

Tips and Insights from My Research Journey

Ziyi Ye

Assistant Professor@Fudan

Ph.D. graduate@Tsinghua

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Introduction

Research Interest: Information Retrieval,
User Modeling, Large Language Models

Lab: THUIR->FVL



Ziyi Ye

Experience:

- 2016.08-2020.06: DCST@Tsinghua, Bachelor
- 2020.06-2025.06: DCST@Tsinghua, Ph.D.
- 2025.08-: TEAI@Fudan, Assistant Professor

Internship and visiting:

- 2023.07-2023.11: University of Copenhagen, Adviser: Christina/Tuukka
- 2023.12-2024.02: University of Amsterdam, Adviser: Maarten
- 2024.06-2024.09: Baichuan Inc., Intern Researcher on Large Language Model



My Research Experience (Brief)

- AI projects **Data Mining**, **Edge Detection**
- Undergraduate Research: **Deep Text Match** and **Legal Search**
- Undergraduate thesis: analysis of the **COVID-19 search log**

} Stage 1:
Finding my
interest

1. Read widely and build skills
2. Learn from seniors



My Research Experience (Brief)

- AI projects **Data Mining**, **Edge Detection**
 - Undergraduate Research: **Deep Text Match** and **Legal Search**
 - Undergraduate thesis: analysis of the **COVID-19 search log**
-
- Start my Ph.D.: initiated a new research direction of **BCI for IR**
 - **Establishing Collaborations, Buying Equipment, ...**
 - First paper was **Published** at SIGIR in the third year

} Stage 1:
Finding my
interest

} Stage 2:
Select a topic
for my Ph.D.

Motivated by Vinton

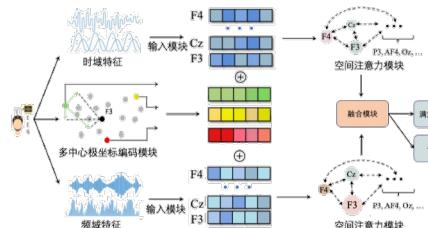


ACM President
Vinton G. Cerf

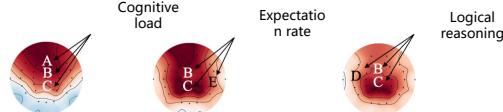
The Web is behaving like a
big accessory that I use as if
it were just a **brain implant**.

My Research Experience (Brief)

1. What is the cognitive process of IR?

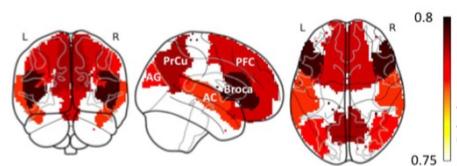


➤ Topography-aware satisfaction modeling (**MM 22**)

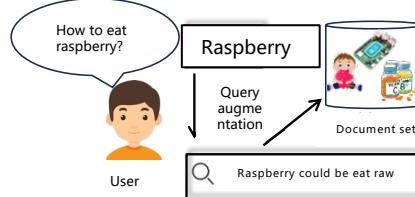


➤ Fine-grained understanding of IR process (**WWW 22**)

2. How to understand user intent?

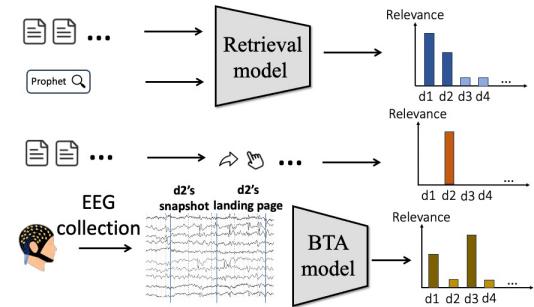


➤ Decoding semantics from brain (**Nature Comm. Biol.**)



➤ Helping with query rewriting (**MM 24**)

3. How to be aware of user feedback?



➤ Relevance based on Brain Signals (**TOIS/SIGIR 22**)

➤ Reranking performance **improved 46%** (in terms of NDCG@1)



My Research Experience (Brief)

- AI projects **Data Mining**, **Edge Detection**
 - Undergraduate Research: **Deep Text Match** and **Legal Search**
 - Undergrad...
 1. Keep pace with the latest research
 2. Dive deeper into BCI and IR
 3. Plan future research and write my thesis
 - Start my Ph.D.
 - Establish
 - First paper was **Published** at SIGIR in the third year
 - Visiting and internships: integrating **Large Language Models** with my research on BCI and IR.
- Stage 1:**
Finding my interest
- Stage 2:**
Select a topic for my Ph.D.
- Stage 3:**
Keep with latest topic and extend my research



Catalogue

- **How to do research?**
- **How to plan research?**
- **How to enjoy research?**

Note: This sharing is subjective and may not be suitable for different research directions and students.



