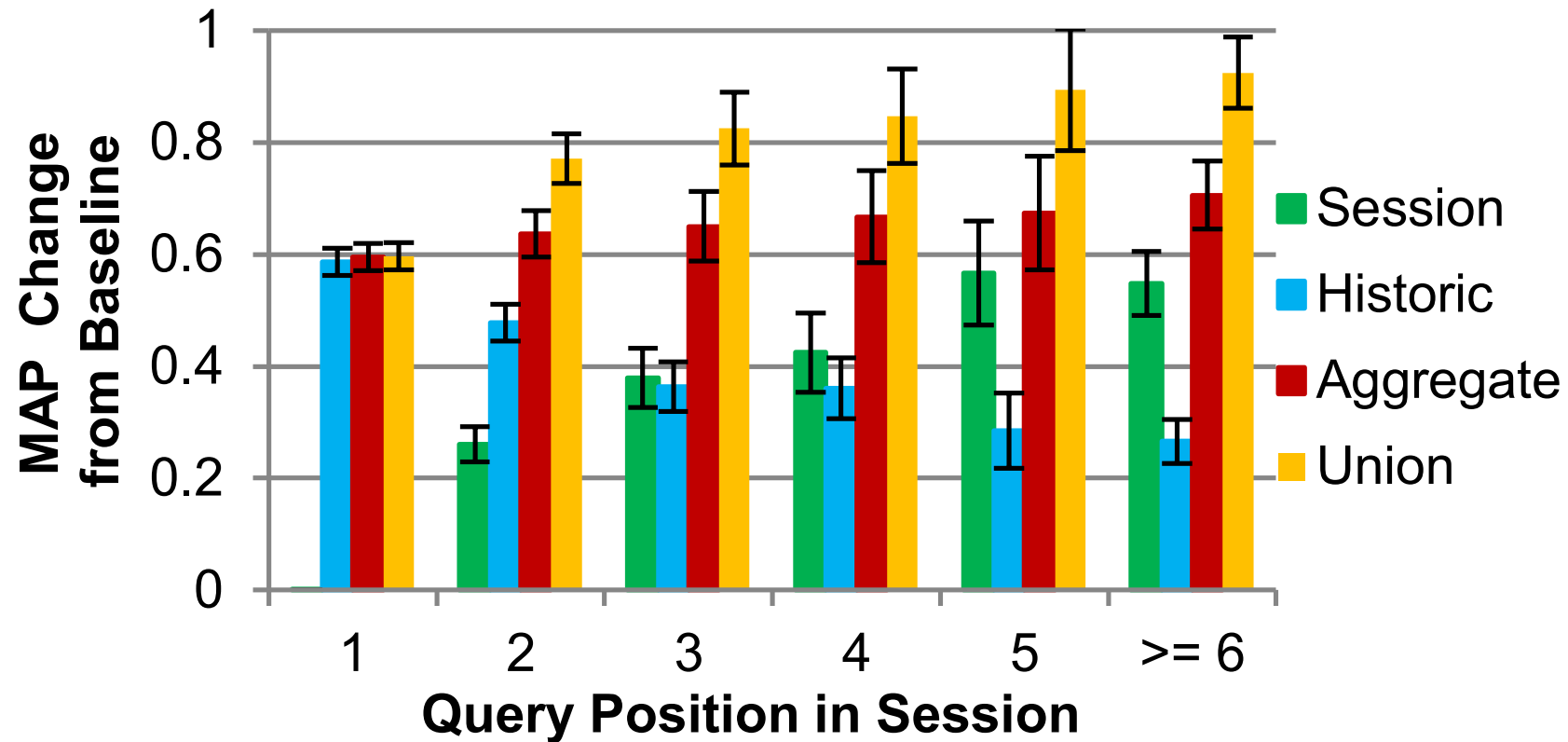# From sessions to conversations and back again

Evangelos Kanoulas

Informatics Institute & Amsterdam Business School

University of Amsterdam

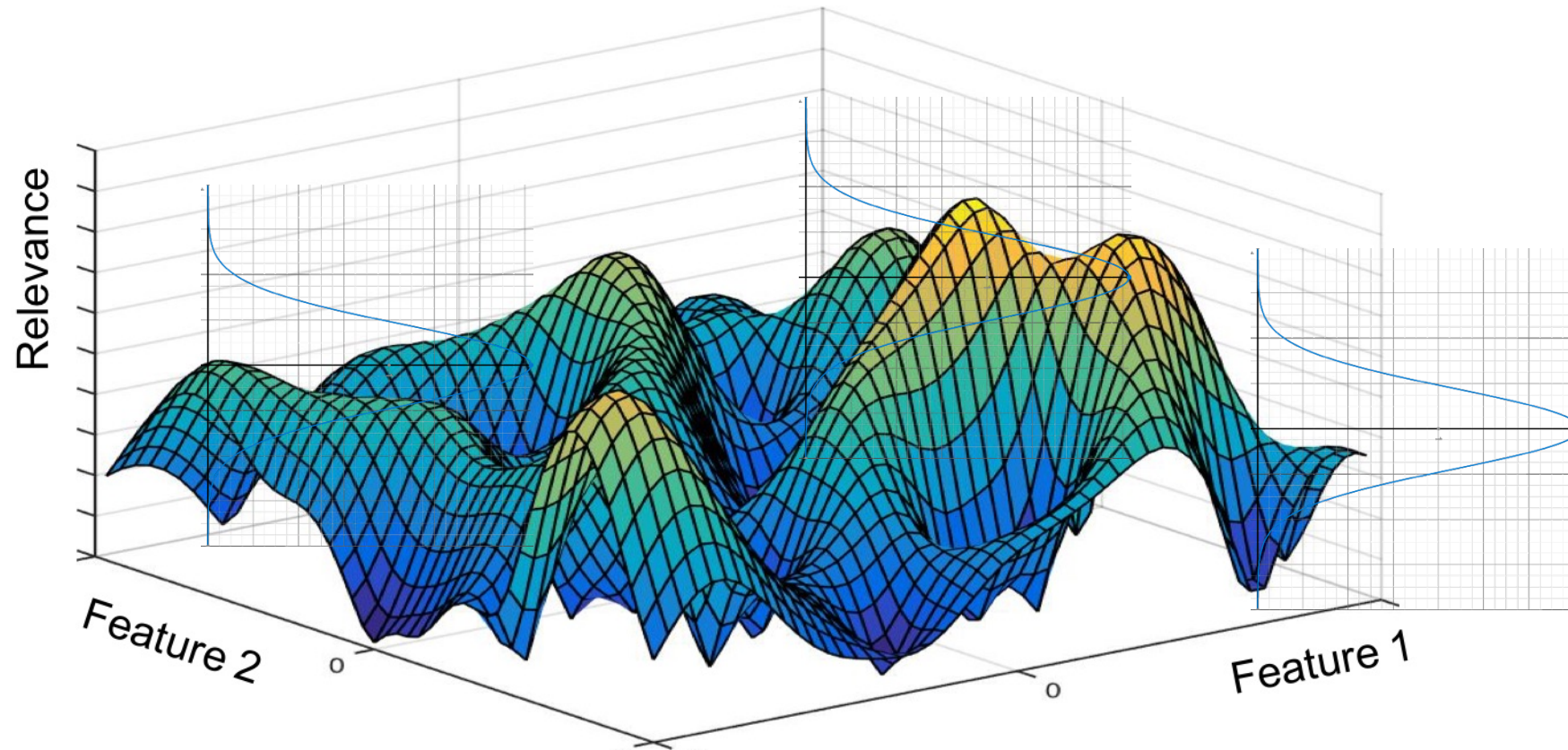March 19, 2021

Historic vs Session-based Personalization

✓ Bennett, P. N., White, R. W., Chu, W., Dumais, S. T., Bailey, P., Borisyuk, F., & Cui, X. Modeling the impact of short-and long-term behavior on search personalization. SIGIR 2012

What to expect from a search agent?

1. Profile users

2. Account for session history

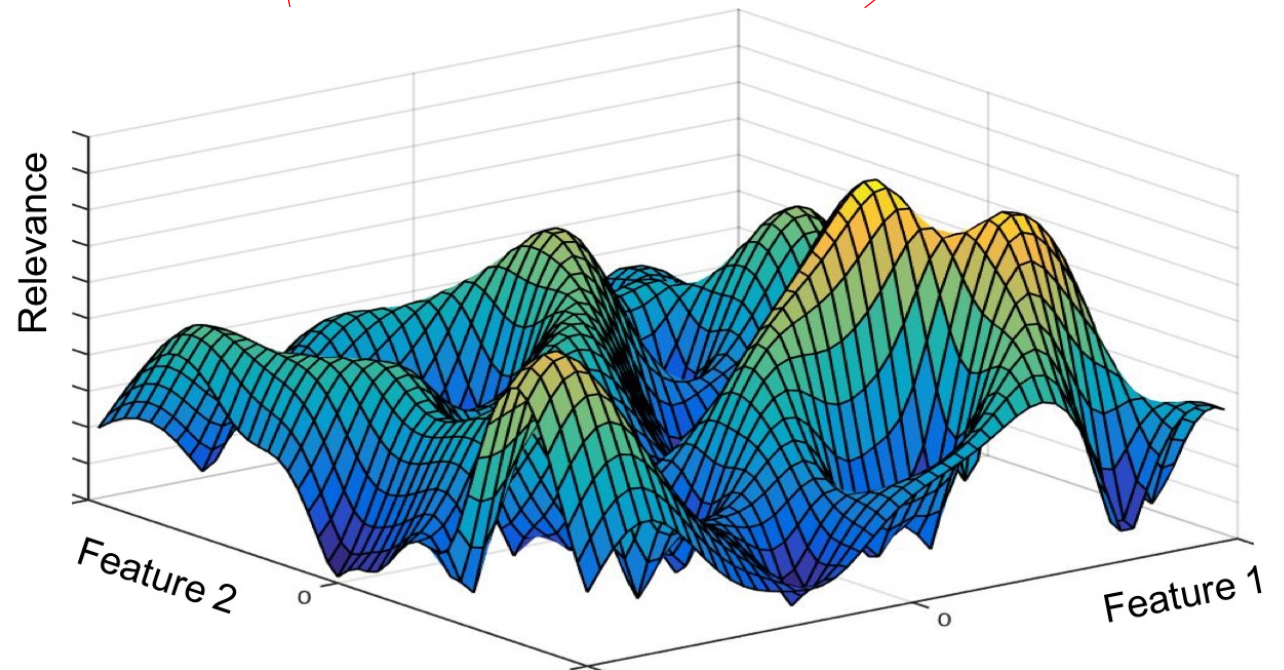What is the best available osteoporosis treatment?

Rank List 1

What are the cons of bisphosphonates?

It is an expensive therapy.

Can it rebuild low bone density?

