Responsible AI from the Lens of an Information Retrieval Researcher

Half-Day Tutorial

CHIIR 2025

ADM+S
ARC Centre of Excellence for **Automated Decision-Making and Society**

Damiano Spina

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RMIT UNIVERSITY

Centre for Human-AI Information Environments

Information Retrieval on Country

by Dr Treahna Hamm (Firebrace),

Yorta Yorta

admscentre.org.au/information-retrieval-on-country/

Weelam: A Safe and Open Learning Space

(Home/Camp)

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9 Australian Universities

345 Centre Members

21 Partner Organisations

79 Collaborating Organisations

740+ Publications

50+ Submissions to major inquiries

80+ Government, industry & community briefings

720+ Media appearances

Outline

Outline

Part 1: Positionality and Keywords

Outline

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BREAK

Outline

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BREAK

Part 2: Use Cases

Outcomes

- A better understanding of the concept of positionality, and the acknowledgment of differences in terminology and methods when working in multidisciplinary teams

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- A better understanding of the concept of positionality, and the acknowledgment of differences in terminology and methods when working in multidisciplinary teams

- The application of responsible AI concepts in the context of interactive information retrieval research

Udine, May 2024

Damiano Spina, Kevin Roitero, Stefano Mizzaro, Vincenzo Della Mea, Francesca Da Ros, Michael Soprano, Hafsa Akebli, Alex Falcon, Mehdi Fasihi, Alessio Fiorin, David La Barbera, Daniele Lizzio Bosco, Riccardo Lunardi, Alberto Marturano, Zaka-Ud-Din Muhammad, Francesco Nascimben, Moritz Nottebaum, Massimiliano Pascoli, Mihai Horia Popescu, Laura Rasotto, Mubashara Rehman, Francesco Taverna, Biagio Tomasetig, and Alessandro Tremamunno. 2025. Report on the Hands-On PhD Course on Responsible AI from the Lens of an Information Access Researcher. SIGIR Forum 58, 2 (December 2024), 1–61. https://doi.org/10.1145/3722449.3722456

Positionality

Responsible AI Research Needs Impact Statements Too

Alexandra Olteanu
Microsoft Research

Michael Ekstrand
Drexel University

Carlos Castillo
ICREA and UPF

Jina Suh
Microsoft Research

All types of research, development, and policy work can have unintended, adverse consequences—work in responsible artificial intelligence (RAI), ethical AI, or ethics in AI is *no* exception.

Olteanu, A., Ekstrand, M., Castillo, C. and Suh, J., 2023. Responsible AI Research Needs Impact Statements Too. *arXiv preprint arXiv:2311.11776*.

Positionality Statement

To make **transparent** how the identities of the authors relate to the research topic and to the identity of the participants.

Not mandatory to disclose any aspect of their identities, only encouraged.

Authors may choose to disclose one or more of their identities, in less or more detail.

Positionality Statement: Another Example

Positionality statement. The research, disciplinary background, and personal views of the lead author, AO, have significantly influenced this perspective, as her own work has examined how our choices of what problems to prioritize and work on, of how we do our work, and of how we interpret research results are often shaped by unstated or implicit values, norms, goals, practices, and assumptions, as well as by our own "failures of imagination." ME similarly draws from several years of efforts to bridge between different communities, particularly RAI and the recommendation and information retrieval (IR) communities, and his use of the pedagogical idea of "scaffolding" to model and advocate for continuous improvement in the quality of RAI work in these communities and the attention of that work to the needs and impact on marginalized communities (including shifts in his own research methods and writing). CC is influenced by a perspective centered on computing research, computing applications, and computing education, and by the specific concerns of the FAccT conference with which they have been involved for the past five years. JS draws from her research at the intersection of technology and human well-being where she examines the role of technologies, design choices, and values embedded in them in shifting power dynamics and improving individual and organizational well-being. In relation to the perspective presented in this article, she draws on her research on worker well-being, especially surrounding the invisible forms of labor that underlie the creation and deployment of technologies.

Alexandra Olteanu, Michael Ekstrand, Carlos Castillo, and Jina Suh. 2023. Responsible AI Research Needs Impact Statements Too. *arXiv preprint arXiv:2311.11776*.

Positionality Statement: An Example

5.3 Positionality and ethical considerations

The authors span a range of disciplines, including Computer Science (with a focus on data science and information retrieval), Law, Moral Philosophy, and Digital Ethics. However, it is important to note the absence of expertise in other domains such as media studies and psychology. We acknowledge that our viewpoints come from a Western, liberal, democratic societal and cultural contexts, and that other perspectives (e.g., Indigenous perspectives [50, 57, 113]) are not fully captured in our discussions.

The paper aims to bridge the gap between technology and ethics within the context of SEs. While there are opinions in the paper that reflect authors' viewpoint—which may differ from those of the reader—we hope the paper can facilitate further discussions across disciplines, contributing to a more comprehensive understanding around the ethical implications, regulation, and accountability associated with SEs.

Coghlan, S., Chia, H.X., Scholer, F., Spina, D. Control search rankings, control the world: What is a good search engine?. *AI and Ethics* (2025). https://doi.org/10.1007/s43681-025-00695-8

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Let’s Form Groups!

https://deadlystory.com/page/aboriginal-country-map/Aboriginal_Country_Completed/Wurundjeri/Wurundjeri_Language

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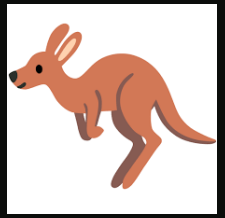

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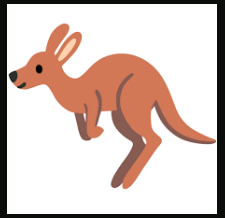

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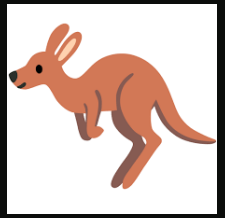

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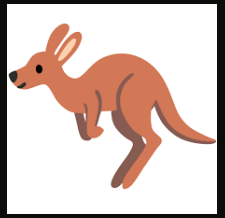

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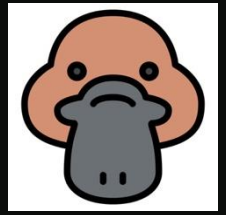

Dulai wurrung (Platypus)

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Activity 1 (10 min)

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1.3. Discuss your reflection with your peers.

Activity 1 (+10 min.)

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How did it go?

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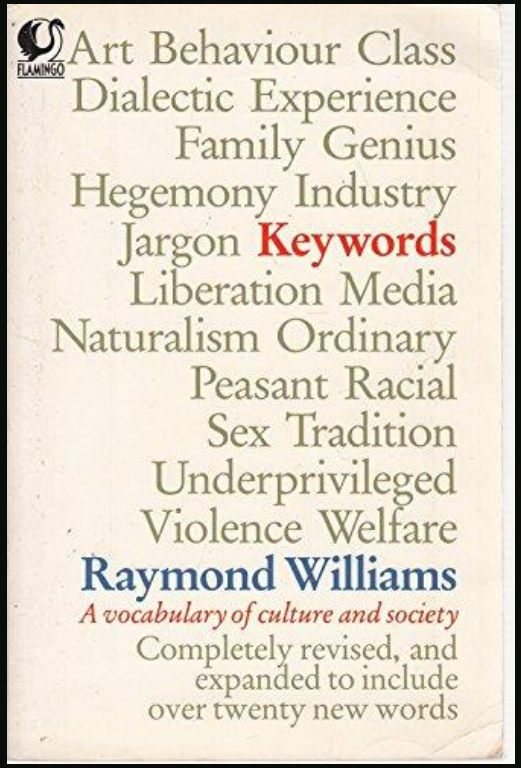
How did it go?

1.4 Draft a positionality statement relevant to your research

Keywords

Keywords for Dialogue

→ “This is not a review of natural meanings. […] not a *tradition* to be learned, nor a *consensus* to be accepted… but as a shaping and a reshaping in real circumstances and from profoundly different and important points of view: a vocabulary to use, to find our own ways in, to change as we find it necessary to change it, as we go on making our own language and history” (24-5)



Activity 2 – Layer 1 (10 min.)

Gather and Curate

- **Gather ‘keywords’,** cluster and roughly organise them around themes, issues… semantically;

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- **Gather ‘keywords’,** cluster and roughly organise them around themes, issues… semantically;

- **Identify terms** that carry the most tension, polysemy, are the most iconic, or feel like the ‘stars of the show’… those with large affective valence and complex feels…

Activity 2 – Layer 2 (10 min.)

Scrutinise

- Nominate a set of **landmine terms** ones that generated tensions, uncertainty.

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- Nominate a set of **landmine terms** ones that generated tensions, uncertainty.
- Scrutinise:
  - Why those words?
  - Who speaks on their behalf?
  - What are their interests?
  - What are the discontinuities and between their technical or disciplinary and ‘ordinary’ usage?
  - Who is included or excluded through their use?

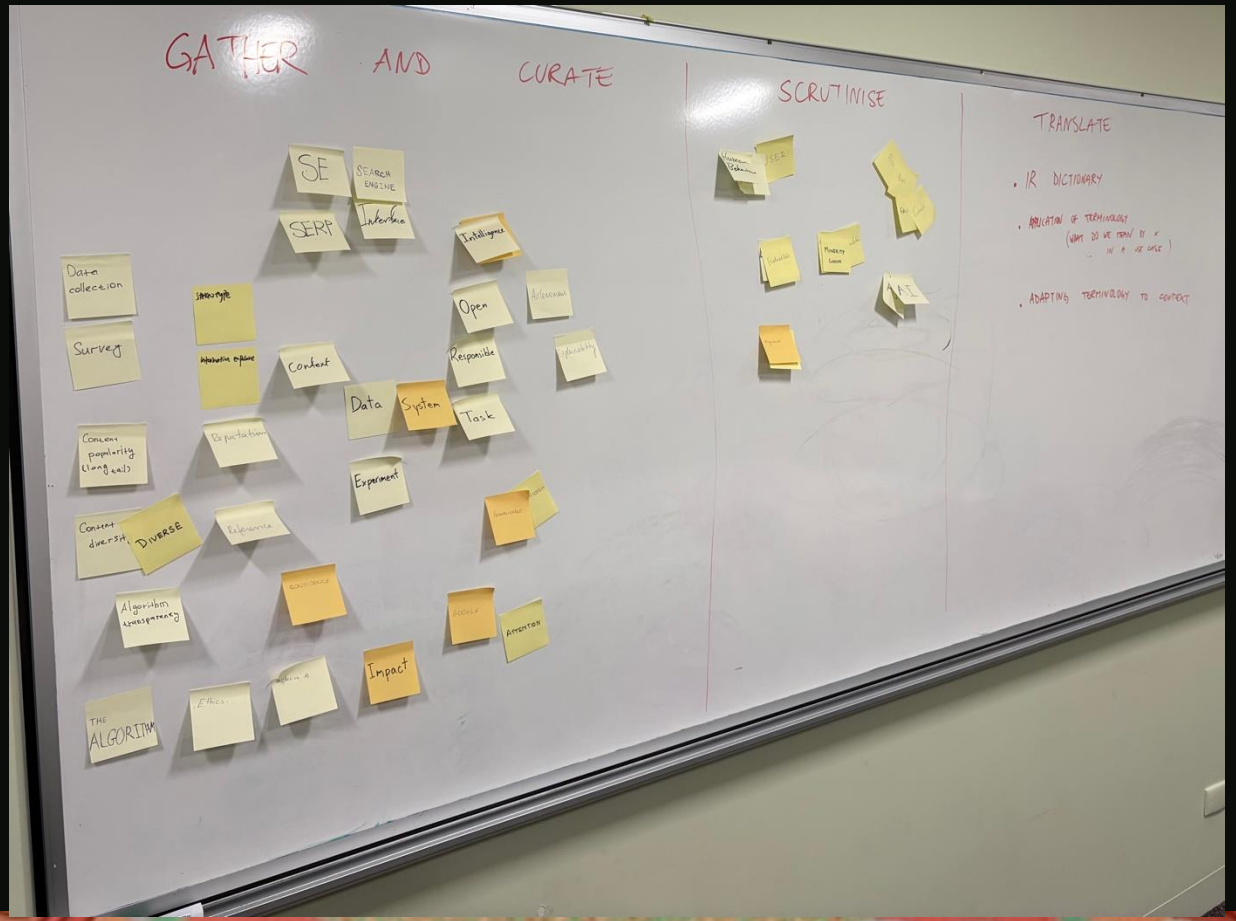
Activity 2 – Layer 3 (5 min.)

Translate

- How do we build **inclusive dialogues** around all this in contexts that will count?

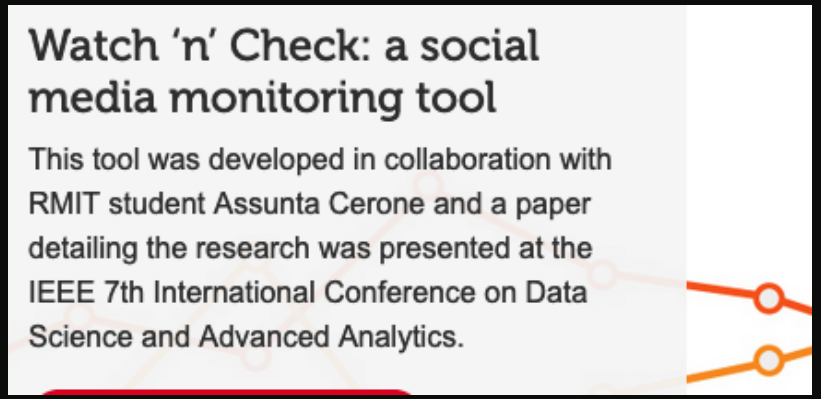
- What kinds of tools and materials do we need to produce…?

- What next steps do we want to take?


GATHER AND CURATE
SCRUTINISE
TRANSLATE
. IR DICTIONARY
. ADAPTING TERMINOLOGY TO CONTEXT
SE
SEARCH ENGINE
SERP
Interface
Intelligence
Data collection
Survey
Open
Responsible
Content
Data
System
Task
Experiment
DIVERSE
Algorithm transparency
Impact
THE ALGORITHM
Attention

Interdisciplinary Research (My Experience)

Collaboration with RMIT ABC Fact Check



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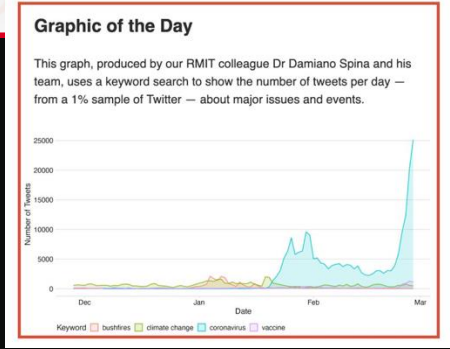

CoronaCheck newsletter, 4 April 2020

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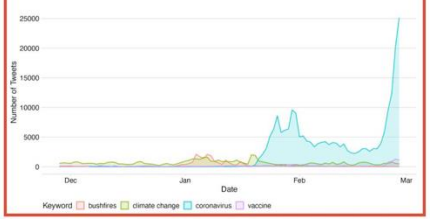

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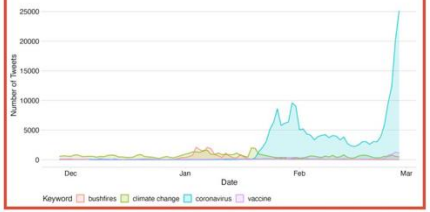

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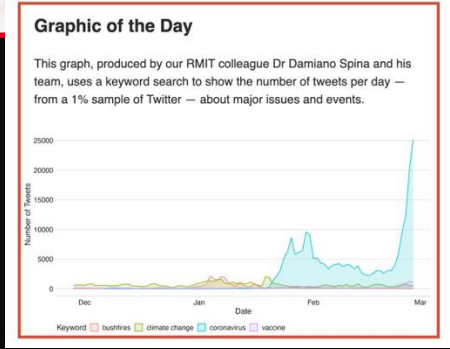

