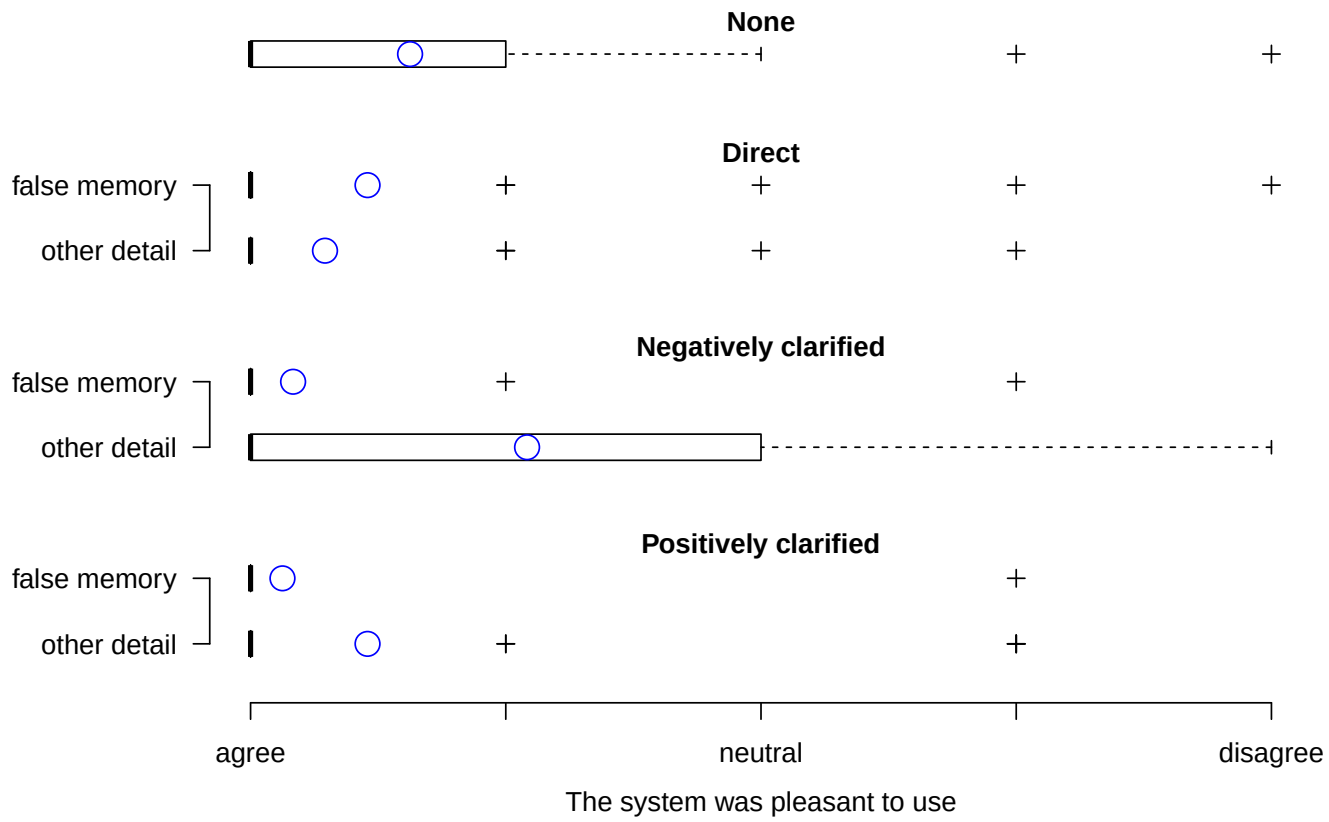


Research questions

- **RQ I:** Does language fluency affect user satisfaction?
- **RQ II:** Do wrong clarifications degrade user satisfaction?
- **RQ III:** How to best clarify false memories?

Results

Distribution and mean (∘) of pleasantness by response method and changed detail:

