Towards Mixed-Initiative Conversational Information Seeking

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Why Conversational Information Seeking?

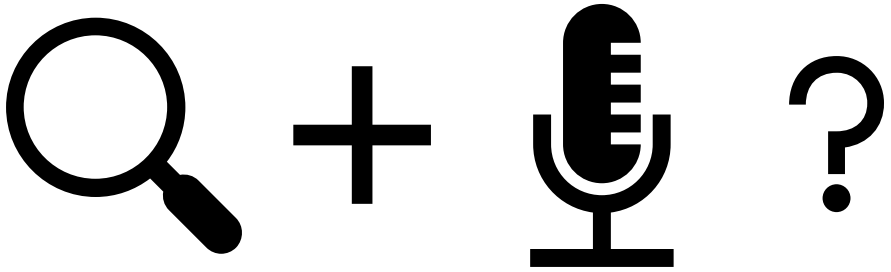
Recent advances in automatic speech recognition

Popularity of devices with limited bandwidth interfaces

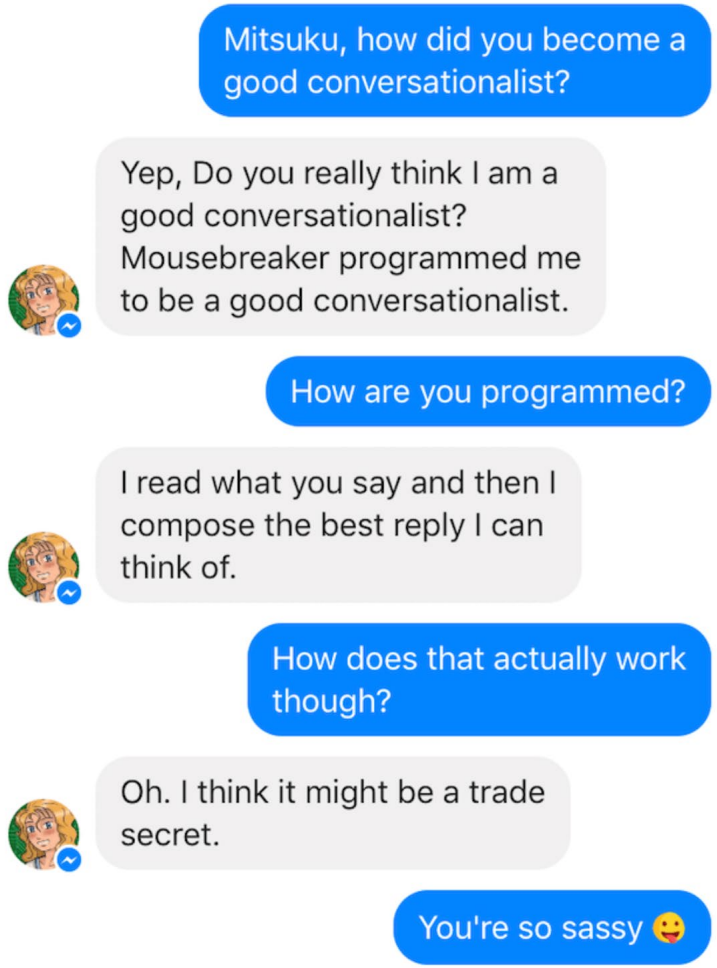
Recent advances in neural models

Information access is an important service.

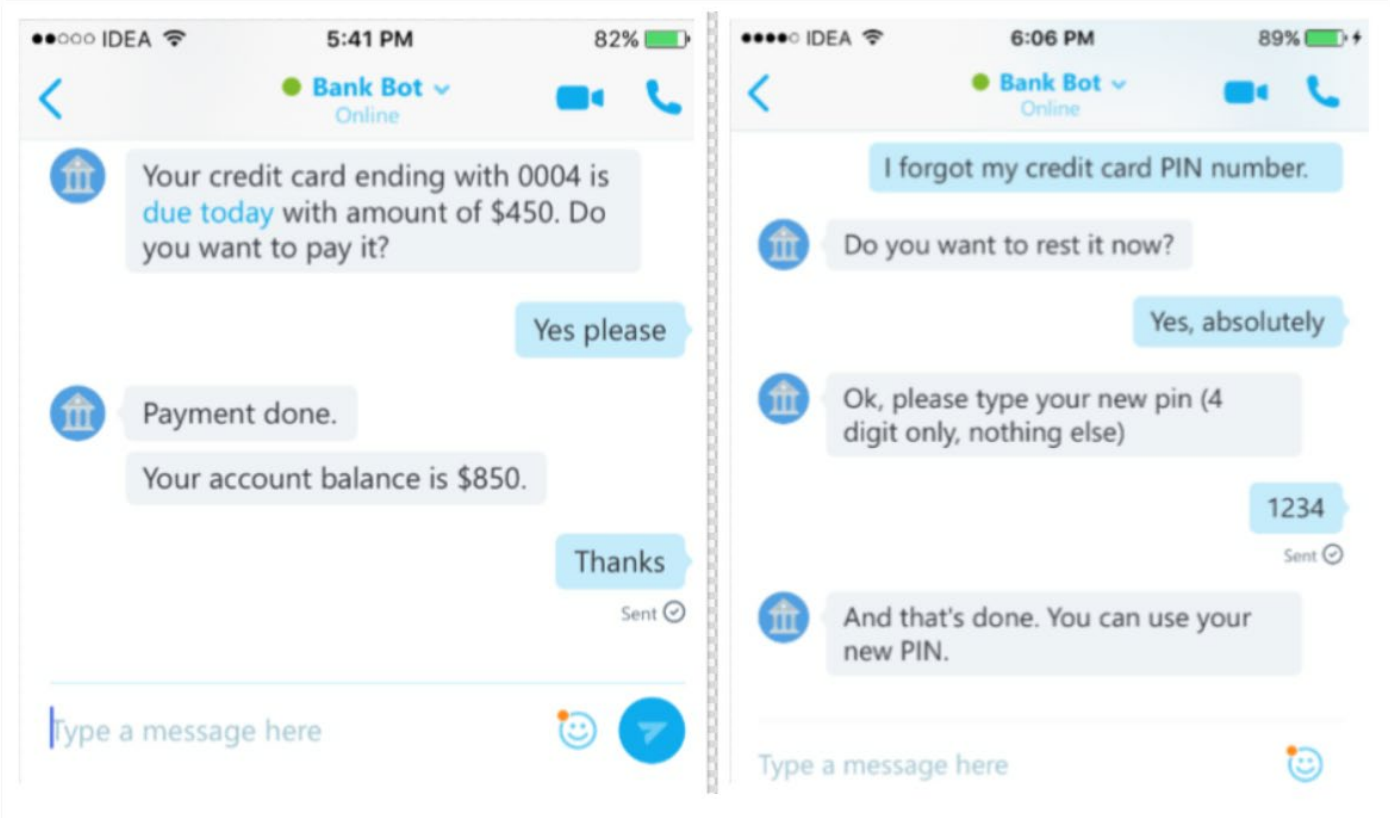
What is conversational search?

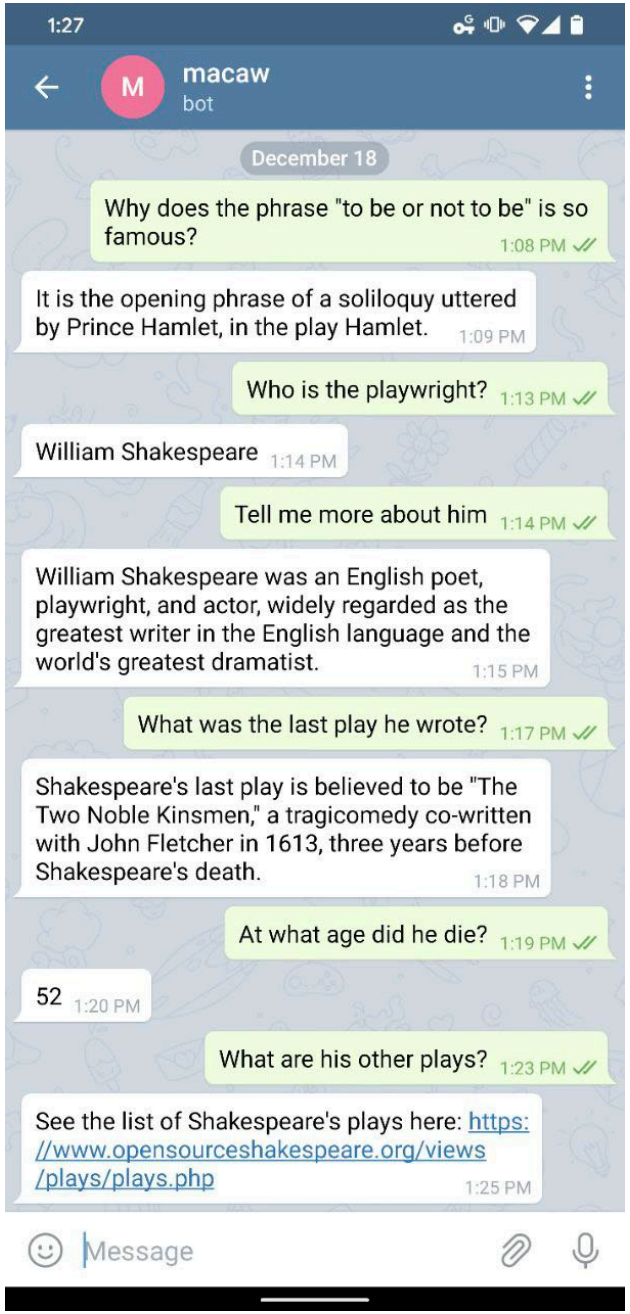


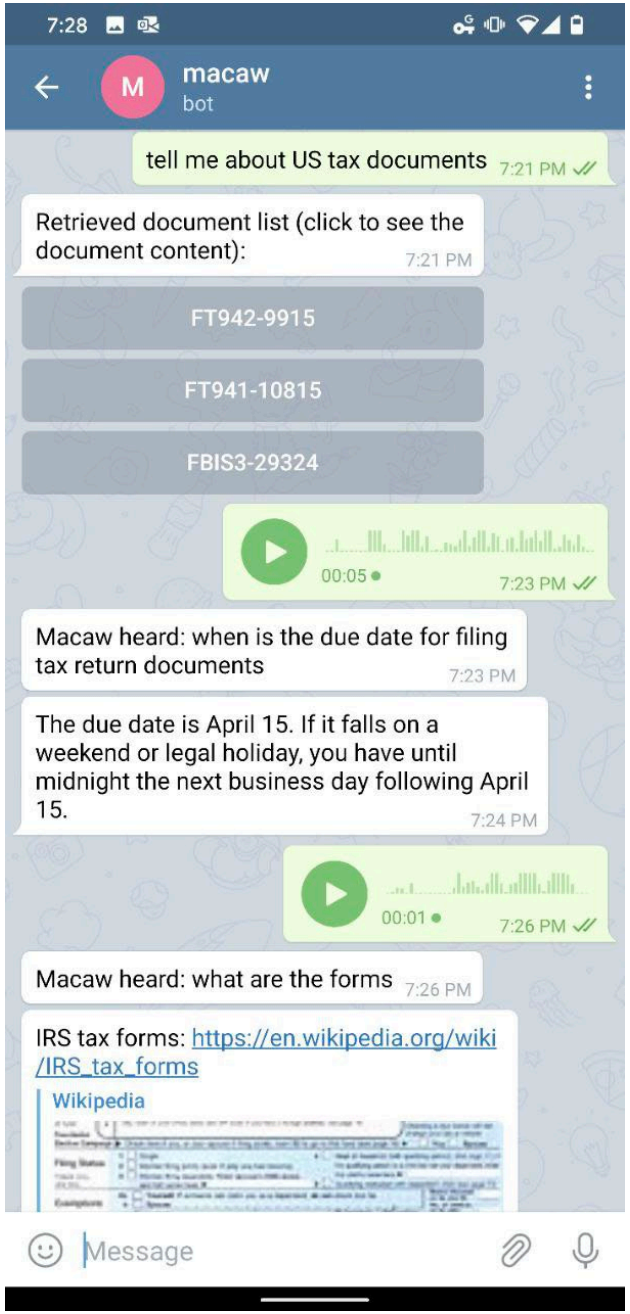
Is This Conversational Search?



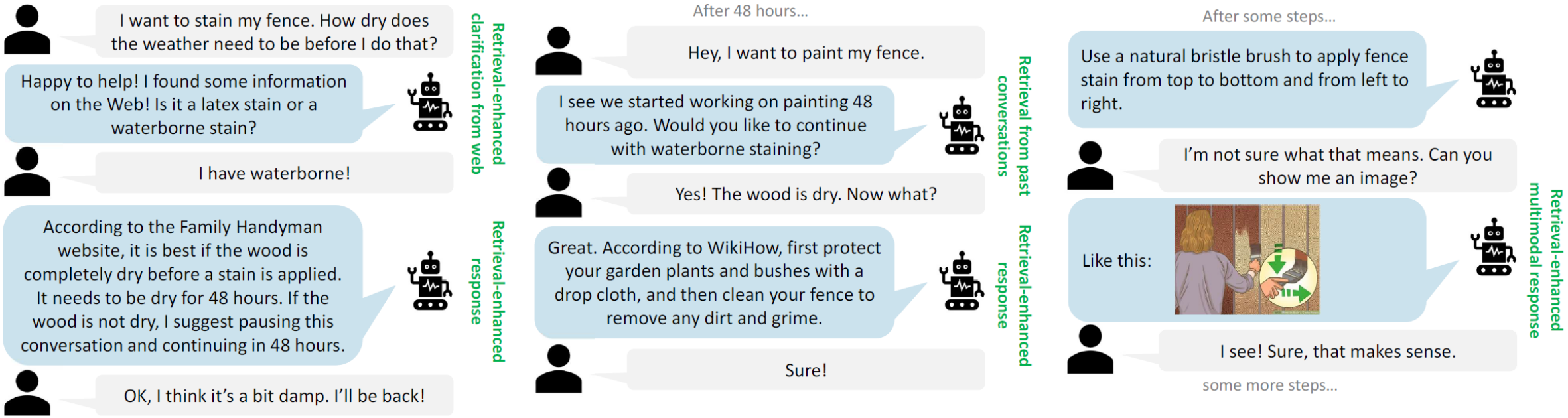
Is This Conversational Search?




1:27
macaw
bot
December 18
Why does the phrase "to be or not to be" is so famous? 1:08 PM
It is the opening phrase of a soliloquy uttered by Prince Hamlet, in the play Hamlet. 1:09 PM
Who is the playwright? 1:13 PM
William Shakespeare 1:14 PM
Tell me more about him 1:14 PM
William Shakespeare was an English poet, playwright, and actor, widely regarded as the greatest writer in the English language and the world's greatest dramatist. 1:15 PM
What was the last play he wrote? 1:17 PM
Shakespeare's last play is believed to be "The Two Noble Kinsmen," a tragicomedy co-written with John Fletcher in 1613, three years before Shakespeare's death. 1:18 PM
At what age did he die? 1:19 PM
52 1:20 PM
What are his other plays? 1:23 PM
See the list of Shakespeare's plays here: https://www.opensourceshakespeare.org/views/plays/plays.php 1:25 PM
Message


7:28
macaw
bot
tell me about US tax documents 7:21 PM
Retrieved document list (click to see the document content): 7:21 PM
FT942-9915
FT941-10815
FBIS3-29324
00:05 7:23 PM
Macaw heard: when is the due date for filing tax return documents 7:23 PM
The due date is April 15. If it falls on a weekend or legal holiday, you have until midnight the next business day following April 15. 7:24 PM
00:01 7:26 PM
Macaw heard: what are the forms 7:26 PM
IRS tax forms: https://en.wikipedia.org/wiki/IRS_tax_forms
Wikipedia
Message

Conversations can be complex!



Definitions

Conversation is **interactive** communication for **exchanging information** between two or more participants (i.e., humans or machines) that involves a **sequence** of interactions. While **natural language** is considered as prerequisite for conversational interactions, conversations can also exhibit **other types of interaction** with different characteristics and modalities (e.g., click, touch, and gestures).

Zamani, Trippas, Dalton, Radlinski. “Conversational Information Seeking”, 2022.

Definitions

Information seeking conversation is a **conversation** in which the goal of information exchange is **satisfying the information needs** of one or more participants.

A **Conversational Information Seeking** (CIS) system is a system that satisfies the information needs of one or more users by engaging in **information seeking conversations**. CIS responses are expected to be concise, fluent, stateful, **mixed-initiative**, context-aware, and personalized.

Zamani, Trippas, Dalton, Radlinski. “Conversational Information Seeking”, 2022.

Conversational Search has roots in early IR research!