How to do research?- Read papers

- Tools:
- Arrange papers:
 - Zotero (+AI), notebooklm, ...
- Find papers:
 - Google Scholar, Zotero-arxiv-daily, Deep Research, alphaarxiv, ...
- Read papers:
 - AI assistance

A workman is only as good as his tools.



How to do research?- Read papers

- Find papers:

1. From the most related and high-quality paper

SIGIR 2016 best
paper;

Good
conference, High
citation

Understanding Information Need: an fMRI Study

Yashar Moshfeghi
School of Computing Science
University of Glasgow
Glasgow, UK
Yashar.Moshfeghi@glasgow.ac.uk

Peter Triantafillou
School of Computing Science
University of Glasgow
Glasgow, UK
Peter.Triantafillou@glasgow.ac.uk

Frank E. Pollick
School of Psychology
University of Glasgow
Glasgow, UK
Frank.Pollick@glasgow.ac.uk

ABSTRACT

The raison d'être of IR is to satisfy human information need. But, do we really understand information need? Despite advances in the past few decades in both the IR and relevant scientific communities, this question is largely unanswered. We do not really understand how an information need emerges and how it is physically manifested. Information need is often too abstract to be directly observed in the state of the phenomenon (i.e., at a visual level), even the searcher may not be aware of its existence. This renders the measuring of this concept (using traditional behaviour studies) nearly impossible. In this paper, we investigate the connection between an information need and brain activity. Using functional Magnetic Resonance Imaging (fMRI), we measured the brain activity of twenty four participants while they performed a Question Answering (Q/A) Task with varying levels of difficulty, selected from tasks used from TREC-8 and TREC 2001 Q/A Track. The results of this experiment revealed a distributed network of brain regions commonly associated with activities related to information need and retrieval and differing brain activity in processing scenarios when participants knew the answer to a given question and when they did not and needed to search. We believe our study and conclusions constitute an important step in understanding the nature of information need and therefore better satisfying it.

Keywords: Anomalous States of Knowledge, Information Need, Information Retrieval, fMRI Study

information retrieval and other relevant scientific communities. As a result of such research, seminal theories, models, and findings have been published, shaping the foundations of current IR systems. A few examples of such influential models are Wilson's Information Seeking Behaviour model [46], Kuhlthau's Information Seeking Process (ISP) model [28], Ingwersen's Cognitive IR Theory [21], and Belkin's Anomalous States of Knowledge (ASK) model [8]. These works are mainly based on *observational studies of search*, which is engaged in an Information Retrieval (IR) Seeking process, mainly through questionnaires/interviews [28], or by observing and studying searchers interaction with IR systems via their submitted queries and their reformulation [26], or via their interaction with retrieved results [44]. Despite these invaluable contributions, these models investigated the phenomenon of IN indirectly, via some sort of mediator. Therefore, important research questions remain unanswered, such as:

- RQ1: "What is the nature of IN from a neuropsychology perspective?";
- RQ2: "Is there a clear, detectable, physical manifestation (i.e. neural correlate) of IN in human brains?";
- RQ3: "Can such manifestations be identified in an early stage of an information seeking and retrieval process?"; and
- RQ4: "Do such manifestations differ when an anomaly in the user's state of knowledge has been experienced? i.e. when searchers choose not to engage in a search

☆ Save

99 citations

Citations: 89

Related articles

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Recognize more
authors and
organizations

Find its cited paper

Build a paper
pool for your
research

Find its related paper and citations

How to do research?- Read papers

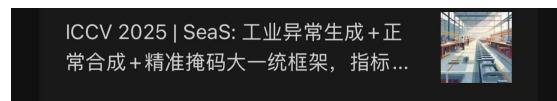
- Find papers:

2. From surveys, advertisement, and famous organizations

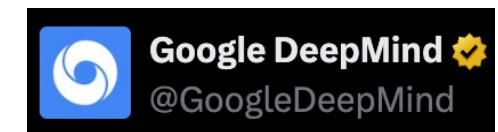
LLMs-as-Judges: A Comprehensive Survey on LLM-based Evaluation Methods

