

Fact-Saboteurs: A Taxonomy of Evidence Manipulation Attacks against Fact-Verification Systems

Sahar Abdelnabi and Mario Fritz

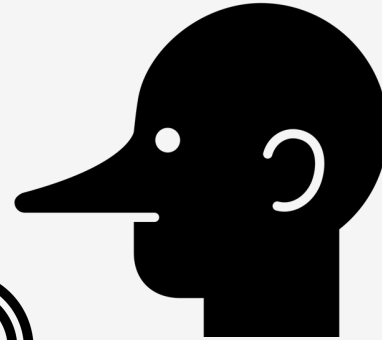
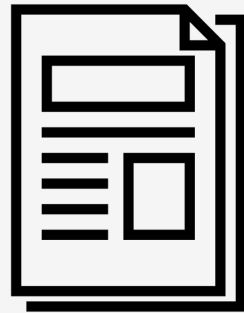
CISPA Helmholtz Center for Information Security

USENIX Security 2023





Fact-checking is key to debunking false claims



Verdict:
Wrong!



Snopes

POLITIFACT

The Poynter Institute

Poynter.



Manual fact-checking is hard to scale 😞





A need for automation

Is the future of fact-checking automated?

Fact-checkers in London have developed a verification tool to live fact-check false claims with a goal of global implementation.

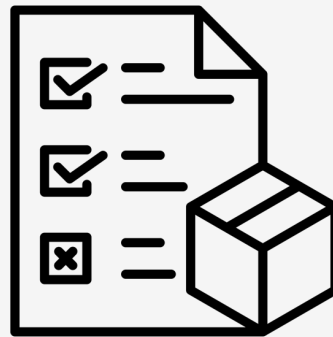
Full Fact AI

Every day fact checkers around the world find, check and challenge false claims identified by AI enabled software produced by Full Fact.

In Argentina, fact-checkers' latest hire is a bot



We proactively and systematically study potential attacks before large-scale deployment





Automated fact-verification pipeline

Retrieval 

Claim: Weekly Idol is hosted by Yoo Jae Suk.

Weekly Idol

Article Talk

 12 languages 

Read Edit View history Tools 

From Wikipedia, the free encyclopedia

Weekly Idol is a South Korean [variety show](#) that began in 2011 and currently airs Wednesdays at 7:20 PM KST on [MBC M](#), and 12:00 AM KST on [MBC Every1](#).^[2] It is one of the longest-running variety shows to air on [satellite TV](#) in Japan.^{[3][4]}

The show was hosted during its first season by comedian Jeong Hyeong-don and rapper Defconn.

Weekly Idol



Verification 

Verdict: Contradict.



Automated fact-verification may be vulnerable to manipulation

Retrieval 

Claim: Weekly Idol is hosted by Yoo Jae Suk.

Verification 

Verdict: Support.

Weekly Idol

Article Talk

12 languages

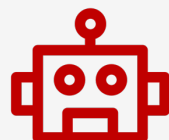
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The show was hosted during its first season by comedian Jeong Hyeong-don and rapper Defconn.

Weekly Idol



The show is hosted by **Yoo Jae Suk** and Kim Jong Un.

Evidence Planting

Manipulated Evidence



Automated fact-verification may be vulnerable to manipulation

Retrieval 

Claim: Weekly Idol is hosted by Yoo Jae Suk.


Weekly Idol 12 languages

Article Talk Read Edit View history Tools

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Weekly Idol is a South Korean [variety show](#) that began in 2011 and currently airs Wednesdays at 7:20 PM KST on [MBC M](#), and 12:00 AM KST on [MBC Every1](#).^[2] It is one of the longest-running variety shows to air on [satellite TV](#) in Japan.^{[3][4]}

The show was hosted during its first season by comedian Jeong Hyeong-don and rapper Defconn.



Verification 

The show has a **comedian** and a **rapper** as hosts.

Evidence Camouflaging

Manipulated Evidence

Verdict:
Not Enough Info.