Five general types of information necessary to get the desired state:

- Determination of subject
- Objective and motivation
- Personal characteristics of the inquirer
- Relationship of inquiry description to file organization
- Anticipated or acceptable answers

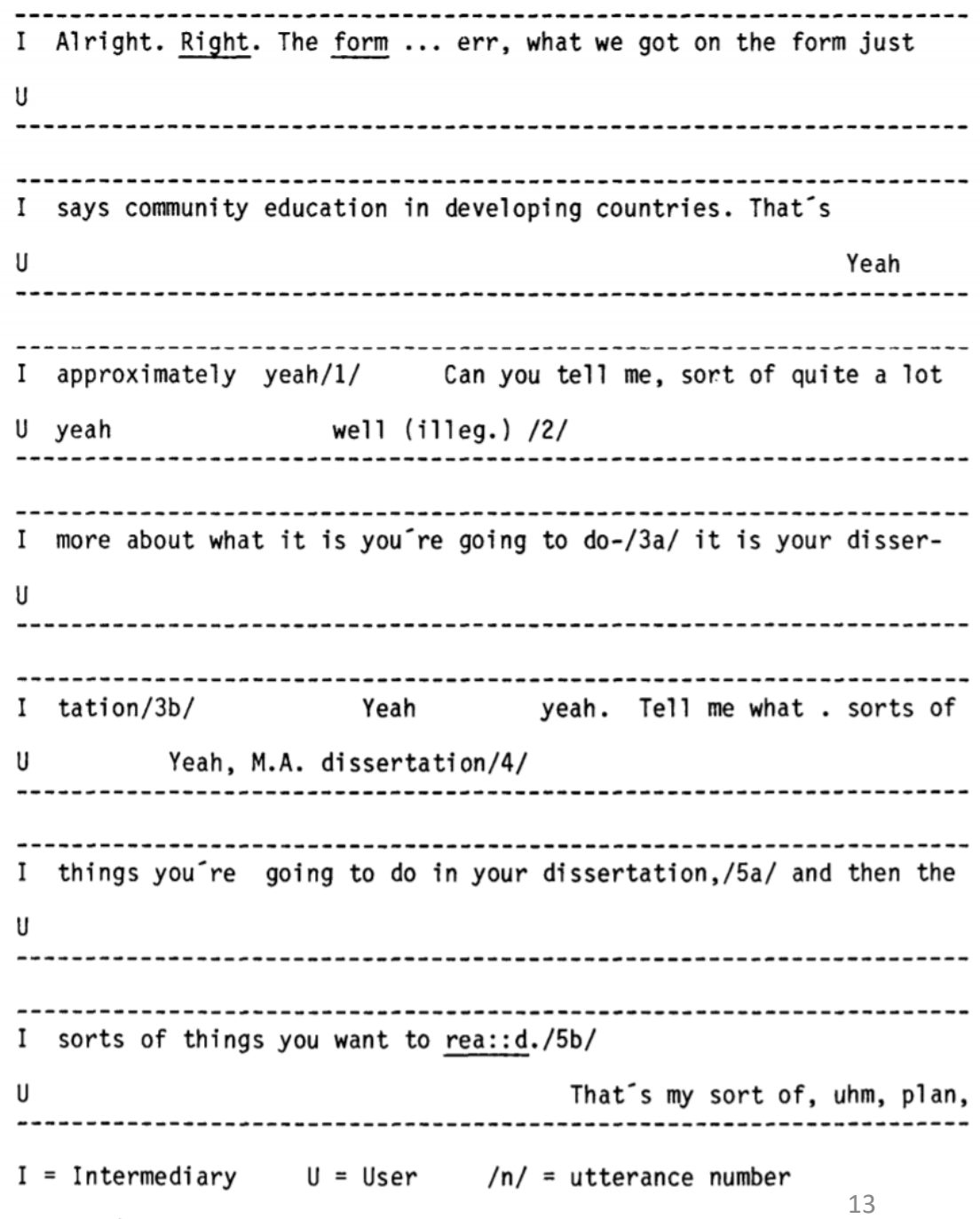
“Question Negotiation and Information Seeking in Libraries”, Robert Taylor, 1968.

Intermediary-based Online IR

Nature of interaction between user and intermediary, in both cognitive and affective senses, is a key factor in search satisfaction.

"Estimating the satisfaction of information users", R. Tagliacozzo, 1977.

User-Intermediary Interactions



I Alright. Right. The form ... err, what we got on the form just

U

I says community education in developing countries. That´s

U Yeah

I approximately yeah/1/ Can you tell me, sort of quite a lot

U yeah well (illeg.) /2/

I more about what it is you´re going to do-/3a/ it is your disser-

U

I tation/3b/ Yeah yeah. Tell me what . sorts of

U Yeah, M.A. dissertation/4/

I things you´re going to do in your dissertation,/5a/ and then the

U

I sorts of things you want to rea::d./5b/

U That´s my sort of, uhm, plan,

I = Intermediary U = User /n/ = utterance number

Figure 3. Example span of user-intermediary pre-search interaction.

"Using Discourse Analysis for the Design of Information Retrieval Interaction Mechanisms", Brooks and Belkin, 1983

User-Intermediary Interactions

VARIABLE	CODE
Problem Description function	PD
Mode: Ask	1
Offer	2
Task: Description of problem topic or clarification	a
Description of problem type or context	b
Description of subject area	c
Terminology	d
Literature	e
User Model function	UM
Mode: Ask	1
Offer	2
Task: Personal background (status)	a
Intentions/goals	b
Familiarity with information systems	c
Familiarity with topic	d
Knowledge resource codes	
Subject knowledge	SUB
System knowledge	SYS
Query language	1
Index language	2
Data base	3
Technical	4
Functions	5
Knowldge of users	US
Types	1
Characteristics	2
Intentions	3
General world knowledge	WK

Figure 4. Coding key for function and resource analysis.

"Using Discourse Analysis for the Design of Information Retrieval Interaction Mechanisms", Brooks and Belkin, 1983

The THOMAS System

THOMAS, THE REFERENCE RETRIEVAL PROGRAM

Help can be obtained whenever the program has displayed the start symbol by typing '?' immediately after it.

Please give a short name for the search:
▶ Alv.Resp.

Start searching:
▶ pulmonary alveoli

Influence of fasting on blood gas tension, pH, and related values in dogs.; Pickrell *et al*, *Am J Vet Res*, *34*, 805–8, Jun 73
1. J A Pickrell, 2. J L Mauderly, 3. B A Muggenburg, 4. U C Luft, 5. animal experiments, 6. animal feed, 7. arteries, 8. blood, 9. body temperature, 10. carbon dioxide, 11. dogs, 12. fasting, 13. hemoglobin, 14. hydrogen-ion concentration, 15. irrigation, 16. lung, 17. oxygen, 18. pulmonary alveoli, 19. respiration, 20. time factors
▶ ?

"Information Retrieval through Man-Machine Dialogue", Oddy, 1977.

The THOMAS System

There can be three parts to your statement (all optional):

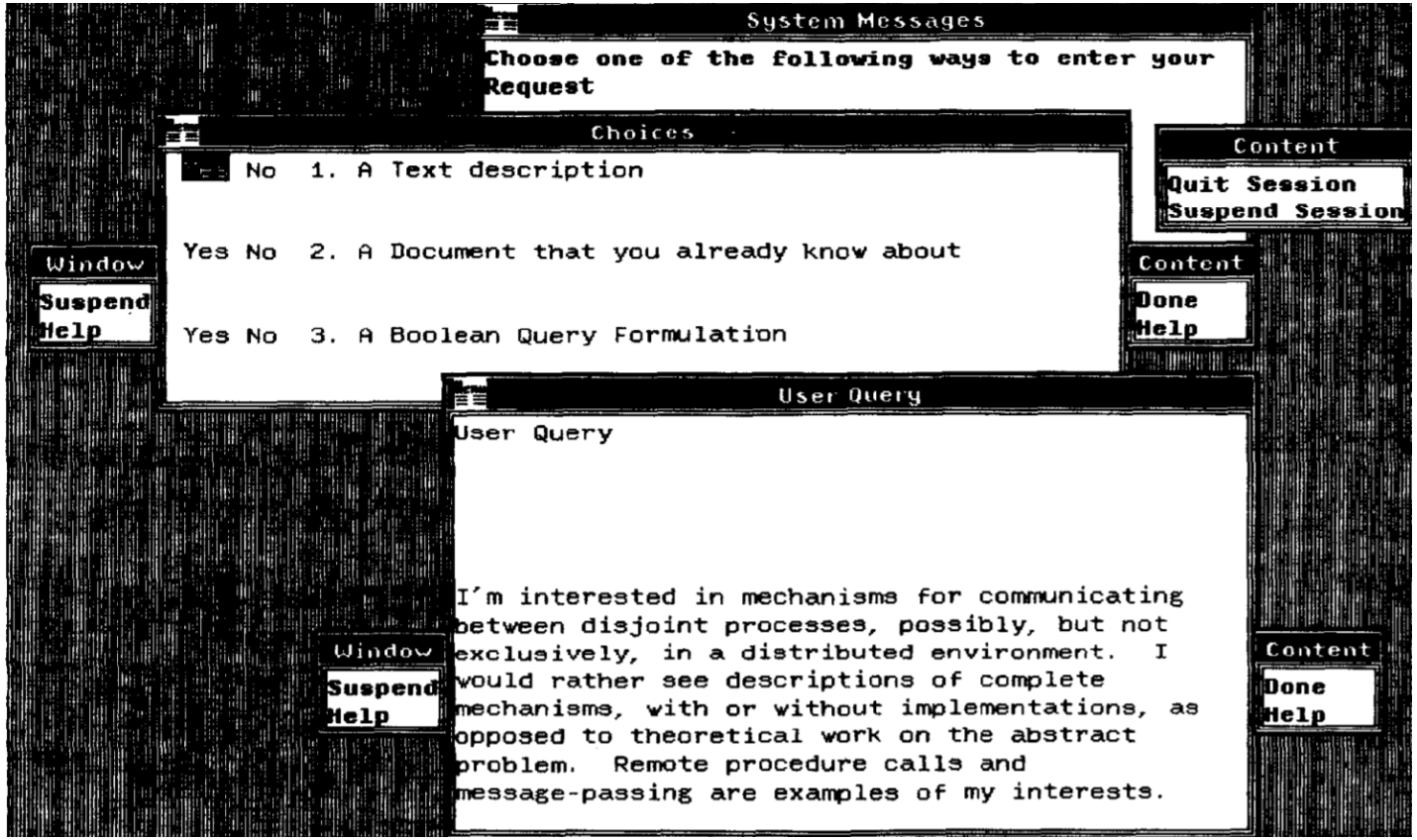
1. Your reaction to the reference just shown (if any).
   This must come first:
   "Yes" or "No"
2. A selection from the names (authors) or terms shown, by number. A "not" in the statement signifies rejection of all numbers that follow it.
3. New names or terms (terms preferably in quotes). The elements of the statement should be separated by commas.

Examples: 'posture', 'circulatory system'
Yes, not 11,12
No, 7,13,4
'heart rate'
Yes

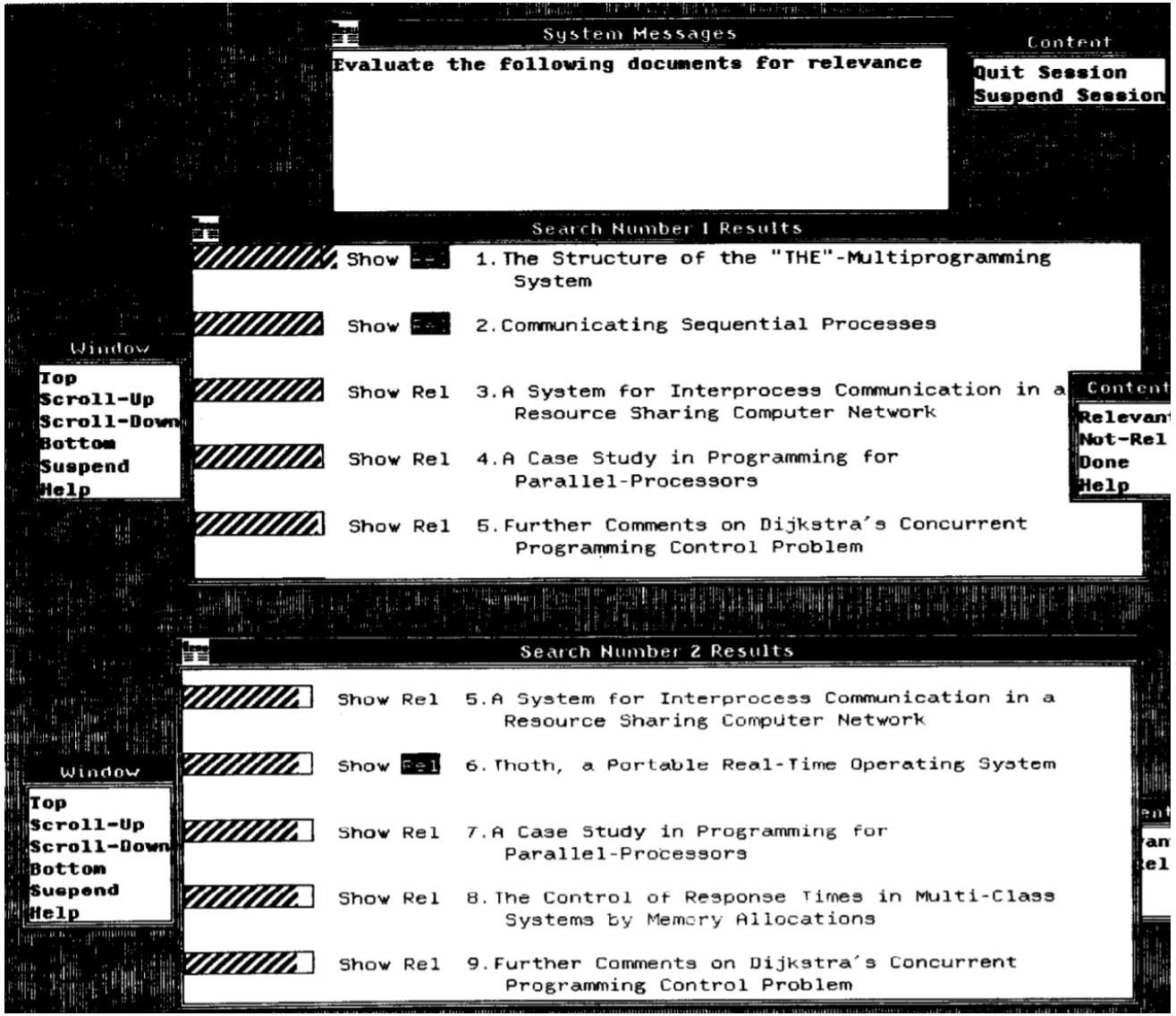
Press enter key when you are ready to proceed ▶

"Information Retrieval through Man-Machine Dialogue", Oddy, 1977.

The I^{3}R System



"I^{3}R: A New Approach to the Design of Document Retrieval Systems", Croft and Thompson, 1986.



"I^{3}R: A New Approach to the Design of Document Retrieval Systems", Croft and Thompson, 1986.

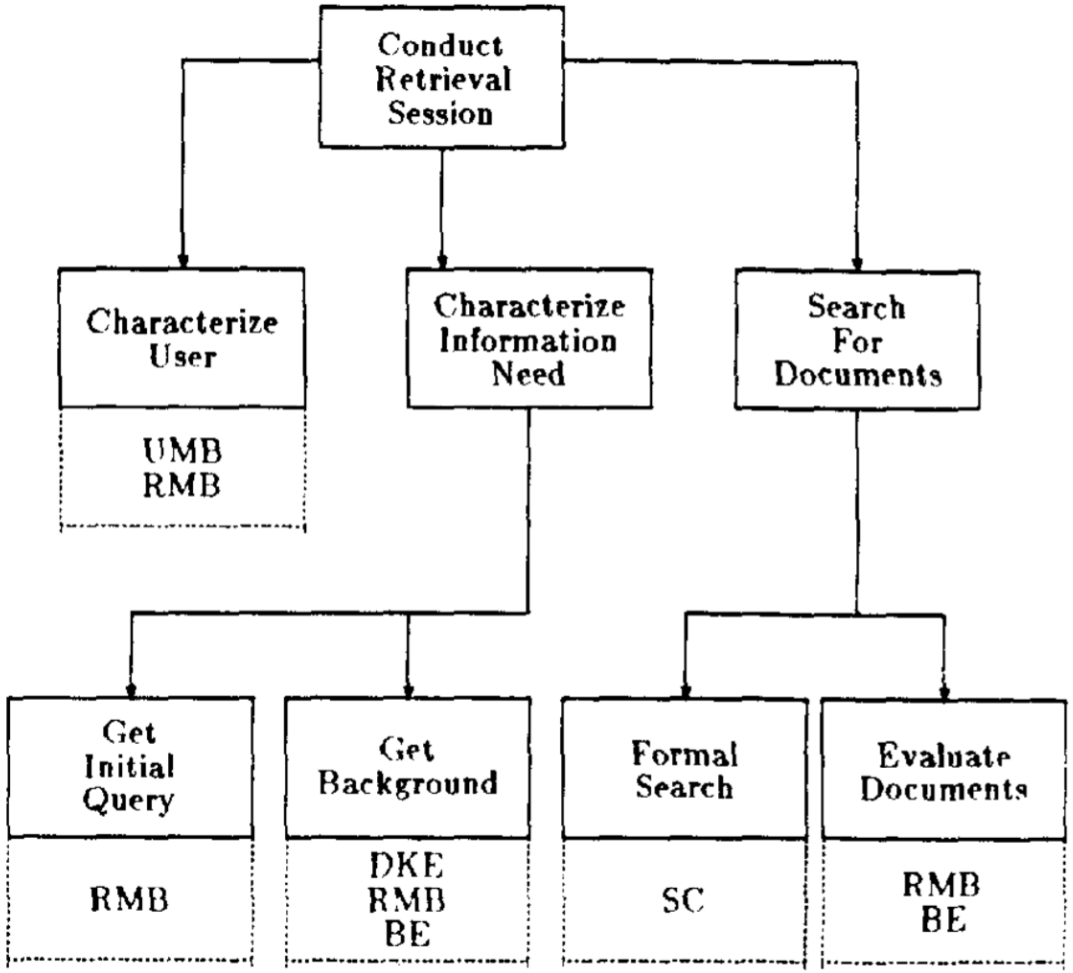


FIG. 3. Default scheduler plan.

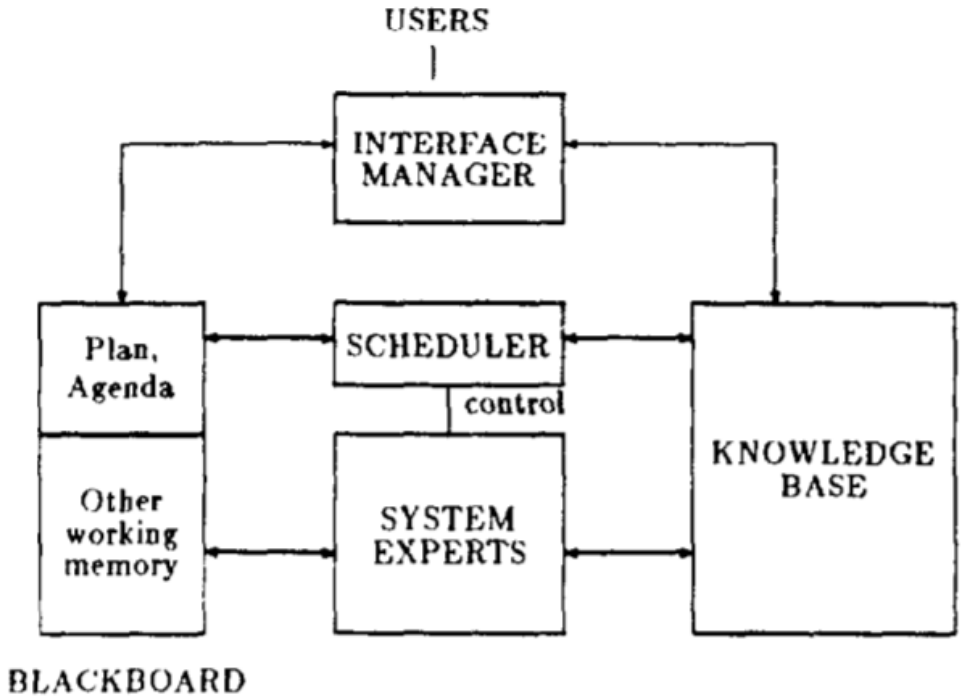


FIG. 2. Major system components.