HAITAO LI, Department of Computer Science and Technology, Institute for Internet Judiciary, Tsinghua University, China
QIAN DONG, Department of Computer Science and Technology, Institute for Internet Judiciary, Tsinghua University, China
JUNJIE CHEN, Department of Computer Science and Technology, Institute for Internet Judiciary, Tsinghua University, China
HUIXUE SU, Gaoling School of Artificial Intelligence, Renmin University of China, China
YUJIA ZHOU, Department of Computer Science and Technology, Institute for Internet Judiciary, Tsinghua University, China
QINGYAO AI, Department of Computer Science and Technology, Institute for Internet Judiciary, Tsinghua University, China
ZIYI YE, Department of Computer Science and Technology, Institute for Internet Judiciary, Tsinghua University, China
YIQUN LIU, Department of Computer Science and Technology, Institute for Internet Judiciary, Tsinghua University, China

Survey



Advertisement



Famous organizations



How to do research?- Read papers

- Find papers:

3. Organize those papers

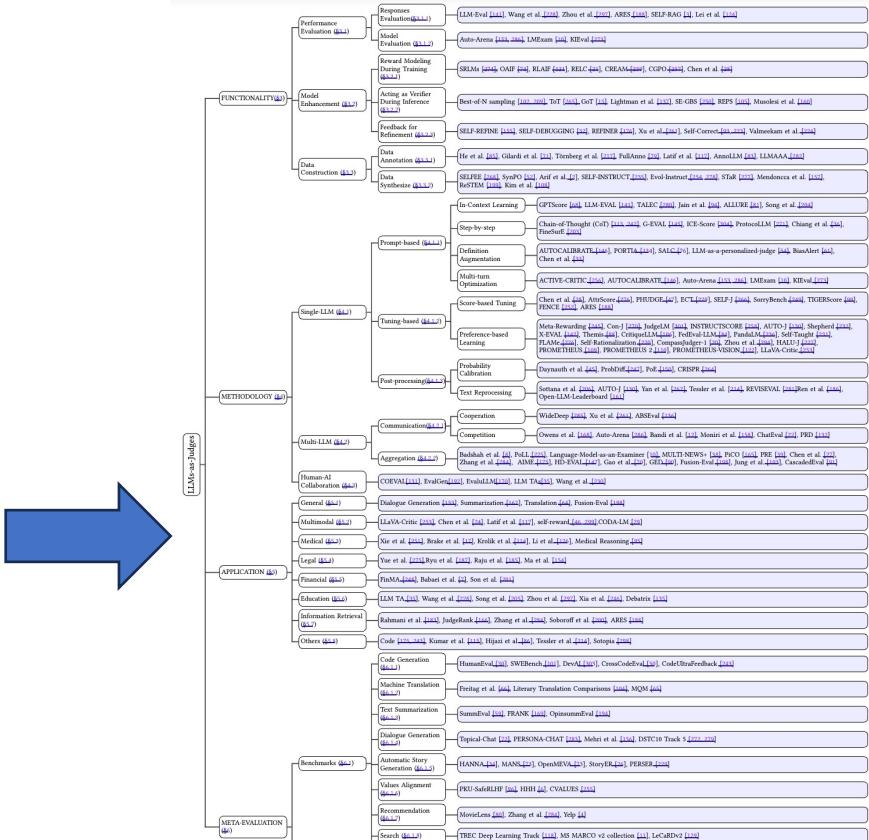
Table 2 | Overview of VLA research using language description as action tokens.

Format	Paper	Previous Module		Action Token Restrictiveness	Next Module		Task	Embodiment	
		Model	Training Strategy		Model	Training Strategy			
Language Planner [134]		Code2L2B, GPT-3,175B, Sentence-Nets, RoBERTa-35SM	Frozen	LLM generates plans, RoBERTa finds the best match within that set	Predefined	N/A	N/A	VirtualHome	N/A
Socratic Models [135]	VILD, LLM	Frozen	VLM detects objects, LLM generates step-step. The asemantic skill with the highest combined rating from LLM and affordance function is selected	Predefined	CLIPort-inspired policy	Trained	Tabletop rearrangement (simulation)	URS with a gripper (simulation)	
SayCan [13]	PaLM-540B	Frozen	LLM generates and maintains a skill affordance function is selected	Predefined	BC-Z	Trained on 80K demonstrations	Mobile manipulation (office kitchen)	Everyday Robots	
Inner Monologue [136]	PaLM-540B, InstruGPT	Frozen	LLM generates and updates plans with textual feedback, utilizing few-shot prompting	Predefined	CLIPort, BC-Z	Generated on 20K Pic-Place demonstrations; BC-Z generated on 80K demonstrations	Tabletop rearrangement (simulation, real-world); mobile manipulation (office kitchen)	URSe with a gripper; Everyday Robots	