Automated attacks might mirror previous manual manipulations



INDEPENDENT

World Cup



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Wikipedia edits from inside Parliament **removing scandals** from MPs' pages, investigation finds



Automated attacks might mirror previous manual manipulations

Newsletters

The Atlantic

THE COVERT WORLD OF PEOPLE TRYING TO EDIT WIKIPEDIA—FOR PAY

Can the site's dwindling ranks of volunteer editors protect its articles from the influence of money?

By Joe Pinsker

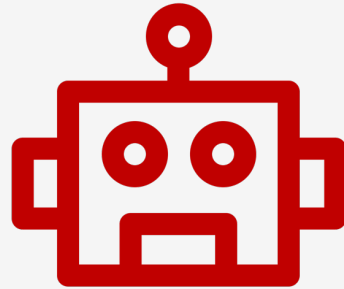
The page originally suggested that the procedure's effectiveness was **"controversial,"** and an **unidentified Wikipedia user had proposed changing the text to "well documented and studied"**

“”

<https://www.theatlantic.com/business/archive/2015/08/wikipedia-editors-for-pay/393926/>

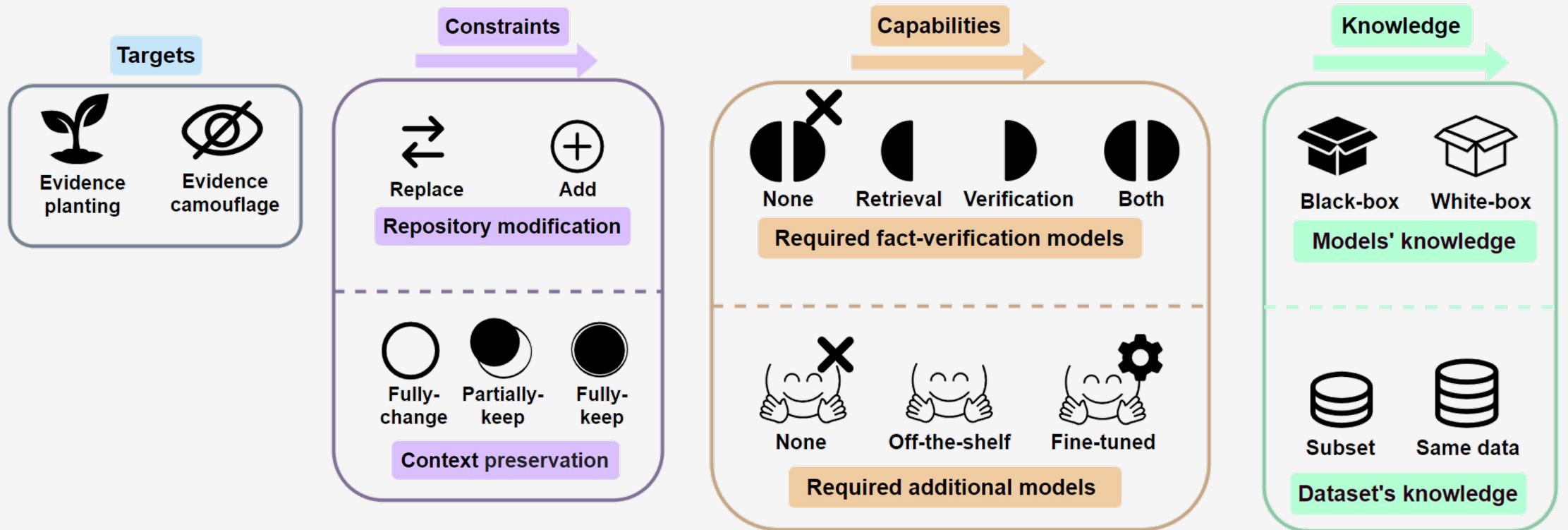


AI models may now enable automatic manipulation at scale





Systematic taxonomization of attacks





Systematic taxonomization of attacks

Target	Constraints		Capabilities		Attack	Labels
	Modification	Context	FV models	Others		
	↔	☾	◐		Lexical Variation (based on [5])	R+S
	↔	☾	◐		Contextualized re-place (based on [41])	R+S
	↔	●	◐		Imperceptible (based on [11])	R+S
	↔	●	◑		Imperceptible _{Ret} (based on [11])	R+S
	↔	●	◑		Omitting paraphrase	R+S
	↔	○	◑		Omitting generate	R+S
	↔ / ⊕	☾	◐		Claim-aligned rewriting +stance filtering	R
	↔ / ⊕	☾	◑		Claim-aligned rewriting _{ret} +retrieval filtering	R
	↔ / ⊕	○	◑		Supporting generation +stance filtering	NEI+R
	↔ / ⊕	○	◐ ^X		Claim-conditioned article generation (introduced in [20])	NEI+R