"I^{3}R: A New Approach to the Design of Document Retrieval Systems", Croft and Thompson, 1986.

More Recently

- TREC CAsT: TREC Conversational Assistance Track
- CoQA: Conversational Question Answering
- QuAC: Question Answering in Context
- ShARC: Shaping Answers with Rules through Conversation
- ConvQuestions: Conversational Question Answering over Knowledge Graphs
- …

Section: Augusto Pinochet : Intellectual life...

STUDENT: **Was he known for being intelligent?**

TEACHER: ↪ No, Pinochet was publicly known as a man with a lack of culture.

STUDENT: **why did people feel that way?**

TEACHER: ↪ reinforced by the fact that he also portrayed himself as a common man

STUDENT: **did he have any hobbies?**

TEACHER: ↪ Yes, Before wresting power from Allende, Pinochet had written two books.

STUDENT: **what is the name of a book written by him?**

TEACHER: ↪ Geopolitica (1968) and Campana de Tarapaca (1972).

STUDENT: **what were the books about?**

TEACHER: ↪ Chile's military literature.

STUDENT: **was there anything noteworthy regarding his books?**

TEACHER: ↪ Yes, In Geopolitica Pinochet plagiarized (...) Gregorio Rodriguez Tascon

STUDENT: **did he deny those allegations?**

TEACHER: ↛ No answer

STUDENT: **what did he plagiarize in Geopolitica?**

TEACHER: ↪ In Geopolitica Pinochet plagiarized (...) paragraphs from a 1949 presentation

. . .

Mixed-Initiative Interactions in Human Conversation

Mixed-initiative levels	Capabilities
Unsolicited reporting	Agent may notify others of critical information as it arises
Subdialogue initiation	Agent may initiate subdialogues to clarify, correct, and so on
Fixed subtask initiative	Agent takes initiative to solve predefined subtasks
Negotiated mixed initiative	Agents coordinate and negotiate with other agents to determine initiative

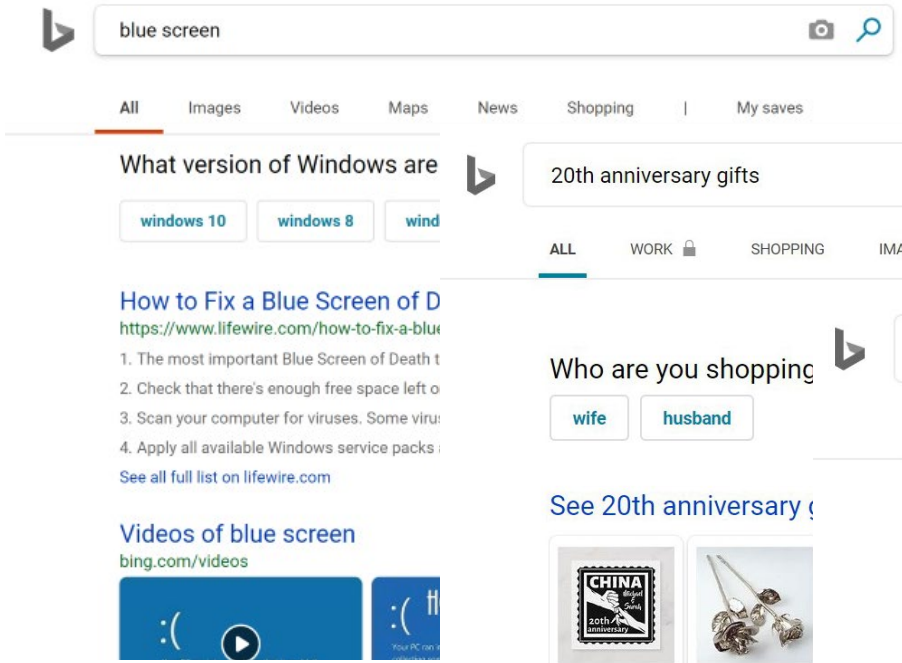
Action	Amount (%)
Evaluating and comparing options	25
Suggesting courses of action	23
Clarifying and establishing state	13.5
Clarifying or confirming the communication	13.5
Discussing problem-solving strategy	10
Summarizing courses of action	8
Identifying problems and alternatives	7

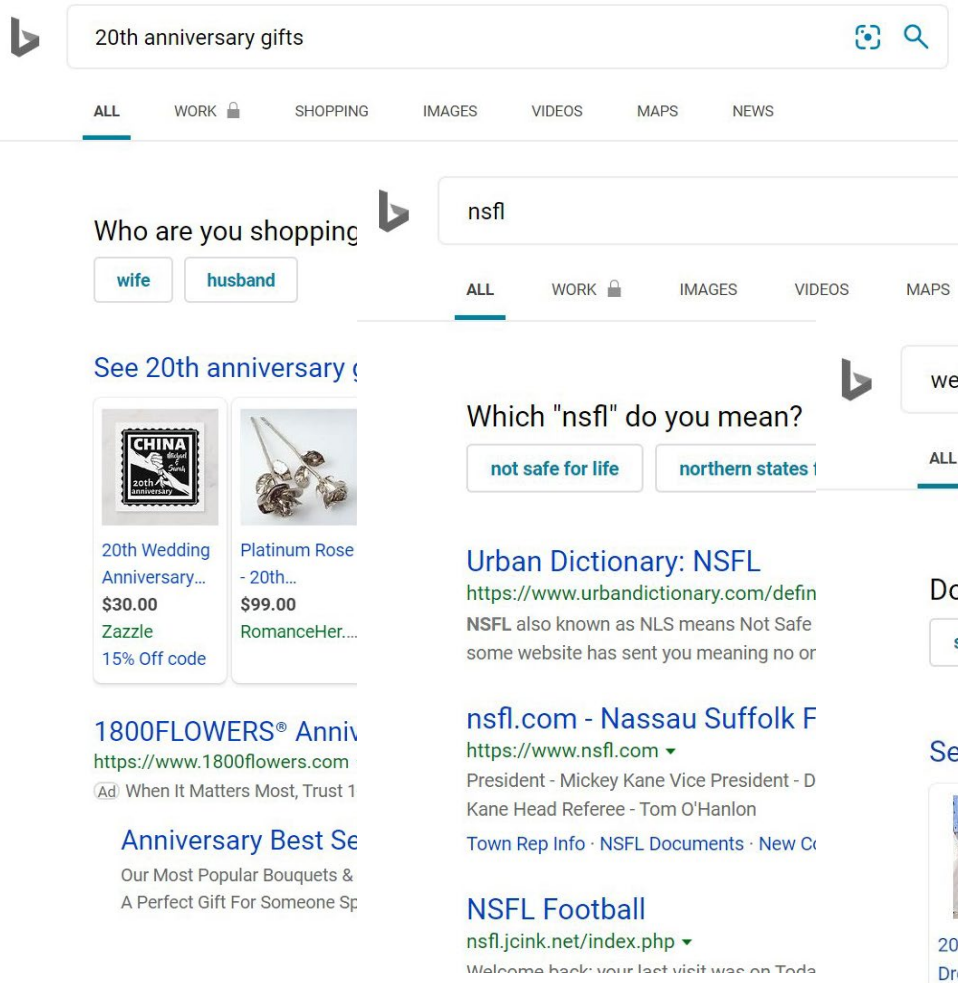
"Mixed-Initiative Interaction", Allen, Guinn, and Horvitz, 1999.

Clarification

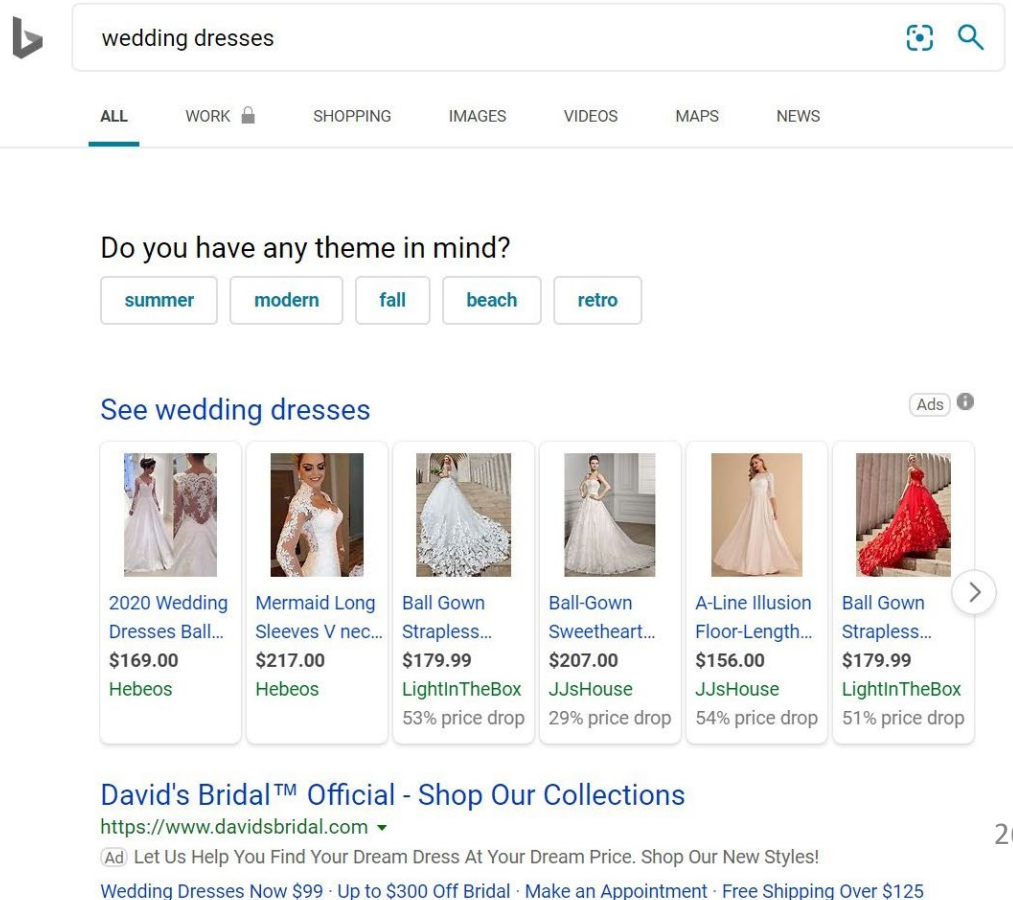
- Confirming or clarifying the communication
  - For example, to reduce ASR error.
- Correcting user mistakes
  - Did you mean …?
- **Intent clarification**

Search Clarification


blue screen
All
Images
Videos
Maps
News
Shopping
My saves
What version of Windows are
windows 10
windows 8
How to Fix a Blue Screen of D
https://www.lifewire.com/how-to-fix-a-blue
1. The most important Blue Screen of Death t
2. Check that there's enough free space left o
3. Scan your computer for viruses. Some viru
4. Apply all available Windows service packs
See all full list on lifewire.com
Videos of blue screen
bing.com/videos


20th anniversary gifts
ALL
WORK
SHOPPING
IMAGES
VIDEOS
MAPS
NEWS
Who are you shopping
wife
husband
See 20th anniversary
20th Wedding Anniversary...
$30.00
Zazzle
15% Off code
Platinum Rose - 20th...
$99.00
RomanceHer...
1800FLOWERS® Anniv
https://www.1800flowers.com
Ad When It Matters Most, Trust 1
Anniversary Best Se
Our Most Popular Bouquets &
A Perfect Gift For Someone Sp

nsfl
ALL
WORK
IMAGES
VIDEOS
MAPS
NEWS
SHOPPING
Which "nsfl" do you mean?
not safe for life
northern states
Urban Dictionary: NSFL
https://www.urbandictionary.com/defin
NSFL also known as NLS means Not Safe
some website has sent you meaning no or
nsfl.com - Nassau Suffolk F
https://www.nsfl.com
President - Mickey Kane Vice President - D
Kane Head Referee - Tom O'Hanlon
Town Rep Info · NSFL Documents · New C
NSFL Football
nsfl.jcink.net/index.php


wedding dresses
ALL
WORK
SHOPPING
IMAGES
VIDEOS
MAPS
NEWS
Do you have any theme in mind?
summer
modern
fall
beach
retro
See wedding dresses
Ads
2020 Wedding Dresses Ball...
$169.00
Hebeos
Mermaid Long Sleeves V nec...
$217.00
Hebeos
Ball Gown Strapless...
$179.99
LightInTheBox
53% price drop
Ball-Gown Sweetheart...
$207.00
JJsHouse
29% price drop
A-Line Illusion Floor-Length...
$156.00
JJsHouse
54% price drop
Ball Gown Strapless...
$179.99
LightInTheBox
51% price drop
David's Bridal™ Official - Shop Our Collections
https://www.davidsbridal.com
Ad Let Us Help You Find Your Dream Dress At Your Dream Price. Shop Our New Styles!
Wedding Dresses Now $99 · Up to $300 Off Bridal · Make an Appointment · Free Shipping Over $125
Related se
dillards wedding
bridesmaid dres
cheap wedding
wedding dresse
jcpenney weddi
jjshouse weddi
online wedding
unique inexpens

Clarifying Question?

- **Query:** acts 17:16

To generate a clarifying question, we need to identify different aspects of the query.

Query Reformulation Data

- shoes → running shoes
- shoes → shoes basketball
- shoes → formal shoes
- shoes → shoes nike
- shoes → shoes adidas
- shoes → shoes for women
- shoes → shoes for kids
- shoes → shoes sale
- shoes → shoes online
- shoes → shoes near me
- …

Taxonomy of Search Clarification

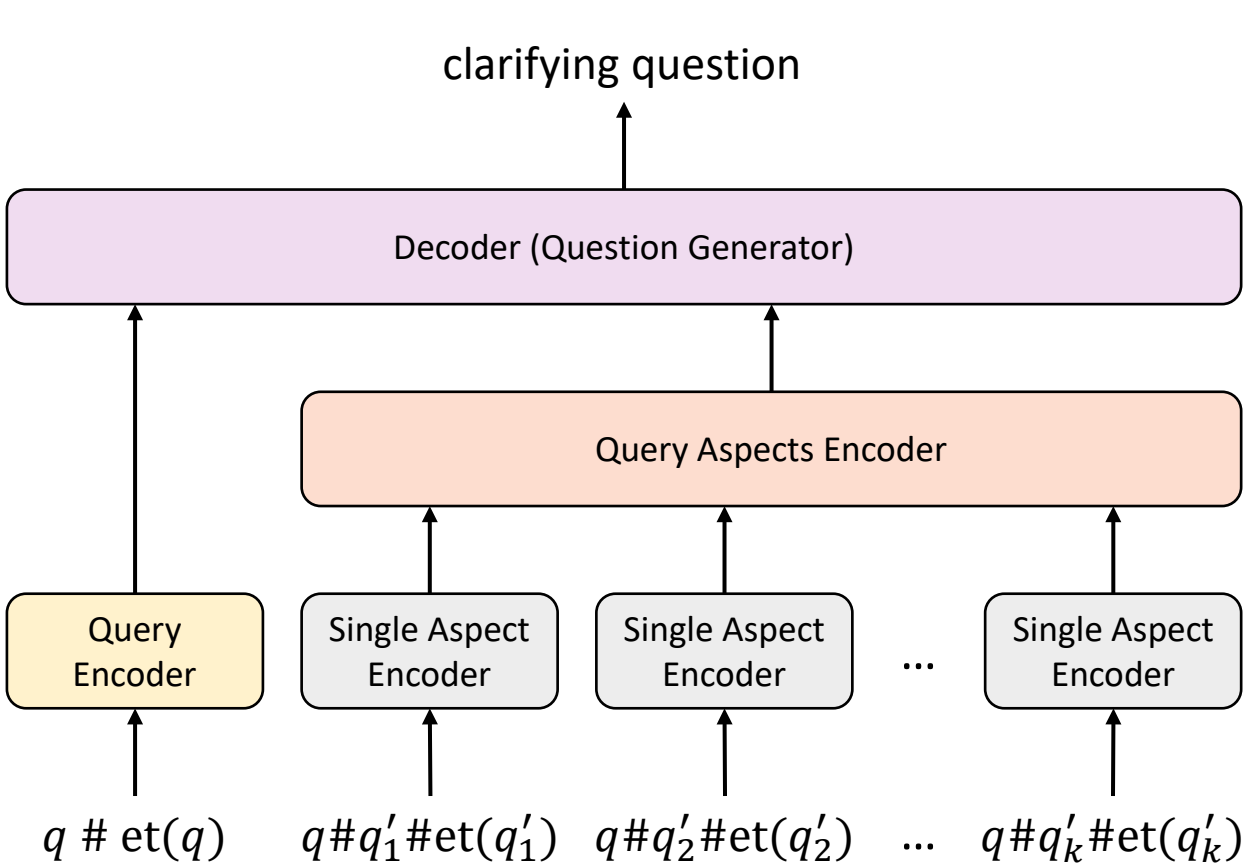
- **Disambiguation**
- **Preference**
  - **Personal information (“for whom”)**
  - **Spatial information (“where”)**
  - **Temporal information (“when”)**
  - **Purpose (“for what purpose”)**
- **Topic**
  - **Sub-topic information**
  - **Event and news**
- **Comparison**

Zamani, Dumais, Craswell, Bennett, Lueck. “Generating Clarifying Questions for Information Retrieval”. In WWW ‘20.