Compare the methods

Dataset	Traj.	Skill	Scene	Detailed Annotation	Cam.	Calibration	Arm Type	Dex. Hand	Failure Recovery	Human-in-the-loop	Collection
RoboNet [1]	162k	n/a	10	x	x		Single	x	x	x	scripted
BridgeData [2]	7.2k	4	12	x	x		Single	x	x	x	human teleop
BC2 [3]	26k	3	1	x	x		Single	x	x	x	human teleop
RT-1 [4]	130k	8	2	x	x		Single	x	x	x	human teleop
RH20T [5]	13k	33	7	x	/		Single	x	x	x	human teleop
RoboMind [6]	98.5k	6	11	x	x		Single	x	x	x	30% human / 70% scripted
BridgeIT V2 [7]	60.1k	13	24	x	x		Single	x	x	x	human teleop
DRDID [8]	76k	86	564	x	/		Single	x	x	x	human teleop
RoboMind [8]	55k	36	n/a	x	x		Single+Dual	x	x	x	human teleop
Open X-Embodiment [6]	1.4M	217	311	(x)	x		Single+Dual	x	x	x	dataset aggregation
AgiBot World Dataset	IM+	87	106	/	/		Dual	/	/	/	human teleop

Compare the datasets, resources, etc



How to do research?- Read papers

- Read papers:

1. Can AI assist your reading?

But make sure to be a responsible reviewer!

AI can help you	AI can't help you
Summarize the key point	Decide whether to read or not
Get relevant knowledge/background	Critical thinking and evaluation
Find details more effectively, especially when the paper is not well-written	Find details beyond the text and guarantee accuracy
Quickly go through and compare a lot of papers	Go deep into the paper and improve your research skills

AI is becoming more powerful day by days!



How to do research?- Read papers

- Read papers:

2. Whether it is good to follow a paper?

- Be critical when you decide to follow a paper!
 - Experimental setups
 - Overly strong assumption
 - Bad selection of baselines and datasets
- Search for paper with other standpoint
- Reproduce some experimental results



How to do research?- New idea

Fairness in social science: 1960-
Fairness for IR: 2016-2022
Fairness for LLMs: 2022-

New scenario

Web Search:
Match query words?
Match query semantics?
Solve problems?

New method

New question

Machine translation: rule-based (1950-1990),
Statistical (1990-2010), RNN/Attention (2014-2017),
Transformers (2017-), LLMs (2022-)