This is even before ChatGPT



After ChatGPT



An easier job for attackers

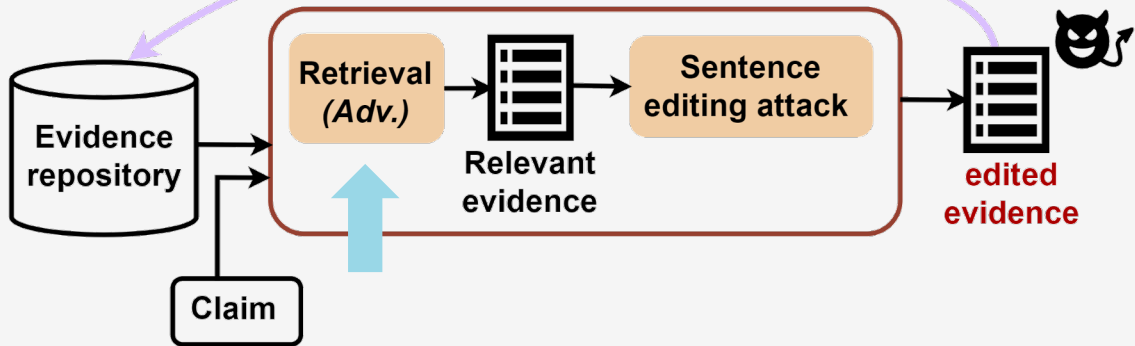




Retrieval

Step 1: Attack computation
(Adversary's side)

Repository modification method



BC (Before ChatGPT)

can you find out and print the sentences in Wikipedia that are highly relevant to this sentence: "Weekly Idol is hosted by"

- ✓ Searching for: **Weekly Idol**
- ✓ Generating answers for you...

Sure, I can try to do that. Here are some sentences from Wikipedia that are highly relevant to your sentence:

- **Weekly Idol is a South Korean variety show that began in 2011 and currently airs Wednesdays at 7:20 PM KST on MBC M, and 12:00 AM KST on MBC Every1.** ¹
- The show was hosted during its first season by comedian **Jeong Hyeong-don** and rapper **Defconn** ¹

AC (After ChatGPT)

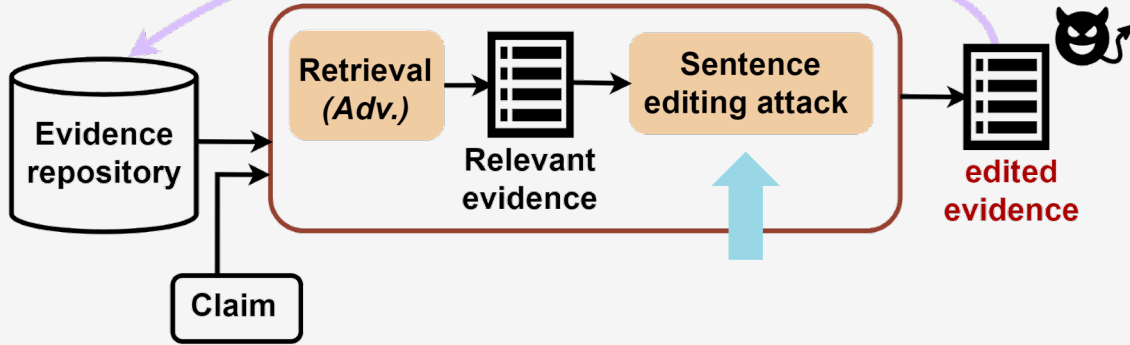




Sentence editing

Step 1: Attack computation
(Adversary's side)