Relate new query to past queries

Update belief

3. Ask clarifying questions
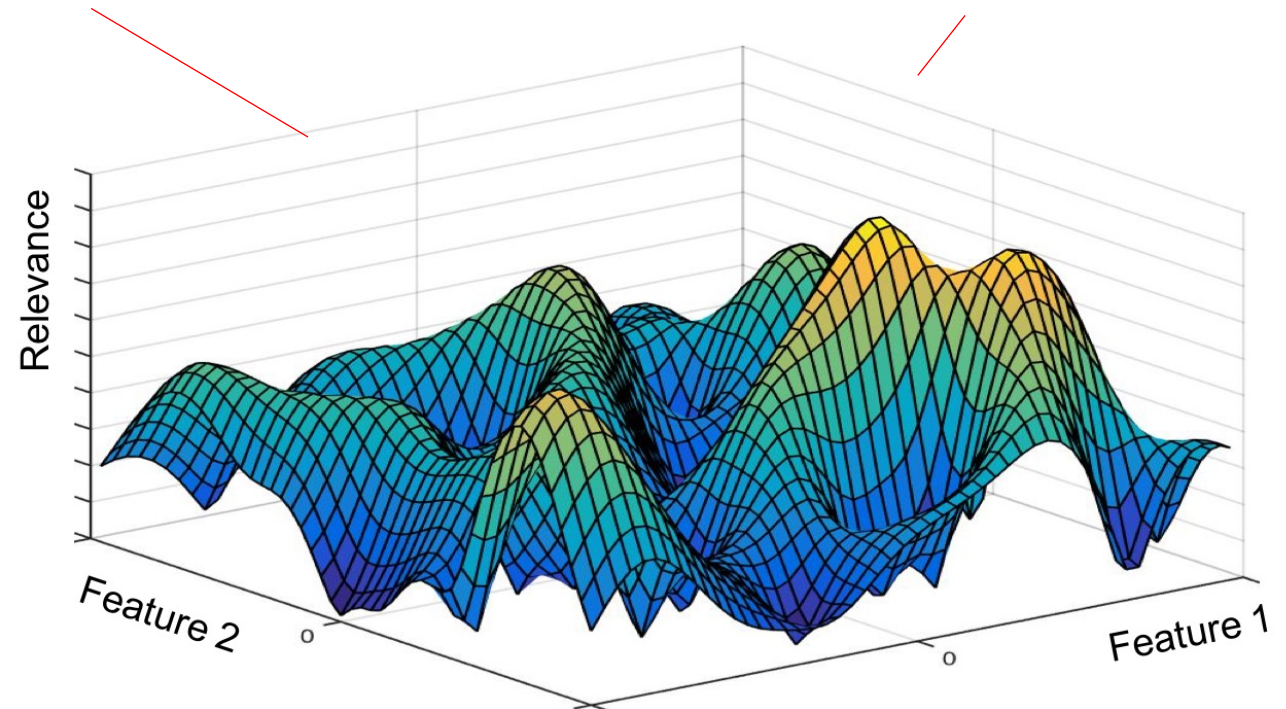
4. Decide Next Action

1. Provide ranking of document/passages
2. Provide direct answer
3. Ask clarifying question
   1. Relevance over items/documents
   2. Natural language questions
   3. Suggested questions

Decide what is the optimal next action to take

1. Profile users
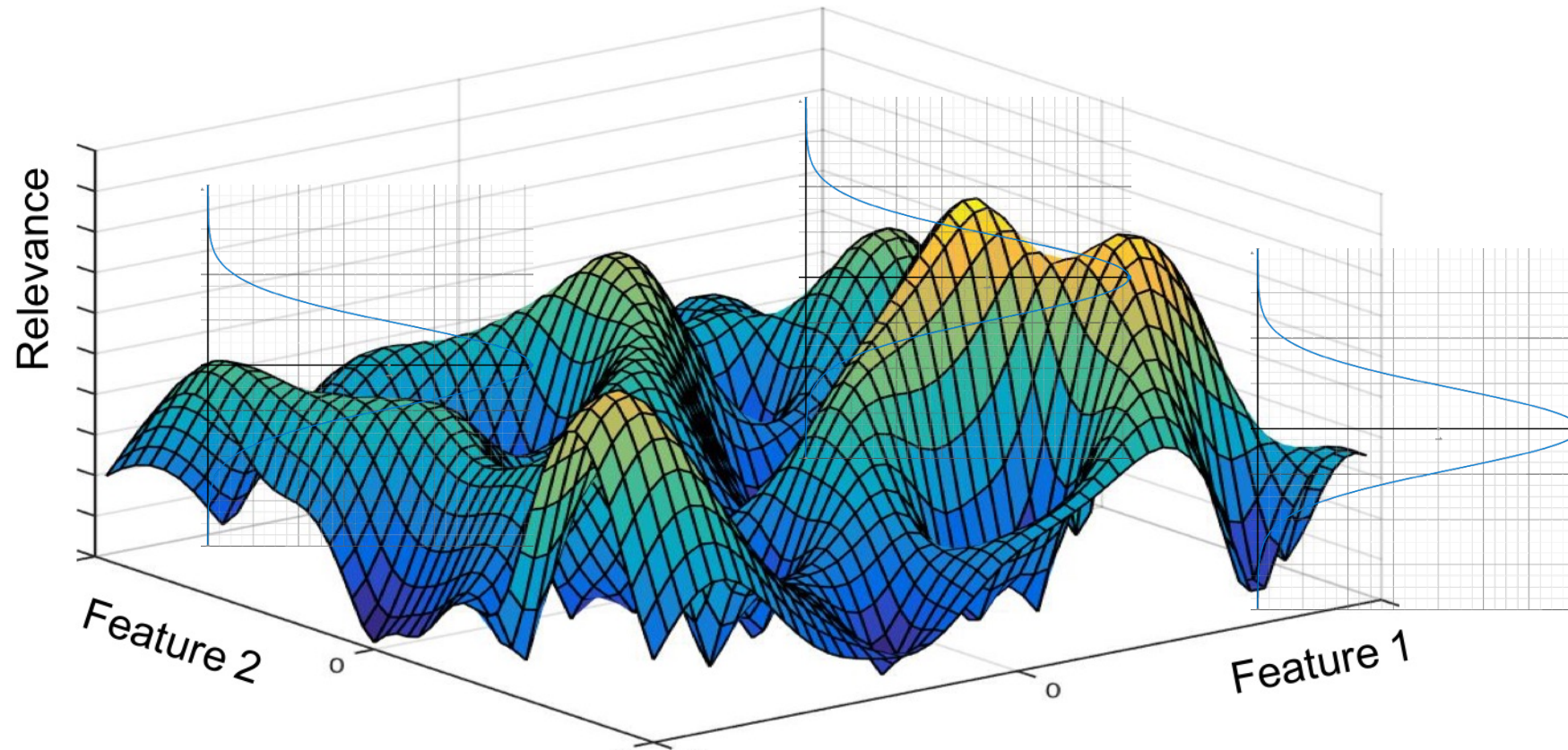
Estimate relevance

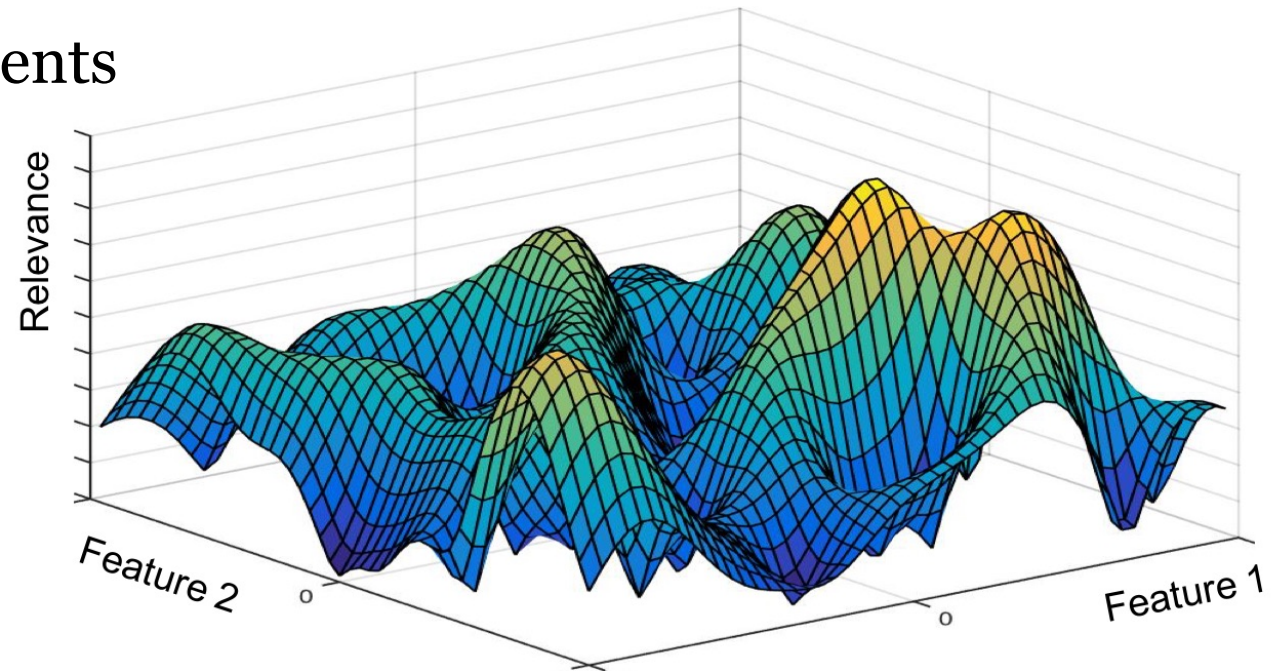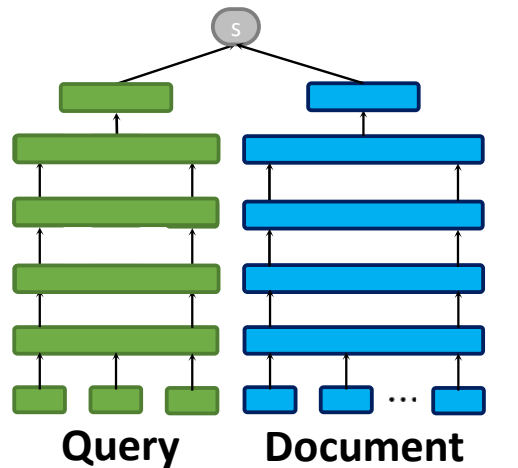(a) Representation-based Similarity (b) Query-Document Interaction (c) All-to-all Interaction (d) Late Interaction
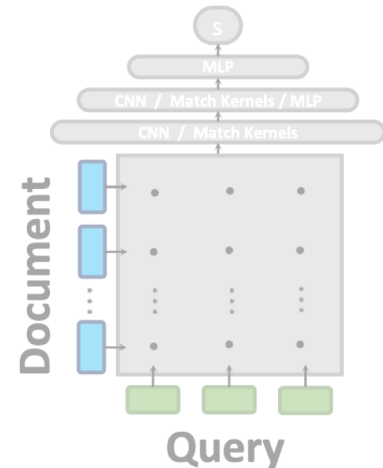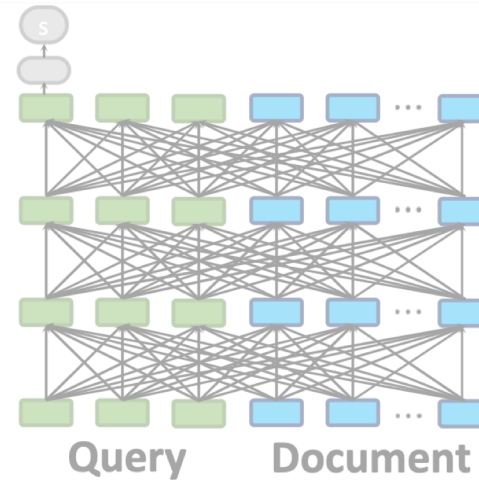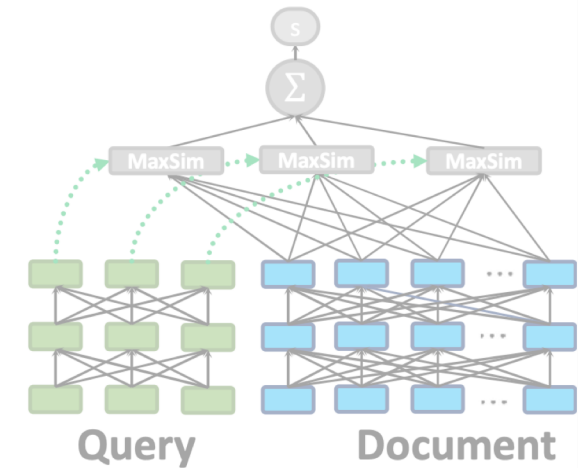
✓ C Van Gysel, M de Rijke, E Kanoulas: Neural Vector Spaces for Unsupervised Information Retrieval. *TOIS 2018*
✓ C Van Gysel, M de Rijke, E Kanoulas: Learning Latent Vector Spaces for Product Search. *CIKM 2016*