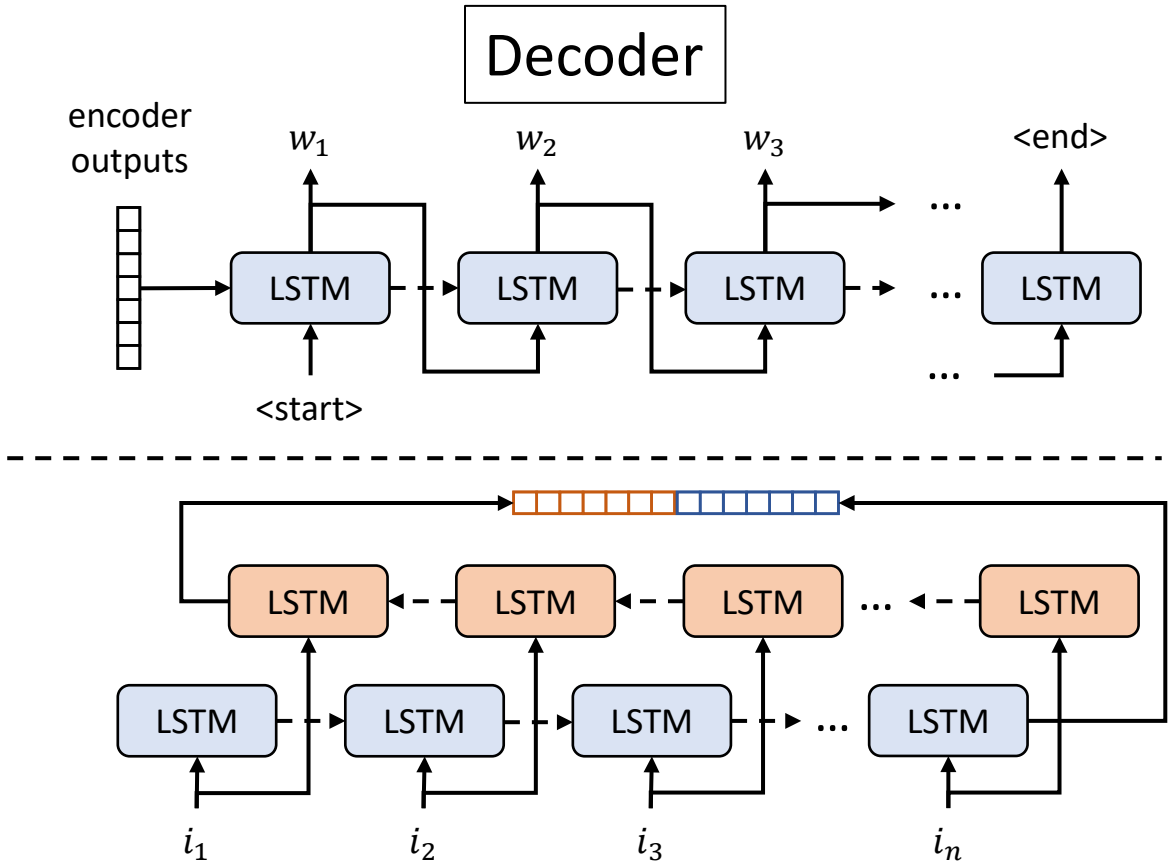
Question Templates

- What do you want to know about **QUERY**?
- What do you want to know about this **QUERY_ENTITY_TYPE**?
- What **ASPECT_ENTITY_TYPE** are you looking for?
- Whom are you looking for?
- …

Question Generation

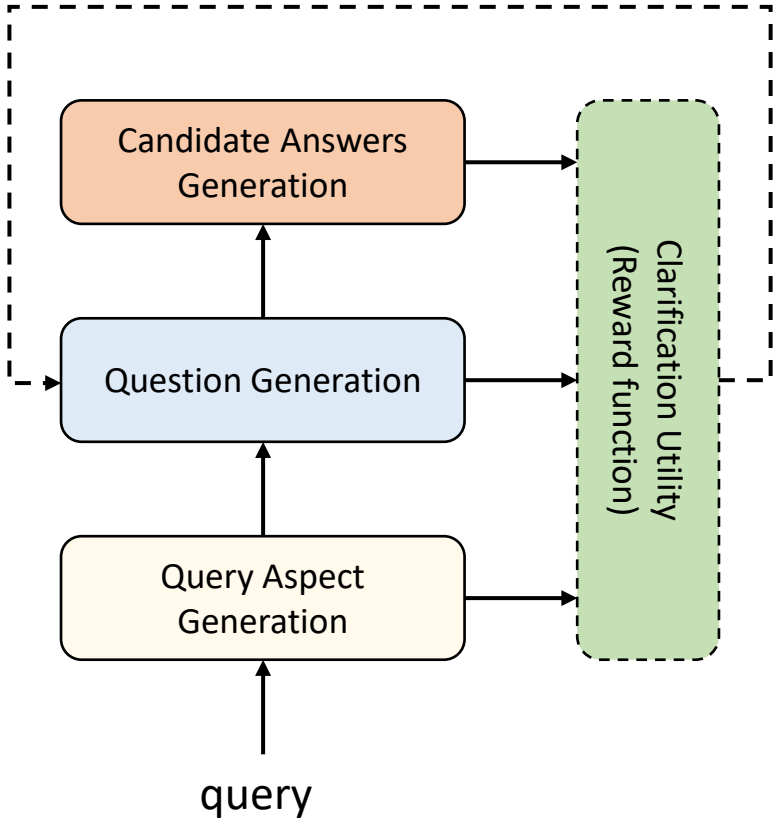


Question Generation Component



Sequence Encoder

Query Clarification Maximization Model



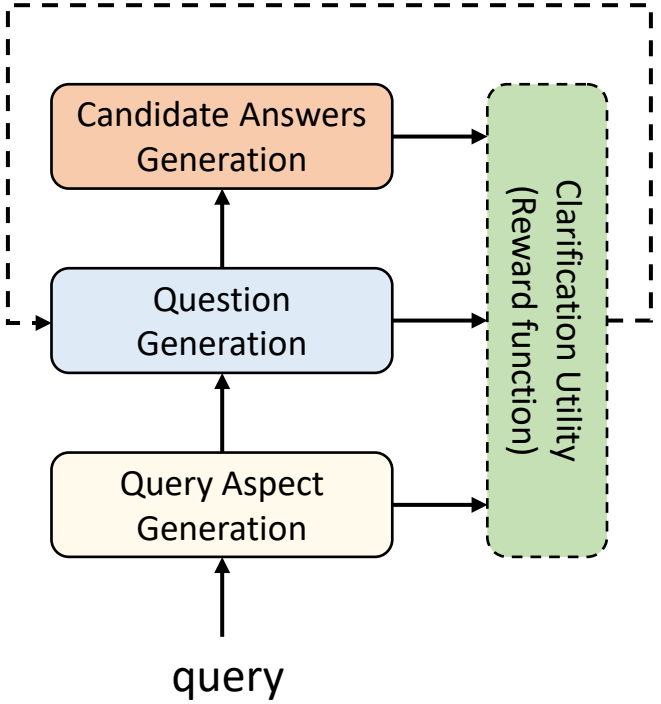
Zamani, Dumais, Craswell, Bennett, Lueck. “Generating Clarifying Questions for Information Retrieval”. In WWW ‘20.

Query Aspect Generation

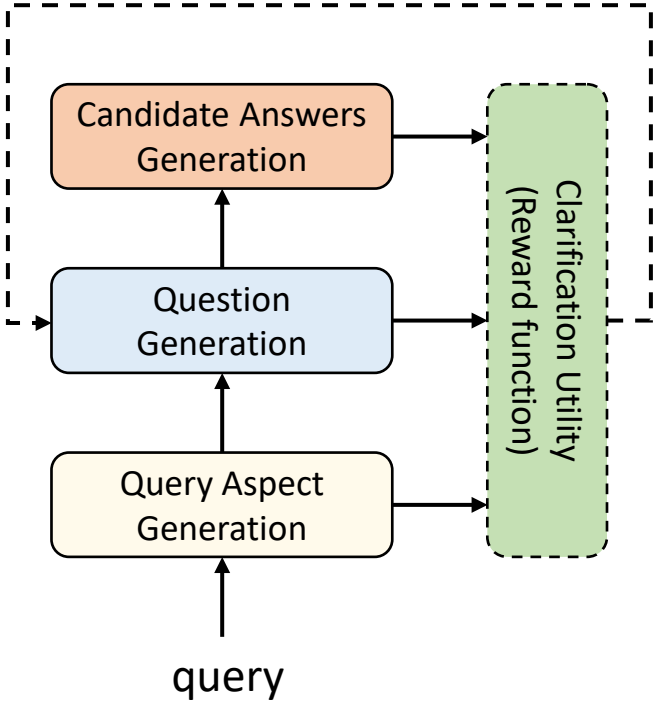
- To generate a good clarification question, we must first identify different aspects of the query.

- We mine Bing query logs to find all possible reformulations with the form of $X \rightarrow XY$ or $X \rightarrow YX$.
  - "shoes" → "running shoes"
  - "running shoes" → "running shoes for women"

- Input: X
- Output: all possible Ys with some pre-processing (e.g., initial stopword removal, etc.)



Clarification Utility

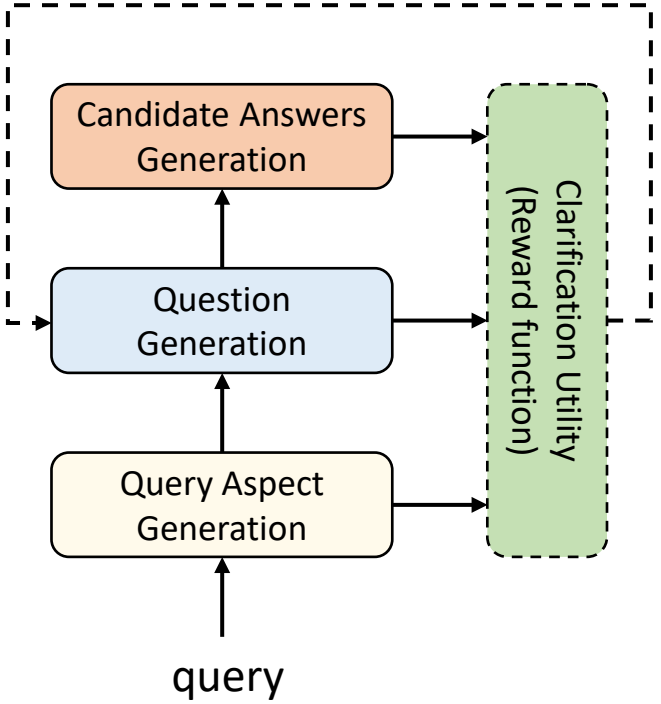


$$p(\mathrm{c} = 1 \mid q, q^*, A) = \sum_{i \in I_q} p(c = 1 \mid i, q, q^*, A)\, p(i \mid q, q^*, A)$$

- I_q is the set of all intents for the query q.
- I_q is generally *unknown*, but can be estimated using query reformulation data.

Zamani, Dumais, Craswell, Bennett, Lueck. “Generating Clarifying Questions for Information Retrieval”. In WWW ‘20.

Candidate Answer Generation



$$\arg\max_{A} p(\mathrm{c} = 1 \mid q, q^*, A)$$

- NP-hard
- The good news is the objective is a **monotone, sub-modular** function
- There is a nice approximation guarantee for a greedy algorithm that generates answers one by one.
- **Theorem (Fisher, Nemhauser, Wolsey, 1978):** if f is monotone, sub-modular, and $f(\emptyset) = 0$ then the greedy algorithm return a solution that achieves:

$$f(S) > \left(1 - \frac{1}{e}\right) OPT$$

Zamani, Dumais, Craswell, Bennett, Lueck. “Generating Clarifying Questions for Information Retrieval”. In WWW ‘20.

Training

- Training is based on REINFORCE:

$$L = -\left(r(q^*) - r(q^*_{ML})\right) \sum_{t=1}^{T} \log p(q_t | q_1 \dots q_{t-1})$$

- q^* is obtained by sampling from the output distribution of the model.
- q^*_{ML} is the output of pre-trained model.
- $r(\cdot)$ is the reward function, based on clarification utility.

Query	rytary
Question	what do you want to know about this medication?
Options	dosage, coupon, side effects, cost, information
Query	acts 17:16
Question	what bible translation are you looking for?
Options	american standard version, kjv, esv, niv, nlt
Query	that's how i got to memphis
Question	what song information are you looking for?
Options	lyrics, stream, download, artist
Query	alan turing
Question	what do you want to know about this british mathematician?
Options	movie, suicide note, quotes, biography

Zamani, Dumais, Craswell, Bennett, Lueck. "Generating Clarifying Questions for Information Retrieval". In WWW '20.

User Interactions with Search Clarification

Quotes from User Interviews

- “convenient and easy”
- “it saves time and steps”
- “it sometimes cues the user to things they may not have considered”
- “helped them find more relevant results”

Opinion on non-relevant and low-quality clarifications:

- “It’s like when I look at iPhones, and eBay says ’since you looked at iPhones you may be interested in these hair curlers!’ And I’m like, well that’s weird, whatever”
- The quality of result page after using clarification is important.

Zamani, Dumais, Craswell, Bennett, Lueck. “Generating Clarifying Questions for Information Retrieval”. In WWW ‘20.

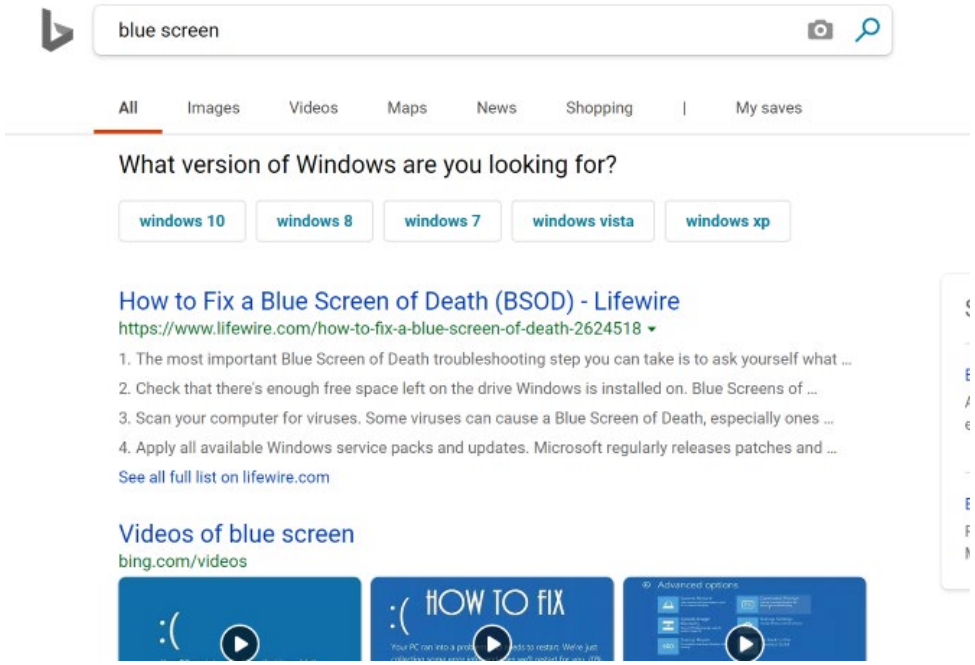
Key Findings from User Interviews

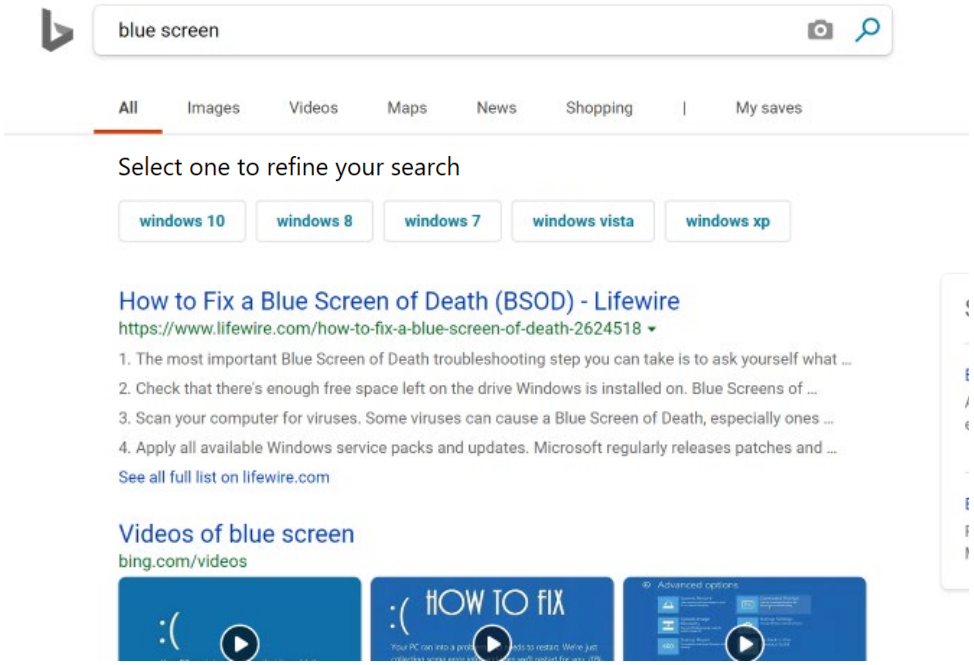
- Functional benefit:
  - “questions help guide users in the right direction”

- Emotional benefit:
  - it brings to users a **sense of confidence** that the search engine understands what the user wants.
  - it gives the users a **sense of security** and coming to the right conclusion.
  - The users pointed out that sometimes, especially when it comes to product search, they feel **less stress** when the search engine asks questions on different features of the product.

Zamani, Dumais, Craswell, Bennett, Lueck. “Generating Clarifying Questions for Information Retrieval”. In WWW ‘20.

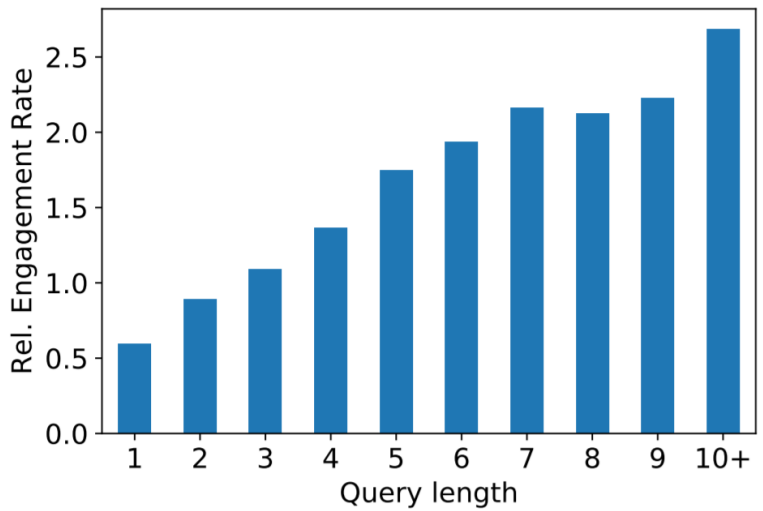
A/B Test





+48% more user engagement

Zamani, Dumais, Craswell, Bennett, Lueck. “Generating Clarifying Questions for Information Retrieval”. In WWW ‘20.