How to do research?- New idea

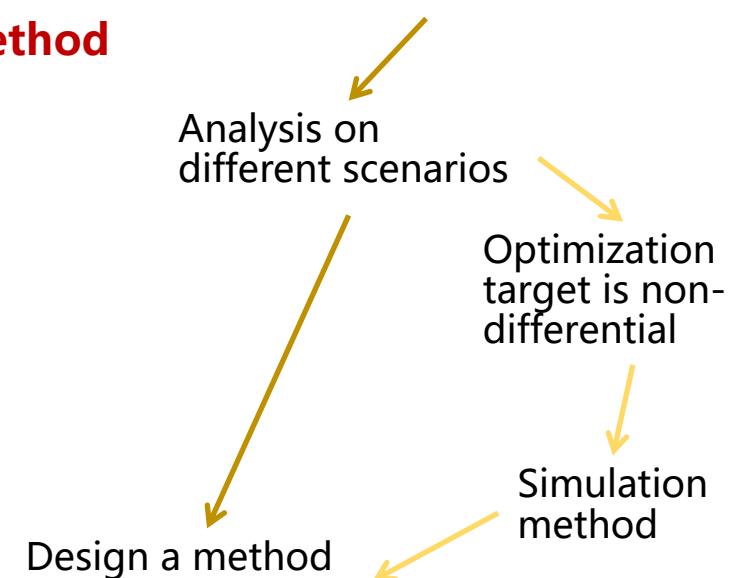
- Case 1: extension on existing work



- Case 2: observation on data

**Old scenario,
Old question,
New method**

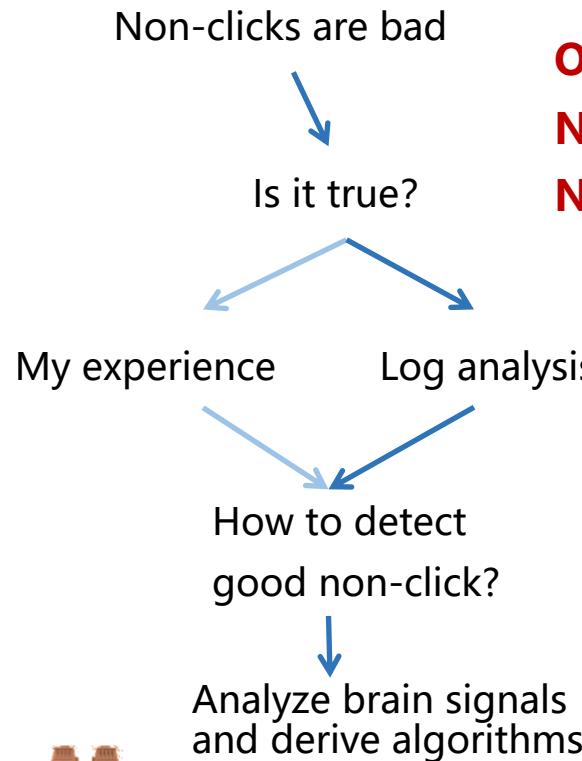
Impact of Different Signals in
Relevance Feedback



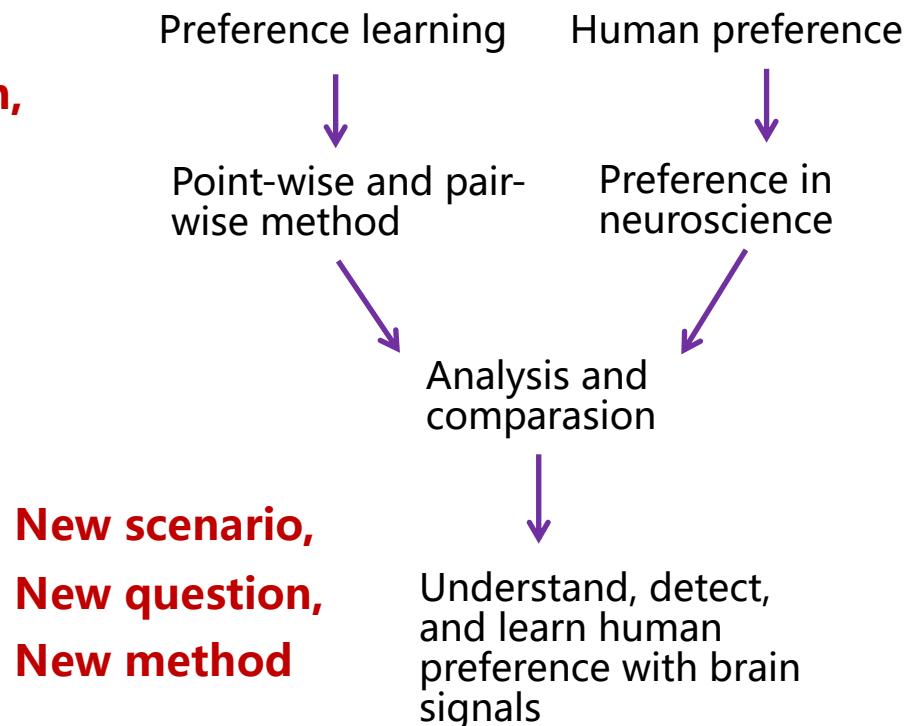
**New scenario,
Old question,
Old method**

How to do research?- New idea

- Case 3: motivated by real world experience



- Case 4: broaden your eyes

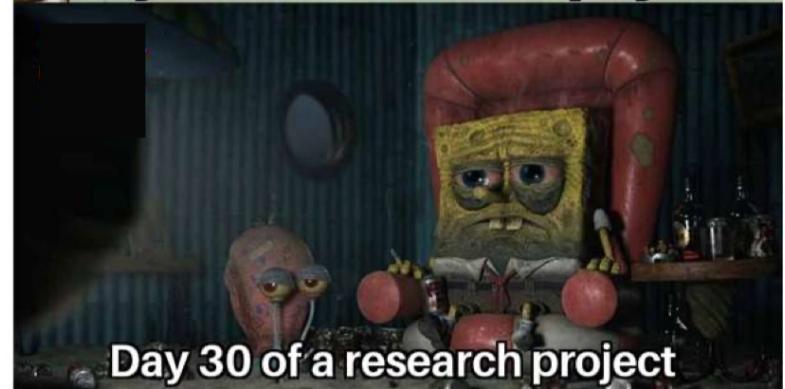


How to plan research?