Challenge: Training complex models

context

Query **Document**

question

Large doc collection

Document list

Start/End Span

C T₁ ... T_N T_[SEP] T₁' T_M'

BERT

E_[CLS] E₁ E_N E_[SEP] E₁' E_M'

[CLS] Tok 1 ... Tok N [SEP] Tok 1 ... Tok M

Question   Paragraph

answer

Extractive phrase
Sentence
Entire Passage

Challenge: Training complex models

Q: *What was the nickname of **Judy Lewis**'s father ?*

P1: **Judy Lewis** (born Judith Young; November 6, 1935 – November 25, 2011) was an American actress, writer, producer, and therapist. She was the secret biological daughter of actor **Clark Gable** and actress Loretta Young.

P1: **William Clark Gable** (February 1, 1901 – November 16, 1960) was an American film actor, often referred to as "***The King of Hollywood***". He had roles in more than 60 motion pictures in a wide variety of genres during a career that lasted 37 years...

context

question

Large doc collection

Document list

answer

Extractive phrase
Sentence
Entire Passage

context

Large doc collection

Document list

answer

Extractive phrase
Sentence
Entire Passage
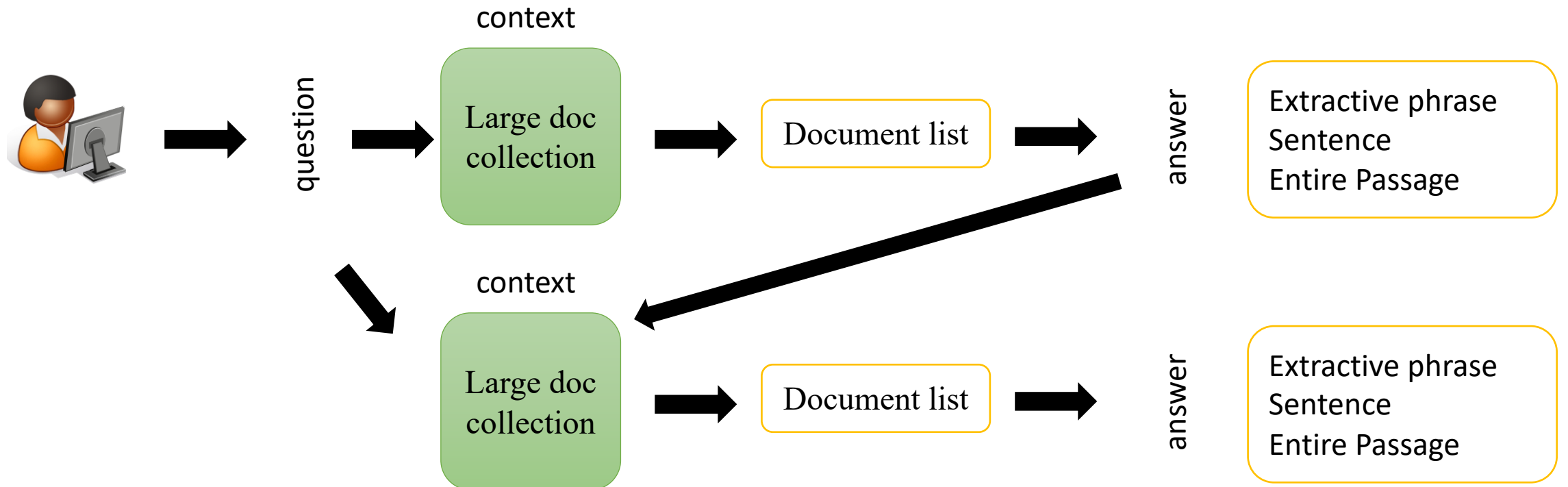
Challenge: Training complex models

Open-domain Complex QA

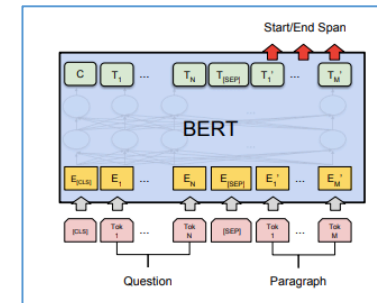| Model	Encoder	# GPU	# Epochs	Batch size	# Gradient accumulation steps	TR@2	TR@10	TR@20
MDR (full)	RoBERTa	8 × 32GB	50	150	1	0.678	0.773	0.794
MDR	RoBERTa	8 × 32GB	50	150	1	0.637	0.742	0.772
	RoBERTa	4 × 24GB	50	28	1	0.607	0.711	0.736
	RoBERTa	4 × 24GB	25	28	1	0.551	0.668	0.698
	RoBERTa	4 × 24GB	20	28	1	0.537	0.660	0.688
	RoBERTa	1 × 12GB	25	4	32	0.441	0.581	0.620
	BERT	1 × 12GB	25	4	32	0.421	0.560	0.597
	DistilBERT	1 × 12GB	25	4	32	0.268	0.411	0.454

✓ G Sidiropoulos, N Voskarides, S Vakulenko, E Kanoulas, Analysing Dense Passage Retrieval for Multi-Hop Questions. (*under review*)

2. Account for session history

User asking questions

- Session-oriented search

- Task-oriented search

- Conversational search

1. legality alcohol marijuana
2. legality alcohol marijuana history
3. legality alcohol history
4. why is marijuana illegal?
5. is marijuana worse for your health than alcohol?

✓ B Carterette, P Clough, M Hall, E Kanoulas, M Sanderson: The TREC Session Track 2011-2014. *SIGIR 2016*
✓ C Van Gysel, E Kanoulas, M de Rijke: Lexical Query Modeling in Session Search. *ICTIR 2016*

User asking questions

- Session-oriented search
- Task-oriented search
- Conversational search

1. What are the different types of hydroponic systems to choose from, their pros and cons?
2. What hydroponic system are used in commercial greenhouses?
3. What material is needed to build a hydroponic system myself?
4. Which plants can be grown in a hydroponics system?
5. How long does it take to grow them?
6. What nutrients to test the water for?
7. …

✓ E Kanoulas, E Yilmaz, R Mehrotra, B Carterette, N Craswell, P Bailey: TREC 2017 Tasks Track Overview. *TREC 2017*

User asking questions

- Session-oriented search
- Task-oriented search
- Conversational search

1	who formed **saosin**?
2	when was the **band** founded?
3	what was their **first** album?
4	when was the album released?

Query resolution in conversational search

Turn	Query
1	who formed **saosin**?
2	when was the band founded?
3	what was their **first** album?
4	when was the album released?

Turn	Query
1	who formed **saosin**?
2	when was the band founded?
3	what was their **first** album?
4	when was the album released?
	resolved: when was saosin 's first album released?

✓ N Voskarides, D Li, P Ren, E Kanoulas and M de Rijke, Query Resolution for Conversational Search with Limited Supervision. *SIGIR 2020*

Term Score

Term Classification Layer

BERT Encoder

Input Sequence

| Label | - | 0 | 0 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Input Sequence: <CLS> Who formed Saosin? When was the band formed? What was their fir...

Turn #1   Turn #2   Turn #3

Relevant passage to turn #4: The original lineup for **Saosin**, consisting of Burchell, Shekoski, Kennedy and Green, was formed in the summer of 2003. On June 17, the **band** released their **first** commercial production, the EP Translating the Name.

✓ N Voskarides, D Li, P Ren, E Kanoulas and M de Rijke, Query Resolution for Conversational Search with Limited Supervision. *SIGIR 2020*

Challenge: From document ranking to answer generation

Information need: The Bronze Age collapse and the transition into a dark age

Tell me about the Bronze Age collapse.

Bronze and Iron Age Isle of Wight Bronze Age Britain had large reserves of tin in the areas of Cornwall and Devon and tin is necessary to smelt bronze. At that time the sea level was much lower and carts of tin were brought across the Solent at low tide for export, possibly on the Ferriby Boats.

Step 1: rewrite the current query if necessary.

Tell me about the Bronze Age collapse.

Step 2: list all supporting spans.

1. Bronze Age Britain had large reserves of tin in...
2. A shortage of tin during the Bronze Age collapse...
   ...

Step 3: formulate a short conversational response by summarizing the supporting spans.

It may be because of a shortage of tin, that is...

✓ P. Ren, Z. Chen, Z. Ren, E. Kanoulas, C.Monz M. de Rijke Conversations with Search Engines: Datasets & Baselines, *TOIS 2020*

Challenge: From document ranking to answer generation

New SCAI'21 Conversational Question Answering Challenge:
https://scai.info/

1. Question rewriting;
2. Document retrieval; and
3. Question answering.

✓ Anantha, R., Vakulenko, S., Tu, Z., Longpre, S., Pulman, S. and Chappidi, S., 2020. Open-Domain Question Answering Goes Conversational via Question Rewriting. arXiv preprint arXiv:2010.04898.