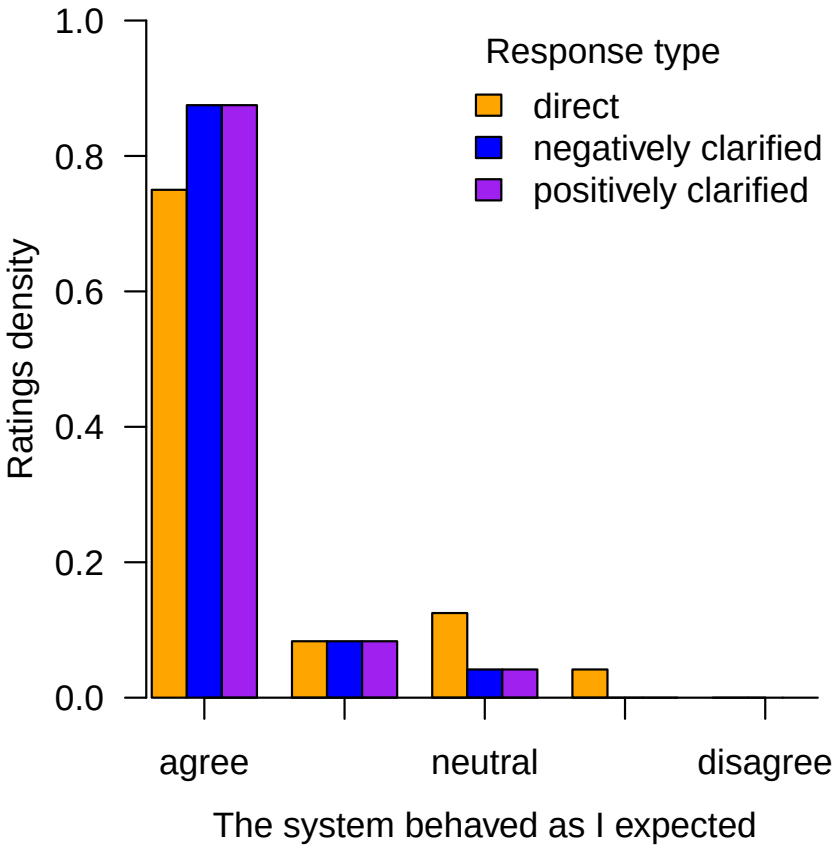


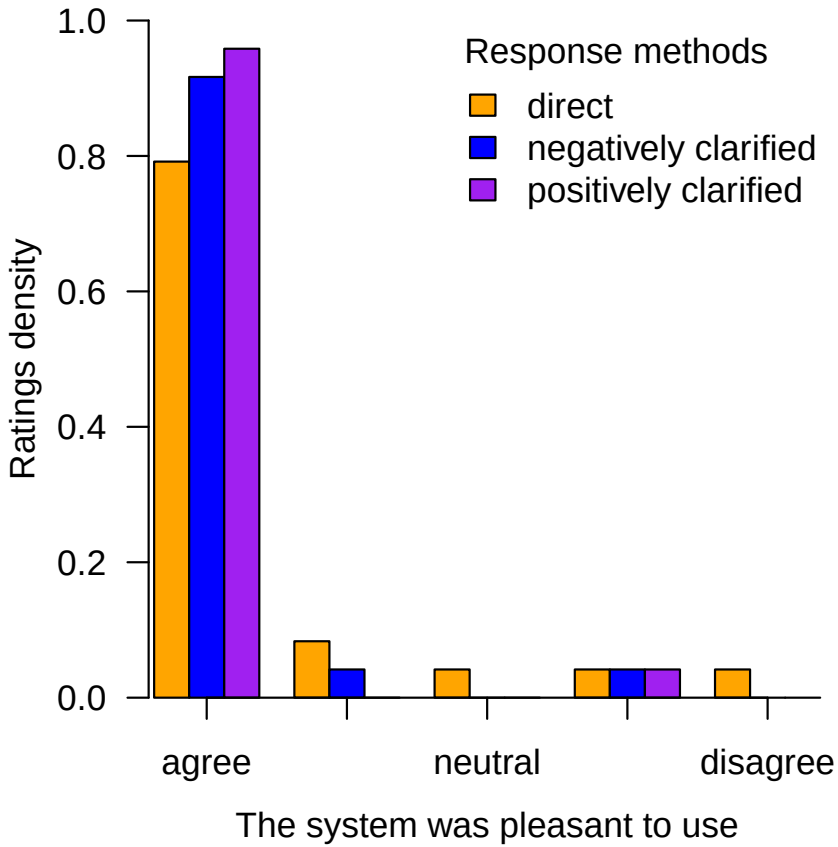
Research questions

- **RQ I:** Does language fluency affect user satisfaction?
- **RQ II:** Do wrong clarifications degrade user satisfaction?
- **RQ III:** How to best clarify false memories?

Results

Response-specific ratings for predictability and pleasantness when the false memory detail is corrected:





Summary

- First step towards the task of voice search query clarification.
- 1st Study: clarifying ambiguous queries, 7 response types, mock-up skill for Amazon Alexa, results analysis.
- 2nd Study: clarifying queries with false memories, 4 response types, mock-up skill, results analysis.

Conclusion & Future work

- Users won't mind be asked for clarification.
- Consider English fluency level.
- Use positive tone in the response.
- Three clarification options work best.

- Test alternative response methods.
- Use crowdsourcing platforms.

Conclusion & Future work

- Users won't mind be asked for clarification.
- Consider English fluency level.
- Use positive tone in the response.
- Three clarification options work best.

- Test alternative response methods.
- Use crowdsourcing platforms.

Thank you!