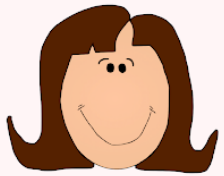
Query type	Relative engagement rate
Natural language question	1.58
Other queries	0.96
Faceted queries	1.52
Ambiguous queries	0.70
Tail queries	1.01
Torso queries	1.02
Head queries	0.99

Zamani, Mitra, Chen, Lueck, Mitra, Bennett, Craswell, Dumais. “Analyzing and Learning from User Interactions for Search Clarification”. In SIGIR ‘20.

Clarification is also useful for exploratory search!

Over 7% of interactions with the clarification pane lead to ***exploration***!

Free-Form Clarification Responses



dinosaur

Information Need (Facet)

I'm looking for the Discovery Channel's dinosaur site, which has pictures of dinosaurs and games.

Are you looking for dinosaur books?

No, just the discovery channel website.

Are you looking for meat-eating or plant-eating dinosaurs?

I'm not sure.

No answer

Would you like to see pictures or videos of dinosaurs?

I'd like to see pictures of dinosaurs on the discovery channels website.

dinosaur

Information Need (Facet)

I'm looking for a list of all (or many of) the different kinds of dinosaurs, with pictures.

Are you looking for dinosaur books?

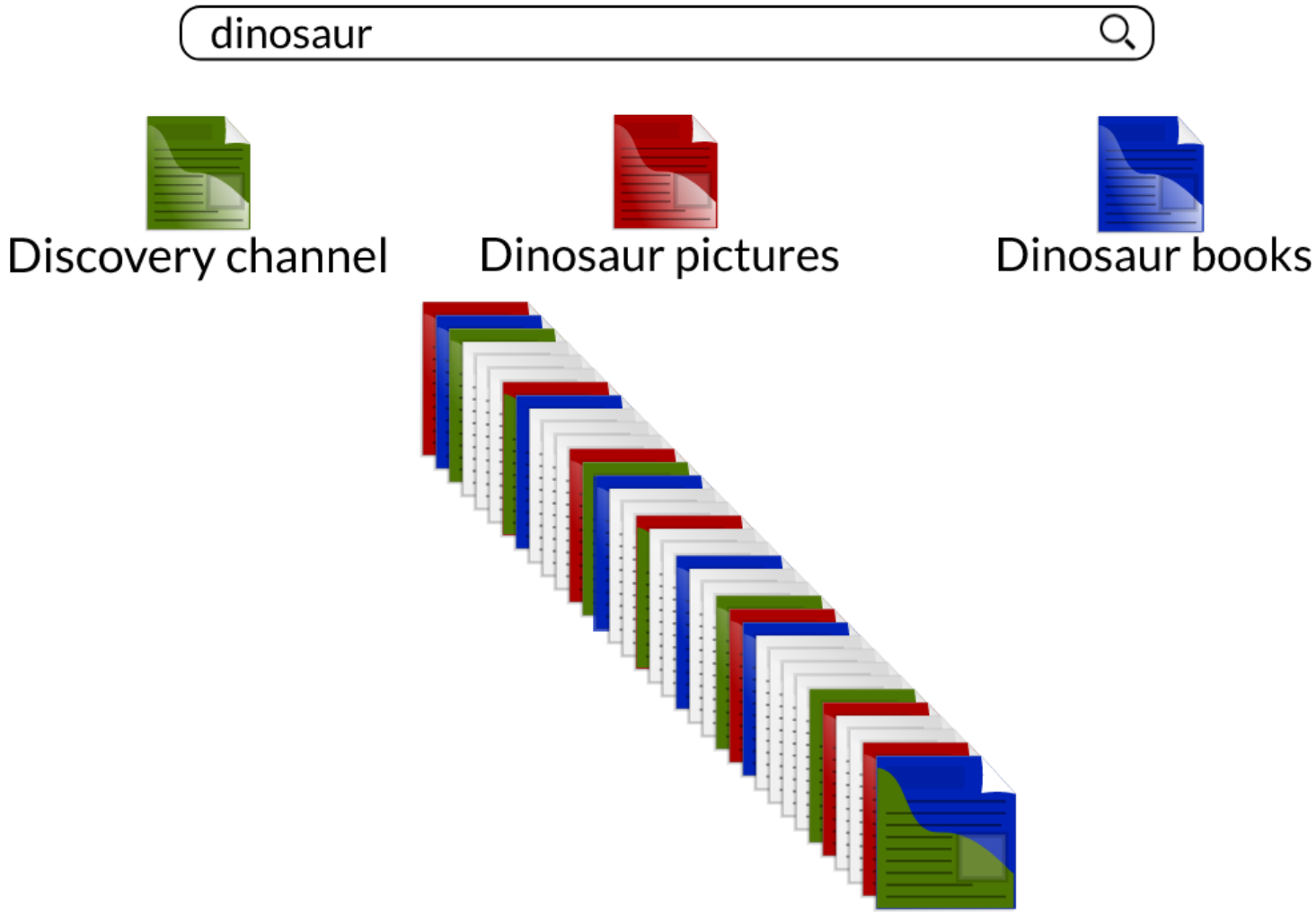
Yes, if they contain pictures of all the different kinds of dinosaurs.

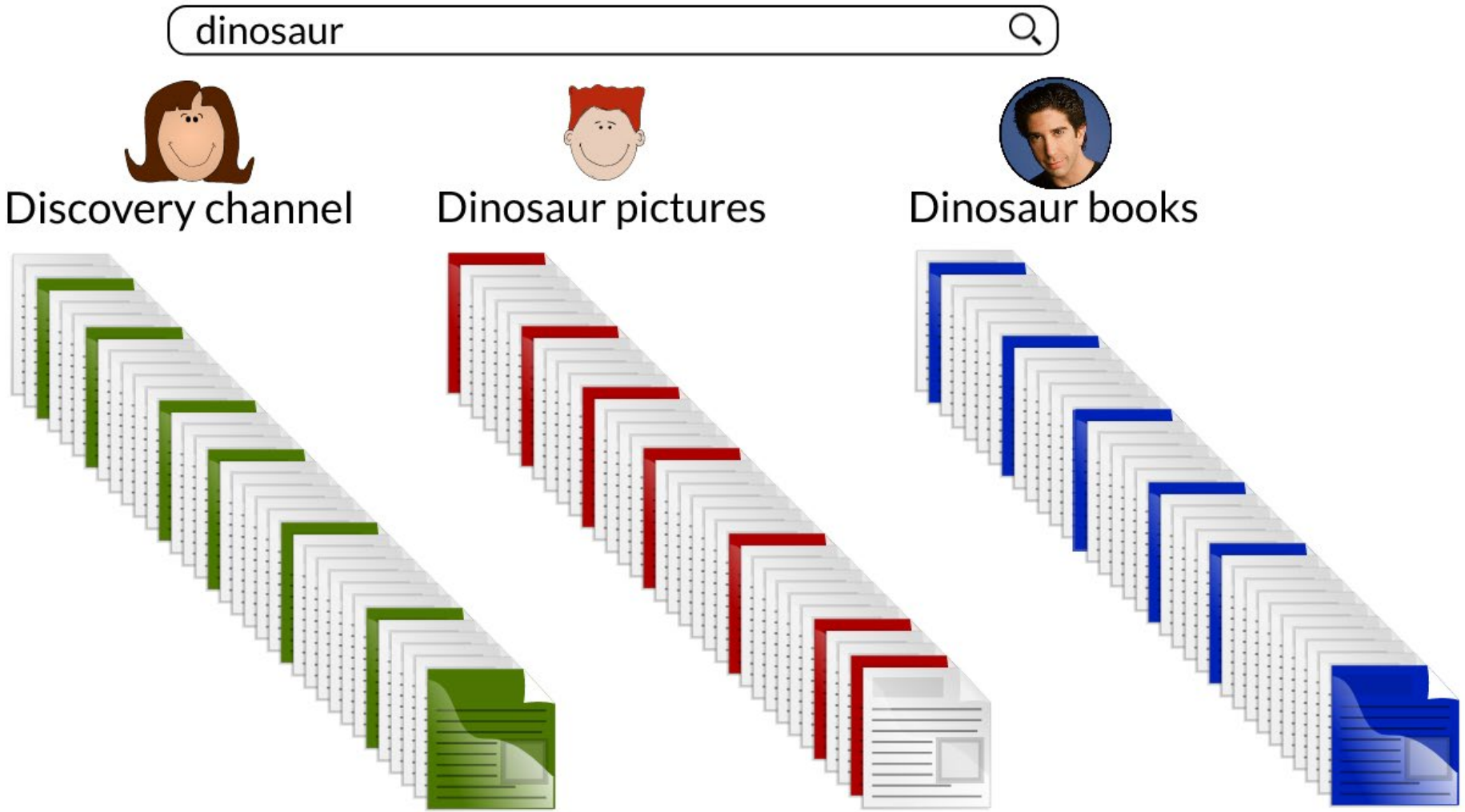
Which dinosaurs are you interested in?

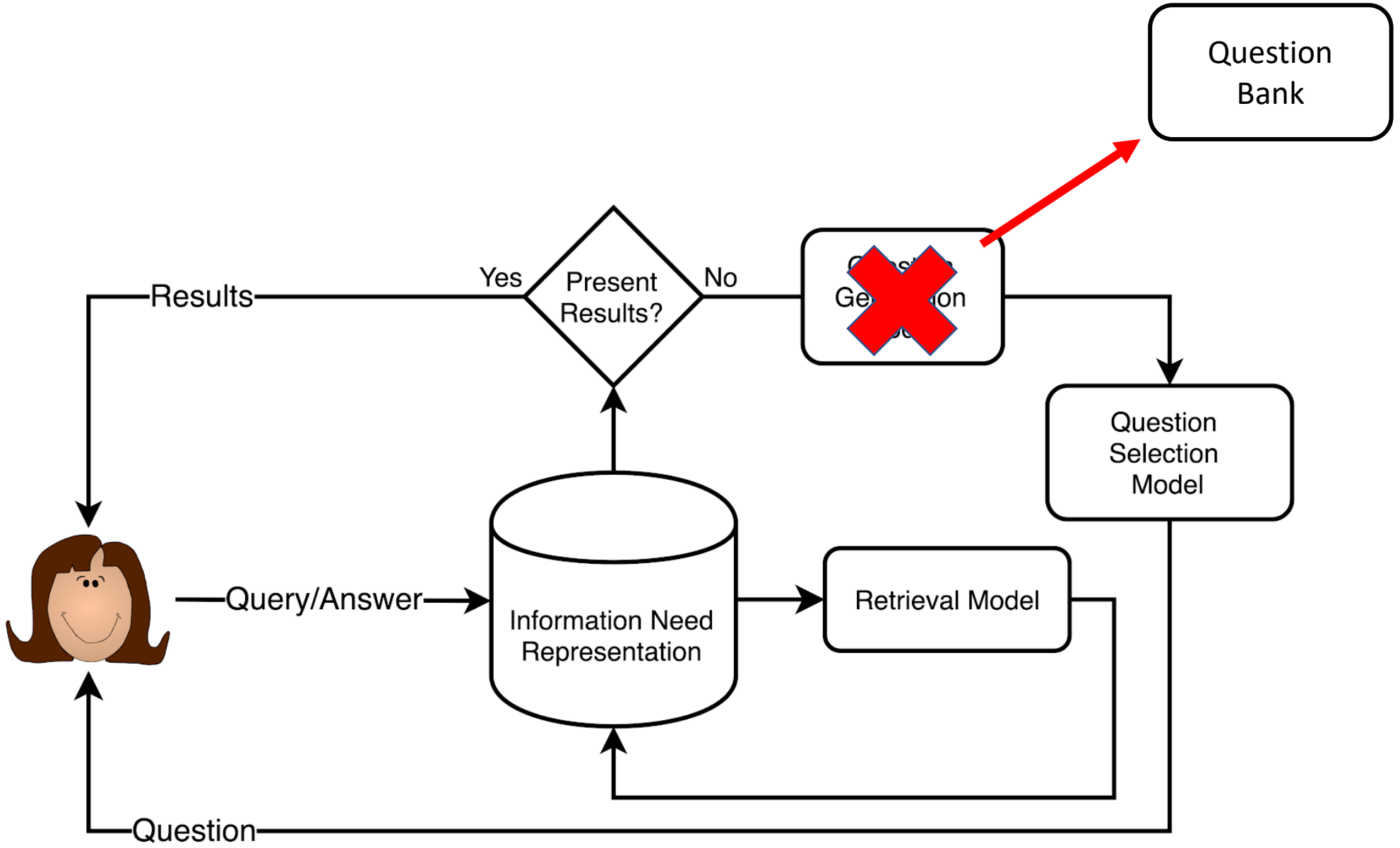
I'm interested in any and all dinosaurs.

Do you want a list of dinosaurs names?

Yes, I would also like the list to include pictures of the dinosaurs.


dinosaur
Discovery channel
Dinosaur pictures
Dinosaur books


dinosaur
Discovery channel
Dinosaur pictures
Dinosaur books

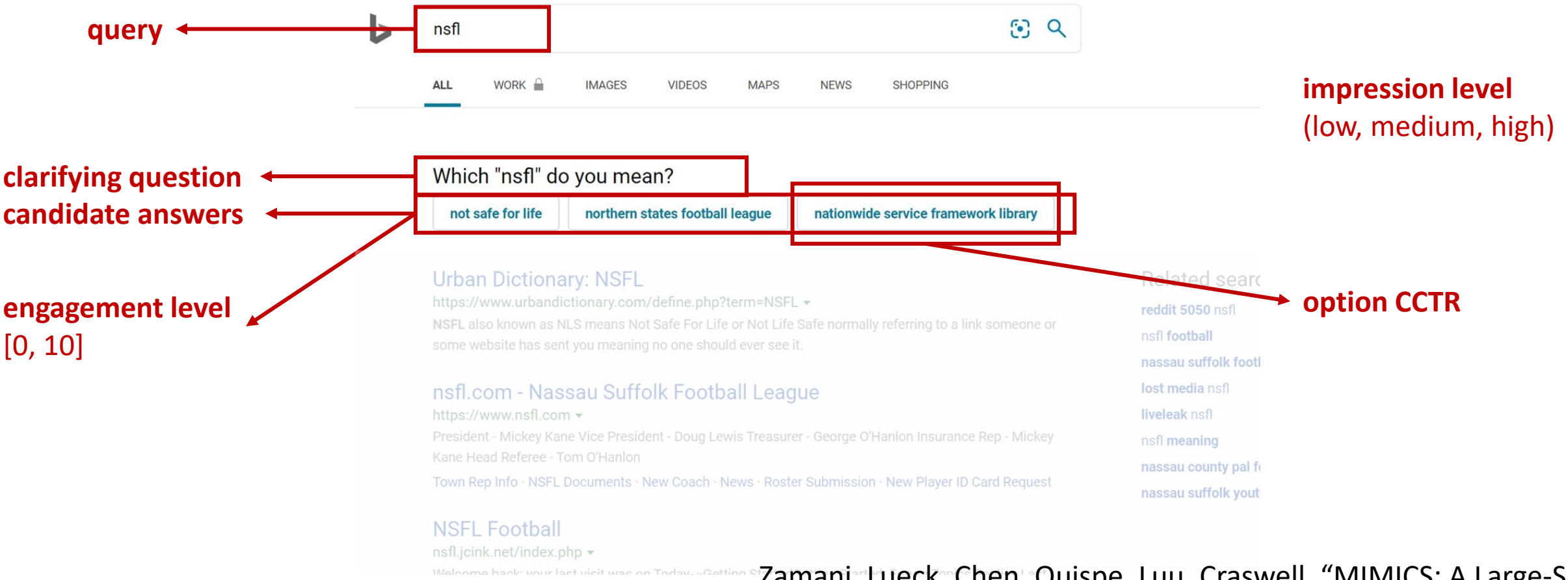

Question Bank
Yes
Present Results?
No
Results
Question Selection Model
Query/Answer
Information Need Representation
Retrieval Model
Question

QULAC

# topics	198
# faceted topics	141
# ambiguous topics	57
# facets	762
Average facet per topic	3.85 ± 1.05
Median facet per topic	4
# informational facets	577
# navigational facets	185
# questions	2,639
# question-answer pairs	10,277
Average terms per question	9.49 ± 2.53
Average terms per answer	8.21 ± 4.42

Aliannejadi, Zamani, Crestani, Croft. "Asking Clarifying Questions in Open-Domain Information Seeking Conversations". In SIGIR '19.

MIMICS



Zamani, Lueck, Chen, Quispe, Luu, Craswell. "MIMICS: A Large-Scale Data Collection for Search Clarification". In CIKM '20.

Data Statistics

	MIMICS-Click	MIMICS-ClickExplore	MIMICS-Manual
# unique queries	414,362	64,007	2464
# query-clarification pairs	414,362	168,921	2832
# clarifications per query	1 ± 0	2.64 ± 1.11	1.15 ± 0.36
min & max clarifications per query	1 & 1	2 & 89	1 & 3
# candidate answers	2.81 ± 1.06	3.47 ± 1.20	3.06 ± 1.05
min & max # candidate answers	2 & 5	2 & 5	2 & 5
# query-clarification pairs with positive engagement	71,188	89,441	N/A
# query-clarification pairs with low/medium/high impressions	264,908 / 105,879 / 43,575	52,071 / 60,907 / 55,943	N/A

Zamani, Lueck, Chen, Quispe, Luu, Craswell. “MIMICS: A Large-Scale Data Collection for Search Clarification”. In CIKM ‘20.