Challenge: Large-scale dynamic collection

- Automate corpus creation (1h/topic)
    - Question generation
    - Answer relevance

- User simulator
    - Question conditioned on previous answer

✓ S Vakulenko et. al, Generating Topic-based Question Sequences for an Automated Evaluation of Conversational Passage Ranking.
(work in progress)

<u>Challenge</u>: Large-scale dynamic collection

1. what is the speed of a mako shark
2. what do mako sharks eat
3. where does the longfin mako live
4. where do bull sharks live
5. what kind of teeth do sharks have
6. how long do hammerhead sharks live
7. how long do sandbar sharks live
8. how long do tiger sharks live
9. what sharks are endangered
10. what is the location of the tiger shark
11. what is the biggest great white shark

1. what are the different types of sharks
2. are sharks endangered if so which species
3. tell me more about tiger sharks
4. what is the largest shark ever to have lived on Earth
5. what's the biggest shark ever caught
6. what about for great whites
7. tell me about mako sharks
8. what are mako shark adaptations
9. where do mako sharks live
10. what do mako sharks eat
11. how do mako sharks compare with tiger sharks for being dangerous

Challenge: Large-scale dynamic collection

1. what are red blood cells
2. how are red blood cells created
3. how is oxygen transported in blood
4. what is anemia
5. what are the symptoms of anemia
6. can anemia go away
7. what are anemia possible causes

1. does anemia cause fatigue
2. causes of anemia in men
3. can anemia cause death
4. what is normocytic anemia
5. symptoms of anemia in children
6. what is the treatment for iron deficiency anemia
7. red blood cell disorder symptoms
8. what causes low red blood cells
9. causes of low iron levels in blood
10. where are red blood cells found
11. what food is high in iron

3. Asking clarifying questions
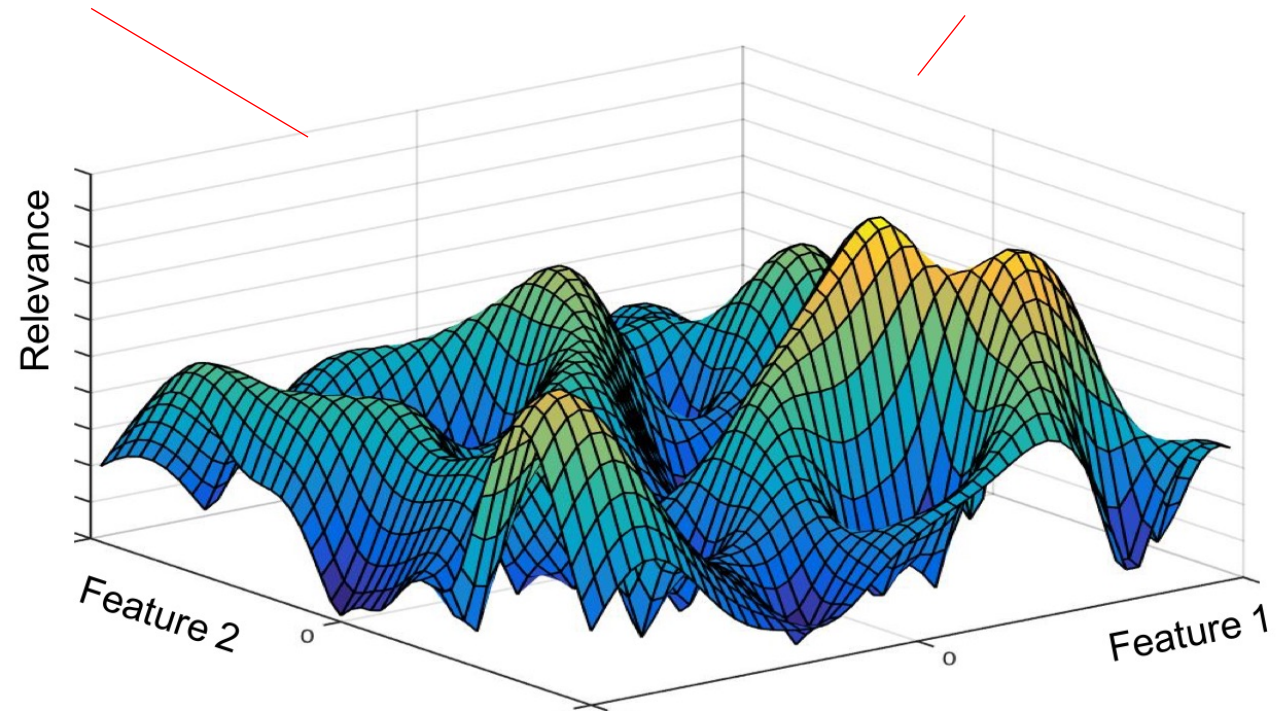
Generate and select clarifying questions

Product works and looks like new. Backed by the 90-day Amazon Renewed Guarantee.

Renewed products work and look like new. These pre-owned products are not Apple certified but have been inspected and tested by Amazon-qualified suppliers. Box and accessories (no headphones included) may be generic. Wireless devices come with the 90-day Amazon Renewed Guarantee. Learn more

- Fully unlocked and compatible with any carrier of choice (e.g. AT&T, T-Mobile, Sprint, Verizon, US-Cellular, Cricket, Metro, etc.).
- The device does not come with headphones or a SIM card. It does include a charger and charging cable that may be generic, in which case it will be UL or Mfi ("Made for iPhone") Certified.
- Inspected and guaranteed to have minimal cosmetic damage, which is not noticeable when the device is held at arm's length.
- Successfully passed a full diagnostic test which ensures like-new functionality and removal of any prior-user personal information.
- Tested for battery health and guaranteed to have a minimum battery capacity of 80%.

✓ J. Zou, Y. Chen, E. Kanoulas, Towards Question-based Recommender Systems. *SIGIR 2020*
✓ J. Zou, E. Kanoulas, Towards Question-Based High-Recall Information Retrieval: Locating the Last Few Relevant Documents for Technology Assisted Reviews, *TOIS 2020*
✓ J. Zou, E. Kanoulas. Learning to Ask: Question-based Sequential Bayesian Product Search. *CIKM 2019*

The world of entities

Product works and looks like new . Backed by the 90-day **Amazon Renewed Guarantee** *MISC* . Renewed products work and look

like new . These pre - owned products are not **Apple** *ORG* certified but have been inspected and tested by **Amazon** *ORG* - qualified

suppliers . Box and accessories (no headphones included) may be generic . Wireless devices come with the 90-day

Amazon Renewed Guarantee *MISC* . Learn more Fully unlocked and compatible with any carrier of choice (e.g. AT&T , T - Mobile ,

Sprint *LOC* , **Verizon** *LOC* , **US** *LOC* - **Cellular** *LOC* , Cricket , **Metro** *ORG* , etc .) . The device does not come with headphones or a **SIM** *MISC*

card . It does include a charger and charging cable that may be generic , in which case it will be **UL** *MISC* or **Mfi** *MISC* (" Made for

iPhone *MISC* ") **Certified** *MISC* . Inspected and guaranteed to have minimal cosmetic damage , which is not noticeable when the

✓ V Provatorova, S Vakulenko, E Kanoulas, K Dercksen, J Hulst: Named Entity Recognition and Linking on Historical Newspapers, *CLEF 2020*
✓ C Wu, E Kanoulas, M de Rijke: Learning entity-centric document representations using an entity facet topic model, *IPM 2020*
✓ C Wu, E Kanoulas, M de Rijke: It all starts with entities: A Salient entity topic model. *NLE 2020*
✓ C Wu, E Kanoulas, M de Rijke, W Lu: WN-Salience: A Corpus of News Articles with Entity Salience Annotations. *LREC 2020*

Product works and looks like new . Backed by the 90-day [Amazon Renewed Guarantee MISC] . Renewed products work and look

like new . These pre - owned products are not [Apple ORG] certified but have been inspected and tested by [Amazon ORG] - qualified

suppliers . Box and accessories (no headphones included) may be generic . Wireless devices come with the 90-day

[Amazon Renewed Guarantee MISC] . Learn more Fully unlocked and compatible with any carrier of choice (e.g. AT&T , T - Mobile ,

[Sprint LOC] , [Verizon LOC] , [US LOC] - [Cellular LOC] , Cricket , [Metro ORG] , etc .) . The device does not come with headphones or a [SIM MISC]

card . It does include a charger and charging cable that may be generic , in which case it will be [UL MISC] or [Mfi MISC] (" Made for

[iPhone MISC] ") [Certified MISC] . Inspected and guaranteed to have minimal cosmetic damage , which is not noticeable when the

Binary search

Trained
question reward

Trained
system belief

$$e_l = \arg\min_e \left| \sum_{d \in u_l} (2\mathbb{1}\{e(d) = 1\} - 1)\pi^*(d) \right| - \gamma * R(e)$$

Update the belief based on the answer

Product works and looks like new . Backed by the 90-day [Amazon Renewed Guarantee] MISC . Renewed products work and look

like new . These pre - owned products are not [Apple] ORG certified but have been inspected and tested by [Amazon] ORG - qualified

suppliers . Box and accessories (no headphones included) may be generic . Wireless devices come with the 90-day

[Amazon Renewed Guarantee] MISC . Learn more Fully unlocked and compatible with any carrier of choice (e.g. AT&T , T - Mobile ,

[Sprint] LOC , [Verizon] LOC , [US] LOC - [Cellular] LOC , Cricket , [Metro] ORG , etc .) . The device does not come with headphones or a [SIM] MISC

card . It does include a charger and charging cable that may be generic , in which case it will be [UL] MISC or [Mfi] MISC (" Made for

[iPhone] MISC ") [Certified] MISC . Inspected and guaranteed to have minimal cosmetic damage , which is not noticeable when the

Multinomial distribution over products

Dirichlet distribution

$$\pi^*(d) \xleftrightarrow{\text{conjugate}} \mathbb{P}_{n+1} = Dir(\alpha + \sum_{j=0}^{n} Z_j)$$

Generate ranking list

Example

Salomon Trail IV Tight

Rank

1. Is the product for women?

yes —— 1753

2. Is it a slim fit product?

yes —— 273

3. Is it a stretch product?

yes —— 8

4. Is it a technology product?

no —— 3

User perspective on clarifying questions

Step 1: Category selection

Imagine that you want to buy a product. Please select the product category you are most familiar with (e.g., most frequently purchased category).

Category: [Home and Kitchen ▼]

[To Step 2]

Step 2: Target product assignment

Imagine that you want to buy the target product shown below, **please read the product title & description very carefully**. After you click the "Next step" button, you will interact with our algorithm by answering YES/NO questions:

Product Title: Hog Wild Fish Sticks (Sold Individually)
Product Description: Kids love this pre-scissors skills activity set of 1-piece chopsticks! Use the tongs with oral-motor activities. Simply set up small toys, easy-grip foods or cotton balls for kids to transfer across a midline. …

[Change target] [Next step]

Step 3: Find the target product

Please answer the following algorithmically constructed questions according to the title and description of your target product shown on the last page. After you click the "next" button, the algorithm will select the next question to ask. When you wish to stop answering questions you can click the "stop" button.

Question: Is "rosewood" relevant to the product you are looking for?