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FULL FACT

Auditing Information Access Tools for the Automation of Fact Checking

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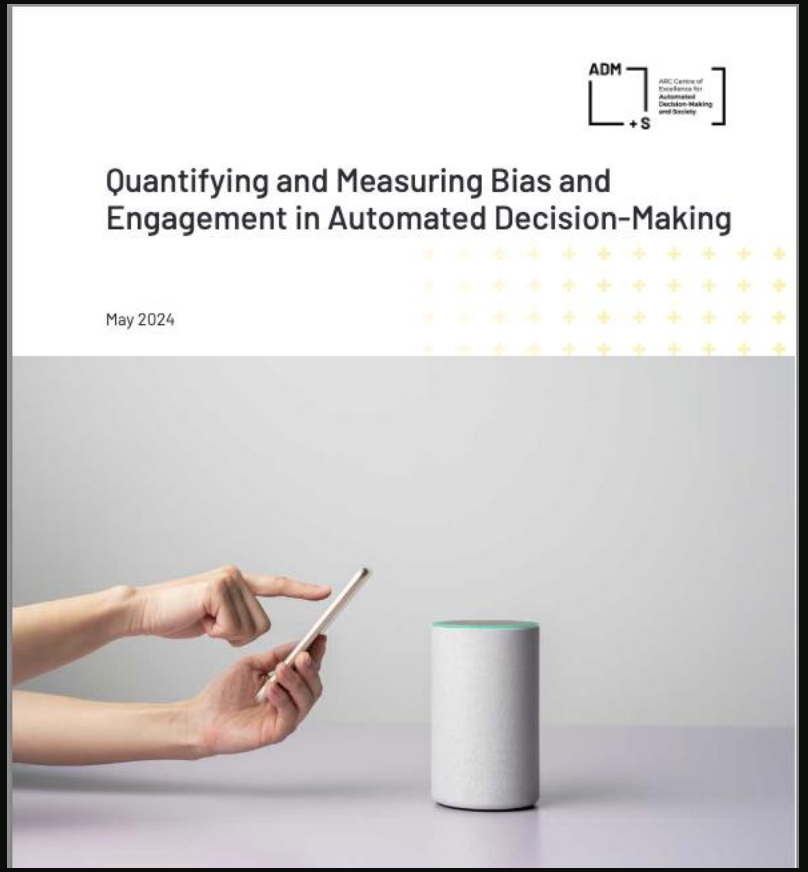
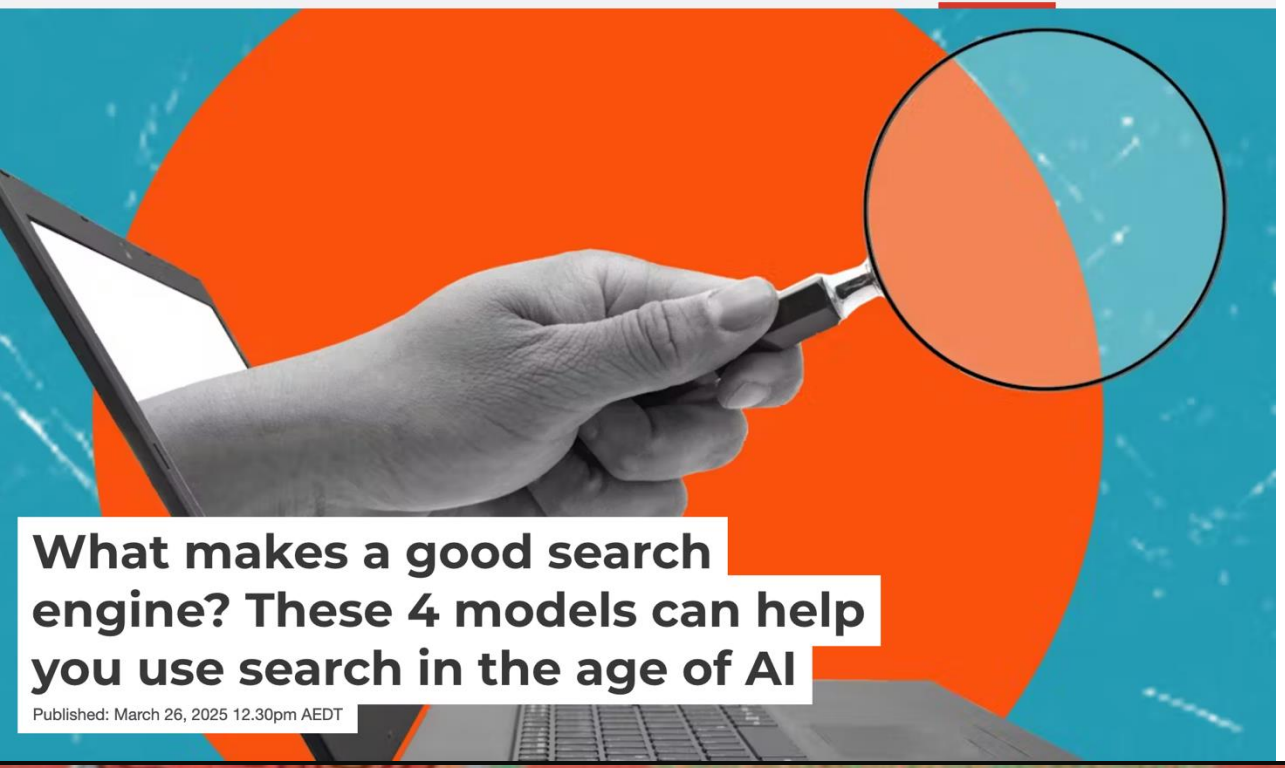


admscentre.org.au/quantifying-and-measuring-bias-and-engagement/



What makes a good search engine? These 4 models can help you use search in the age of AI

Published: March 26, 2025 12.30pm AEDT

Authors

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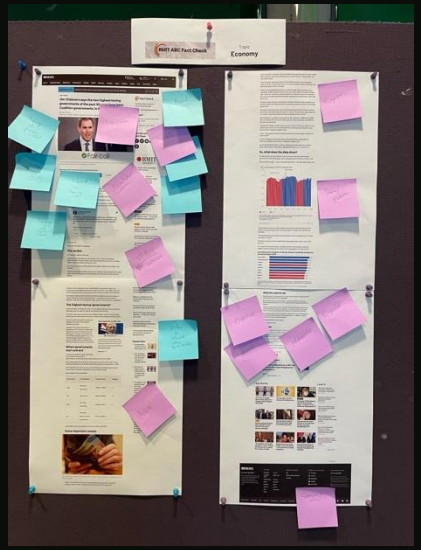
Falk Scholer
Professor of Information Access and Retrieval, RMIT University

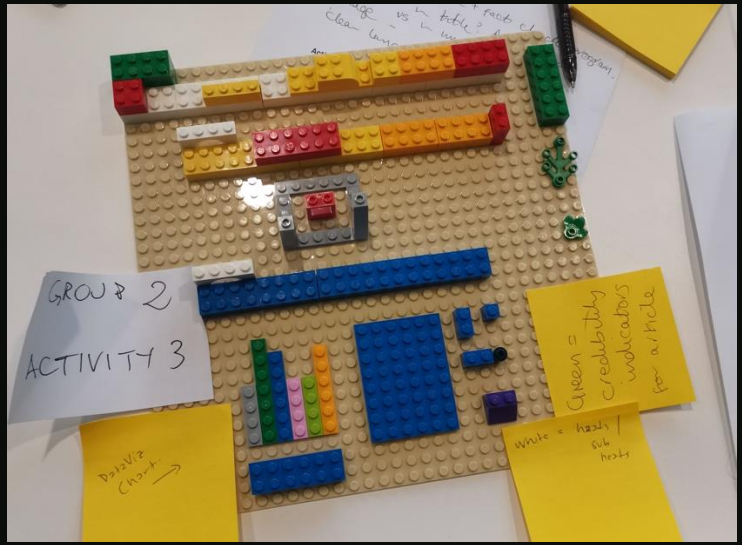
Hui Chia
PhD Candidate in Law, The University of Melbourne

Same keywords, different meaning
Same challenges, different ways of doing

- Computer Science
- Media & Communication
- Digital Ethnography
- Psychology
- Law
- Digital Ethics
- …

After the Break: Designing Presentation Strategies for Fact-checked Content





Participatory Research: Designing Presentation Strategies for Fact-checked Content

ADM+S Project: Quantifying and Measuring Bias and Engagement

ADM +S

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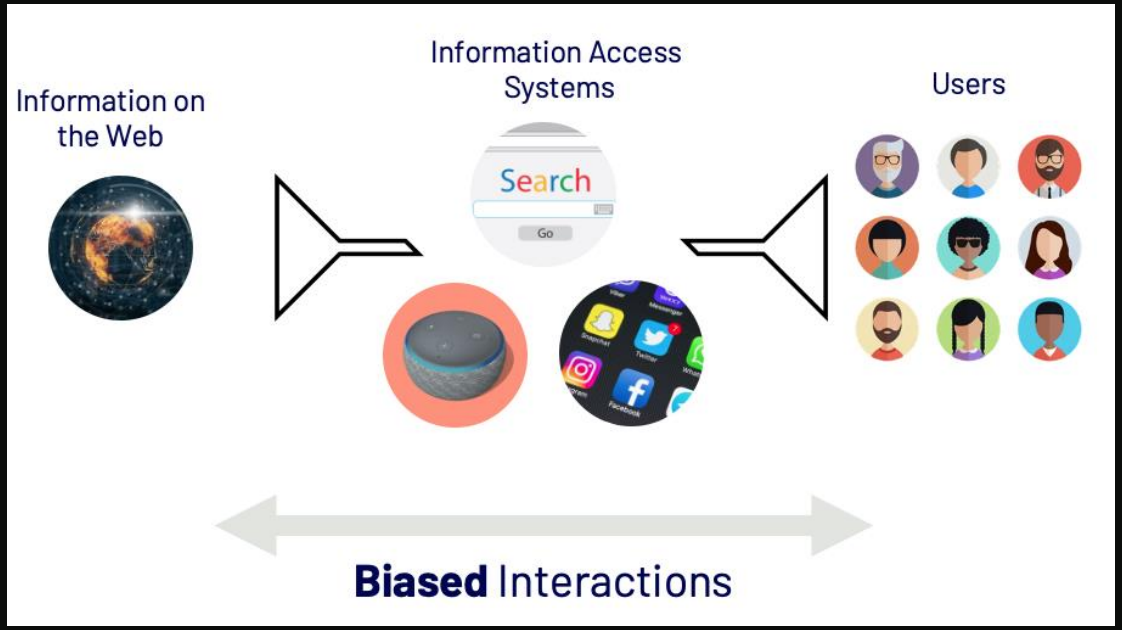


admscentre.org.au/quantifying-and-measuring-bias-and-engagement/

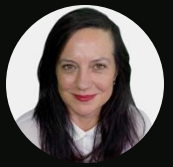
The Team

Dr Damiano Spina
Lead Investigator

Dr Danula Hettiachchi
Associate Investigator

Prof Anthony McCosker
Chief Investigator

A/Prof Jenny Kennedy
Associate Investigator



Devi Mallal
RMIT ABC Fact Check

Prof Flora Salim
Chief Investigator

Prof Falk Scholer
Associate Investigator

Prof Mark Sanderson
Chief Investigator

Kaixin Ji
PhD Student

International Fact Checking Network

IFCN Code of Principles: commitments organizations abide by to promote excellence in fact-checking.

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In Australia:

International Fact Checking Network

IFCN Code of Principles: commitments organizations abide by to promote excellence in fact-checking.

In Australia:

Computational methods to empower fact-checking experts to:

- Scale (more cost-effective process)
- Get access to more information in near real-time (trace narratives spreading in the web and social media)
- More effective dissemination and reach

Computational Methods to Assist in Fact-Checking

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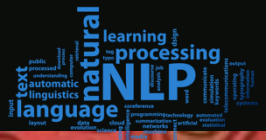
Claim Detection and Check-worthiness

Social Network Analysis

Natural Language Processing



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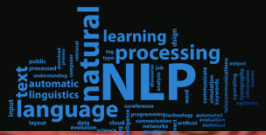
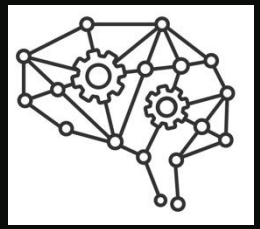


Information Access and Retrieval

Computational Methods to Assist in Fact-Checking

Claim Detection and Check-worthiness	Evidence Retrieval	Veracity/Truthfulness Classification
Social Network Analysis	Information Access and Retrieval	Machine Learning, Foundation Models, Deep Learning, and AI
		
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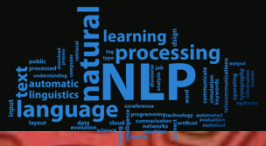		

Computational Methods to Assist in Fact-Checking

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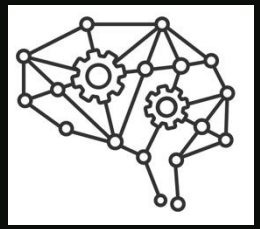
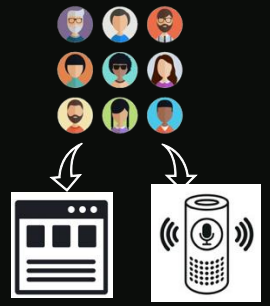
Social Network Analysis	Information Access and Retrieval	Machine Learning, Foundation Models, Deep Learning, and AI	Human-Computer Interaction
			
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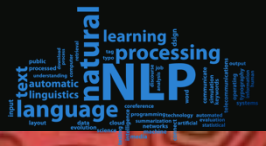			

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		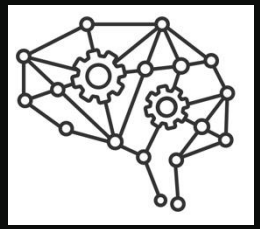	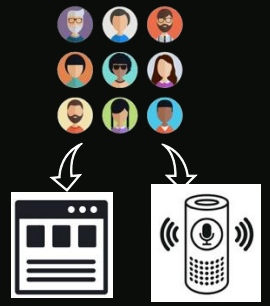
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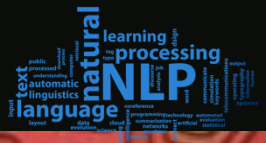			

FACT CHECK

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RMIT ABC Fact Check
Posted Thu 26 Aug 2021 at 8:11am

Overreach

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In a July 30 tweet, Greens leader Adam Bandt claimed house prices are rising by $1,200 a day, warning that younger workers have been locked out.

> **Adam Bandt** @AdamBandt
>
> Young people have been left behind by this government.
>
> Locked down by lack of vaccines.
>
> Locked in to low wages.
>
> Locked out of the housing market.

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Africa Check FACT-CHECKS WHO WE ARE WHAT WE DO HOW WE FACT-CHECK GET INVOLVED DONATE

Home › Fact-checks › Reports › 100-million people globally wi...

100-million people globally with persistent symptoms? Two 'long Covid' stats, investigated

The term "long Covid" is by now familiar for the symptoms many suffer months after infection with Covid-19. But early studies used differing definitions for it and this, coupled with a lack of truly global data, has made conclusions on the phenomenon hard to reach.

Published on 09 February 2022

Shutterstock

- While the term "long Covid" refers to a collection of long-term symptoms, the World Health Organization issued a standardised definition for the term in October 2020 to guide research.
- Estimates of long Covid prevalence vary widely – from as low as a quarter to as high as 80% – but experts told us that somewhere between 25 and 30% was "reasonable".
- A systematic review released in November 2021 – but not peer-reviewed – estimated the overall prevalence of long Covid at 43%, but calculations of worldwide numbers need to reference truly global and current data.

Kirsten Cosser

Share

The South African government has, as of 1 February 2022, relaxed its regulations to prevent the spread of Covid-19. Children have returned to school full time and asymptomatic patients no longer have to isolate.

In the third year of the pandemic, life appears to be returning to normal. But concerns have been raised about the long-term health implications of Covid-19 infections.

In an interview on Cape Talk radio, professor of physiology at South Africa's Stellenbosch University, Resia Pretorius, described how people who had tested positive for Covid-19 experienced symptoms that lasted for months after the initial diagnosis.

"Between 25 and 30% of individuals will have these persistent symptoms," said Pretorius. She is one of the authors of an August 2021 paper looking into the possible causes of "long Covid".

In an article published by Cape Talk about the interview, the station said the number of people around the world thought to experience long Covid symptoms is estimated at "close to 100-million".

Are these estimates accurate? We checked.

Claim

"Between 25 and 30% of individuals" will have persistent symptoms after Covid-19 infection.

Verdict

Mostly Correct

Pretorius told Africa Check her claim was based on a study conducted in late 2020 which found that among "individuals with Covid-19 who were followed up for as long as nine

Claim

Two claims about long Covid

Verdict

One mostly correct, one unproven.

Source

Interview and article on South African radio station, Cape Talk (January 2022)

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Tweets

stated on August 30, 2021 in tweets:

A video shows the "Taliban hanging someone from a helicopter."

FALSE
POLITIFACT TRUTH-O-METER

AFGHANISTAN FACEBOOK FACT-CHECKS TWEETS

A U.S. Chinook helicopter flies over the U.S. Embassy in Kabul, Afghanistan, on Aug. 15, 2021. (AP/Gul)

By Bill McCarthy
August 31, 2021

Person hanging from helicopter in Afghanistan appears to be wearing a harness

IF YOUR TIME IS SHORT

- The person can be seen in other photographs and videos moving and waving his arms while suspended from a harness.
- Several news outlets and fact-checkers reported that the person had been tasked with trying to fix a flag on a public building.

See the sources for this fact-check

Conservative blog sites, pundits and politicians such as Sen. Ted Cruz, R-Texas, claimed that the Taliban hanged someone from a helicopter flying over Afghanistan.

The viral rumor was based on a short, blurry video that shows a helicopter flying over the country with a person dangling from a rope beneath it. It's not clear who filmed the footage and when, but the clip appears to be real. However, that doesn't mean it

Research Questions

What are the important design elements in a fact-checking report?

To what extent can these elements improve users' ability to accurately interpret fact-checking reports?