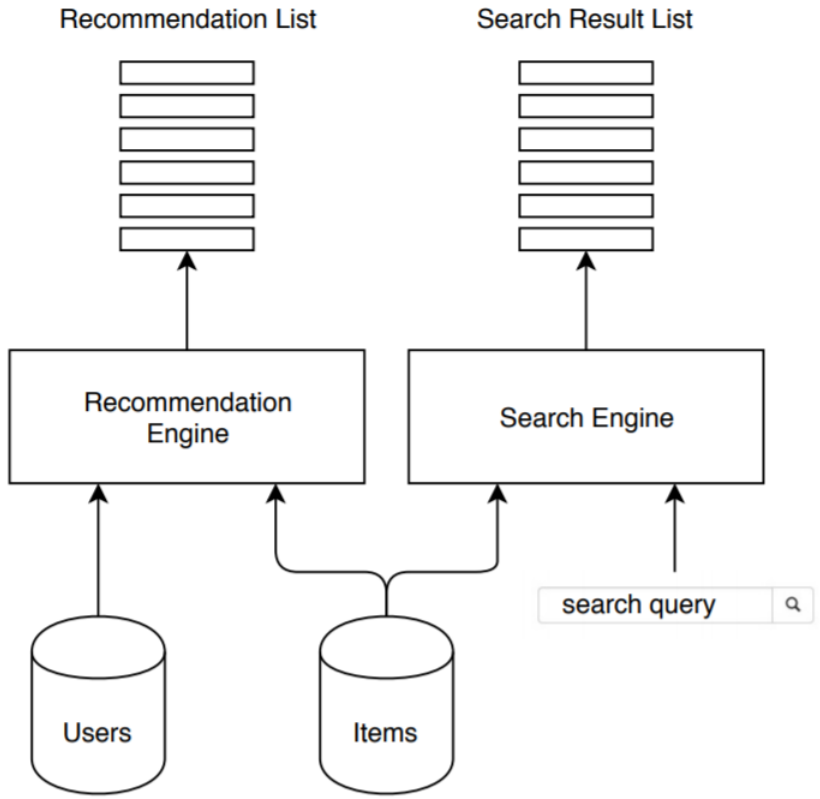
Qulac vs. MIMICS

	Qulac [SIGIR 2019]	MIMICS [CIKM 2020]
# queries	198	>450,000
Document type	webpages	webpages
Clarifying questions	Generated through crowdsourcing	Generated using a machine learning model
User responses to clarification	Generated through crowdsourcing	Real user interaction signals

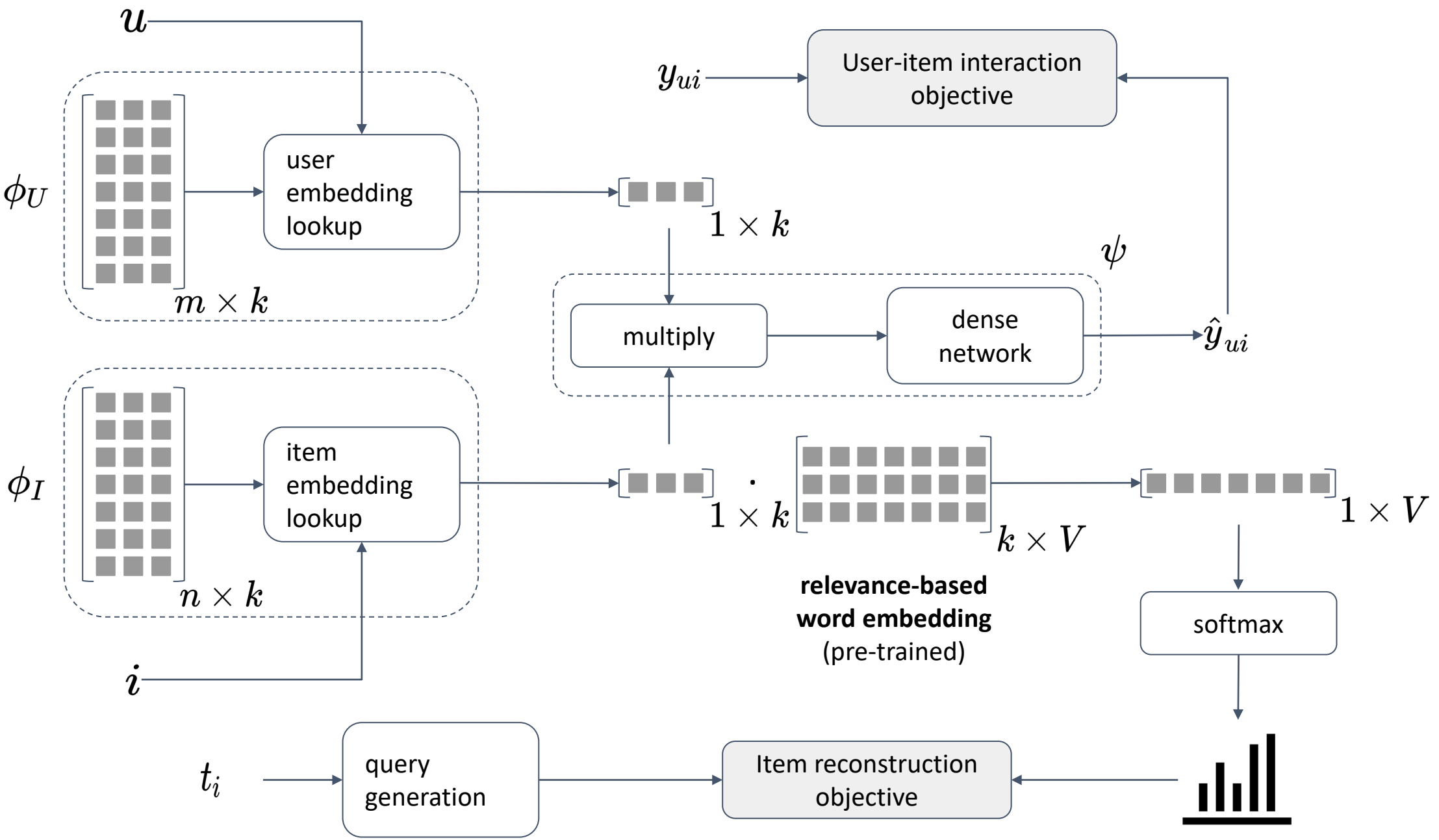
MIMICS-Duo [Tavakoli et al., SIGIR 2022] enables both offline and online evaluation for search clarification.

Bridging the Gap between IR and RecSys

Joint Modeling of Search and Recommendation



Zamani and Croft. “Joint Modeling and Optimization of Search and Recommendation”. In DESIRES ‘18.


u
y_{ui}
User-item interaction objective
ϕ_U
user embedding lookup
$m \times k$
$1 \times k$
ψ
multiply
dense network
$\hat{y}_{ui}$
ϕ_I
item embedding lookup
$n \times k$
i
$1 \times k$
$k \times V$
$1 \times V$
relevance-based word embedding (pre-trained)
softmax
t_i
query generation
Item reconstruction objective
estimated unigram distribution

The Lord of the Rings (1978)	Batman Returns (1992)	Gandhi (1982)	The Mask (1994)
fantasy	batman	documentary	cartoon
magic	character	film	parody
movies	superhero	directed	movie
wizard	horror	prize	black[5]
animation	thriller	award	comic
potter	starring	supporting	comedy
cartoon	fantasy	films	film
fiction	movie	movie	monster
classic	joker	fiction	thriller
novel	comedy	drama	shows

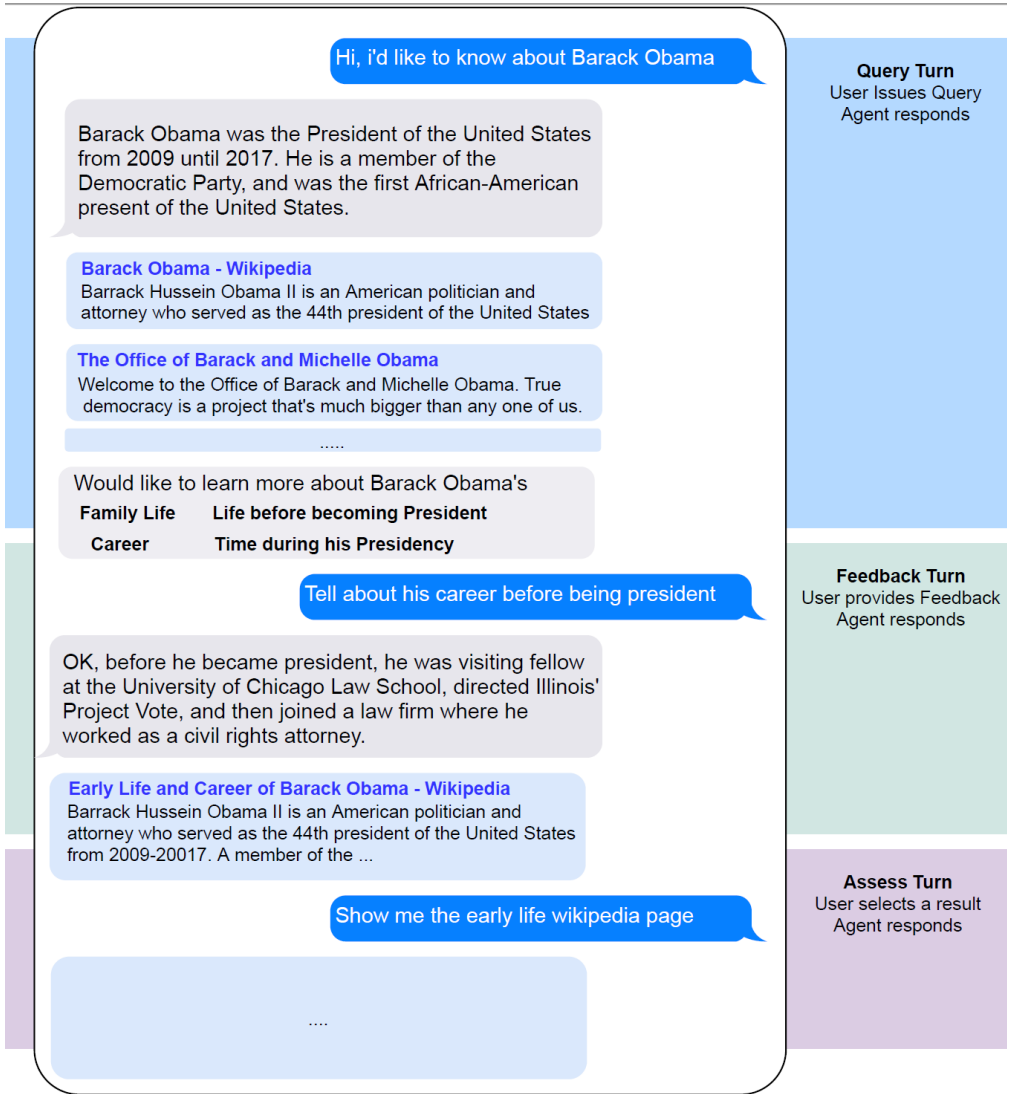
Zamani and Croft. “Learning a Joint Search and Recommendation Model from User-Item Interactions”. In WSDM ‘20.

Applications of JSR

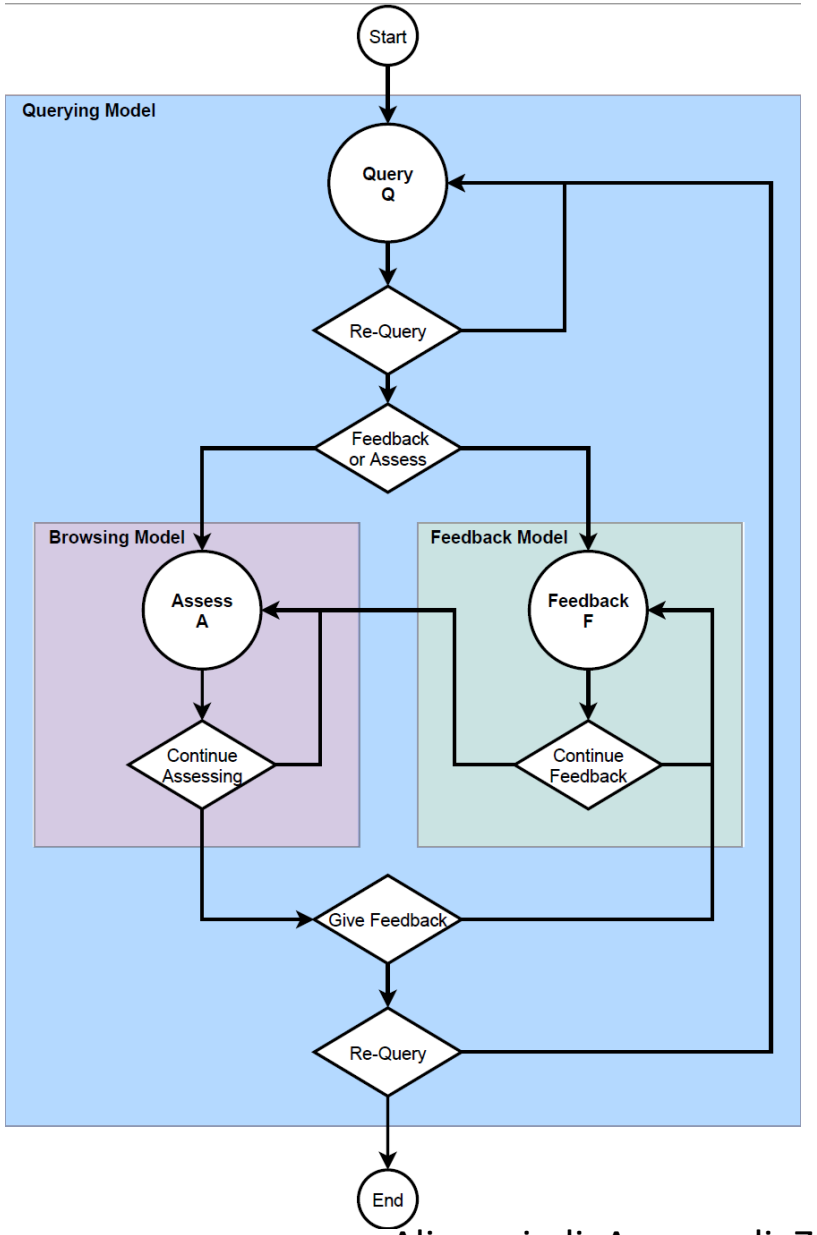
- Improving both search and recommendation performance
- Interpretable, transparent, and explainable recommendation
- User profiling
- Universal representation across domain and modality
- Conversational recommendation

Modeling and Measuring Conversational Search

With a focus on mixed-initiative interactions

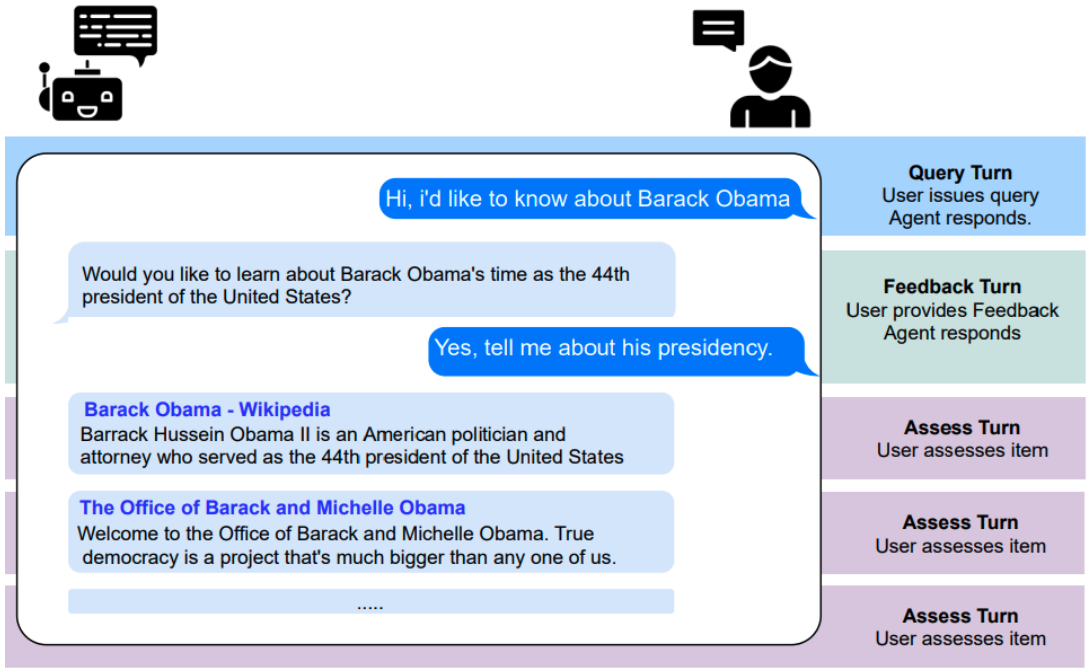


Aliannejadi, Azzopardi, Zamani, Kanoulas, Thomas, and Craswell. "Analyzing Mixed Initiatives and Search Strategies during Conversational Search". *CIKM '21*.

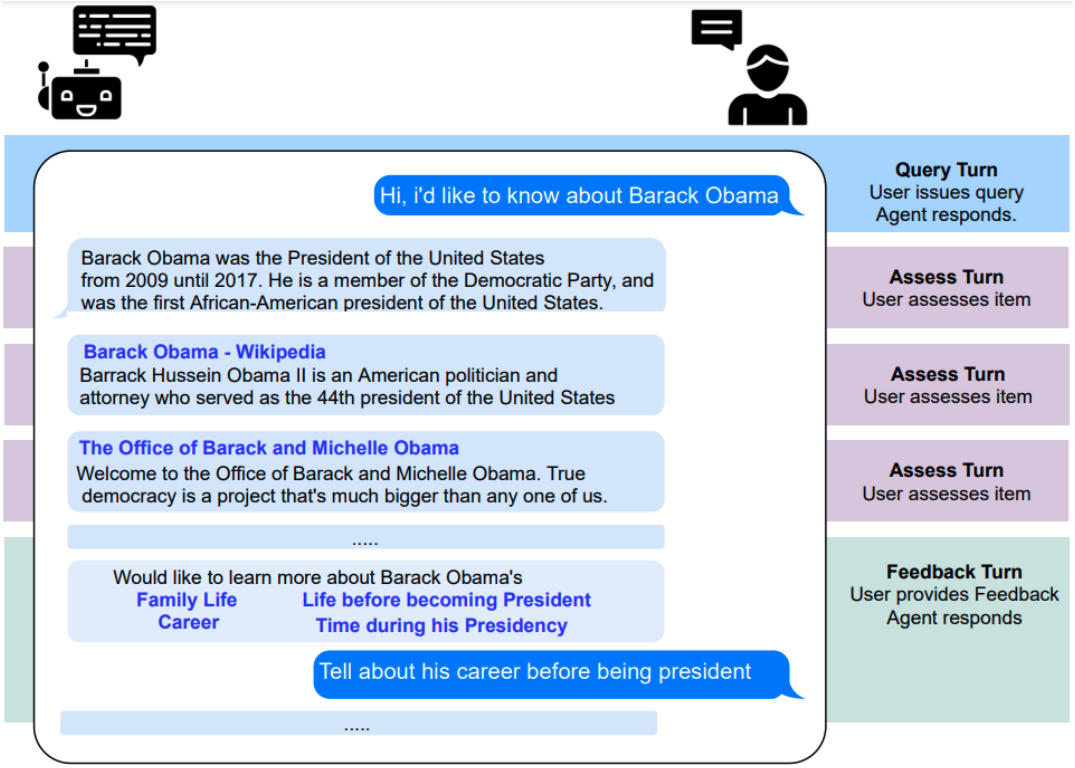


Aliannejadi, Azzopardi, Zamani, Kanoulas, Thomas, and Craswell. "Analyzing Mixed Initiatives and Search Strategies during Conversational Search". *CIKM '21*.