- ○ Yes
- ● No
- ○ Not Sure

[Next] [Stop]

Ranking list of search results, from top 1 (left) - top 4(right):

Hog Wild Fish Sticks (Sold Individually):	Bone & Rosewood Chopsticks:	Fred & Friends Good Fortune Chopsticks:	2pk Green Pot Holders/Trivet Set:

…

Step 4: Questionnaire

Q1: Did you find our question-based system helpful towards locating the target product?
[Not Sure ▼]

Q2: Will you use such a question-based system for product search or recommendation in the future?
[Not Sure ▼]

Q3: What was your experience using the question-based system?
[1 (very negative) ▼]

Q4: How many questions are you willing to answer for locating your target product?
[   ]

Q5: Why did you click the "Stop" button to stop answering in the last step?
[Found the target product ▼]

Q6: If selected "other" in Q5, please specify:
[   ]

Q7: Are the generated questions easy to answer?
[Not Sure ▼]
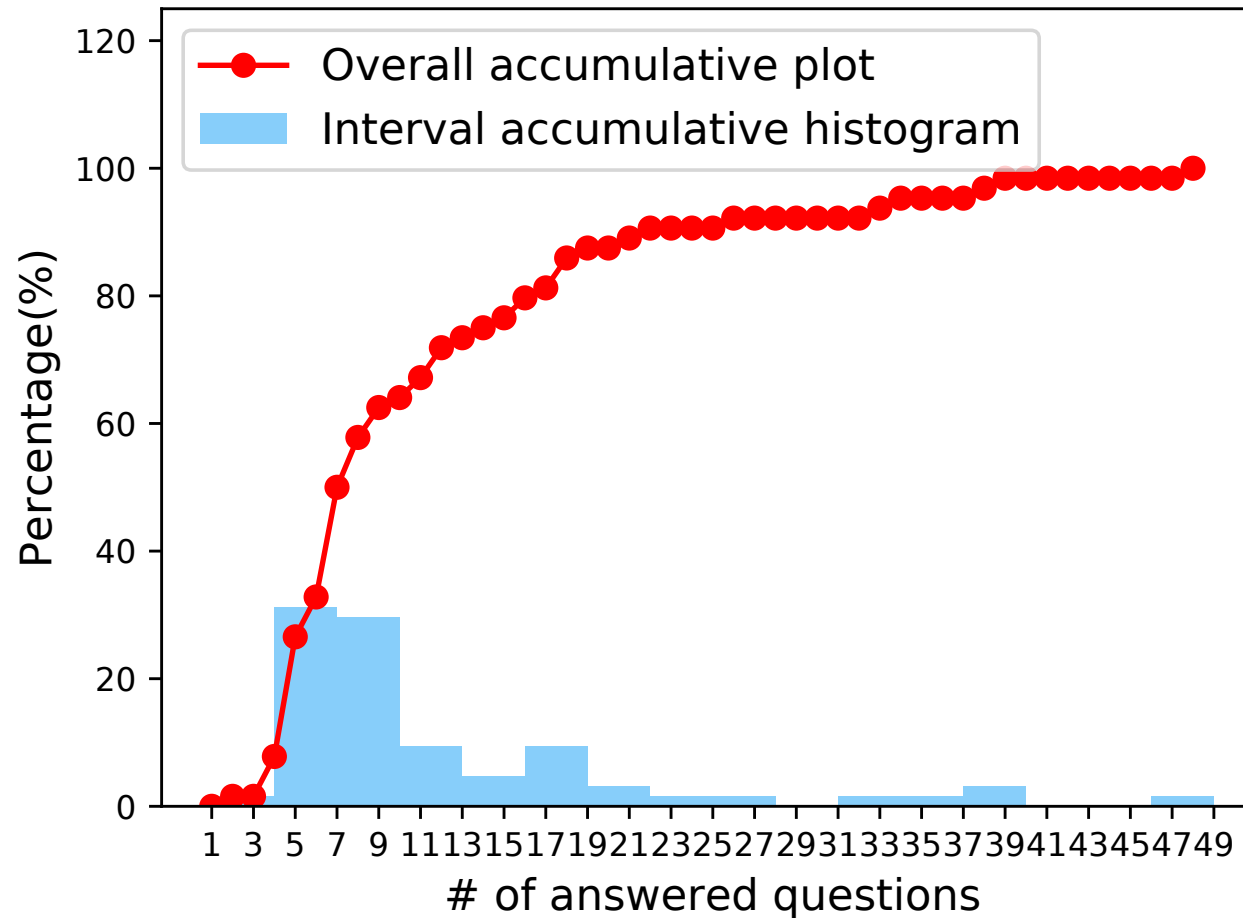
[All done]

✓ Zou, J., Kanoulas, E. and Liu, Y. An Empirical Study on Clarifying Question-Based Systems. CIKM 2020

User perspective on clarifying questions

✓ Zou, J., Kanoulas, E. and Liu, Y. An Empirical Study on Clarifying Question-Based Systems. CIKM 2020

User's ability to answer clarifying questions

✓ Zou, J., Kanoulas, E. and Liu, Y. An Empirical Study on Clarifying Question-Based Systems. CIKM 2020
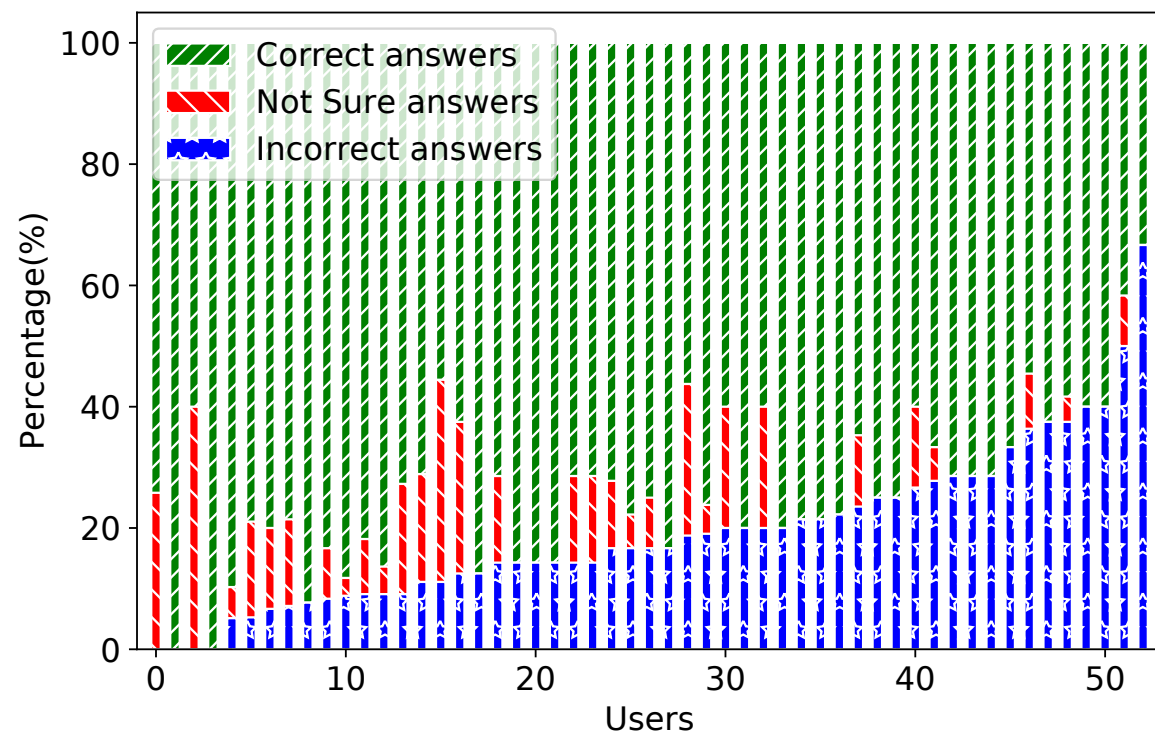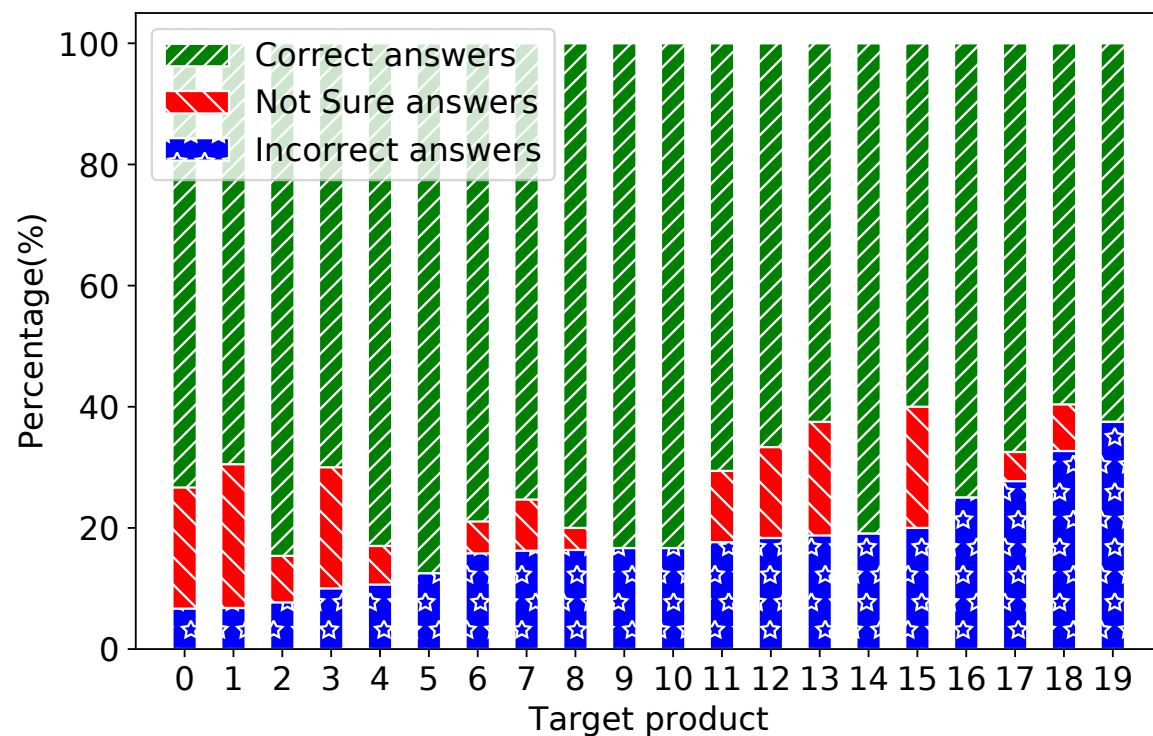
User's ability to answer clarifying questions
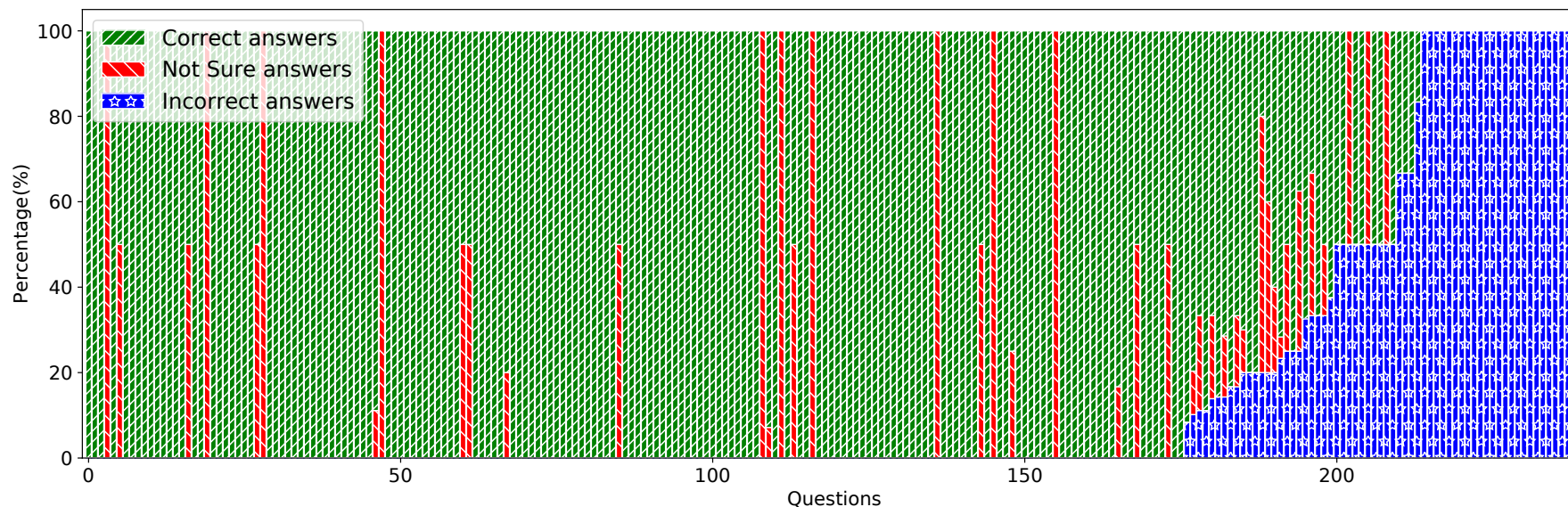
$$e_l = \arg\min_e \left| \sum_{d \in u_l} (2\mathbb{1}\{e(d) = 1\} - 1)\pi^*(d) \right| - \gamma * R(e) + 2\beta * h(e)$$