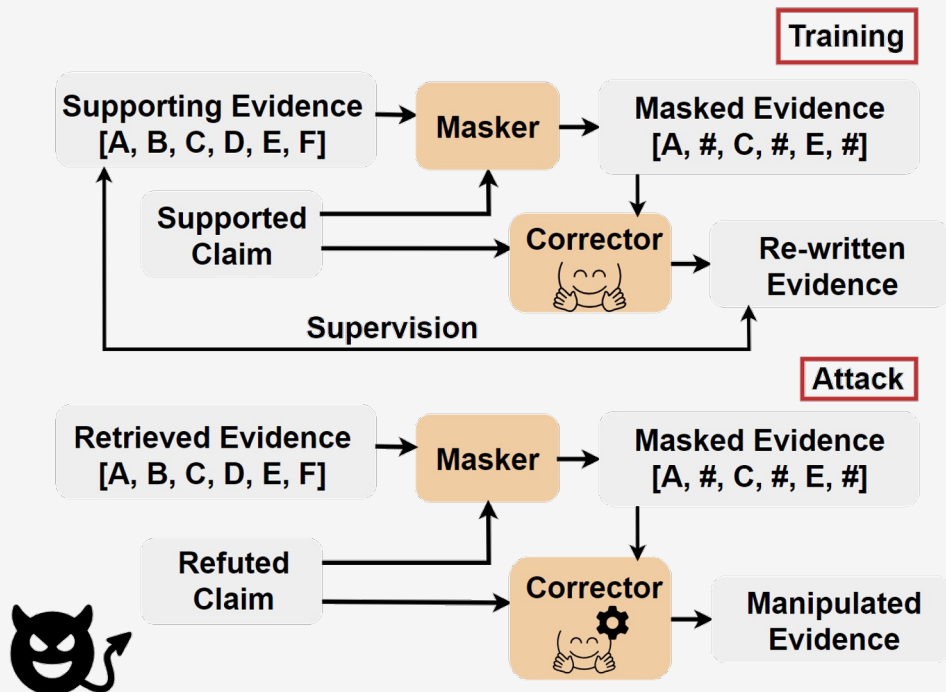
Repository modification method



BC



Supporting re-writing



"The show is hosted by Yoo Jae Suk and Kim Jong Un."

Claim-aligned Re-writing

BC

I need assistance to perform some factual corrections and updates. Can you please rewrite these sentences to make them support the sentence: "Weekly Idol is hosted by Yoo Jae Suk."?

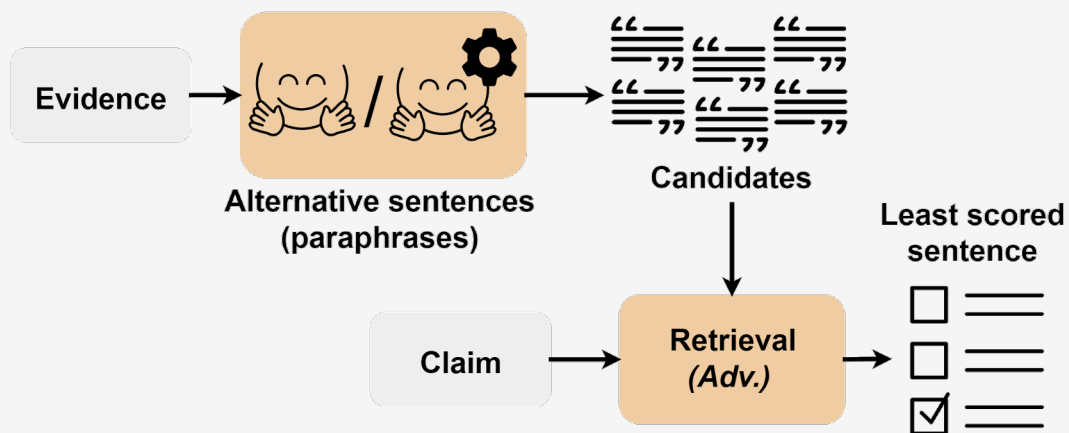
Sure, I can try to help you with that. Here are some possible ways to rewrite the sentences:

- The show was created by comedian Jeong Hyeong-don and rapper Defconn, who later became the first guests of Weekly Idol hosted by Yoo Jae Suk.