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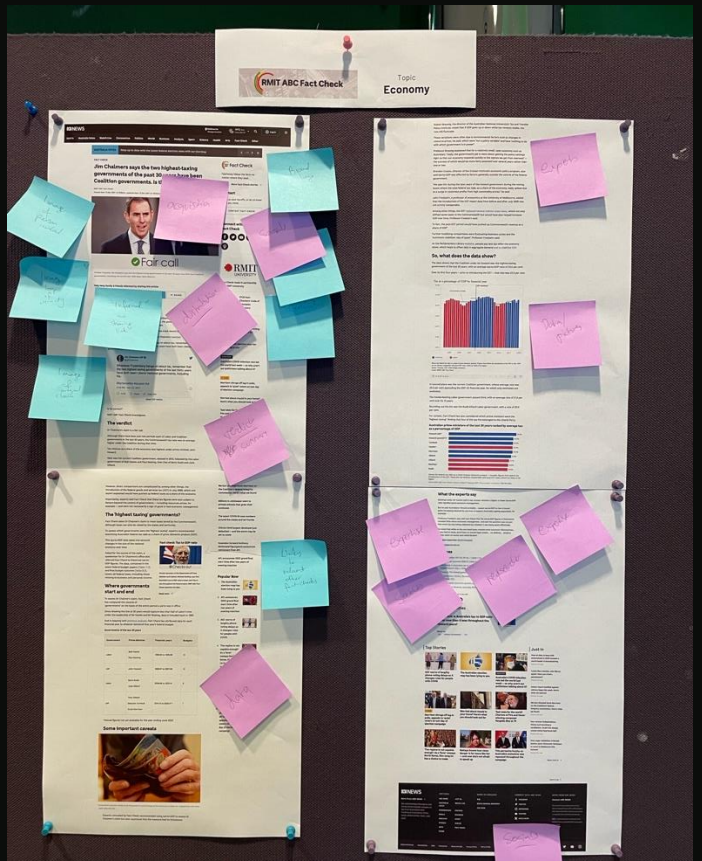
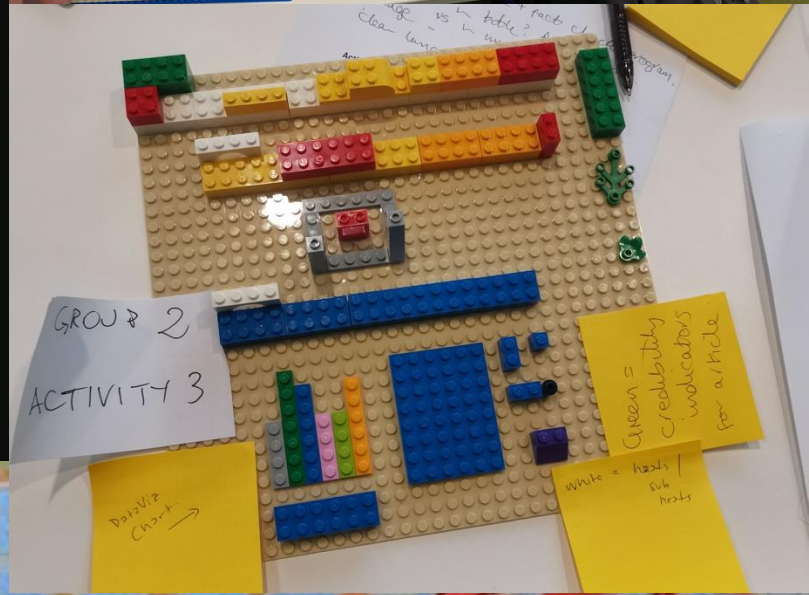
Phase 1: Participatory Research

- A hands-on workshop that brought together fact-checking professionals, communication experts and researchers.

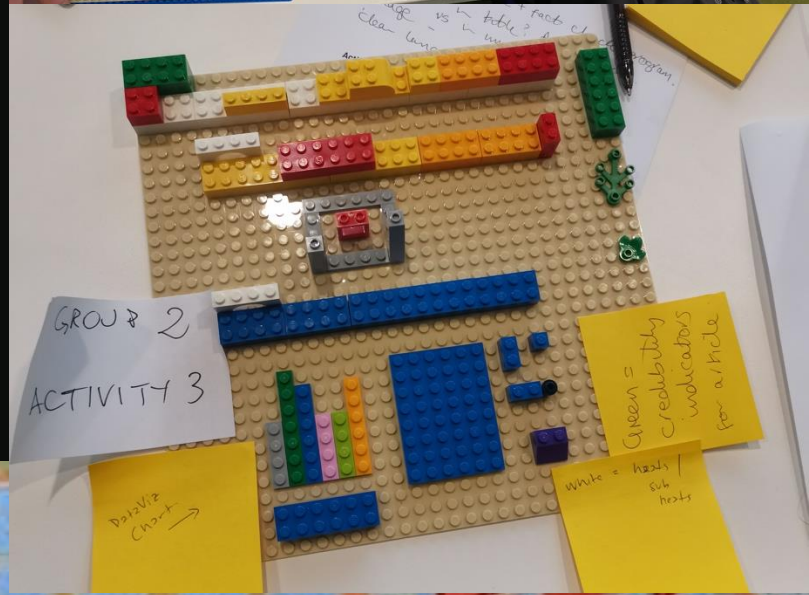


Workshop Activities



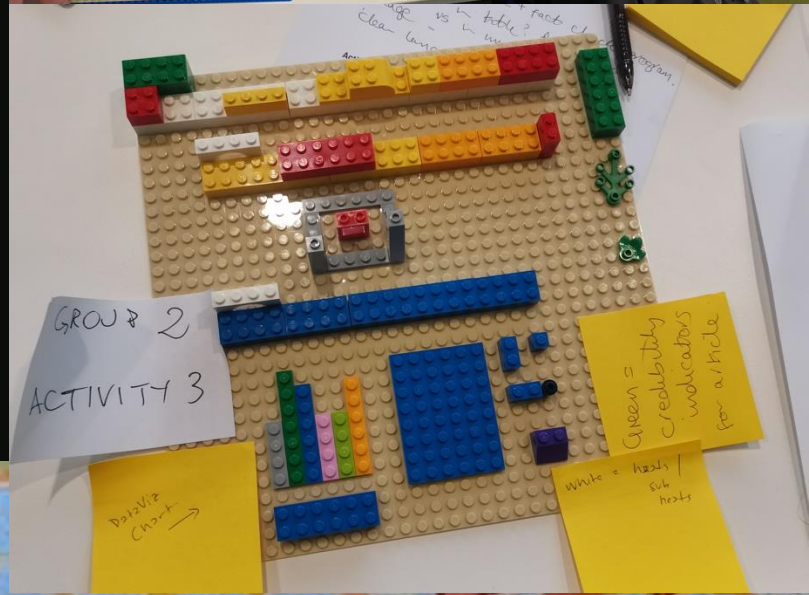
Workshop Activities

- Understanding fact-checking presentation and different presentation elements



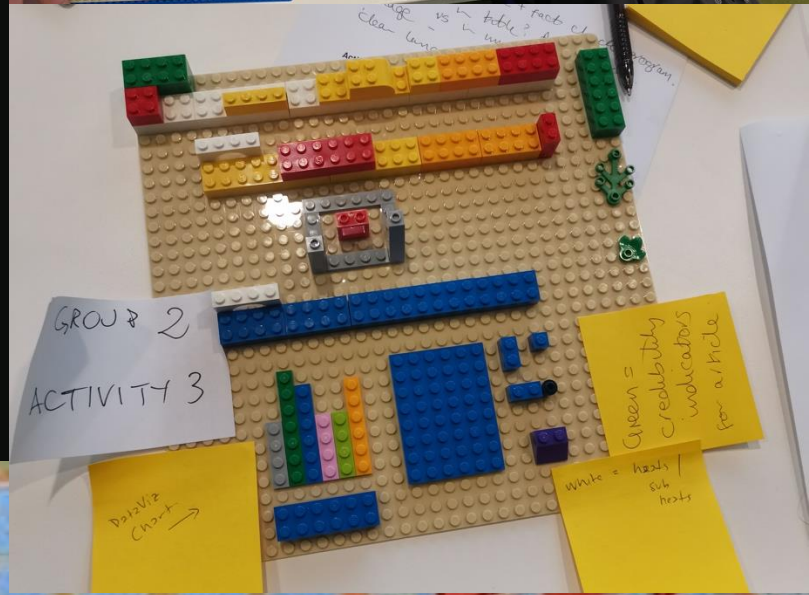
Workshop Activities

- Understanding fact-checking presentation and different presentation elements
- Creating presentation strategies for Screens and Audio-only channels



Workshop Activities

- Understanding fact-checking presentation and different presentation elements
- Creating presentation strategies for Screens and Audio-only channels
- Customizing presentations for personas and scenarios

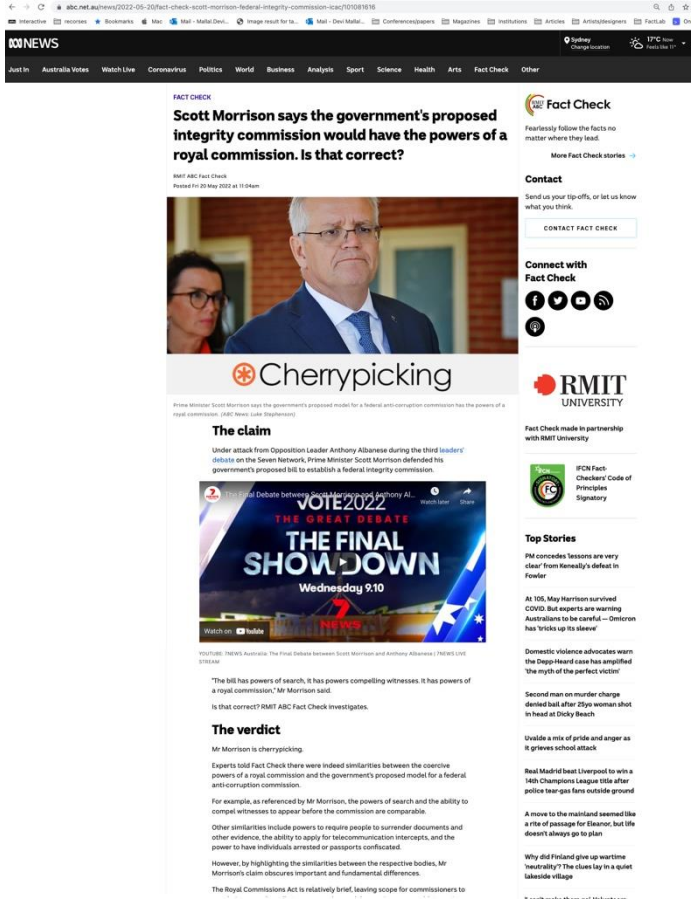


Workshop Schedule

Time	Session
(20 mins)	Introduction
(30 mins)	Understanding Fact-checking Presentation
(80 mins)	Creating Presentation Strategies for Screens
(30 mins)	Break - Light Refreshments
(60 mins)	Understanding Presentation for Voice-interaction
(15 mins)	Closing and Feedback


DNES
Děti na prodej

Why Presentation is Important in Fact-Checking



FACT CHECK

Scott Morrison says the government's proposed integrity commission would have the powers of a royal commission. Is that correct?

RMIT ABC Fact Check
Posted Fri 20 May 2022 at 11:04am

Cherrypicking

The claim

Under attack from Opposition Leader Anthony Albanese during the third leaders' debate on the Seven Network, Prime Minister Scott Morrison defended his government's proposed bill to establish a federal integrity commission.

"The bill has powers of search, it has powers compelling witnesses. It has powers of a royal commission," Mr Morrison said.

Is that correct? RMIT ABC Fact Check investigates.

The verdict

Mr Morrison is cherrypicking.

Experts told Fact Check there were indeed similarities between the coercive powers of a royal commission and the government's proposed model for a federal anti-corruption commission.

For example, as referenced by Mr Morrison, the powers of search and the ability to compel witnesses to appear before the commission are comparable.

Other similarities include powers to require people to surrender documents and other evidence, the ability to apply for telecommunication intercepts, and the power to have individuals arrested or passports confiscated.

However, by highlighting the similarities between the respective bodies, Mr Morrison's claim obscures important and fundamental differences.

The Royal Commissions Act is relatively brief, leaving scope for commissioners to

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Domestic violence advocates warn the Depp-Heard case has amplified 'the myth of the perfect victim'

Second man on murder charge denied bail after 25yo woman shot in head at Dicky Beach

Uvalde a mix of pride and anger as it grieves school attack

Real Madrid beat Liverpool to win a 14th Champions League title after police tear-gas fans outside ground

A move to the mainland seemed like a rite of passage for Eleanor, but life doesn't always go to plan

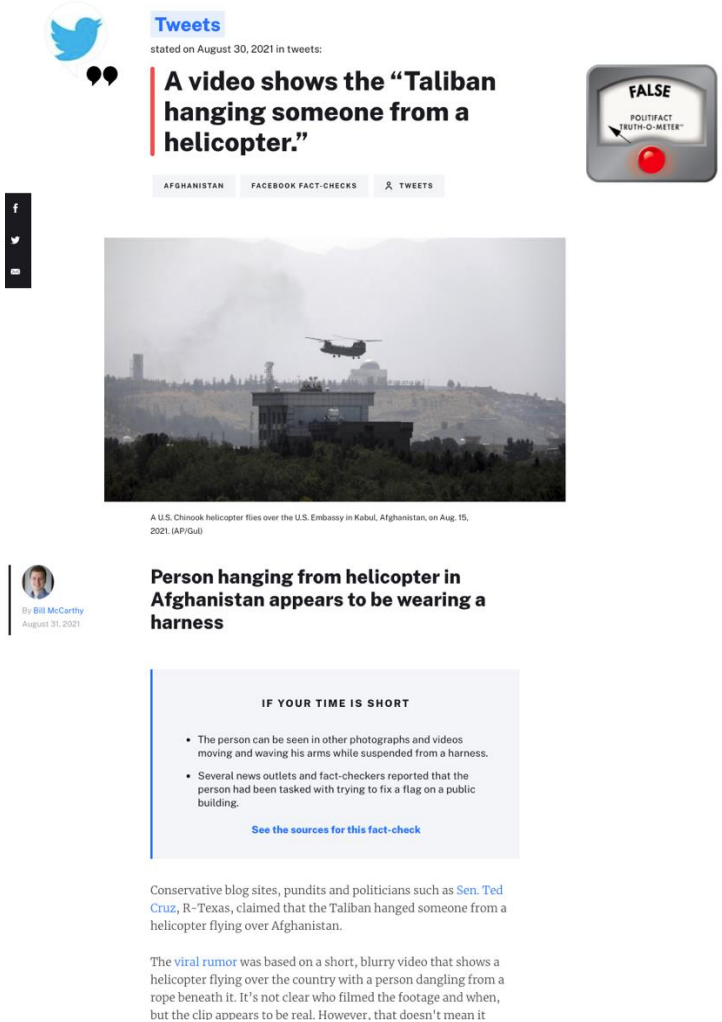
Why did Finland give up wartime 'neutrality'? The clues lay in a quiet lakeside village

Devi Mallal

RMIT ABC Fact Check

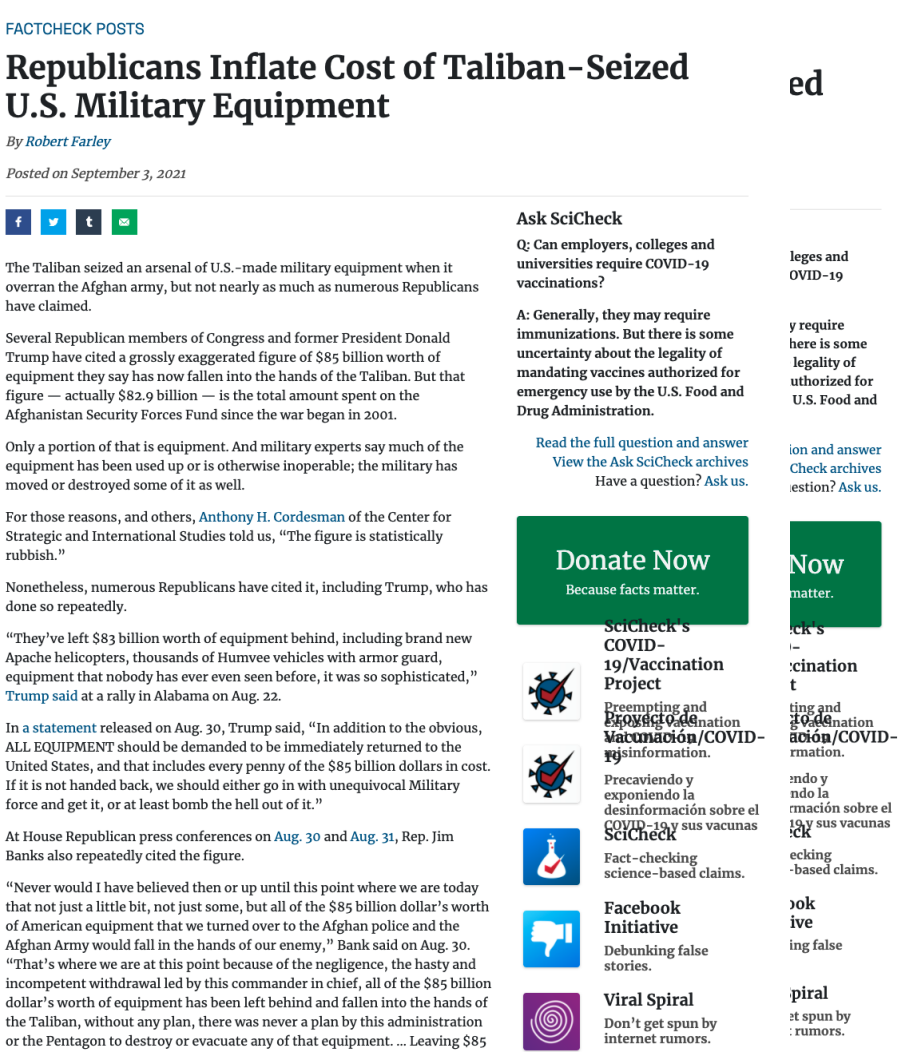
PolitiFact

- Veracity Indicator
- Origin
  - Clear indication on the source (e.g., Twitter)
- Explanation
  - Detailed explanation backed by other sources and background details
- Author
- A good summary
- Obfuscated source image



FactCheck.org

- No Veracity Indicator
- Origin
- Explanation
  - Detailed explanation backed by other sources and background details
- Author
- Limited structure



FACTCHECK POSTS

Republicans Inflate Cost of Taliban-Seized U.S. Military Equipment

By Robert Farley

Posted on September 3, 2021

The Taliban seized an arsenal of U.S.-made military equipment when it overran the Afghan army, but not nearly as much as numerous Republicans have claimed.