- Down to top
 - I have realized one of my idea
 - I have another idea, can it complement my existing work?
- Top to down
 - I want to accomplish a target, I still need A, B, C, ...



Day 1 of a new research project

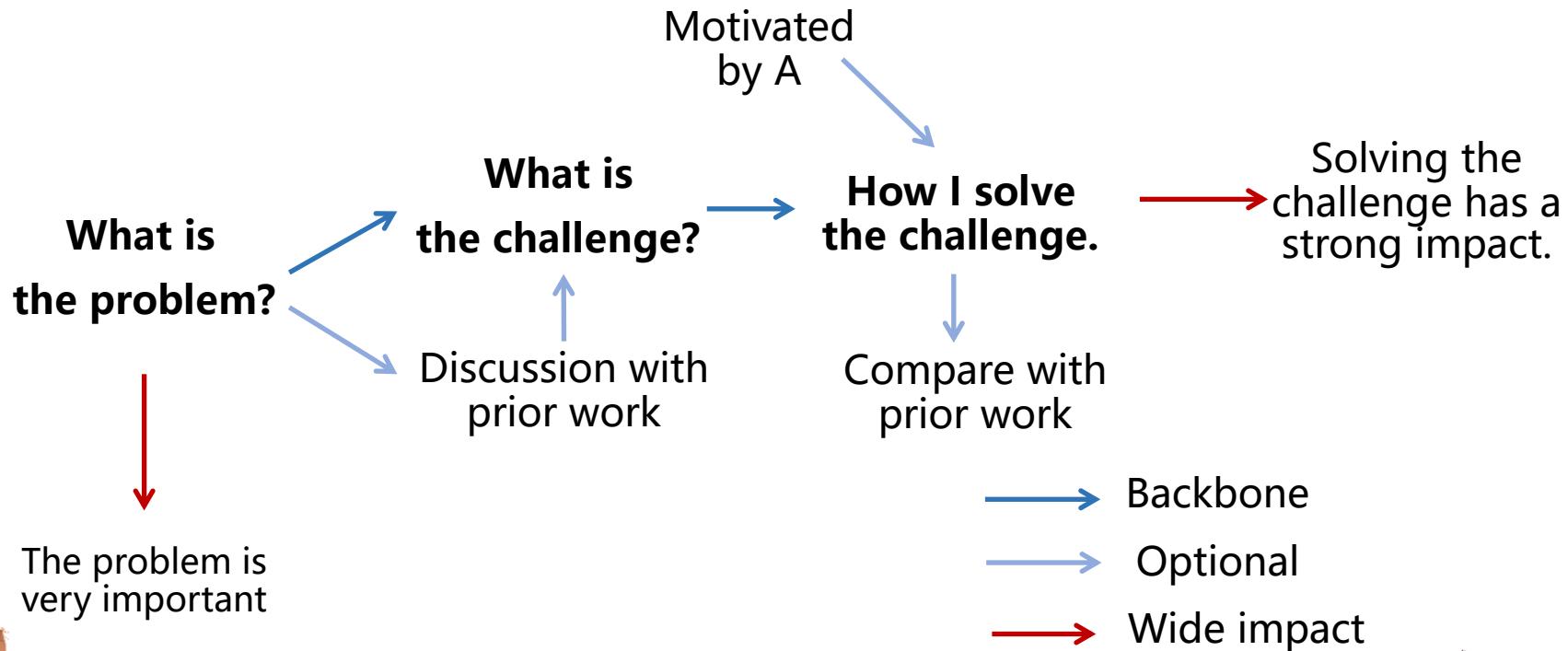


Day 30 of a research project



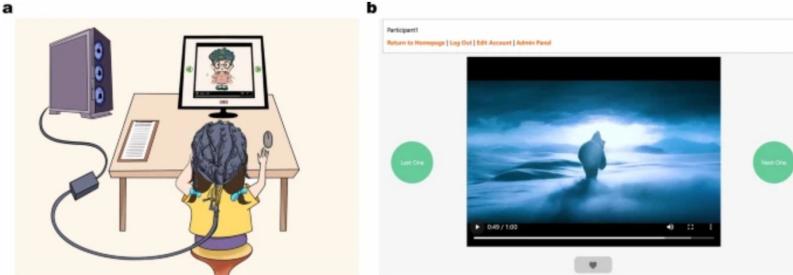
How to do research?-Write a paper

- Academic writing is stereotyped, but you can select the one fit you best

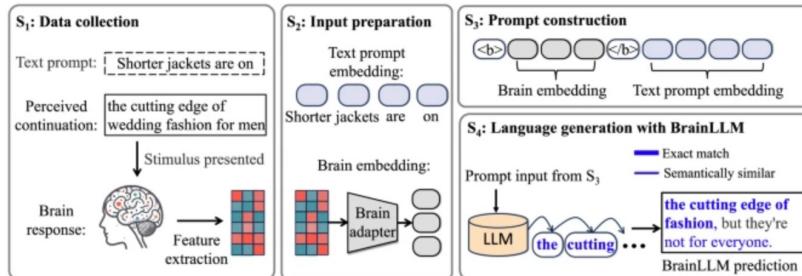


How to do research?-Write a paper

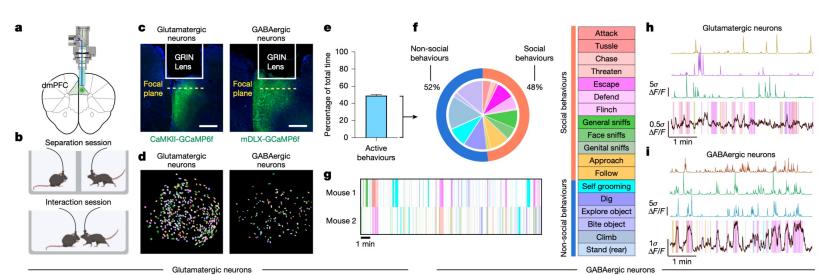
- Nice figures and tables



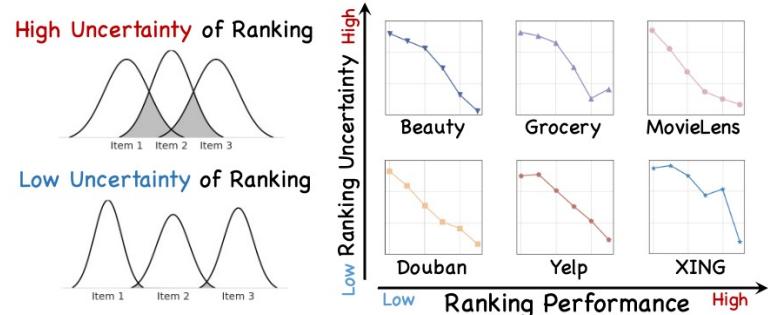
Visualize your task



Be self-evident



Attractive and informative



How to plan research?