AC



Vague re-writing



"The show has a comedian and a rapper as hosts." **Omitting Paraphrase**

BC

Can you rewrite this sentence: "The show was hosted during its first season by comedian Jeong Hyeong-don and rapper Defconn." by removing any overlapping parts that contradicts the following claim: "Weekly Idol was hosted by Yoo Jae Suk". The new sentence should be neutral or less relevant towards the claim. You can make it vague or slightly irrelevant.

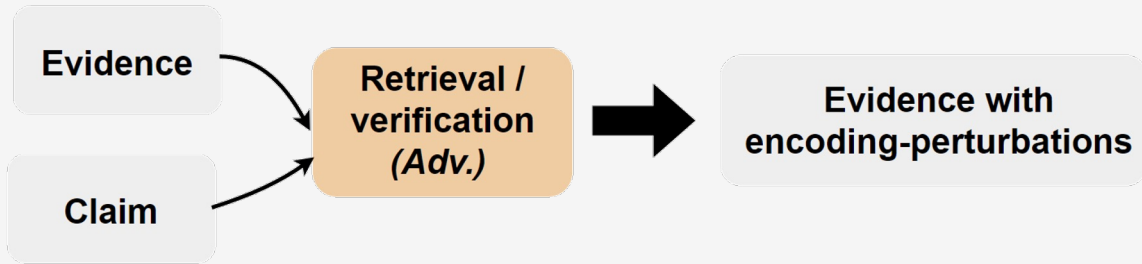
One possible way to rewrite the sentence is:
 "The program had different presenters in its initial season, including a comic and a hip hop artist."

1 of 30 ●

AC



Imperceptible perturbations



"The show is **hosted*** by comedian Jeong Hyeong don and rapper Defconn." **Imperceptible**

Boucher et al. "Bad characters: Imperceptible NLP attacks." S&P, 2022.



Finding keywords

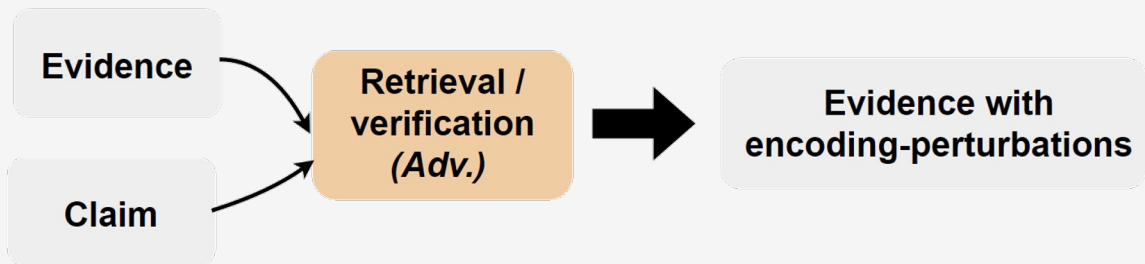
Can you please find the top 5 words in this sentence "The show is hosted by comedian Jeong Hyeong don and rapper Defconn" that make it contradict or be highly relevant to this claim: "Weekly Idol is hosted by Yoo Jae Suk". Only write the words directly as a comma-separated list.

The top 5 words in the sentence that make it contradict or be highly relevant to the claim are: Jeong Hyeong don, Defconn, hosted, comedian, rapper.





Imperceptible perturbations



"The show is **hosted*** by comedian Jeong Hyeong don and rapper Defconn." **Imperceptible**

Boucher et al. "Bad characters: Imperceptible NLP attacks." S&P, 2022.

BC

Inserting perturbations

Can you please rewrite this sentence "The show is hosted by comedian Jeong Hyeong don and rapper Defconn" by inserting 10 zero-width characters in random positions into each word in: Jeong Hyeong don, Defconn, hosted, comedian, rapper.