Several Republican members of Congress and former President Donald Trump have cited a grossly exaggerated figure of $85 billion worth of equipment they say has now fallen into the hands of the Taliban. But that figure — actually $82.9 billion — is the total amount spent on the Afghanistan Security Forces Fund since the war began in 2001.

Only a portion of that is equipment. And military experts say much of the equipment has been used up or is otherwise inoperable; the military has moved or destroyed some of it as well.

For those reasons, and others, Anthony H. Cordesman of the Center for Strategic and International Studies told us, "The figure is statistically rubbish."

Nonetheless, numerous Republicans have cited it, including Trump, who has done so repeatedly.

"They've left $83 billion worth of equipment behind, including brand new Apache helicopters, thousands of Humvee vehicles with armor guard, equipment that nobody has ever even seen before, it was so sophisticated," Trump said at a rally in Alabama on Aug. 22.

In a statement released on Aug. 30, Trump said, "In addition to the obvious, ALL EQUIPMENT should be demanded to be immediately returned to the United States, and that includes every penny of the $85 billion dollars in cost. If it is not handed back, we should either go in with unequivocal Military force and get it, or at least bomb the hell out of it."

At House Republican press conferences on Aug. 30 and Aug. 31, Rep. Jim Banks also repeatedly cited the figure.

"Never would I have believed then or up until this point where we are today that not just a little bit, not just some, but all of the $85 billion dollar's worth of American equipment that we turned over to the Afghan police and the Afghan Army would fall in the hands of our enemy," Bank said on Aug. 30. "That's where we are at this point because of the negligence, the hasty and incompetent withdrawal led by this commander in chief, all of the $85 billion dollar's worth of equipment has been left behind and fallen into the hands of the Taliban, without any plan, there was never a plan by this administration or the Pentagon to destroy or evacuate any of that equipment. ... Leaving $85

Ask SciCheck

Q: Can employers, colleges and universities require COVID-19 vaccinations?

A: Generally, they may require immunizations. But there is some uncertainty about the legality of mandating vaccines authorized for emergency use by the U.S. Food and Drug Administration.

Read the full question and answer
View the Ask SciCheck archives
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SciCheck's COVID-19/Vaccination Project
Preempting and exposing vaccination misinformation.

Proyecto de Vacunación/COVID-19
Precaviendo y exponiendo la desinformación sobre el COVID-19 y sus vacunas

SciCheck
Fact-checking science-based claims.

Facebook Initiative
Debunking false stories.

Viral Spiral
Don't get spun by internet rumors.

RMIT ABC Fact Chec

- Veracity Indicator
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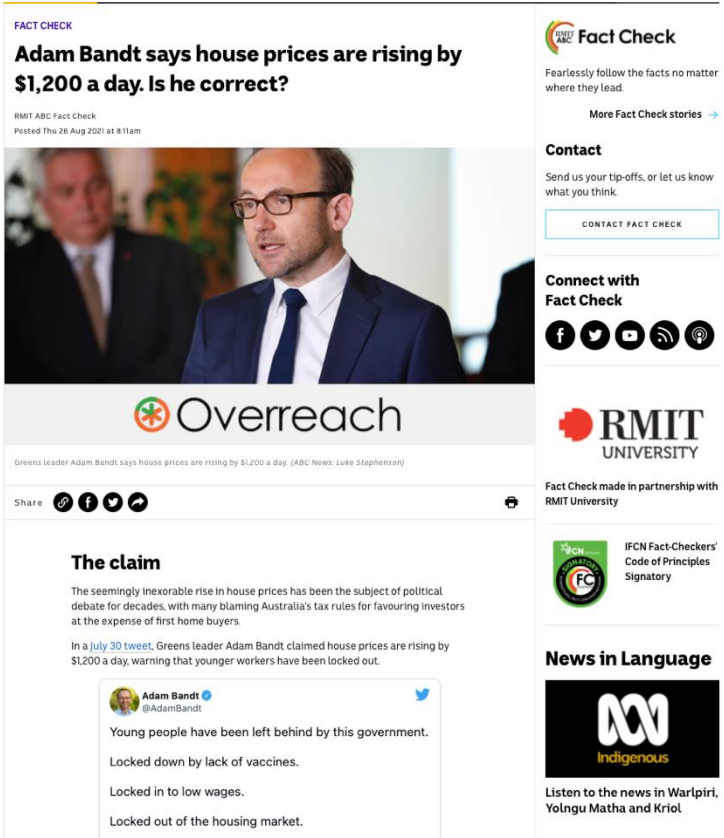
- Credentials and Author



FACT CHECK

Adam Bandt says house prices are rising by $1,200 a day. Is he correct?

RMIT ABC Fact Check
Posted Thu 26 Aug 2021 at 8:11am

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@AdamBandt

Young people have been left behind by this government.

Locked down by lack of vaccines.

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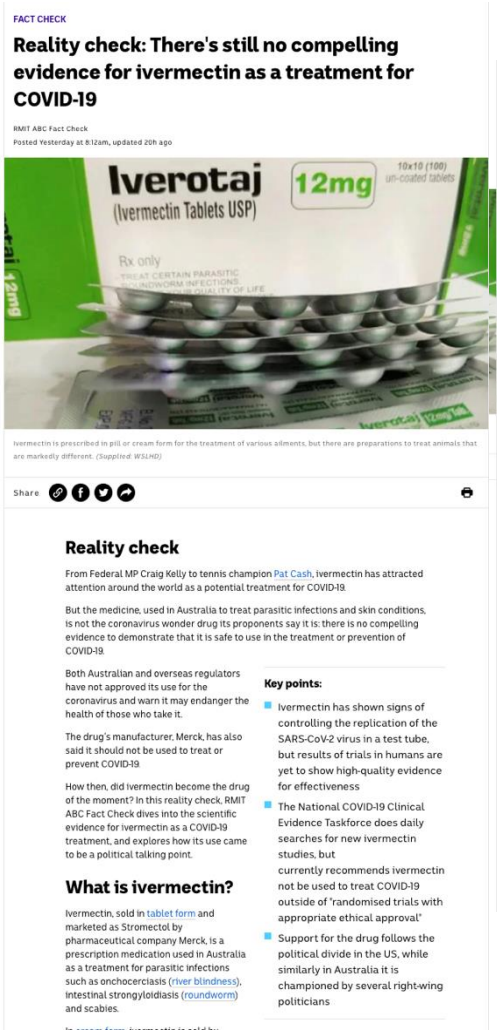


FACT CHECK

Reality check: There's still no compelling evidence for ivermectin as a treatment for COVID-19

RMIT ABC Fact Check
Posted Yesterday at 8:12am, updated 20h ago

Ivermectin is prescribed in pill or cream form for the treatment of various ailments, but there are preparations to treat animals that are markedly different. *(Supplied: WSLHD)*

Share

Reality check

From Federal MP Craig Kelly to tennis champion Pat Cash, ivermectin has attracted attention around the world as a potential treatment for COVID-19.

But the medicine, used in Australia to treat parasitic infections and skin conditions, is not the coronavirus wonder drug its proponents say it is: there is no compelling evidence to demonstrate that it is safe to use in the treatment or prevention of COVID-19.

Both Australian and overseas regulators have not approved its use for the coronavirus and warn it may endanger the health of those who take it.

The drug's manufacturer, Merck, has also said it should not be used to treat or prevent COVID-19.

How then, did ivermectin become the drug of the moment? In this reality check, RMIT ABC Fact Check dives into the scientific evidence for ivermectin as a COVID-19 treatment, and explores how its use came to be a political talking point.

Key points:

- Ivermectin has shown signs of controlling the replication of the SARS-CoV-2 virus in a test tube, but results of trials in humans are yet to show high-quality evidence for effectiveness
- The National COVID-19 Clinical Evidence Taskforce does daily searches for new ivermectin studies, but currently recommends ivermectin not be used to treat COVID-19 outside of 'randomised trials with appropriate ethical approval'
- Support for the drug follows the political divide in the US, while similarly in Australia it is championed by several right-wing politicians

What is ivermectin?

Ivermectin, sold in tablet form and marketed as Stromectol by pharmaceutical company Merck, is a prescription medication used in Australia as a treatment for parasitic infections such as onchocerciasis (river blindness), intestinal strongyloidiasis (roundworm) and scabies.

Activity 1 – 10 minutes

- Find a partner and work in pairs.

- Identify and list different fact-checking elements
- Example - Veracity indicator, origin

- Identify these elements by placing a sticky note on fact-checking presentations displayed on the wall.

Activity 2 – 10 minutes

- Get into your allocated group
- Discuss the elements you noted in the Activity 1
- As a group, identify important elements for fact-checking presentations
- Rank each element according to its importance from 1(most important) to N.
    - Write final rankings in the given worksheet

Group Allocation

- Group 1
    - P1, P2, P3
- Group 2
    - P4, P5, P6
- Group 3
    - P7, P8, P9

Activity 3 – Presentation Strategies
20 minutes

- Continue with the group from Activity 2

- **Develop a fact-checking presentation strategy**
  - A presentation strategy may consist of:
    - Elements identified before
    - An adapted version of those elements
  - Use Lego blocks
    - Colour represents the element type
    - Vertical height represents the level of expected attention/intensity
    - The occupied area of the block represents the space requirement on the website.

- **Please write notes** explaining the motivation for using specific elements (e.g., veracity indicator) in each scenario

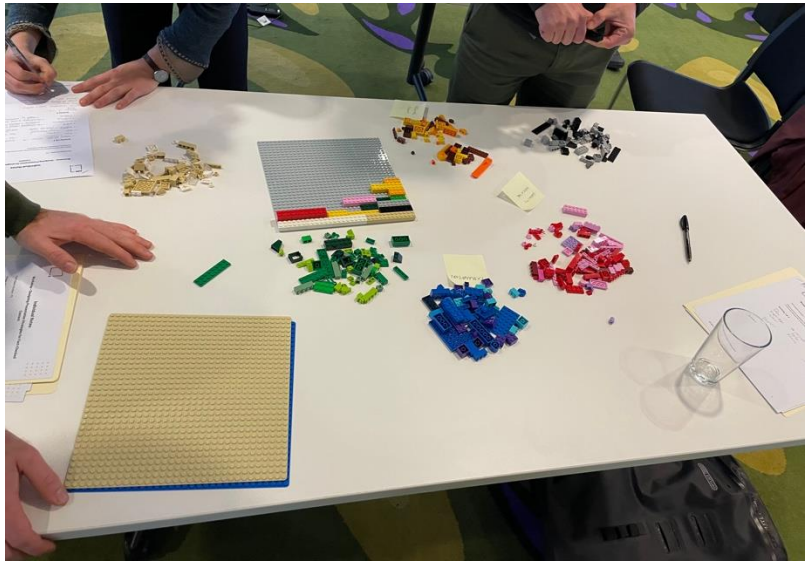
Lego colour guide

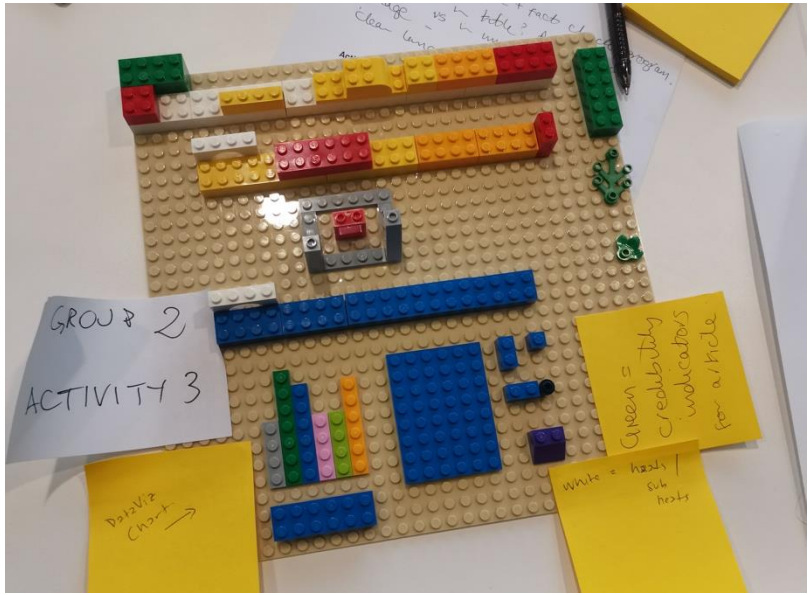
Red – Veracity Indicator

Yellow – Original Claim

Blue – Explanation

Green/Cream/Gray/Black – Other custom elements




GROUP 2
ACTIVITY 3
Green = credibility indicators for article
White = heads / sub heads
Data Viz Chart

Activity 4 A – Personas and Scenarios – 15 minutes

- Each group will receive six personas
- **Select two personas** with contrasting characteristics considering their interest (or willingness) in consuming fact-checking content
- Use topics/articles from Activity 1 (posted on the wall)
- Extend each persona and create a scenario
    - Create a **scenario** using the persona and a topic. It could include details like news consumption channel, motivation to use the fact-checking website etc.
    - You may add more details to the persona (e.g., demographics, familiarity with the topic, willingness to verify information)

Activity 4 A – Personas and Scenarios

- Each persona has the following characteristics in addition to basic demographic information.
  - Technology Attitude: including notions of control, enthusiasm, learning, and confidence toward technology
  - Basic Technology skills: including basic operational functions, such as connecting to the internet, downloading and opening files, using software, deciding what to share, how and who with, managing and monitoring contacts, and communicating with others.
  - Advance Technology skills: including information searching and navigating, verifying trustworthy information and managing third party data collection, adjusting privacy settings, determining what is safe to download, customizing devices and connections
  - English Proficiency: able to read and write in English fluently

Personas: Example

Karen Li - New Immigrant

Gender: Female

Age: 45

Status: Single Mother

Location: Sunshine, AU

Education: Bachelor

Cultural Background: Chinese

Technology Attitude: Open to learning, it is interesting; Little technological confidence.

English Proficiency: 

Basic Technology Skills: 

Advance Technology Skills: 

Fact-checking Frequency: 

I am a new immigrant to Australia. I can read or write a little bit, but not good. Only simple sentences. I am still learning English and practising. I know how to use my mobile phone and laptop, such as keeping up to date and contacting with family overseas. When I see something interesting, I will share the link with my son. He taught me how to use my devices. He also taught me how to use YouTube to watch English learning videos. It was very helpful. The phone is more convenient, so I use it to read information more often. For work, I do some simple organizing paperwork on my laptop. I also use the laptop to read information or news or something interesting when I take a break from work.

Activity 4 B – Customized Presentation Strategies - 15 minutes

- Now, modify the fact-checking presentation you developed for each Persona/Scenario
- **Please write notes** explaining the motivation for using specific elements (e.g., veracity indicator) in each scenario

DOUG HENKE

Voice Interaction and Fact-checking

- Why is it different from screen-based interaction
  - There is a limited information budget
  - Presentation order is highly important
  - Users may follow different paths
  - Technical challenges with speech recognition


09:56
Try "Alexa, open Heads Up!"

Activity 5 – Presentation Strategies for Voice

- **Develop a fact-checking presentation strategy**
  - A presentation strategy may consist of:
    - Elements identified before
    - An adapted version of those elements
  - Use Lego blocks
    - Colour represents the element type
    - Vertical height represents the level of expected attention/intensity
    - The order of elements (top to bottom) represents the turns in conversation.

- **Please write notes** explaining the motivation for using specific elements (e.g., veracity indicator) in each scenario

Lego colour guide

Red – Veracity Indicator

Yellow – Original Claim

Blue – Explanation

Green/Cream/Gray/Black – Other custom elements

Workshop Outcomes

- Annotated Reports with Elements
- Ranking of Elements
- Boards with Presentation Strategies (Screen-based and Voice-based)
- Written Feedback
- Recordings (+ transcriptions)
  - **Debriefing Sessions by participants -> Inductive analysis approach**

Emerging Themes

Screen-based Interfaces

Voice Interfaces

Structure of the Report

- Configuring the report layout.
- Using effective visual elements like graphs.

- Clarity on final verdict.
- A clear, and effective structure.

- Configuring the navigational structure.
- Having an engaging narration.