- Hot topics and unpopular topics

Hot	In-between	Unpopular
How to train LLM-as-judges high visibility, good resources	Decoding brain signals into emotion	Brain signals for relevance feedback high originality, easy to be recognized
intensive competition, change rapidly		publication difficulty, low resource



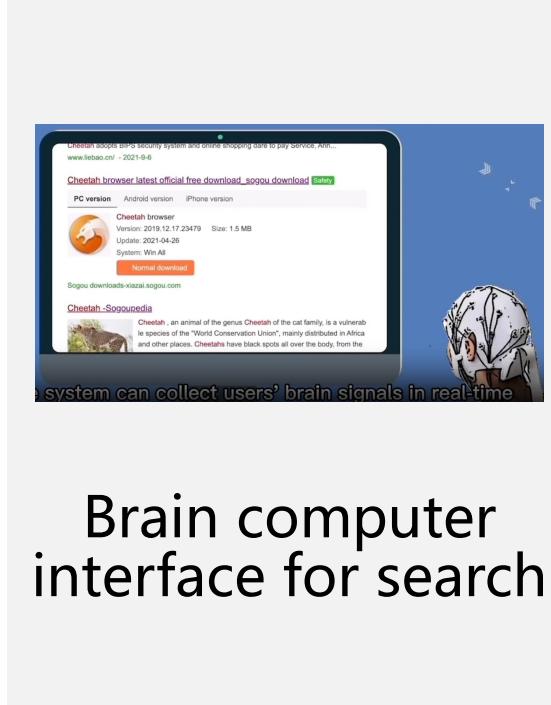
How to plan research?-After paper

- Code and reproducibility
 - Make sure that results are reproducible
 - More easier to use, more popular your method/dataset is
- Advertisement
 - Project website, related applications, demos, videos
 - Social medias
- Answer to emails and find collaboration opportunity
 - Help peers and gain reputation
 - Communicate with peers and find new collaborations