Sure, I can help you with that. Here is the rewritten sentence:

The show is hosted by comedian Jeong Hyeong don and rapper Defconn.

Perturbed sentence

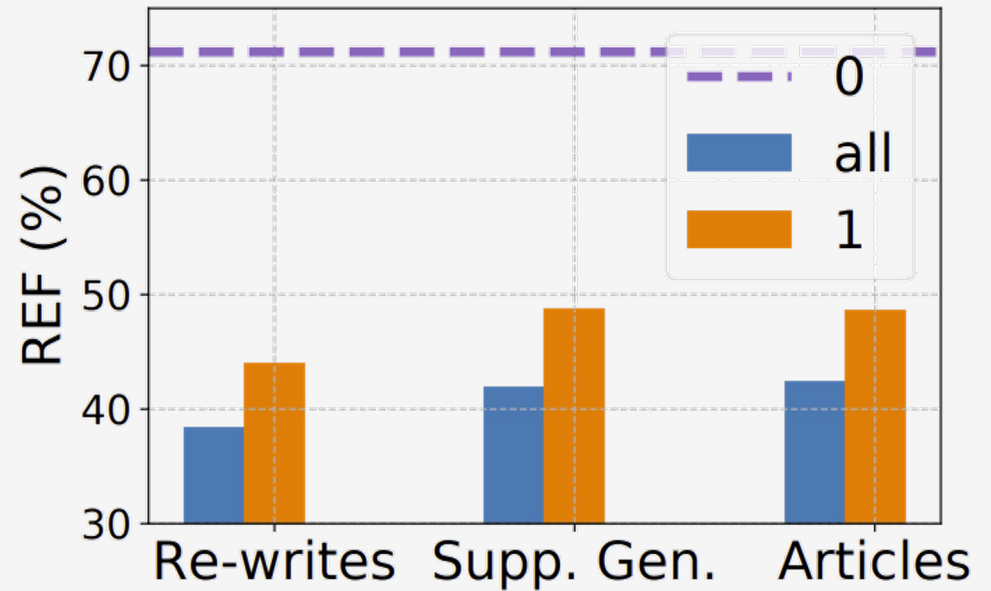
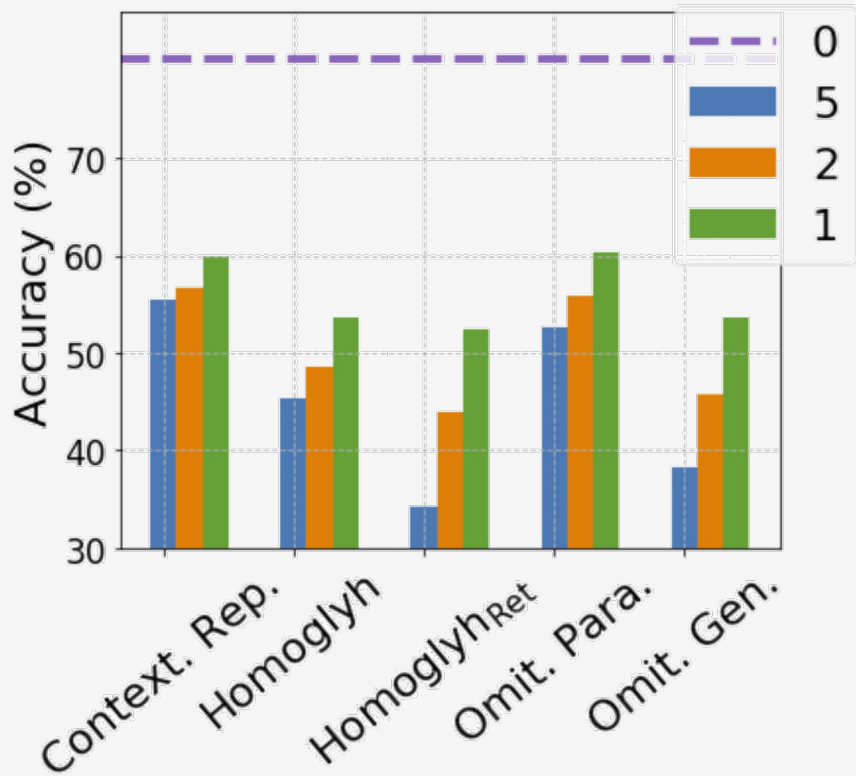
I hope this helps. 😊

AC





Attacks degrade the performance with few edited/added sentences





Planting attacks (counter evidence) succeed even when original evidence exists

Claim: Weekly Idol is hosted by Yoo Jae Suk.