Emerging Themes

Screen-based Interfaces		Voice Interfaces
Structure of the Report		
• Configuring the report layout. • Using effective visual elements like graphs.	• Clarity on final verdict. • A clear, and effective structure.	• Configuring the navigational structure. • Having an engaging narration.
Trust towards the Verdict		
• Details of the author • Organization branding and accreditations.	• Fostering perceived trust towards the organisation and the author.	• Leveraging the relationship between the user and the author.

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Trust towards the Verdict		
• Details of the author • Organization branding and accreditations.	• Fostering perceived trust towards the organisation and the author.	• Leveraging the relationship between the user and the author.
Personalization		
• Customizing the layout to suit personal preferences.	• Preference for different channels. • Time availability.	• Using different voice-characters.

Research Questions

What are the important design elements in a fact-checking report?

To what extent can these elements improve users' ability to accurately interpret fact-checking reports?

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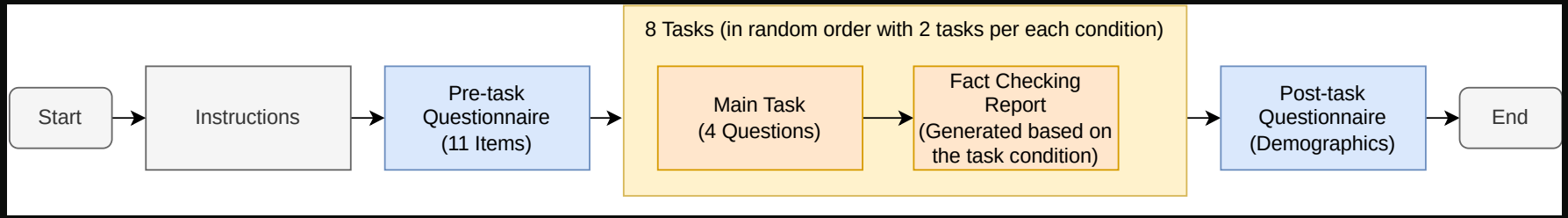
Crowdsourcing Study

- Participants located in the US, recruited through Mturk
- 8 fact-checking articles



Fact-Checking Report

No Improvements (Baseline)

[B] Task 1 - Fact Checking Report - Return to the task window after reading the following.

Fact Check Report by POLITIFACT

Posted on 13 September 2022

40% of student borrowers lack a four-year degree

A manicurist at work in a nail salon in New York in January 2015. Cosmetology degrees are the fifth most popular program among student borrowers. (AP)

POLITIFACT
The Poynter Institute

As Republicans see it, President Joe Biden's student debt relief plan is a gift to the well-off. But Sen. Elizabeth Warren, D-Mass., has pushed back against the image of the privileged borrower.
"The average income for truck drivers is about $70,000 a year, exactly the kind of middle-class worker the Biden administration is helping," Sarabia said.

Debt relief is available for people who earn up to $125,000 a year.

Warren said that "40% of the folks who have student loans do not have a college diploma, four-year diploma. These are people who are truck drivers and who are nail technicians and nurses' aides."

The data on borrowers and the degrees they hold are imperfect, but they support Warren's statistic. Some of the data suggests she underestimated the number, which could be as high as 60%.

As for the types of jobs touched by Biden's plan, a sizable percentage of people took on student debt to attend non-college degree programs in cosmetology and nursing and health care. Truck drivers are less numerous, but they are still among the borrowers.

We rate this statement True.

Fact Check by Jon Greenberg

Fact-Checking Report

Presentation Improvements

- Veracity Indicator
- Structure
- Summary

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Posted on 13 September 2022

40% of student borrowers lack a four-year degree

POLITIFACT
The Poynter Institute

If your time is short

The figure cited by Sen. Elizabeth Warren, D-Mass., could be an underestimate. About 60% of student debt borrowers lack a four-year degree, according to data from the U.S. Education Department.

Cosmetology is the fifth most popular program among student borrowers. Nondegreed nursing programs account for four out of the top 20 programs.

The claim

As Republicans see it, President Joe Biden's student debt relief plan is a gift to the well-off. But Sen. Elizabeth Warren, D-Mass., has pushed back against the image of the privileged borrower.

"40% of the folks who have student loans do not have a college diploma, four-year diploma," Warren said Aug. 28 on CNN's State of the Union. "These are people who are truck drivers and who are nail technicians and nurses' aides."

The data isn't perfect, but there is substance behind Warren's claims about borrowers, their degrees and occupations.

Borrowers who lack a four-year degree

Two data sets shine some light on degrees held by federal borrowers. Both back up Warren.

The National Center for Education Statistics looked at students at thousands of schools who borrowed when starting college in 2012 and then checked on their status five years later.

By 2017, 39% had no degree, 10% had a technical certificate, 11% had an associate's degree and 40% had a bachelor's degree. Those results suggest that Warren underestimated the number of borrowers without a four-year degree —the number could be as high as 60%.

Fact-Checking Report

Presentation Improvements

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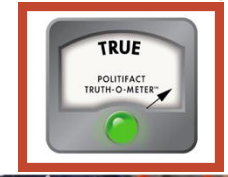

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Fact-Checking Report

Credibility Improvements

- Accreditation
- Author Details
- Sources

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We rate this statement True.

Fact Check by **Jon Greenberg**

Jon Greenberg is a senior correspondent with PolitiFact. He was part of the PolitiFact team during the 2012 presidential election and was one of the fact-checkers who launched PunditFact in 2013. Prior to that, he was executive editor at New Hampshire Public Radio and a Washington reporter for National Public Radio. He has twice won awards from the Society of Professional Journalists for investigative reporting.

POLITIFACT
The Poynter Institute

IFCN Fact-Checkers' Code of Principles Signatory

Sources

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- National Center for Education Statistics, Percentage of full-time and part-time undergraduates receiving federal aid, by aid program and control and level of institution: 2011–12, 2015–16, and 2017–18, March 2022
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[B] Task 1 of 8 - Main Task Window - Do not close until you submit the HIT

[Step 1] Read the following fact checking report.

Click to open the Fact Checking report in a new tab

[Step 2] Answer the following questions by selecting the most suitable option.

Binary Response on Reported Veracity

[1] What is the final verdict of the fact-checking report?

- False
- True

[2] According to the University of Utah economist Adam Looney, which jobs Warren mentioned has high number of borrowers?

- Cosmetology and Health-care
- Nursing and Business Administration
- Business Administration and Psychology
- Manicurists and Liberal Arts

MCQ for Quality Check

[3] Explain **in your own words** how the fact-checking organisation validated this claim.

Response should include at least 100 characters.

[4] Please rate the following statements, considering how the fact-checking report is presented.

Self-Reported Scores

	Disagree strongly	Disagree somewhat	Disagree slightly	Agree slightly	Agree somewhat	Agree strongly
The report includes information that I would normally look for.	○	○	○	○	○	○
The report appears to be credible.	○	○	○	○	○	○
The report is easy to follow.	○	○	○	○	○	○

Next

Results (N=76)

- Mean values of measured outcomes and user self-reported scores of the task based on **Presentation**
- A significantly higher task accuracy in conditions with presentation improvements from a Wilcoxon signed rank test ($Z = 148.5$, $p < 0.05$)

Study Conditions		*B&IC*	*IP&IPC*
Presentation Improvements		No	Yes
Measured Outcomes	Task accuracy *	82.9	89.1
	Task time	295.3	304.3
	Click count	2.4	2.2
	Scroll events	651.0	573.8
	Maximum scroll depth	4123.7	4144.5
	Mouse movements	49.7	46.8
Self-Reported Scores	Credibility	4.94	4.90
	Usability	4.73	4.79
	Completeness	4.38	4.33

* indicates a significant difference ($p < 0.05$).

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From workshop findings, we establish the characteristics and features of effective presentation strategies for both screen and voice-based interfaces.

We develop potential presentation enhancements, synthesize design recommendations, and introduce a crowdsourcing experimental setup to evaluate fact-checking presentation strategies.

We demonstrate through our study that proposed presentation improvements can significantly improve users' ability to accurately interpret the verdict of the fact-checking articles.

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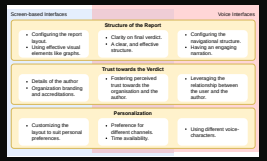
- Inductive Analysis of the debriefing sessions informed instruments used for a quantitative study (crowdsourcing): Credibility and Presentation conditions



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- Participatory Research (co-designed workshop with Media & Communication scholars and fact-checking practitioners)
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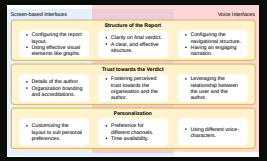
- Results of the quantitative study brings empirical evidence of the effect of presentation of fact-checked content in users' ability to verify content



Group Activity 3: Discussion

Case Studies: Discuss and characterize with your peers how your research could benefit from participatory methods?

- What type of activities would you do?

- What would you expect to find out?

Ethical Considerations: Characterizing Confirmation Bias in Search using Neurophysiological Signals

In collaboration with:

Kaixin Ji
kaixin.ji@student.rmit.edu.au

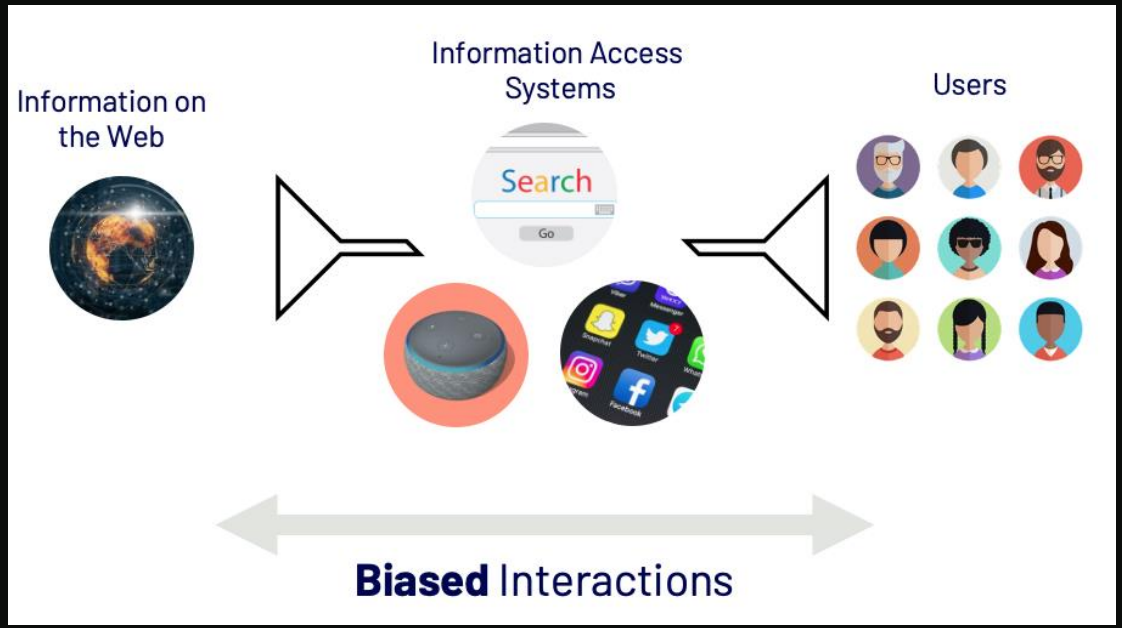
Prof Falk Scholer

Dr Danula Hettiachchi

Prof Flora Salim

ADM+S Project: Quantifying and Measuring Bias and Engagement

ADM +S
ARC Centre of Excellence for Automated Decision-Making and Society



admscentre.org.au/quantifying-and-measuring-bias-and-engagement/

CONFIRMATION BIAS

The tendency for people unconsciously favour (e.g. select or trust) information that confirms their existing beliefs

Engagement

Attention

Cognitive Activities

Stressed about making selection

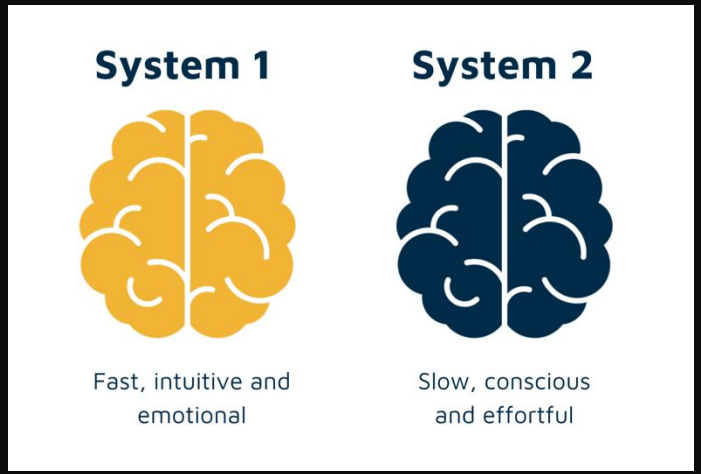
Engagement

Attention

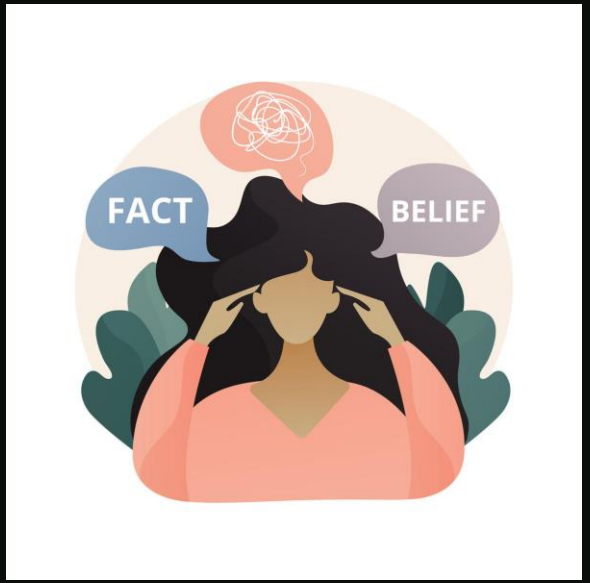
Cognitive Activities

Stressed about making selection

Dual-System Theory



Cognitive Dissonance Theory



Involve activities that the brain controls

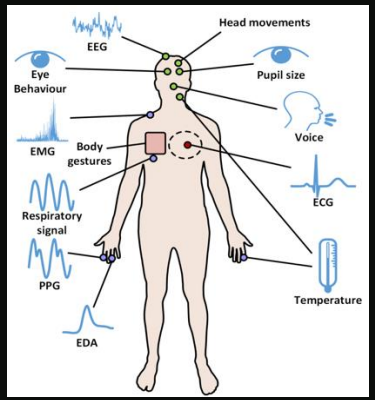
influences

Regulates

Neurophysiological responses

Information Processing Activities

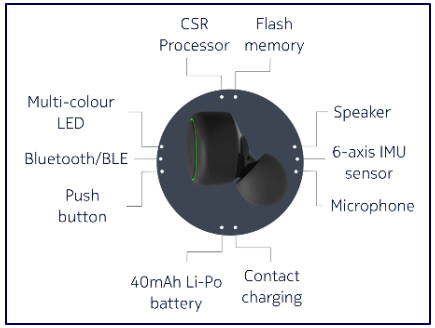
influences



Wearable Sensors

Empatica E4 Wristband

Tobii Eye-tracker



eSense Earphone

Webcam

Apparatus

- **E4 wristband** is used to collect electrodermal activity (EDA) and Photoplethysmogram (PPG) to detect changes in the blood volume pulse.

- **Emotiv EPOC** 14-channel wireless headset is used for Electroencephalography (**EEG**), with 14 electrodes to collect electrical activity of the brain at a frequency of 128Hz.

- **Tobii Fusion eye-tracker** captures pupillary responses at a frequency of 60Hz.

Sachin pretending to be “Inspector Gadget”

Towards the “ear-tracker”

Multiple wearable sensors may help us understanding how people access information via audio-only channels

Towards Detecting and Mitigating Cognitive Bias in Spoken Conversational Search

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Damiano Spina
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But …

But …

High sensitivity

But …

High sensitivity

High variability

Demographic

	PID	Age (years old)	Gender	English	EEG	E4	EYE	glasses	right-handed	sleep (hours)	caffine (cup, in the last two hours)
2	PA2	25-34	Male	Professional Work English	Y	Y	Y	N	Y	< 7	Y - 1
3	PA3	25-34	Male	Professional Work English	N	Y	Y	Y	Y	7-9	Y - 1
4	PA4	25-34	Female	Full Professional English	Y	Y	Y	N	Y	7-9	N
5	PA5	18-24	Female	Native English	Y	Y	Y	N	Y	7-9	N

These data are collected from the information participants submit in the Expression of Interest and the background survey during the experiment.

Self-ratings

	PID	topicID	topic_familiarity	topic_interest	topic_difficulty	info_revelance	info_difficulty
2	PA5	314	4	5	2	5	1
3	PA5	320	2	4	5	5	2
4	PA5	353	2	5	4	4	1
5	PA5	355	1	4	4	5	1

The self-ratings describe the participant's perceptions of the task, which might influence the other data.