Feedback first

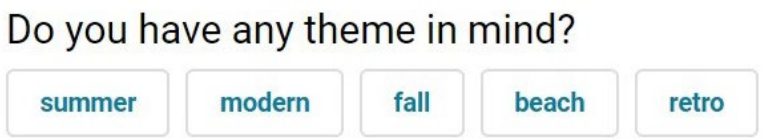


Feedback after

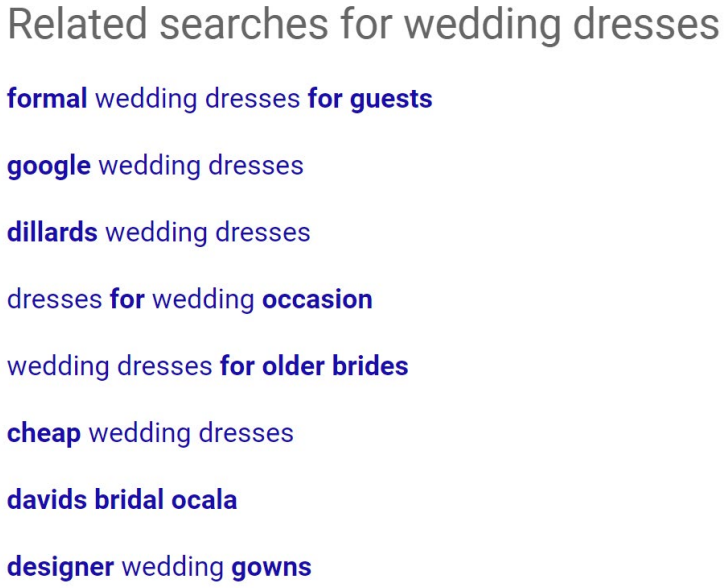


Examples of Feedback

Query clarification



Query suggestion



Cost and Benefit (Gain) of a Conversation

$$G(t_1, t_2, \cdots, t_T) = \sum_{i=1}^{T} g(t_i)$$

We can assume that the user only accumulates gain on an assessment of a relevant document.

$$C(t_1, t_2, \cdots, t_T) = \sum_{i=1}^{T} c(t_i)$$

We can consider time as a good estimator of each interaction cost.

$$R = \frac{G(t_1, t_2, \cdots, t_T)}{C(t_1, t_2, \cdots, t_T)}$$

Aliannejadi, Azzopardi, Zamani, Kanoulas, Thomas, and Craswell. "Analyzing Mixed Initiatives and Search Strategies during Conversational Search". *CIKM '21*.

Estimating the Cost

- Crowdsourcing using the complex TREC Web Track topics.
- Once the user submits a query, the system responds with a result snippet or document for up to five documents (one by one). Then the user can either
  - Reformulate the query, or
  - Answer clarifying questions, or
  - Select a query suggestion, or
  - “Not interested”
- 81 crowdworkers, 144 queries, 1280 snippets, and 268 feedback responses

Aliannejadi, Azzopardi, Zamani, Kanoulas, Thomas, and Craswell. “Analyzing Mixed Initiatives and Search Strategies during Conversational Search”. *CIKM ‘21*.

Estimating the Cost

- The average time taken
  - to issue a query: 29.3 s
  - to assess a result snippet: 6.3 s
  - to assess a result web page: 17 s
  - to provide feedback: 8.3 s
  - …
- They can be used to estimate the cost of each interaction.
- We can then conduct some simulated analysis to explore gain ratio for each conversational strategy.

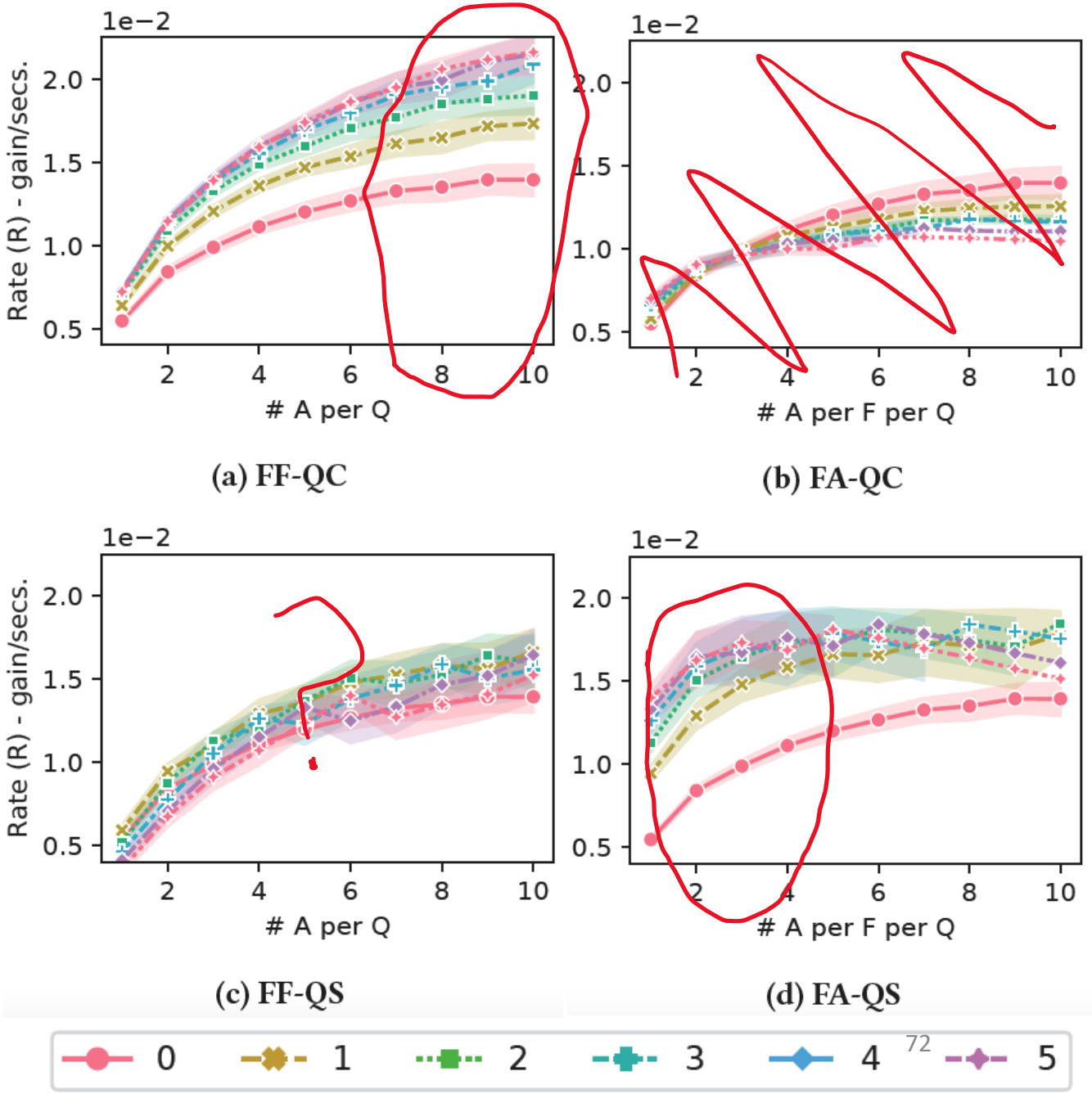
Aliannejadi, Azzopardi, Zamani, Kanoulas, Thomas, and Craswell. "Analyzing Mixed Initiatives and Search Strategies during Conversational Search". *CIKM '21*.

The strategies

FA-QC combination is inferior.

FF-QS leads to a small increase over the baseline but is not superior.

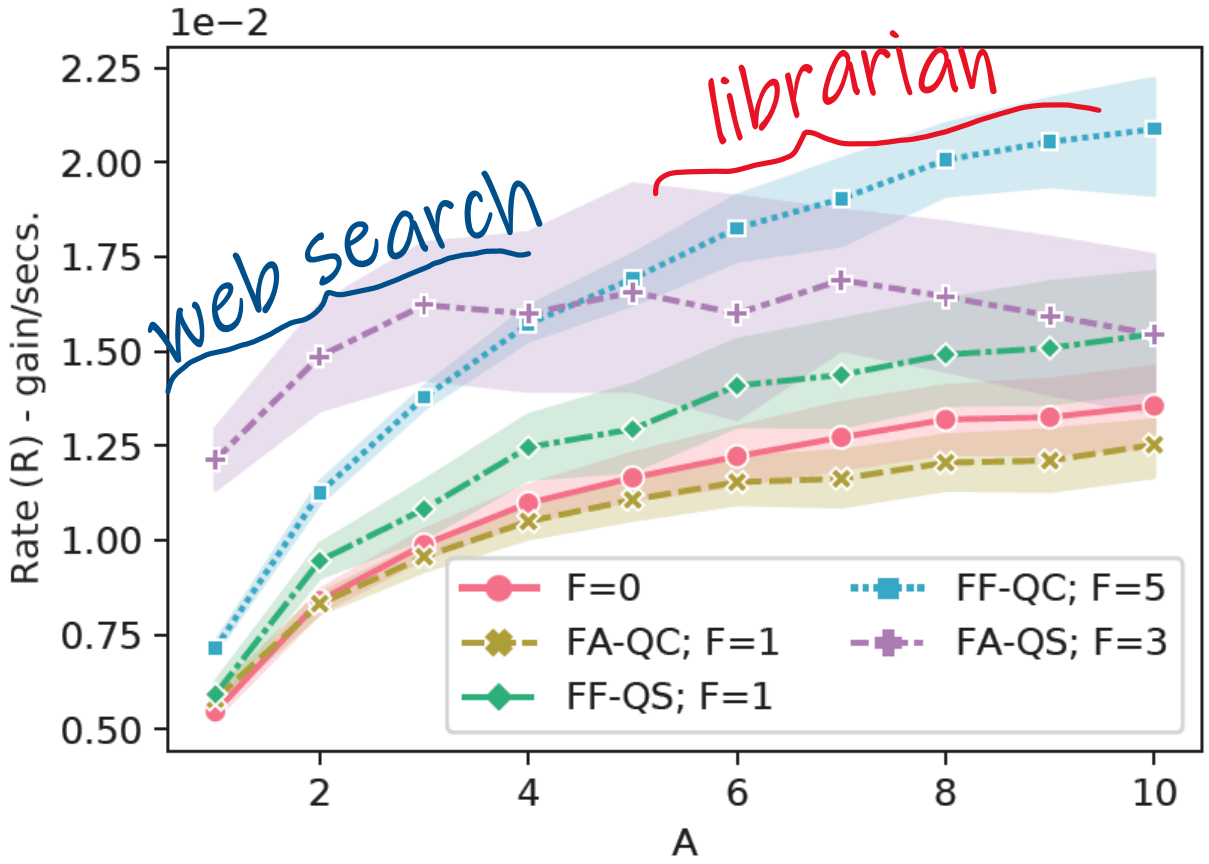
No dominant strategy, depends on #assessments.



Best strategies

Searcher is only willing to **examine a few items**: FA-QS

Searcher is willing to **go deeper**: FF-QC



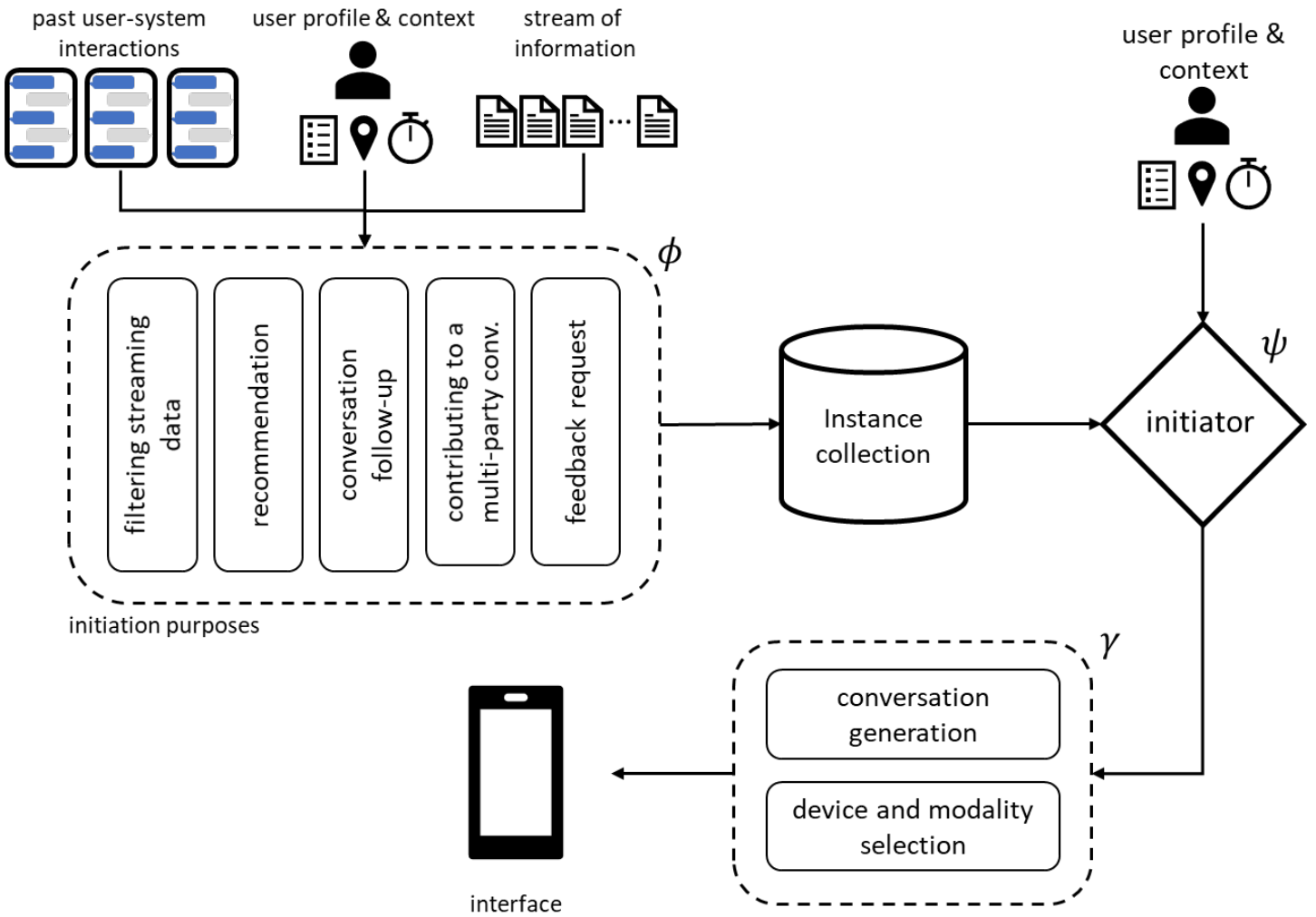
Aliannejadi, Azzopardi, Zamani, Kanoulas, Thomas, and Craswell. "Analyzing Mixed Initiatives and Search Strategies during Conversational Search". *CIKM '21*.

Agent-Initiative Interactions

Three Major Dimensions in Agent-Initiative Interactions

- Initiation Moment (***when*** to initiate a conversation?)
  - Instant initiation
  - Opportune moment initiation
- Initiation purpose (***why*** to initiate a conversation?)
  - Filtering streaming information based on user profile
  - Recommendation
  - Following up a past conversation
  - Contributing to a multi-party human conversation
  - Feedback request
- Initiation means (***how*** to initiate a conversation?)
  - Device
  - Interaction Modality

Wudhwa and Zamani. “Towards System-Initiative Conversational Information Seeking”. *DESIRES ‘21*.



Wudhwa and Zamani. “Towards System-Initiative Conversational Information Seeking”. *DESIRES ‘21*.

Initiation Purposes: Contributing to a multi-party human conversation

- Example:
  - Monitoring factual accuracy of human conversations.
  - Introducing opposing views on the topic being discussed.

Wudhwa and Zamani. “Towards System-Initiative Conversational Information Seeking”. *DESIRES ‘21*.

Initiation Purposes: Following up a Past User-System Conversation

- Based on new information or new deployment of models

- Example:
  - CIS systems are not by any means perfect and they make mistakes in responding to user's requests. Based on new information or new models deployed in the system, a CIS system may initiate a conversation at an opportune moment to accept and correct its mistakes that was made in the past.

Wudhwa and Zamani. “Towards System-Initiative Conversational Information Seeking”. *DESIRES ‘21*.

Open Problems and Future Directions

- Evaluating mixed-initiative conversational search systems
- Studying other types of mixed-initiative interactions
- Search result list explanation
- Integrating chit-chat into conversational search and recommendation
- Generating clarifying questions with no access to query logs
- Preference elicitation
- Joint conversational search and recommendation

“Conversational Information Seeking”
by *Zamani*, Trippas, Dalton, Radlinski. To appear in **FntIR 2023**.

“**Generating Clarifying Questions for Information Retrieval**”
by *Zamani*, Dumais, Craswell, Bennett, Lueck. In **WWW ‘20**.

“**Analyzing and Learning from User Interactions with Search Clarification**”
by *Zamani*, Mitra, Chen, Lueck, Diaz, Bennett, Craswell, Dumais. In **SIGIR ‘20**.

“**MIMICS: A Large-Scale Data Collection for Search Clarification**”
by *Zamani*, Lueck, Chen, Quispe, Luu, Craswell. In **CIKM ’20**.