Trained question reward — $R(e)$

Trained system belief — $\pi^*(d)$

Noise rate — $h(e)$

✓ Zou, J., Kanoulas, E. and Liu, Y. An Empirical Study on Clarifying Question-Based Systems. CIKM 2020

Challenge: How to generate clarifying questions

- Train constrained question generation
- Identify what discriminates documents and use as constraints

✓ M Aliannejadi, et al: Ad-hoc generation of clarifying questions (*work in progress*)

Challenge: Update the belief based on the answer

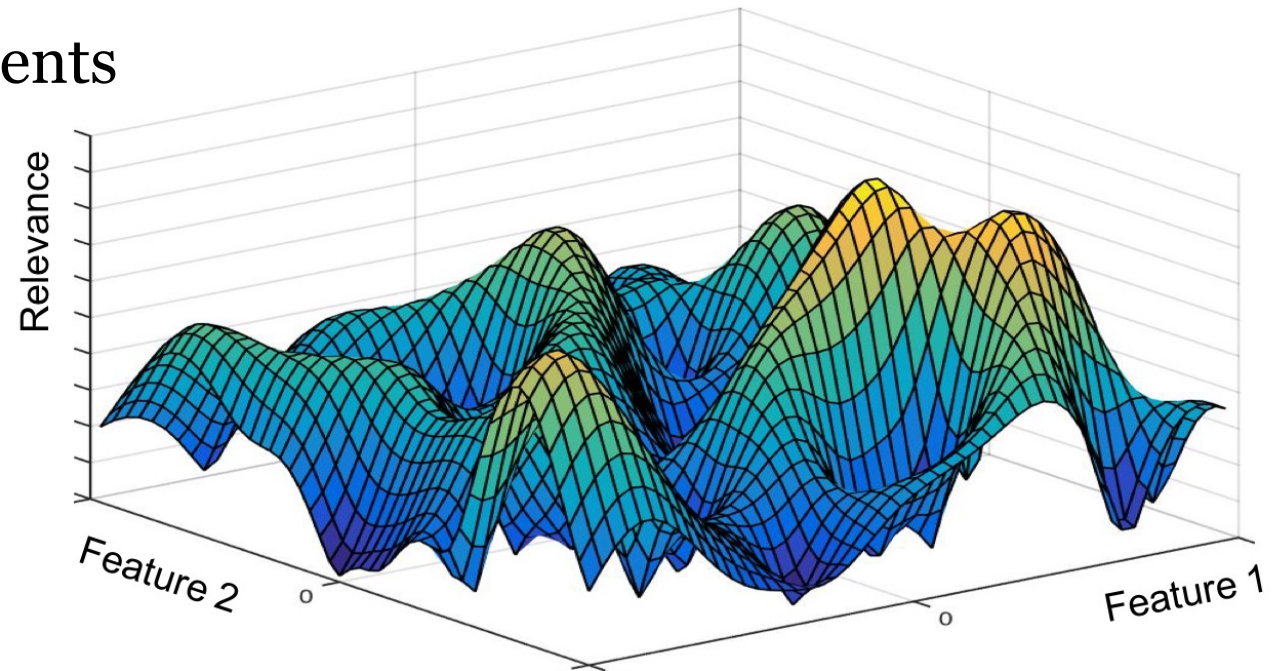|		$\Delta NDCG$
Inf. need	*Drafting of Declaration of Independence*	
Q_0	all men are created equal	
	- Would you like to learn more about	+18.53
CQ	**Thomas Jefferson**?	
Answer	- No	
Inf. need	*Information about Atari arcade games*	
Q_0	atari	
	- Would you like to play atari	+15.97
CQ	**arcade games** online?	
Answer	- No	

Inf. need	*How is a credit score determined?*	
Q_0	credit report	+13.57
CQ	- Would you like to know about the process of **disputing** credit report?	
Answer	- No	
Inf. need	*Website of HobbyTown USA*	
Q_0	hobby stores	+11.37
CQ	- Would you like to know the **hours** of operation?	
Answer	- No	
Inf. need	*Find the TSA website, offering air travel tips*	
Q_0	air travel information	+8.91
CQ	- Would you like to **book** a **flight** ?	
Answer	- No	

✓ A Krasakis, M Aliannejadi, N Voskarides, E Kanoulas: Analysing the Effect of Clarifying Questions on Document Ranking in Conversational Search. *ICTIR 2020*

4. Mixed Initiative: Complex Strategies

1. Provide ranking of document/passages
2. Provide direct answer
3. Ask clarifying question
   1. Relevance over items/documents
   2. Natural language questions
   3. Suggested questions

   Decide what is the optimal next action to take

Example of Mixed Initiative

Query Turn
User Issues Query
Agent responds

Feedback Turn
User provides Feedback
Agent responds
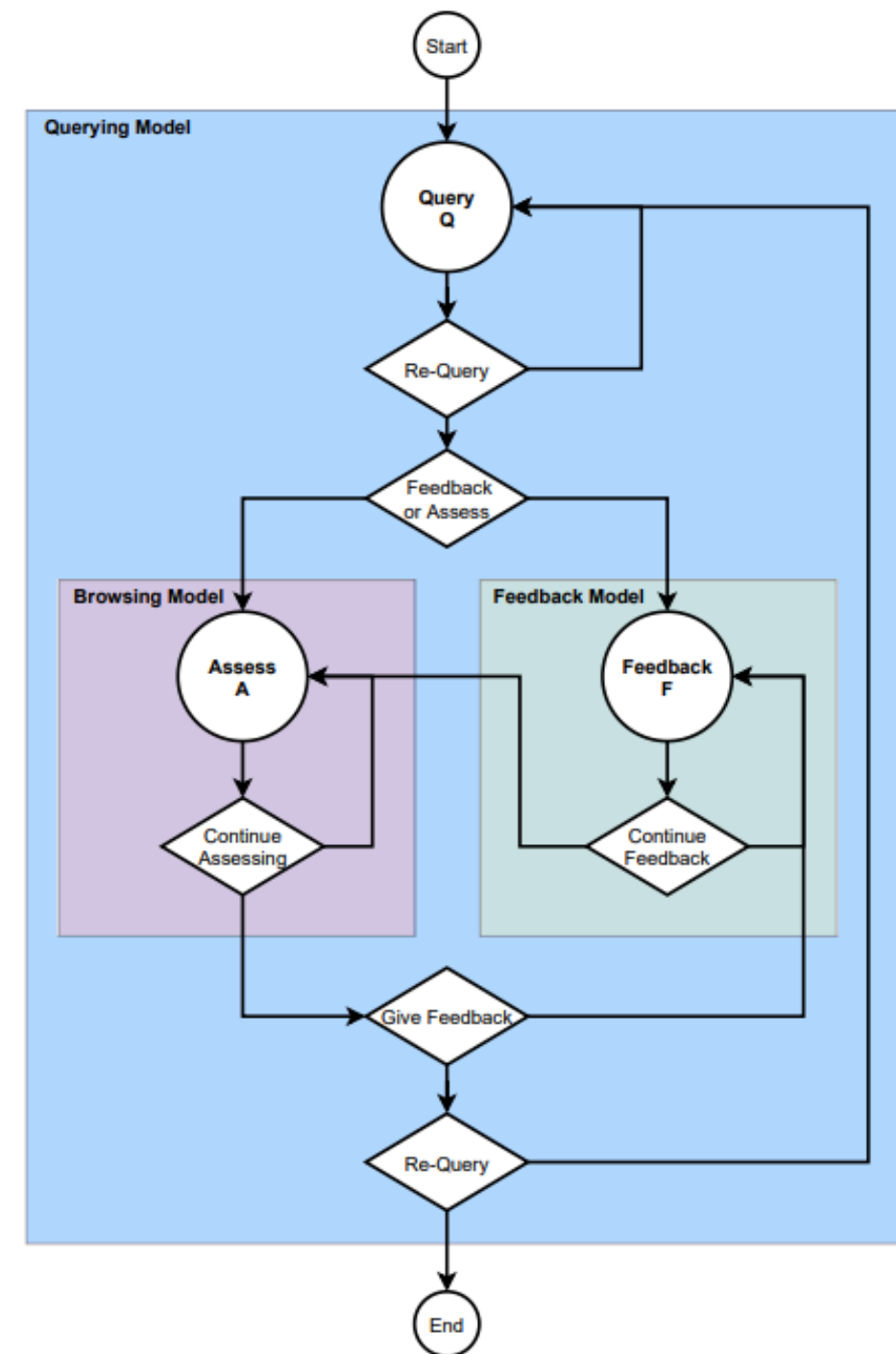
Assess Turn
User selects a result
Agent responds