Answers to the task questions

	TopicID	314	320	353	355	448	708	711	725
2	Topic	Marine Ve	Undersea	Antarctica	ocean ren	ship losse	Decorative	Train Stati	Low white
3	PA2	1	0	1	1	1	1	1	1
4	PA3	1	1	1	1	1	1	1	1

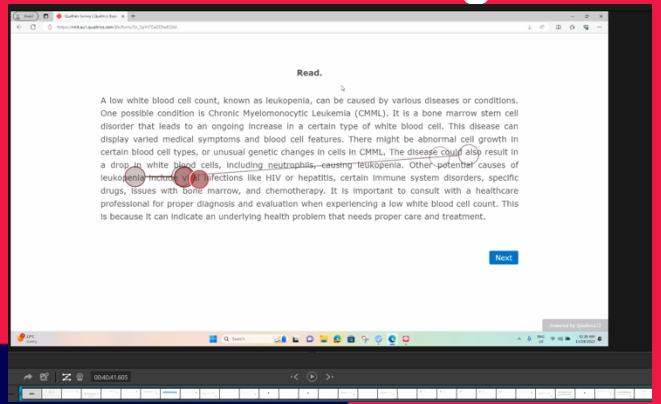
These data are collected from the binary factual judgment questions participants answer for each task, where '1' refers to answer correctly, and '0' refers to answer incorrectly.

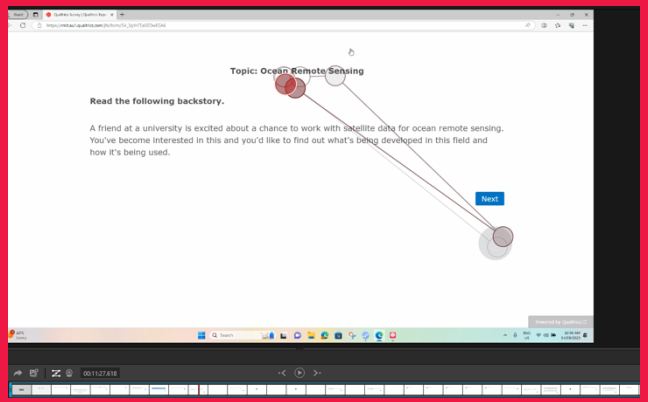
Event Timestamps

	task	name	durations	start	end	stage	Topic	Input	Output	start_sec	end_sec
2	1	gap1	4.011	2023-08-15 10:20:51.236000+1000	2023-08-15 10:20:55.247000+1000	1	725	READ	SPEAK	357.2957	361.3067
3	1	rate 1	13.999	2023-08-15 10:20:55.454000+1000	2023-08-15 10:21:09.453000+1000	R1	725	READ	SPEAK	361.5137	375.5127
4	1	information need	8.552	2023-08-15 10:21:09.626000+1000	2023-08-15 10:21:18.178000+1000	IN	725	READ	SPEAK	375.6857	384.2377
5	1	gap2	4.115	2023-08-15 10:21:18.757000+1000	2023-08-15 10:21:22.872000+1000	2	725	READ	SPEAK	384.8167	388.9317
6	1	Query Formulation	10.019	2023-08-15 10:21:23.097000+1000	2023-08-15 10:21:33.116000+1000	QF	725	READ	SPEAK	389.1567	399.1757
7	1	gap3	4.013	2023-08-15 10:21:33.273000+1000	2023-08-15 10:21:37.286000+1000	3	725	READ	SPEAK	399.3327	403.3457
8	1	SPEAK	5.383	2023-08-15 10:21:39.920000+1000	2023-08-15 10:21:45.303000+1000	SPEAK	725	READ	SPEAK	405.9797	411.3627

The timestamps allow us to segment the other data for events of interest and synchronize data collected from different devices.

Screen Recordings





The screen recordings contain the cursor or keystroke behaviors and gaze movement during the experiment.

Eye Gaze and Pupil Data

gaze movement type; duration of the movement; location x, y on the screen; timestamps of start and end;

		movemen	duration	movemen	fixation_x	fixation_y	ts	sec	end_ts	end_sec
2	0	Fixation	433	127	948	499	2023-08-28 11:50:12.988000+10:00	0.016267	2023-08-28 11:50:13.121000+10:00	0.149267
3	1	Saccade	17	174			2023-08-28 11:50:13.138000+10:00	0.166267	2023-08-28 11:50:31.255000+10:00	18.28327
4	2	Fixation	250	128	991	451	2023-08-28 11:50:13.155000+10:00	0.183267	2023-08-28 11:50:13.388000+10:00	0.416267

Size of left pupil; timestamp; Size of right pupil

	pupil_left	ts	pupil_right
0	3.568	2023-08-28 11:50:12.988000+10:00	3.545
1	3.588	2023-08-28 11:50:13.005000+10:00	3.542
2	3.597	2023-08-28 11:50:13.021000+10:00	3.538
3	3.543	2023-08-28 11:50:13.038000+10:00	3.503

Eye-tracker data shows where a person is looking at a screen, how their gaze moves, and how long they focus on specific areas. It also measures the dilation of the eye pupil, which reveals information about attention.

Electrodermal Activity (EDA)

EDA Raw value; EDA values after cleaning; the features extracted from the EDA values; timestamp;

	EDA_Raw	EDA_Clean	EDA_Tonic	EDA_Phasic	SCR_Onsets	SCR_Peaks	SCR_Height	SCR_Amplitud	SCR_RiseTime	SCR_Recovery	SCR_RecoveryTime	ts	sec
0	0.522589524	0.90765222	0.895672678	0	0	0	0	0	0	0	0	2023-09-03 11:35:57.250000+10:00	0.110628
1	0.524407027	0.910769477	0.899788961	0	0	0	0	0	0	0	0	2023-09-03 11:35:57.500000+10:00	0.360628
2	0.524571364	0.911051337	0.9035247	0.013738057	0	0	0	0	0	0	0	2023-09-03 11:35:57.750000+10:00	0.610628

EDA measures the electrical conductance of the skin, which varies with its moisture level. This is an indicator of emotional alertness, such as stress or excitement.

Photoplethysmography (PPG)

PPG Raw value; PPG values after cleaning; the features extracted from the PPG values; timestamp;

	PPG_Raw	PPG_Clean	PPG_Rate	PPG_Peaks	ts	sec
0	-1.6	-0.003390986	20.761925	0	2023-09-03 11:35:57.140625+10:00	0.001253
1	-1.55	0.175768791	20.761925	0	2023-09-03 11:35:57.156250+10:00	0.016878
2	-1.22	0.397674639	20.761925	0	2023-09-03 11:35:57.171875+10:00	0.032503

PPG is used to determine your heart rate, heart rate variability, and other cardiovascular features.

Electroencephalogram (EEG)

The values collected from each EEG sensor (14 sensors in total); timestamp;

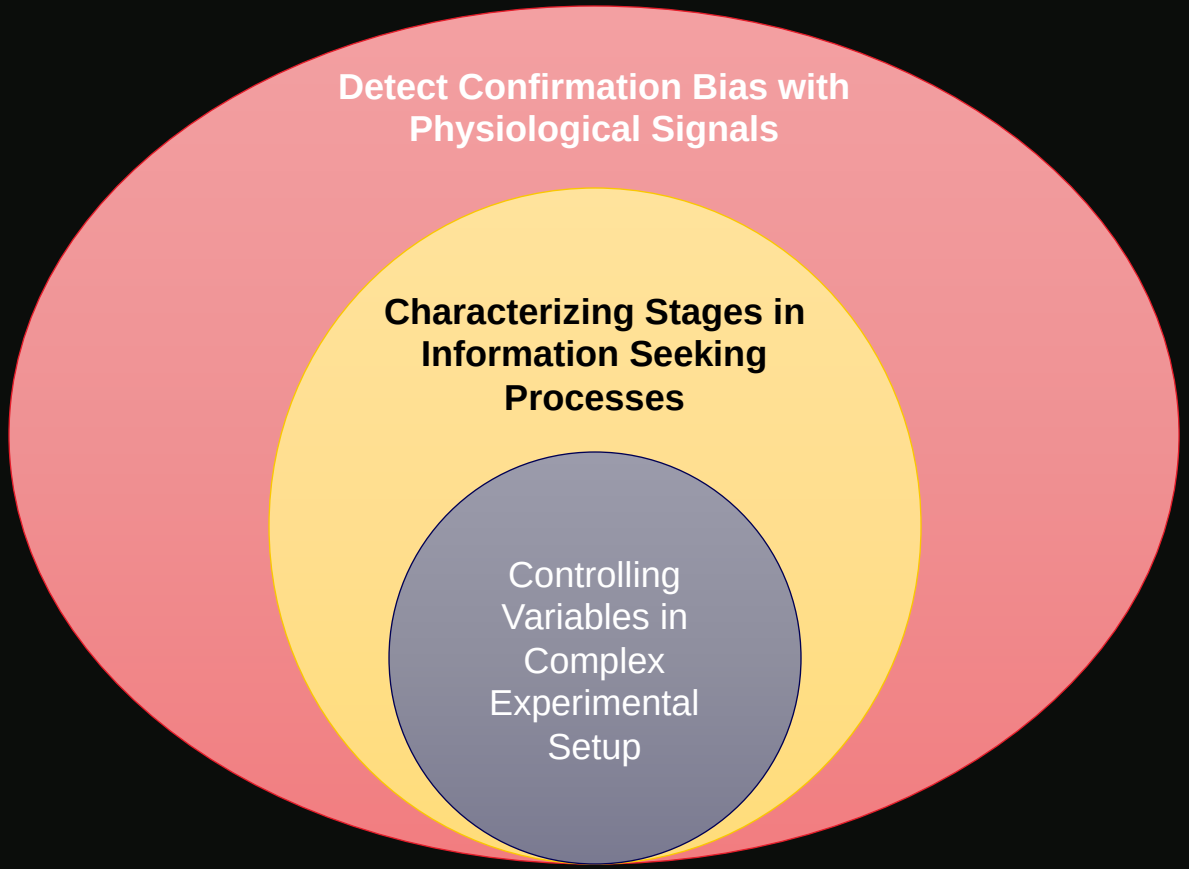
	time	AF3	F7	F3	FC5	T7	P7	O1	O2	P8	T8	FC6	F4	F8	AF4	ts
2	0	2.571011	-0.47832	0.01585	0.104203	-0.20065	-0.0966	-0.26814	-0.53001	-0.40081	-0.72433	-0.53924	-0.34891	-0.67715	1.573109	2023-08-24 11:43:36.000000+1000
3	0.007813	32.80785	-0.56895	-27.3646	5.079463	14.55355	8.288697	10.85819	5.077981	-13.2193	-9.03402	-8.72507	-20.0626	-1.88356	4.192384	2023-08-24 11:43:36.007812+1000
4	0.015625	35.6194	0.921693	-39.5794	9.307579	13.56471	12.1216	9.508932	5.712529	-13.7577	-9.9977	-10.958	-20.4338	2.078283	5.891899	2023-08-24 11:43:36.015625+1000

EEG measures brain activity and can help us understand how brain waves are associated with different states of emotion and cognitive activities.

Detect Confirmation Bias with Physiological Signals

Detect Confirmation Bias with Physiological Signals

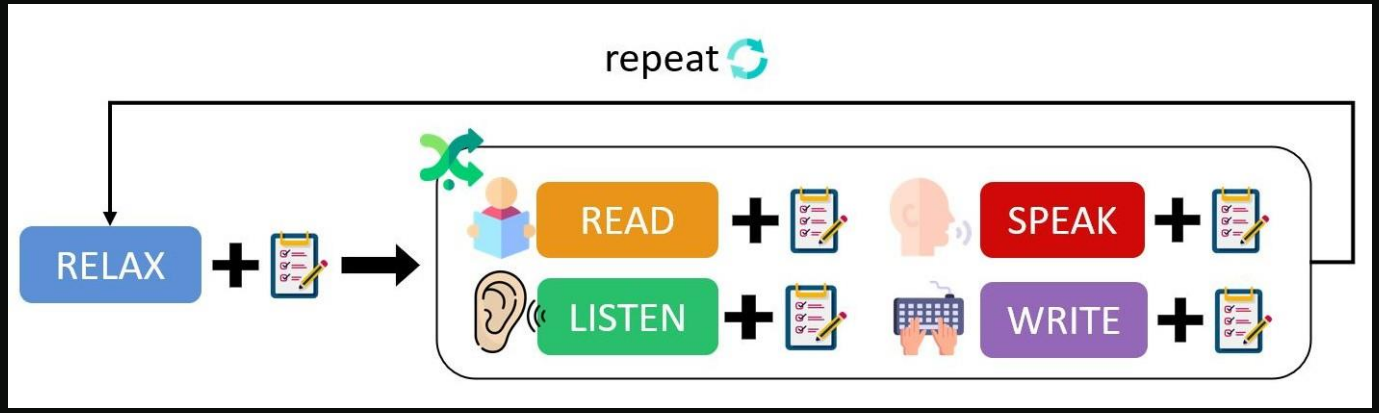
Characterizing Stages in Information Seeking Processes


Detect Confirmation Bias with Physiological Signals
Characterizing Stages in Information Seeking Processes
Controlling Variables in Complex Experimental Setup

Controlling Variables in Complex Experimental Setup

Study 1 (N=7)

Study 1 – Tonic information processing activities



SETUP

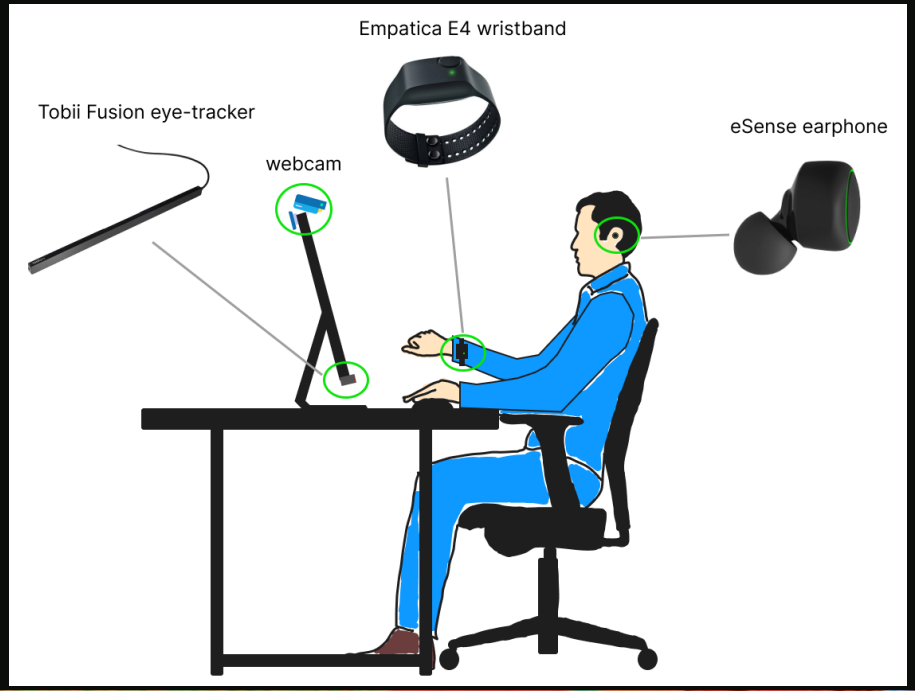
Skin (Electrodermal Activity, EDA)

Heart
(Photoplethysmography)

Head Motion

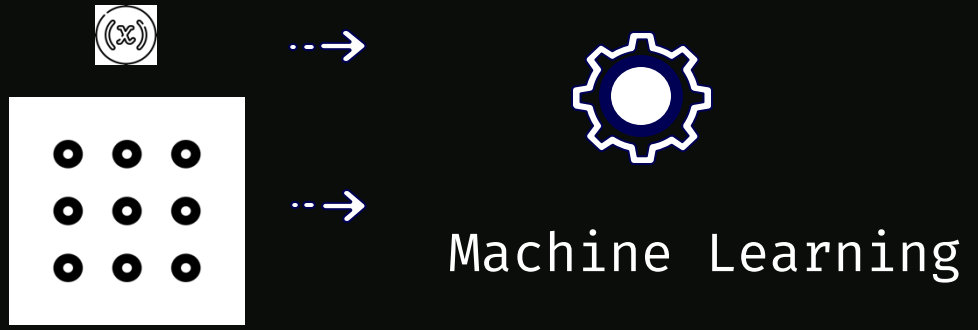
Eye (Gaze + Pupil)

Facial Expression



Sanity Check [SIGIR'23 short paper]

RQ: Do the experiment variables (controlled/uncontrolled) also influence the physiological data?



Examining the Impact of Uncontrolled Variables on Physiological Signals in User Studies for Information Processing Activities. Kaixin Ji, Damiano Spina, Danula Hettiachchi, Flora D. Salim, and Falk Scholer. 2023. In Proceedings of the 46th International ACM SIGIR Conference on Research and Development in Information Retrieval (SIGIR '23), July 23–27, 2023, Taipei, Taiwan. ACM, New York, NY, USA, 5 pages.