“**Learning a Joint Search and Recommendation Model from User-Item Interactions**”
by *Zamani* and Croft. In **WSDM ‘20**.

“**Asking Clarifying Questions in Open-Domain Information Seeking Conversation**”
by Aliannejadi, *Zamani*, Crestani, Croft. In **SIGIR ‘19**.

“**Analyzing Mixed Initiatives and Search Strategies during Conversational Search**”
by Aliannejadi, Azzopardi, *Zamani*, Kanoulas, Thomas, Craswell. In **CIKM ‘21**.

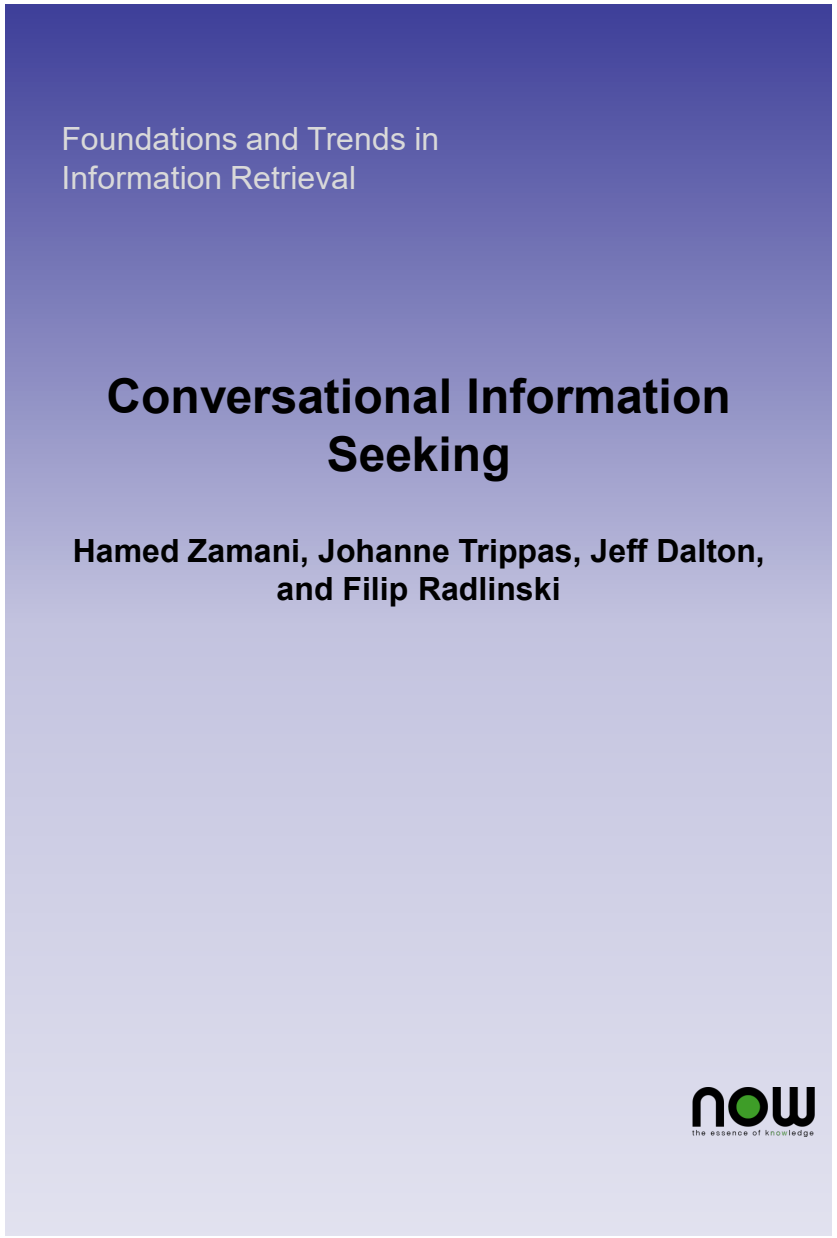
“**Joint Modeling and Optimization of Search and Recommendation**”
by *Zamani* and Croft. In **DESIRES ’18**.

“Towards System-Initiative Conversational Information Seeking”
by Wadhwa and *Zamani*. In **DESIRES ‘21**.

“MIMICS-Duo: Enabling Both Offline & Online Evaluations for Search Clarification”
by Tavakoli, Trippas, *Zamani*, Scholer, Sanderson. In **SIGIR ‘22**.

References

Thank you!



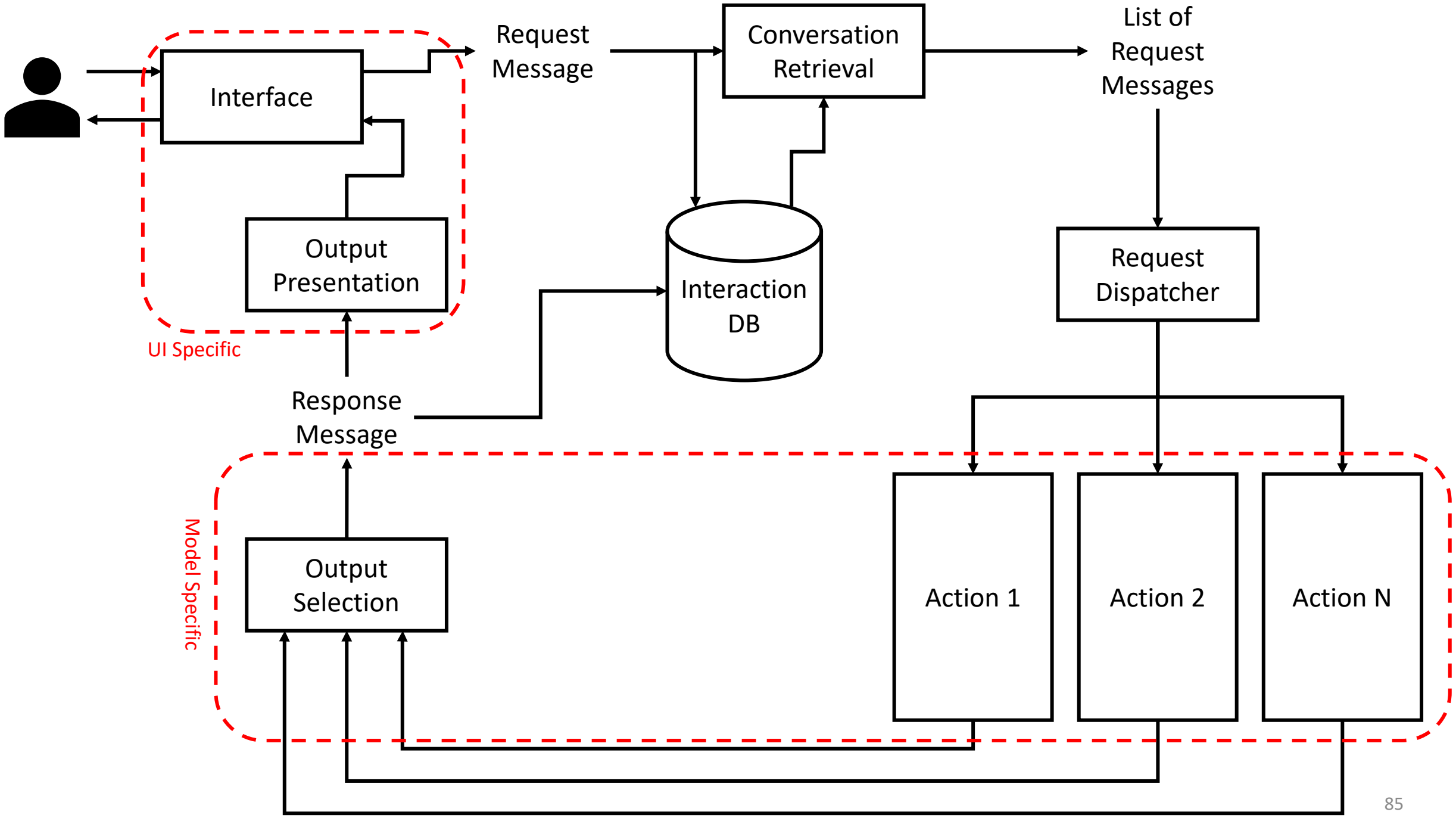
https://arxiv.org/pdf/2201.08808.pdf

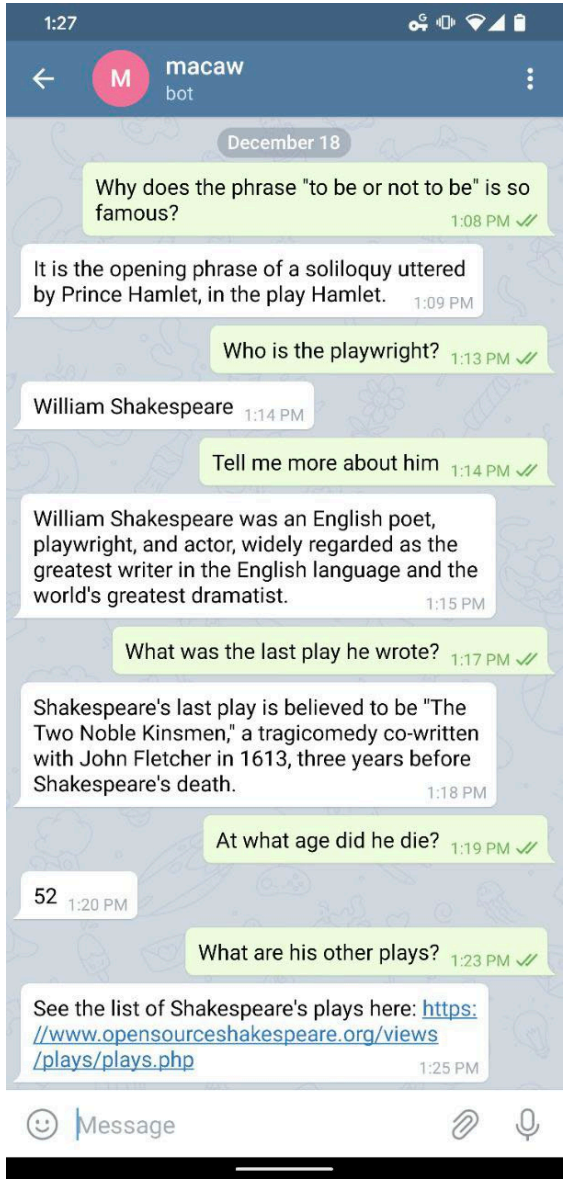
@HamedZamani

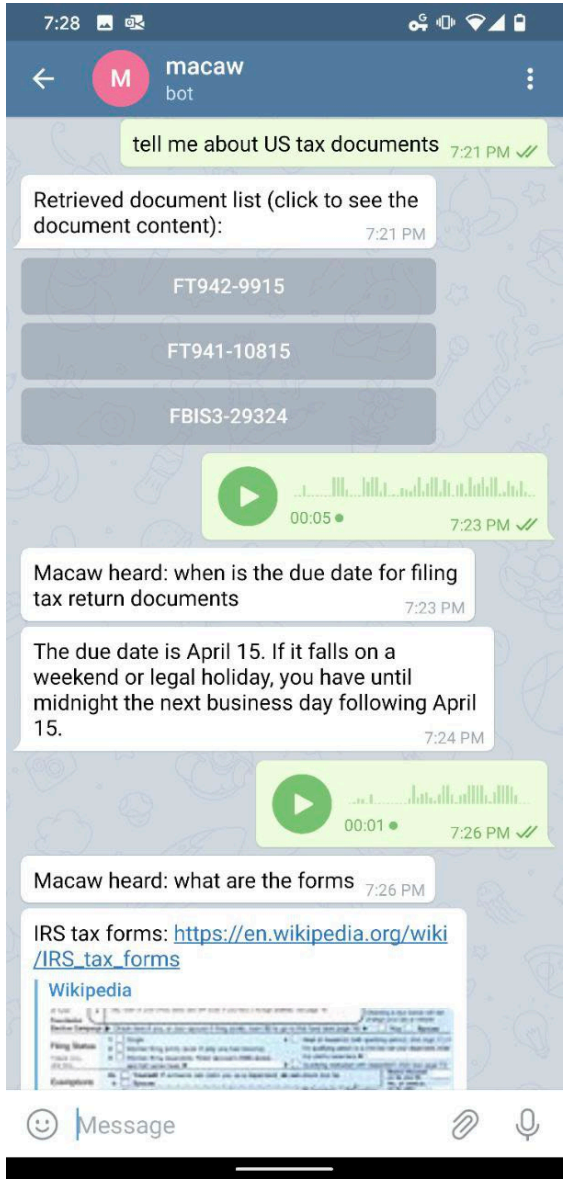
Macaw

https://github.com/microsoft/macaw

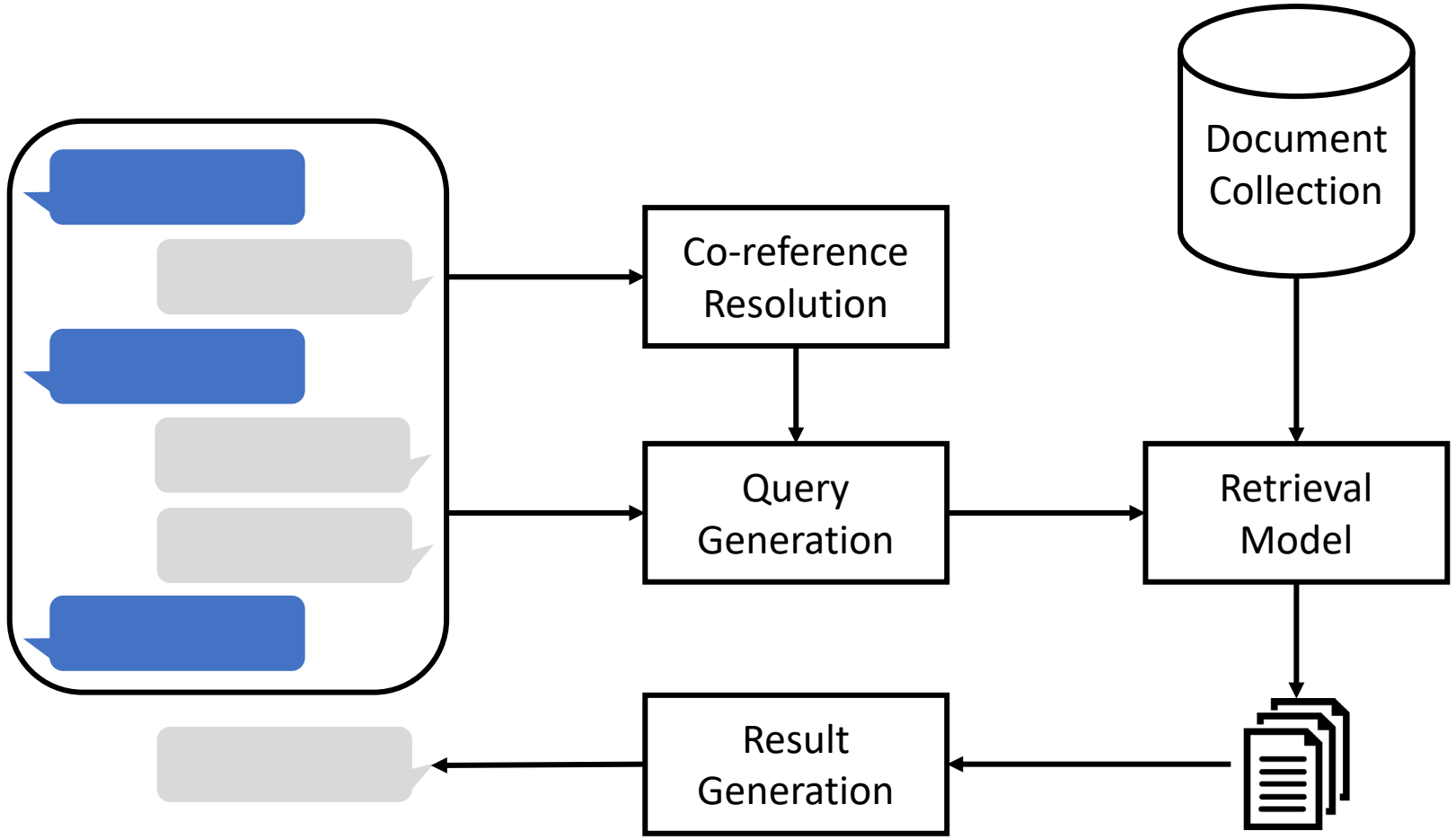
Zamani and Craswell. “Macaw: An Extensible Conversational Information Seeking Platform”. In SIGIR ‘20.


Interface
Output Presentation
UI Specific
Request Message
Conversation Retrieval
List of Request Messages
Interaction DB
Request Dispatcher
Response Message
Model Specific
Output Selection
Action 1
Action 2
Action N


1:27
macaw
bot
December 18
Why does the phrase "to be or not to be" is so famous?
1:08 PM
It is the opening phrase of a soliloquy uttered by Prince Hamlet, in the play Hamlet.
1:09 PM
Who is the playwright?
1:13 PM
William Shakespeare
1:14 PM
Tell me more about him
1:14 PM
William Shakespeare was an English poet, playwright, and actor, widely regarded as the greatest writer in the English language and the world's greatest dramatist.
1:15 PM
What was the last play he wrote?
1:17 PM
Shakespeare's last play is believed to be "The Two Noble Kinsmen," a tragicomedy co-written with John Fletcher in 1613, three years before Shakespeare's death.
1:18 PM
At what age did he die?
1:19 PM
52
1:20 PM
What are his other plays?
1:23 PM
See the list of Shakespeare's plays here: https://www.opensourceshakespeare.org/views/plays/plays.php
1:25 PM
Message


7:28
macaw
bot
tell me about US tax documents
7:21 PM
Retrieved document list (click to see the document content):
7:21 PM
FT942-9915
FT941-10815
FBIS3-29324
00:05
7:23 PM
Macaw heard: when is the due date for filing tax return documents
7:23 PM
The due date is April 15. If it falls on a weekend or legal holiday, you have until midnight the next business day following April 15.
7:24 PM
00:01
7:26 PM
Macaw heard: what are the forms
7:26 PM
IRS tax forms: https://en.wikipedia.org/wiki/IRS_tax_forms
Wikipedia
Message

Action 1 & 2: Search and QA



Other Actions

- Action 4: Clarification
- Action 5: Recommendation
- Action 6: …

Wizard of Oz setting