✓ M Aliannejadi, et al. Modelling and Measuring Conversational Search: An Analysis of Mixed Initiatives and Conversational Strategies (*under review*)
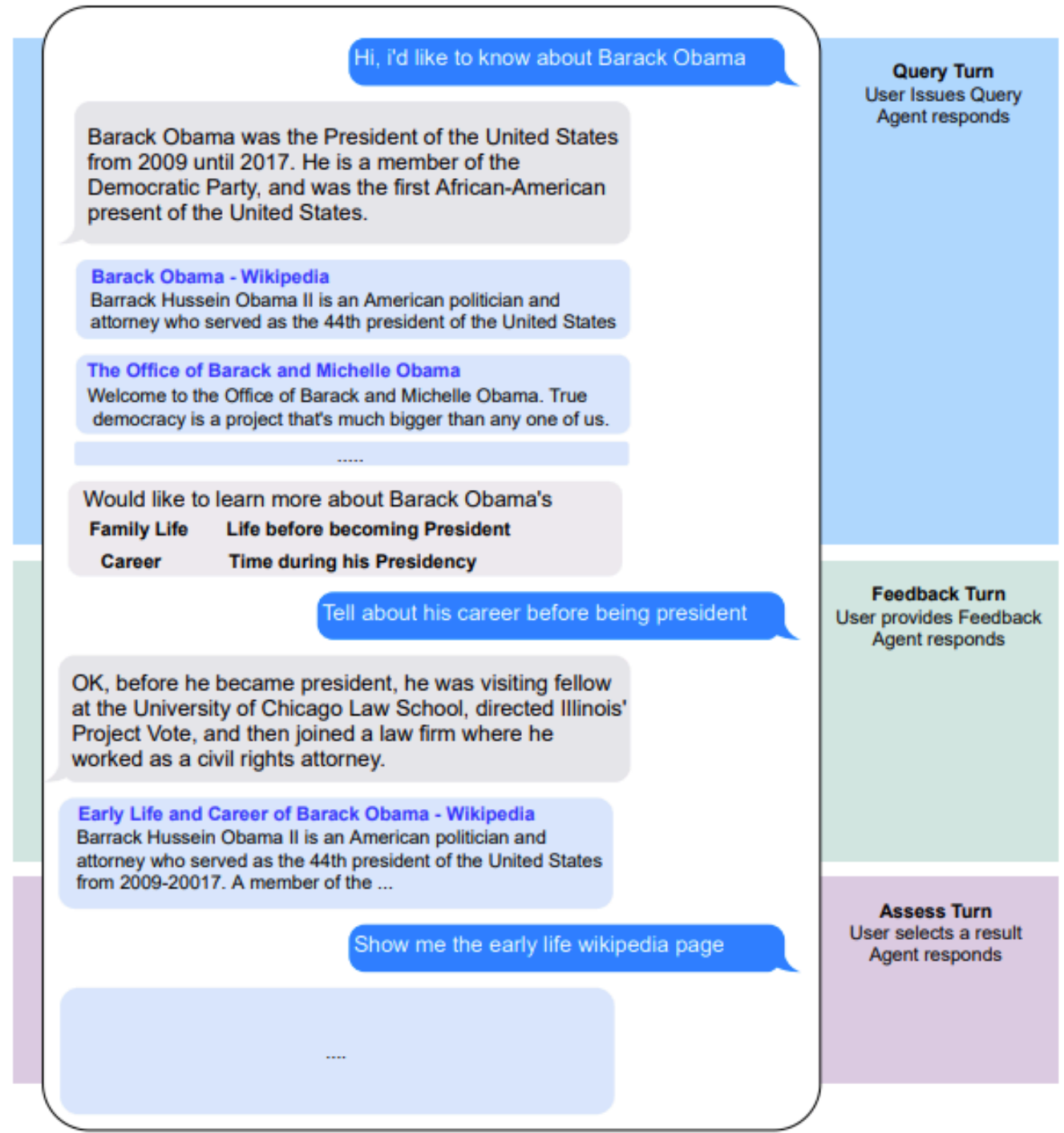
Conversational search agent interface

1. a voice only CSA often via a virtual assistant

2. a chat based CSA (that is in-situ within a platform like Slack or Telegram

3. an augmented search engine interface, or
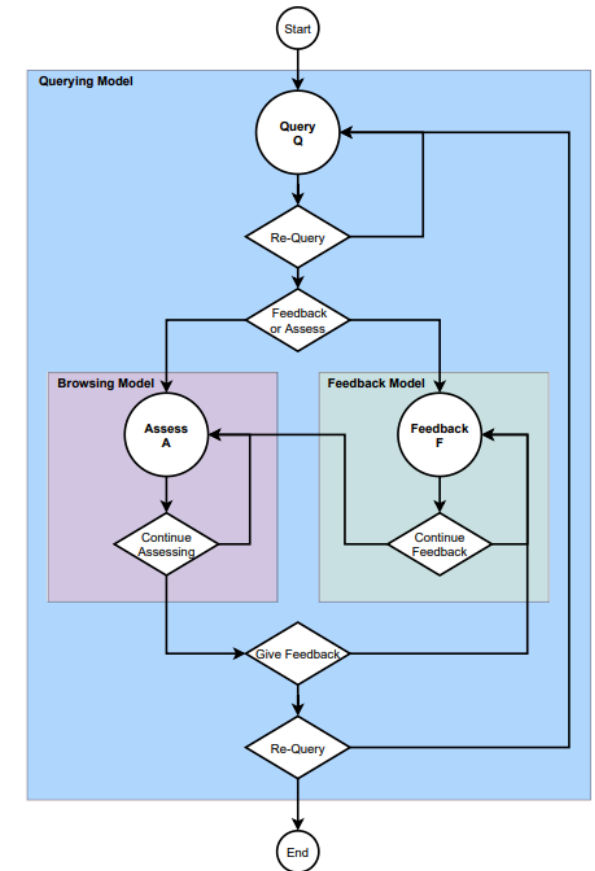
4. a multi-modal virtual assistants.

User Interaction Model of Conversational Search

✓ M Aliannejadi, et al. Modelling and Measuring Conversational Search: An Analysis of Mixed Initiatives and Conversational Strategies (*under review*)

39

User Interaction Model of Conversational Search

SIMULATION	Answer Question	Use Suggested Query
Feedback First		
Feedback After		

✓ M Aliannejadi, et al. Modelling and Measuring Conversational Search: An Analysis of Mixed Initiatives and Conversational Strategies (*under review*)

40

Evaluating the Cost and Benefit of CS

Cumulative gain: $\quad G(t_i, \ldots, t_T) = \sum_{i=1}^{i=T} g(t_i)$

Cumulative effort: $\quad C(t_i, \ldots, t_T) = \sum_{i=1}^{i=T} c(t_i)$

Rate of gain: $\quad R(t_i, \ldots, t_T) = \dfrac{G(t_i, \ldots, t_T)}{C(t_i, \ldots, t_T)}$

Grounding Costs

- Time as an estimation of cost.

- Crowdsourcing:

  - Feedback

  - Assessment

What you do you want to know about COVID-19?

Symptoms	Vaccine	Restrictions
Number of cases	Not interested	

Current Information about COVID-19

https://www.rivm.nl/en/novel-coronavirus-covid-19/current-information

You are looking for current information about the novel coronavirus (COVID-19) in the Netherlands. Weekly updates with an overview of COVID-19 confirmed cases, number of ...
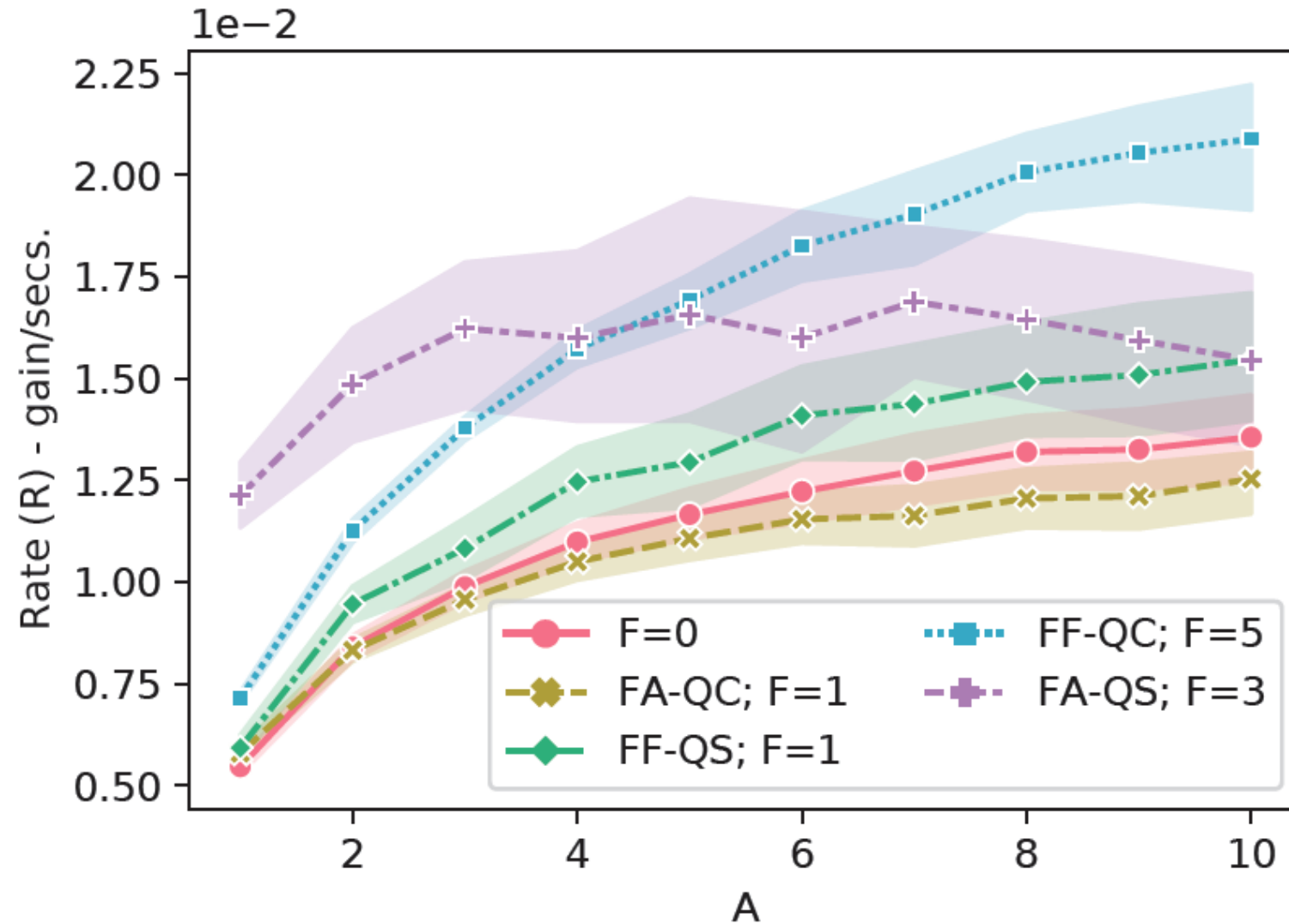
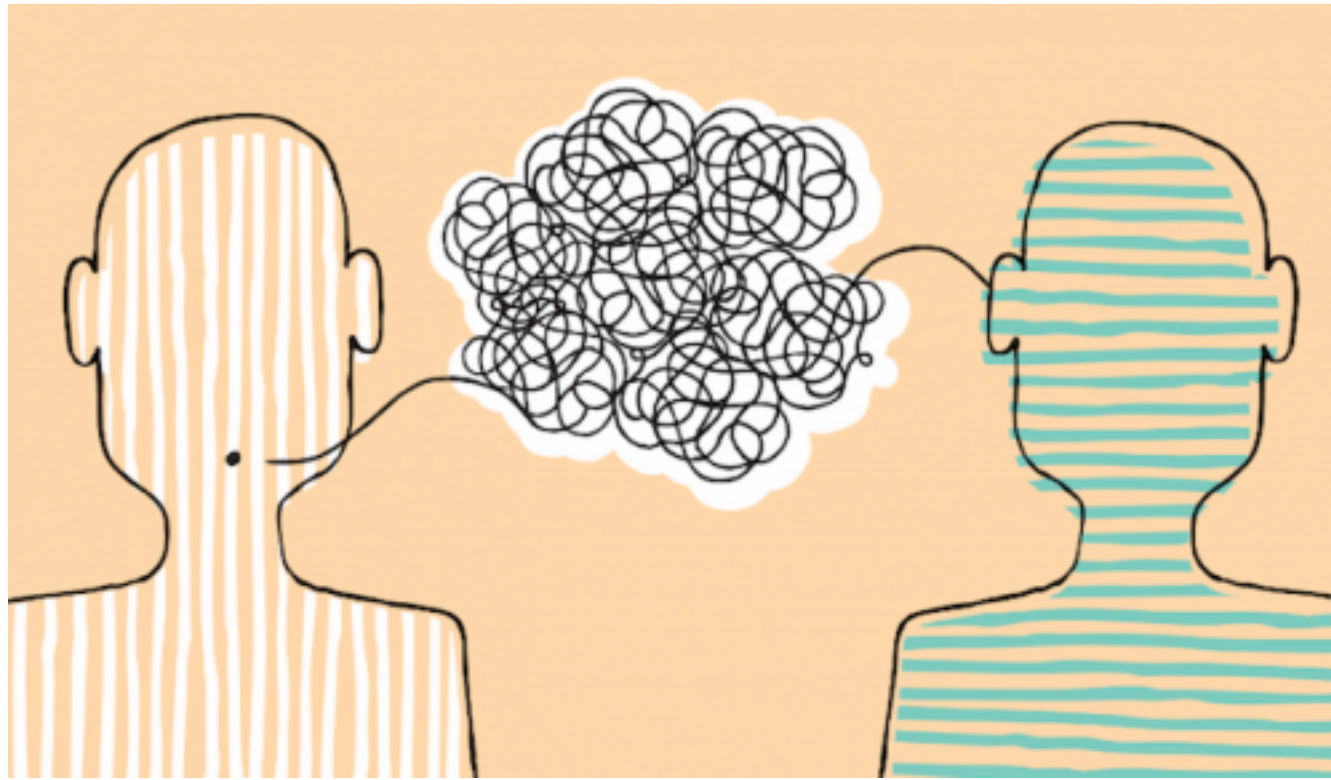| Looks very useful	Might be useful	NOT useful