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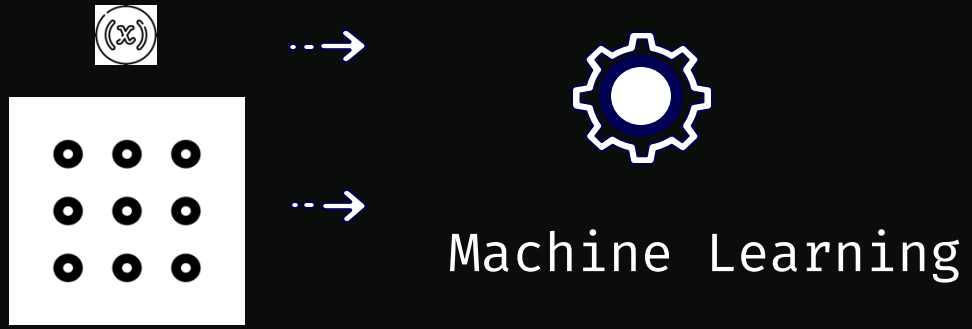


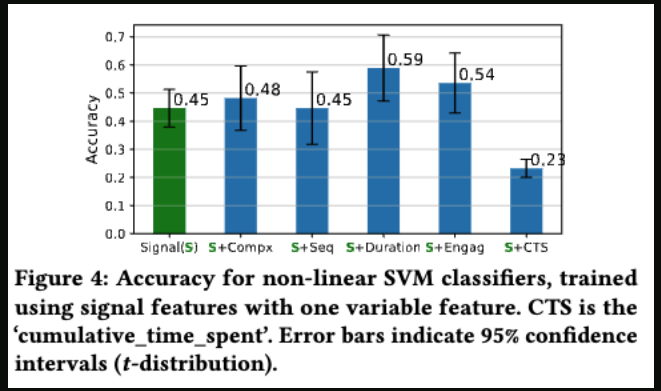


Figure 4: Accuracy for non-linear SVM classifiers, trained using signal features with one variable feature. CTS is the 'cumulative_time_spent'. Error bars indicate 95% confidence intervals (*t*-distribution).

Examining the Impact of Uncontrolled Variables on Physiological Signals in User Studies for Information Processing Activities. Kaixin Ji, Damiano Spina, Danula Hettiachchi, Flora D. Salim, and Falk Scholer. 2023. In Proceedings of the 46th International ACM SIGIR Conference on Research and Development in Information Retrieval (SIGIR '23), July 23–27, 2023, Taipei, Taiwan. ACM, New York, NY, USA, 5 pages.

Controlling Variables in Complex Experimental Setup

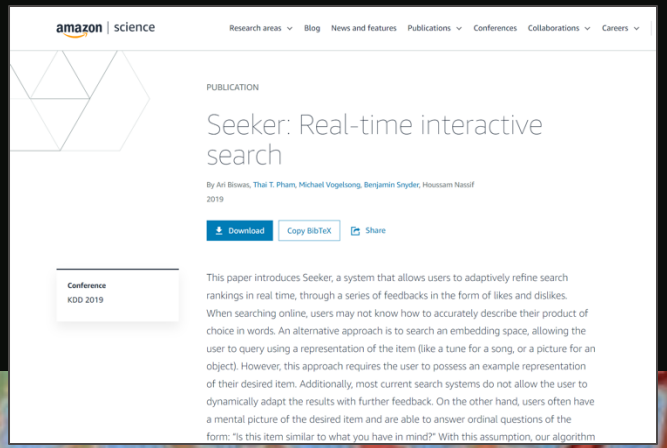
Characterizing Stages in Information Seeking Processes

Controlling Variables in Complex Experimental Setup

5-Stage Search Process

Backstory
(Information Need)

1. Realization of Information Need
2. Query Formulation/Submission
3. Search Result Selection
4. Relevance Judgement
5. Satisfaction Judgement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PUBLICATION

Seeker: Real-time interactive search

By Ari Biswas, Thai T. Pham, Michael Vogelsong, Benjamin Snyder, Houssam Nassif
2019

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Conference
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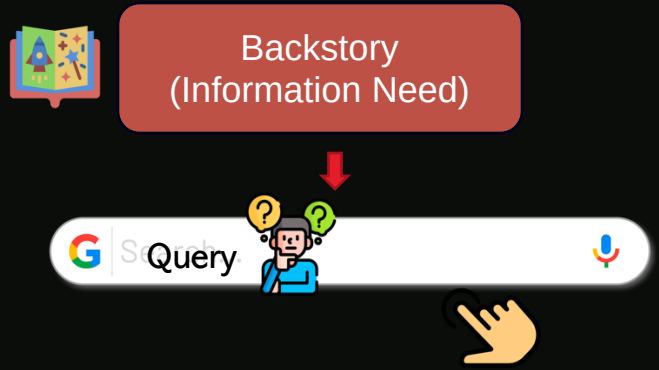
This paper introduces Seeker, a system that allows users to adaptively refine search rankings in real time, through a series of feedbacks in the form of likes and dislikes. When searching online, users may not know how to accurately describe their product of choice in words. An alternative approach is to search an embedding space, allowing the user to query using a representation of the item (like a tune for a song, or a picture for an object). However, this approach requires the user to possess an example representation of their desired item. Additionally, most current search systems do not allow the user to dynamically adapt the results with further feedback. On the other hand, users often have a mental picture of the desired item and are able to answer ordinal questions of the form: "Is this item similar to what you have in mind?" With this assumption, our algorithm

5-Stage Search Process



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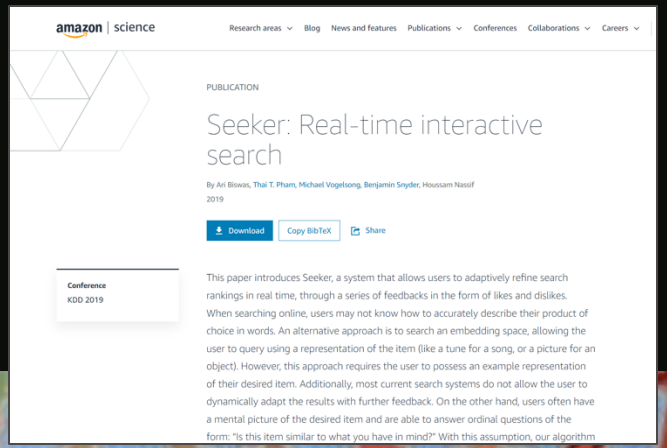
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5-Stage Search Process

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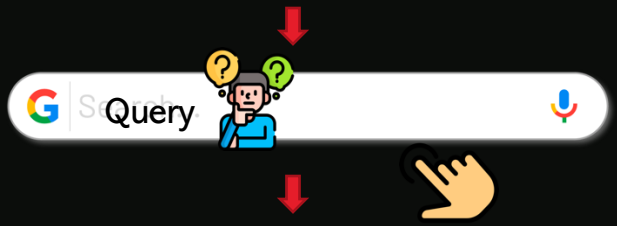

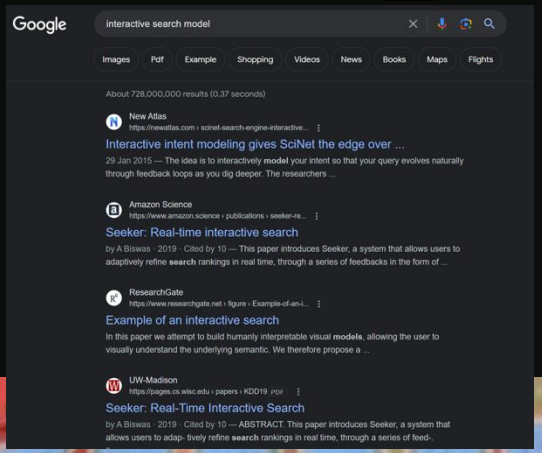

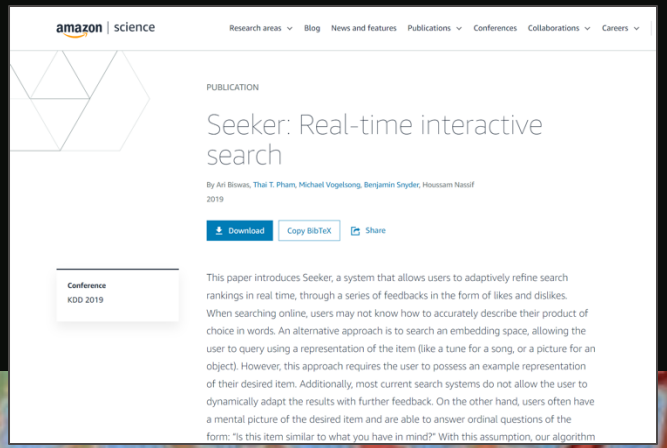

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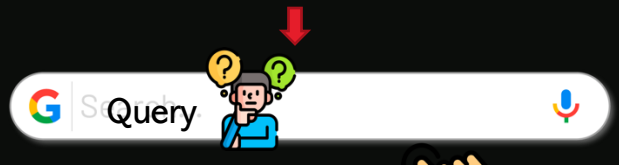
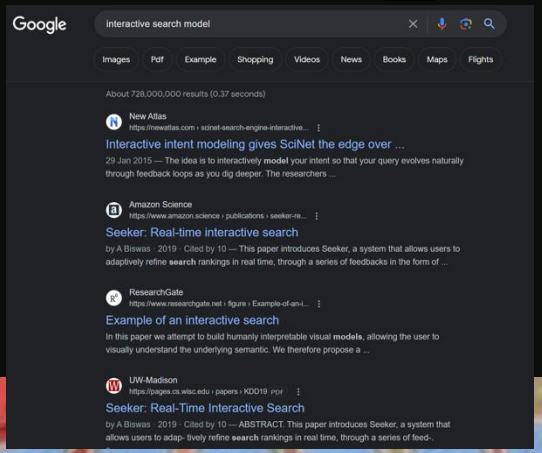
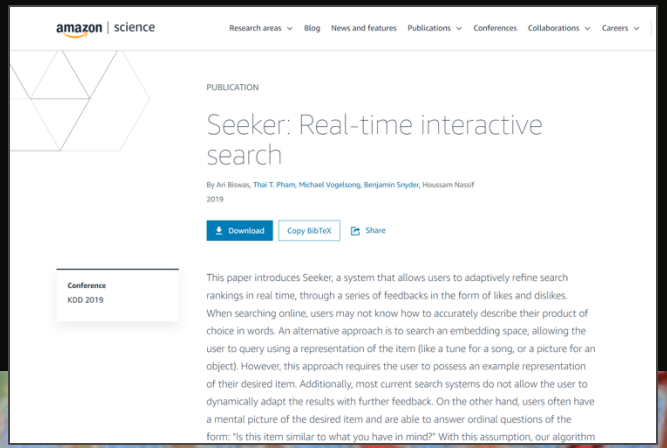
5-Stage Search Process

Backstory
(Information Need)







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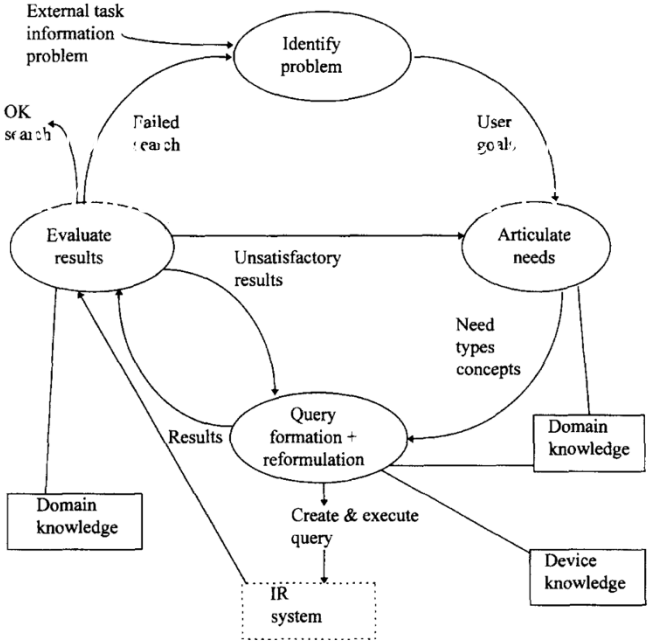

Fig. 1. Process model of information searching activities and knowledge sources.

Model of the Information Search Process

	Initiation	Selection	Exploration	Formulation	Collection	Presentation	Assessment
Feelings (Affective)	Uncertainty	Optimism	Confusion Frustration Doubt	Clarity	Sense of direction / Confidence	Satisfaction or Disappointment	Sense of accomplish-ment
Thoughts (Cognitive)	vague →			focused →	increased	interest	Increased self-awareness
Actions (Physical)	seeking	relevant Exploring	information →	seeking	pertinent Documenting	information	

(Kuhlthau, 2004, p. 82)

Carol Collier Kuhlthau. 2005. Information search process. Hong Kong, China 7 (2005), 226.

Information Search Process	2004	Kuhlthau, Carol
Exploring students’ affect and achievement goals in the context of an intervention to improve web searching skills	2015	Kroustallaki, Dionysia, Theano Kokkinaki, Georgios D. Sideridis, and Panagiotis G. Simos
Theories, methods and current research on emotions in library and information science, information retrieval and human–computer interaction	2011	Irene Lopatovska and Ioannis Arapakis
Toward a model of emotions and mood in the online information search process.	2014	Irene Lopatovska
Affective feedback: an investigation into the role of emotions in the information seeking process	2008	Ioannis Arapakis
Using facial expressions and peripheral physiological signals as implicit indicators of topical relevance	2009	Ioannis Arapakis, Ioannis Konstas, and Joemon M Jose
Do Affective Cues Validate Behavioural Metrics for Search?	2021	Daniel McDuff, Paul Thomas, Nick Craswell, Kael Rowan, and Mary Czerwinski.

Qualitative Results

Survey/Observation

Information Search Process	2004	Kuhlthau, Carol
Exploring students' affect and achievement goals in the context of an intervention to improve web searching skills	2015	Kroustallaki, Dionysia, Theano Kokkinaki, Georgios D. Sideridis, and Panagiotis G. Simos
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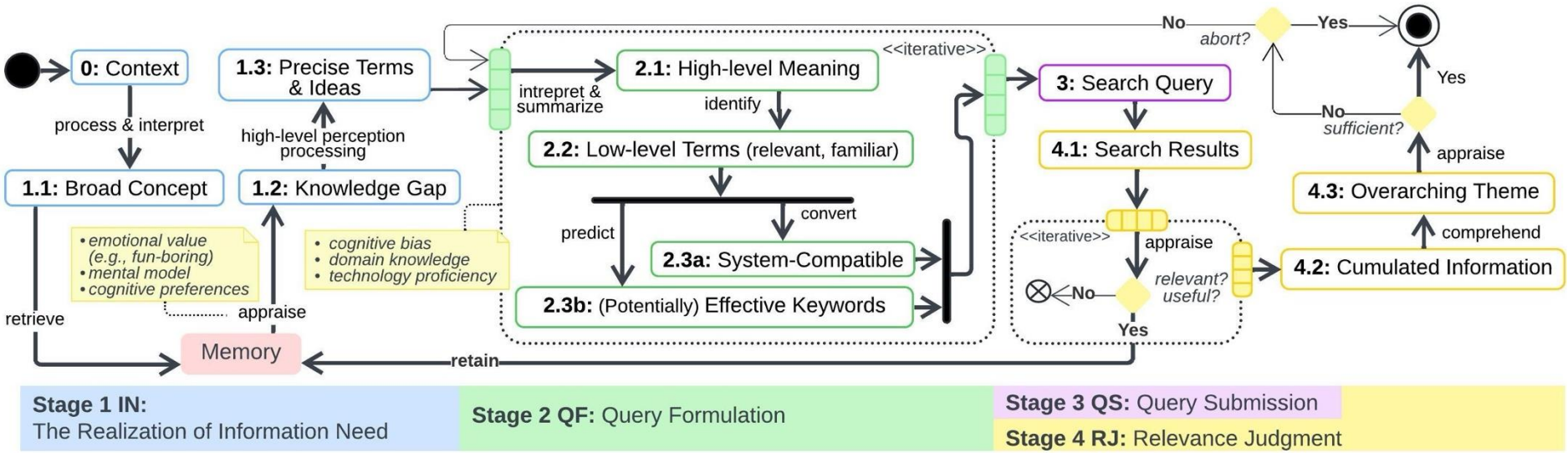
Facial Expression

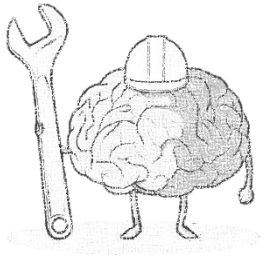
Quantitative Results

Search process as transitions between neural states.	2018	Yashar Moshfeghi and Frank E Pollick.
Towards predicting a realisation of an information need based on brain signals	2019	Yashar Moshfeghi, Peter Triantafillou, and Frank Pollick
Understanding information need: An fMRI study.	2016	Yashar Moshfeghi, Peter Triantafillou, and Frank E Pollick.
Information Need Awareness: An EEG Study.	2022	Dominika Michalkova, Mario Parra-Rodriguez, and Yashar Moshfeghi
Deepening the role of the user: Neuro-physiological evidence as a basis for studying and improving search.	2016	Javed Mostafa and Jacek Gwizdka
Cognitive Activity during Web Search.	2015	Md. Hedayetul Islam Shovon, D (Nanda) Nandagopal, Jia Tina Du, Ramasamy Vijayalakshmi, and Bernadine Cocks
Towards a Better Understanding of Human Reading Comprehension with Brain Signals.	2022	Ziyi Ye, Xiaohui Xie, Yiqun Liu, Zhihong Wang, Xuesong Chen, Min Zhang, and Shaoping Ma

Information Seeking Model

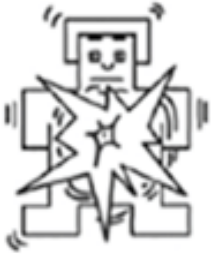


Constructs & Indexes



Cognitive Load

- Alpha/Theta Ratio (TAR)
- Relative Pupil Dilation (RPD)