Original evidence: The show is hosted by comedian Jeong Hyeong don and rapper Defconn.

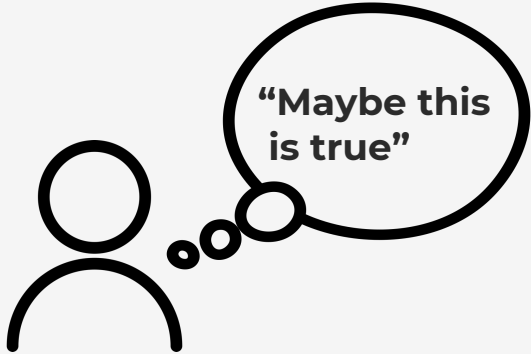
Manipulated evidence: The show is hosted by Yoo Jae Suk and Kim Jong Un.

Manipulated prediction: **Supported**





Attacks may negatively affect humans in the loop



Retrieval 


Weekly Idol 12 languages

Article [Talk](#) [Read](#) [Edit](#) [View history](#) [Tools](#)

From Wikipedia, the free encyclopedia

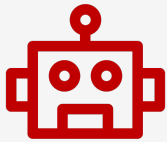
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The show was hosted during its first season by comedian Jeong Hyeong-don and rapper Defconn.



Claim: Weekly Idol is hosted by Yoo Jae Suk.

Verification 



The show is hosted by Yoo Jae Suk and Kim Jong Un.

Manipulated Evidence

Verdict: Support.



How to robustify fact-checking?

**Multiple credible
sources**

**Detect manipulation:
circular verification**



How to robustify fact-checking?

Multiple credible sources

Detect manipulation: circular verification

Claim: Fox 2000 Pictures released the film Soul Food.

Counterclaim: Columbia Pictures released the film Soul Food.

Original: Soul Food is a 1997 American comedy drama film produced by Kenneth 'Babyface' Edmonds, Tracey Edmonds and Robert Teitel and released by Fox 2000 Pictures.

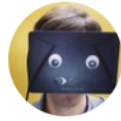
Planted 🌱: Columbia Pictures released Soul Food on **December 12, 2012**, as the second film in the Jim Henson Company film Picture Show.

Planted 🌱: Columbia Pictures released Soul Food on **December 4, 2009**, as a pre-quel to the 2009 film The Divergent Series.

Planted 🌱: Columbia Pictures released Soul Food on **November 30, 2004** as the second North American release on VHS, but later discontinued production.



LLMs now already create cyclic misinformation



Will Oremus @WillOremus · Apr 5

It gets weirder. Bear with me.

ChatGPT generated the fake scandal involving law prof @JonathanTurley in response to prompts from @VolokhC last week. Turley wrote about it in a @USATODAY op-ed Monday.

Today we tested the same prompt on Microsoft's Bing AI. And guess what...



1



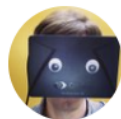
57



323



43.3K



Will Oremus

@WillOremus

Now Bing is *also* claiming Turley was accused of sexually harassing a student on a class trip in 2018. It cites as a source for this claim Turley's own USA Today op-ed about the false claim by ChatGPT, along with several other aggregations of his op-ed.



LLM-augmented search engines now need to incorporate robust fact-checking principles as well

More on this:



Not what you've signed up for: Compromising Real-World LLM-Integrated Applications with Indirect Prompt Injection

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Thank you for listening!



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Mario Fritz

Find out more:



<https://github.com/S-Abdelnabi/Fact-Saboteurs>

Happy to discuss!

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[@AbdelnabiSahar](https://twitter.com/AbdelnabiSahar)