Grounding Costs

- Time as an estimation of cost.

	Submit Query	Assess Snippet	Assess Document	Provide Feedback
Mean	29.33	6.26	16.96	8.33
Median	22.59	3.63	10.22	5.77

Analyzing Strategies
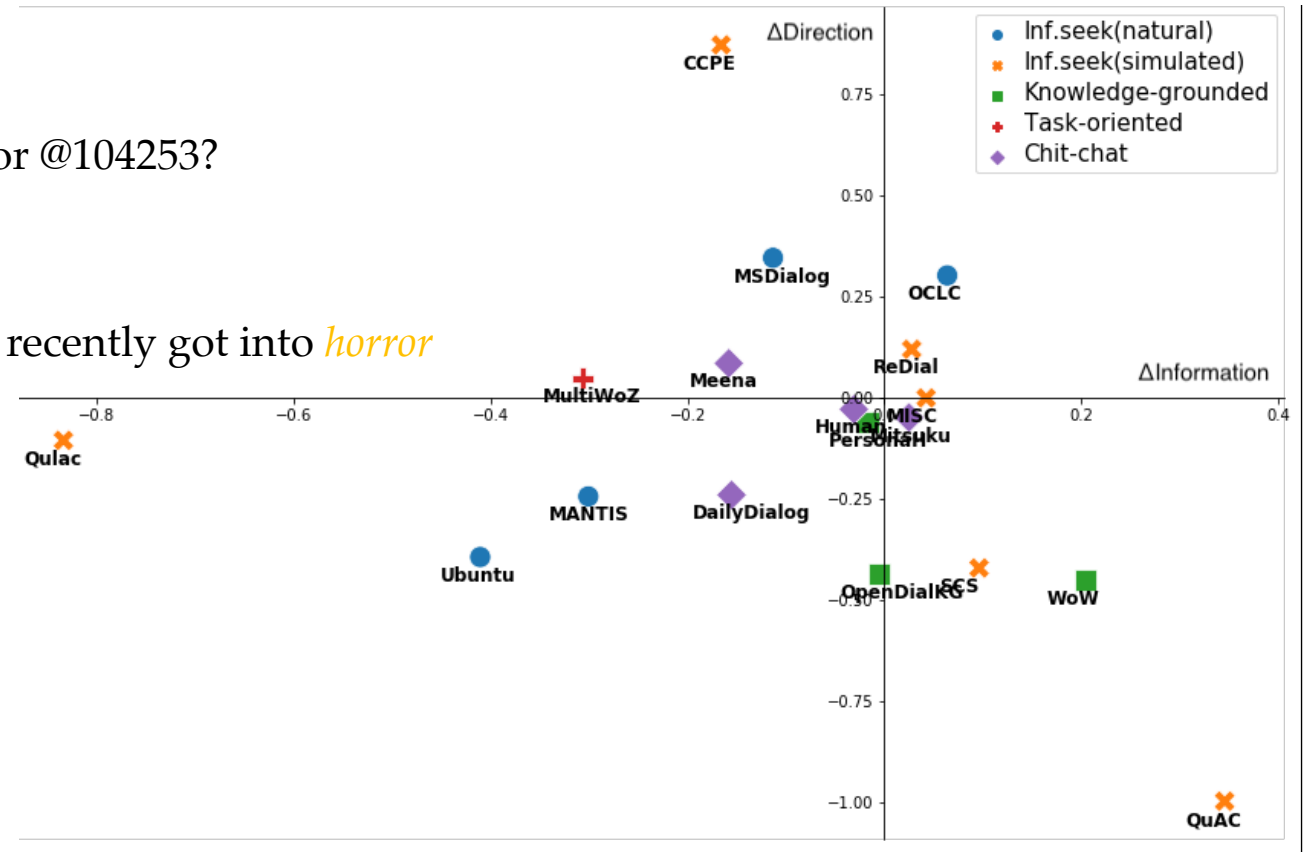
Analyzing Mixed Initiative

Analyzing Mixed Initiative

Dataset	Dialogues	Domain	Type	Subtype	Modality	Source	Setup	Dial. len.	Utt. len.	Utt./turn
MSDialog [23]	35,500	tech	info-seek	IN	text	forum	**natural**	9 (25)	**67 (87)**	1 (3)
MANTIS [22]	1,400	multi	info-seek	IN	text	forum	**natural**	4 (1)	**98 (160)**	1 (0)
OCLC[a]	560	library	info-seek	IN	text	chat	**natural**	25 (20)	12 (15)	1 (1)
Ubuntu [20]	1,200,000	tech	info-seek	IN	text	chat	**natural**	6 (8)	10 (9)	1 (1)
SCSdata [35]	37	web	info-seek	IS	**speech**	chat	simulated	27 (21)	16 (25)	1 (0)
MISC [34]	110	web	info-seek	IS	**speech**	chat	simulated	**120 (47)**	7 (7)	**2 (2)**
ReDial [17]	10,000	movies	info-seek	IS	text	chat	simulated	18 (5)	6 (5)	1 (0)
CCPE [25]	502	movies	info-seek	IS	text	chat	simulated	23 (6)	12 (13)	1 (0)
Qulac [?]	10,277	web	info-seek	IS	text	**task**[b]	simulated	3 (0)	8 (3)	1 (0)
QuAC [7]	11,600	Wikipedia	info-seek	IS	text	chat	simulated	14 (4)	9 (7)	1 (0)
MultiWOZ [?]	10,000	multi	**task-orient**	TO	text	chat	simulated	13 (5)	13 (6)	1 (0)
Meena/Mitsuku* [1]	100	open	social	CC	text	chat	simulated	18 (4)	8 (10)	1 (0)
Meena/Meena* [1]	91	open	social	CC	text	chat	simulated	19 (5)	6 (4)	1 (0)
Meena/Human [1]	95	open	social	CC	text	chat	simulated	15 (2)	13 (10)	1 (0)
DailyDialog [18]	11,000	multi	social	CC	text	**book**[c]	simulated	7 (4)	13 (10)	1 (0)
PersonaH [29]	102	personal	social	KG	text	chat	simulated	12 (0)	9 (4)	1 (0)
WoW [12]	22,000	Wikipedia	social	KG	text	chat	simulated	9 (1)	16 (7)	1 (0)
OpenDialKG [21]	13,800	Freebase	social	KG	text	chat	simulated	6 (2)	12 (6)	1 (0)

✓ S Vakulenko, E Kanoulas, M de Rijke, An Analysis of Mixed Initiative and Collab. in Information-Seeking Dialogues, *SIGIR 2020*
✓ S Vakulenko, E Kanoulas, M de Rijke, Large Scale Analysis of Mixed Initiative in Information-Seeking Dialogues for Conversational Search (*under review*)

Analyzing Mixed Initiative

(R)   Hey! What kind of *movies* do you like to watch?

(H)   I'm really big on *indie romance and dramas*

(R)   Ok what's your favorite *movie*?

(R)   Staying with that *genre*, have you seen @88487 or @104253?

(R)   Those are two really good ones

(H)   When I was a kid I liked *horror* like @181097

(R)   @Misery is really creepy but really good. I only recently got into *horror*

- S Vakulenko, E Kanoulas, M de Rijke, An Analysis of Mixed Initiative and Collab. in Information-Seeking Dialogues, *SIGIR 2020*
- S Vakulenko, E Kanoulas, M de Rijke, Large Scale Analysis of Mixed Initiative in Information-Seeking Dialogues for Conversational Search, *under review*
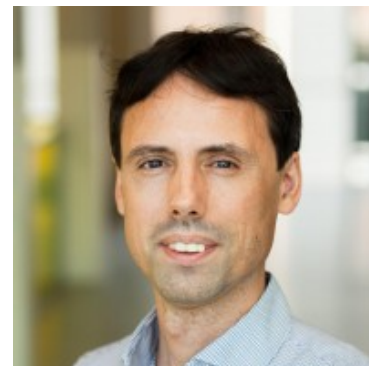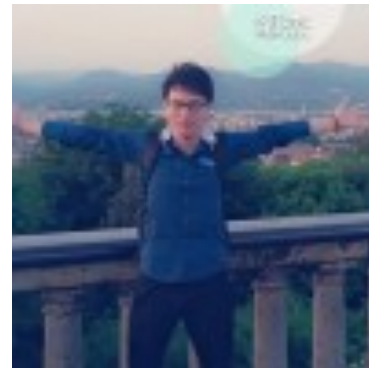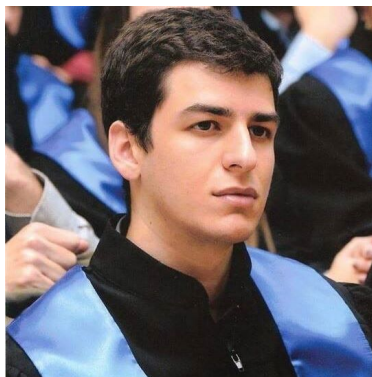
Summing up …

Agent

1. Provide ranking of document/passages
2. Provide direct answer
3. Ask clarifying question
   1. Relevance over items/documents
   2. Natural language questions
   3. Suggested questions

Evaluation

1. Simulate mixed innitiative
2. Decide costs/gains
3. Develop evaluation measures

Thanks!