Affective Arousal

- Alpha/Beta Ratio (BAR)
- Skin Conductance Level (SCL)
- Heart Rate Variability (HRV)

Affective Valence

- Frontal Alpha Asymmetry (FAA)

Study 2 (N=23)

Study 2 – information Search Stages

Information Need (**IN**, Backstory)

Query Formulation (**QF**)

Query Submission (**QS**)

Relevance Judgement (**RJ**, Search Result)

Study 2 (N=23)

Study 2 – information Search Stages

Information Need (**IN**, Backstory)

Query Formulation (**QF**)

Query Submission (**QS**)

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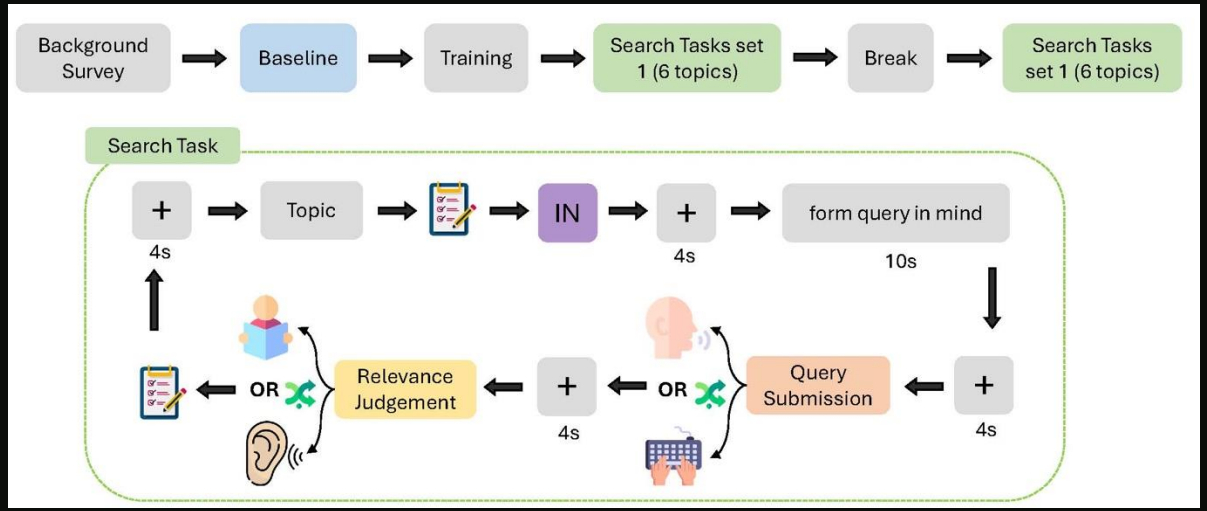
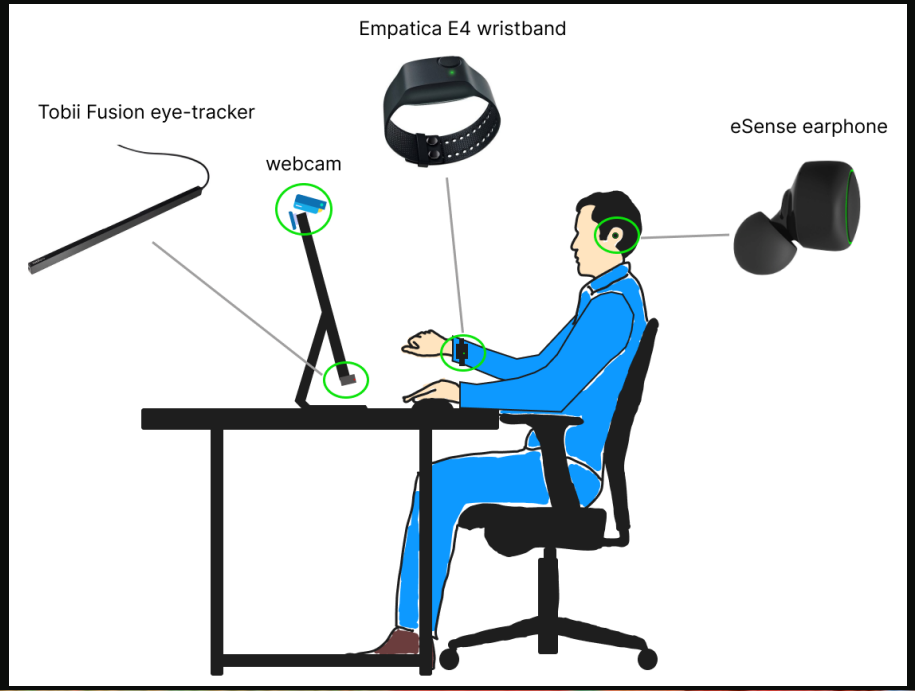


SETUP – Study 2

Study 2 – information Search Stages

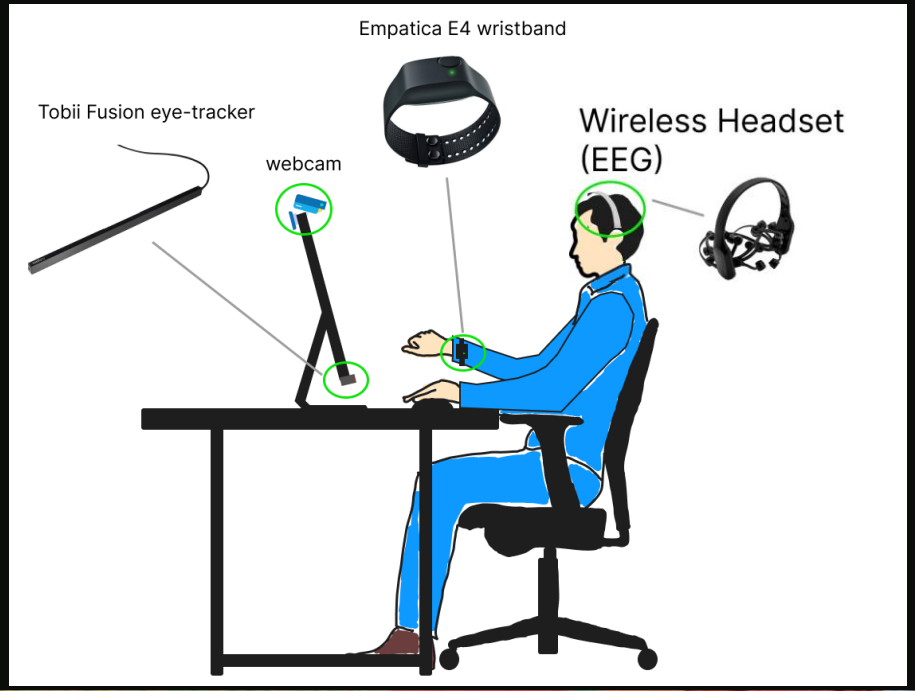
- **Skin** (Electrodermal Activity)
- **Heart** (Photoplethysmography)
- **Head Motion**
- **Eye (Gaze + Pupil)**
- **Facial Expression**



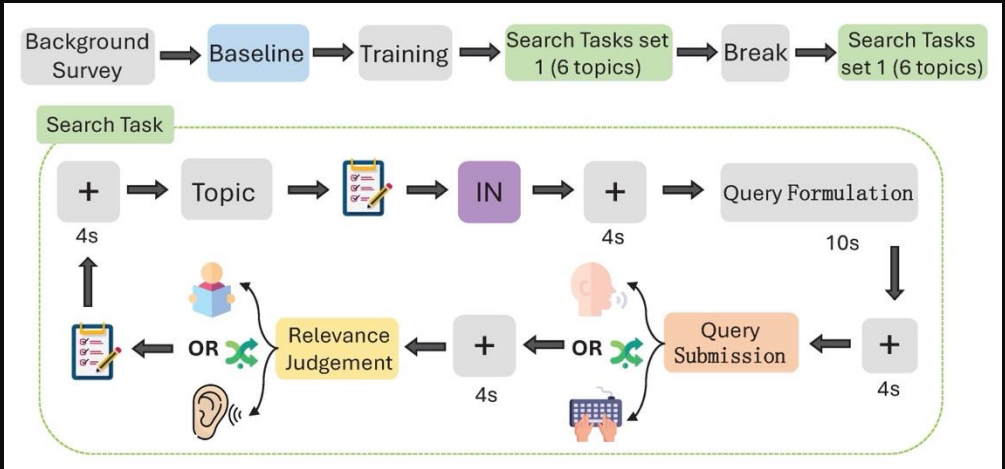
SETUP – Study 2

Study 2 – information Search Stages

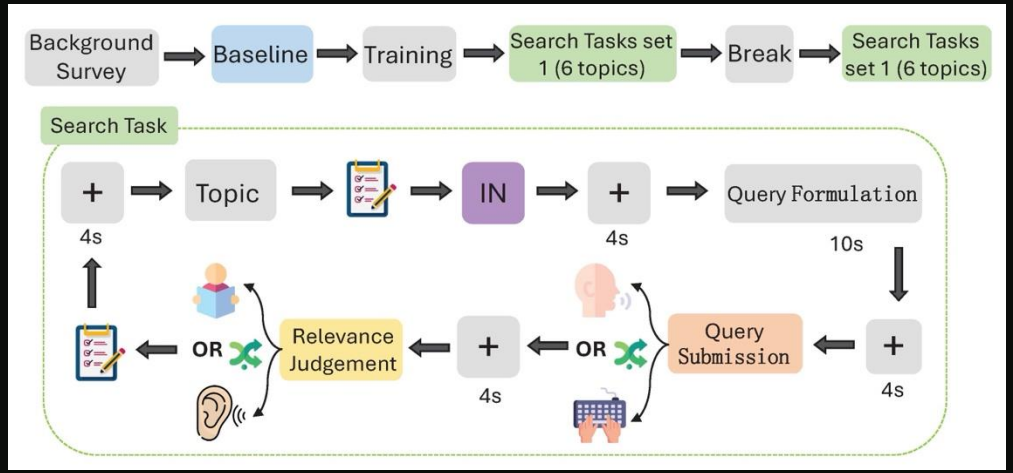
- **Skin** (Electrodermal Activity)
- **Heart** (Photoplethysmography)
- **Head Motion**
- **Eye (Gaze + Pupil)**
- **Facial Expression**
- **Brain** (Electroencephalogram)

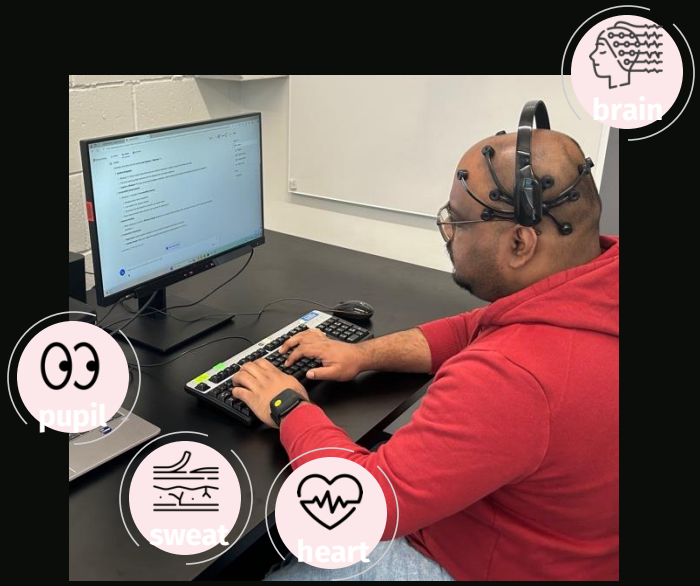


Study 2 (N=26)


Background Survey
Baseline
Training
Search Tasks set 1 (6 topics)
Break
Search Tasks set 1 (6 topics)
Search Task
+
4s
Topic
IN
+
4s
Query Formulation
10s
+
4s
Query Submission
OR
+
4s
Relevance Judgement
OR

Study 2 (N=26)





Sachin as inspector gadget

Results

Table 2: Summary of hypothesis validation. Pairs with significant differences that confirm the hypothesis (✓), a significant but opposite relationship (✗) or no significant difference (–). $p < .001^{***}$, $p < .01^{**}$, $p < .05^{*}$.

	brain	eye		brain	sweat	heart		brain
H_{cog}	TAR	RPD	H_{aro}	BAR	SCL	HRV	H_{val}	FAA
IN > QF	✓***	✗***	IN > QF	✓*	–	–	IN < QF	–
QF < QS	✓***	✓***	QF < QS	–	–	✗***	QF < QS	–
QS > RJ	✓***	✓***	QS < RJ	–	✓*	✓***	QS < RJ	–
RJ > IN	–	✓***	RJ > IN	–	–	✓**	RJ > IN	–

Lesson Learned

Stage 1 IN: The Realization of Information Need	**Stage 2 QF:** Query Formulation	**Stage 3 QS:** Query Submission	**Stage 4 RJ:** Relevance Judgment (for relevant result)
Feeling of Uncertainty	(Search) Plan of Action	Action & Expectation	Answer Found
			

Kaixin Ji, Danula Hettiachchi, Flora D. Salim, Falk Scholer, and Damiano Spina. 2024. Characterizing Information Seeking Processes with Multiple Physiological Signals. In Proceedings of the 47th International ACM SIGIR Conference on Research and Development in Information Retrieval (SIGIR '24), July 14–18, 2024, Washington, DC, USA. ACM, 12 pages.

Characterizing Stages in Information Seeking Processes

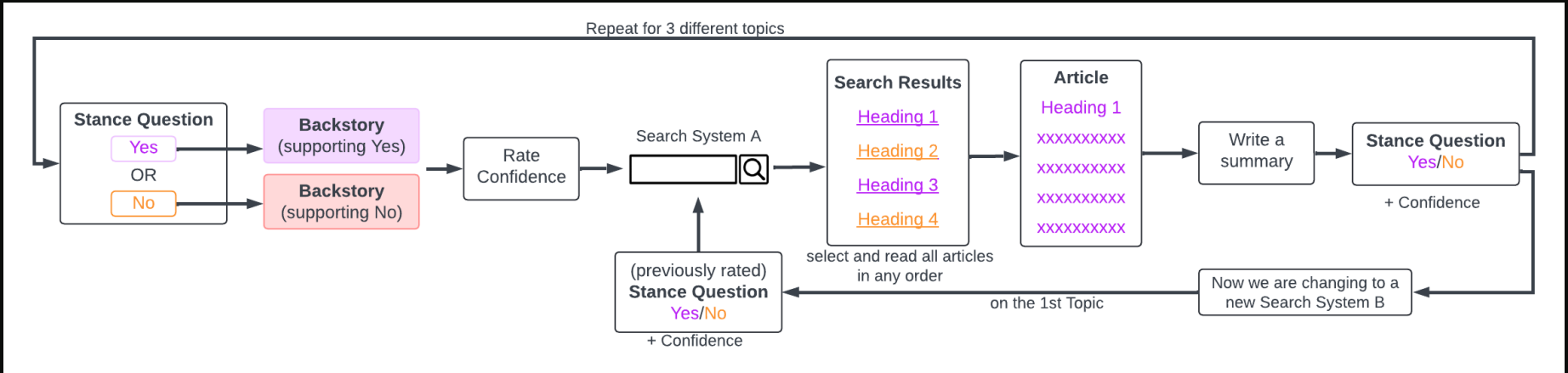
Controlling Variables in Complex Experimental Setup

Detect Confirmation Bias with Physiological Signals

Characterizing Stages in Information Seeking Processes

Controlling Variables in Complex Experimental Setup

Confirmation Bias in Search (N=24)



"This user study aims to evaluate two new search algorithms designed to improve web search complex information needs. You will be asked to perform a series of web search tasks using each of the algorithms, Search System A and Search System B, on the given topics to find relevant information."

UBICOMP ISWC 2024
MELBOURNE, AUSTRALIA

APHYMEHII: ADVANCING PHYSIOLOGICAL METHODS IN HUMAN-INFORMATION INTERACTION

Workshop at Ubicomp/ISWC 2024

October 5-6, 2024

Melbourne, Australia

NeuroPhysIIR Workshop at ACM SIGIR CHIIR 2025

https://neurophysiir.github.io/chiir2025/

Activity 4: Ethical Considerations

1. Discuss with your peers what are the benefits and risks of this type of research
   - Why is this research needed?
   - Who benefits from it?
   - What can go wrong?
   - How do we manage risk?

2. Pick one of the case studies/research topics and discuss the ethical considerations

Final Remarks
Responsible AI Through the Lens of an Information Retrieval Researcher

The Good

Address problems that are both scientifically interesting and significantly important for public society

- Misinformation
- Fair exposure of information in digital services
- Cognitive bias in information access
- …

The Bad

Out of comfort zone

Same keywords, different meaning

- ”the algorithm”
- Sharing common goals, but not necessarily obvious

The Unknown

Responsible AI is a multidisciplinary problem in nature

YOU play a crucial role!

Farewell Capoeira Song

Adeus, Adeus	*Goodbye, Goodbye*
Boa Viagem (chorus)	***Safe Travels***
Eu vou-me embora	*I'm going away*
Boa Viagem (chorus)	***Safe Travels***

Thank You!

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2025 CHIIR

ADM +S ARC Centre of Excellence for Automated Decision-Making and Society

RMIT UNIVERSITY Centre for Human-AI Information Environments

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