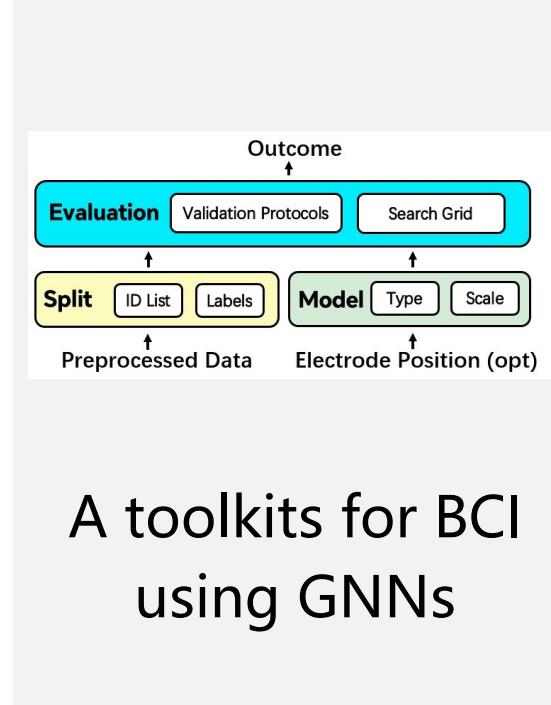
How to plan research?-Beyond paper

Prototype system



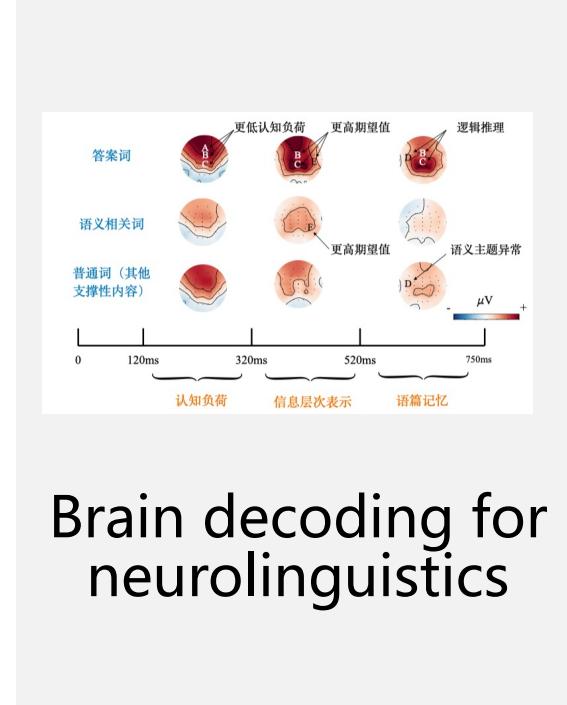
Brain computer
interface for search

Open toolkits



A toolkits for BCI
using GNNs

Good applications



Brain decoding for
neurolinguistics



➤ How to enjoy research?

Mindset

- Love the problem instead of the current result
- The meaning of research is that no research is perfect

Process

- Select a topic you like
- Find what you like most during research

People

- Learn to interact with your adviser
- Find Your Allies
- Seek Mentorship, and Be a Mentor

Life

- Research is only part of life
- Research could be come from life

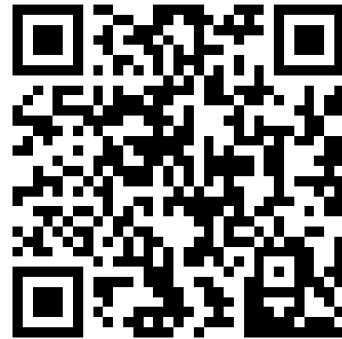


Thank you for listening!

Q & A

Ziyi Ye

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Homepage



Wechat

