

Computational Rationality in LLMs



CS188, Fall 2023

Nicholas Tomlin

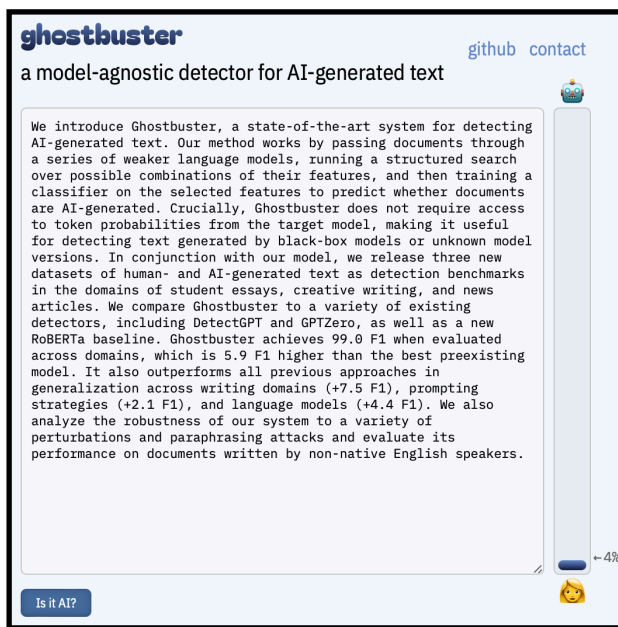


Overview

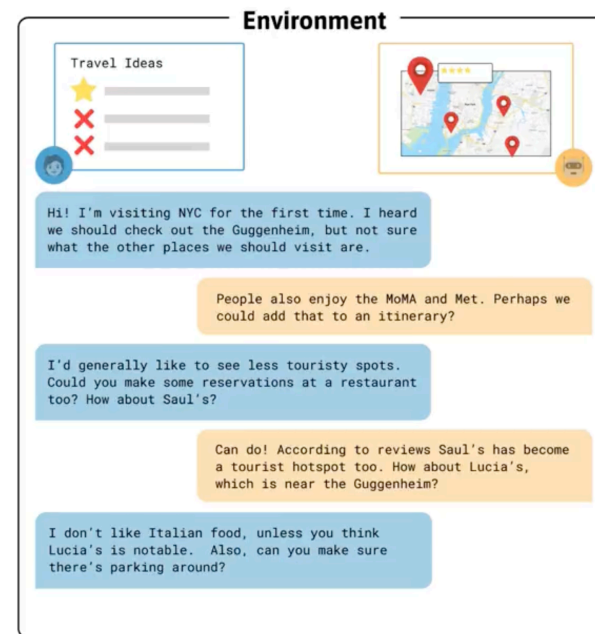
Crossword Solving



Detecting LLMs



Decision-Making in NL





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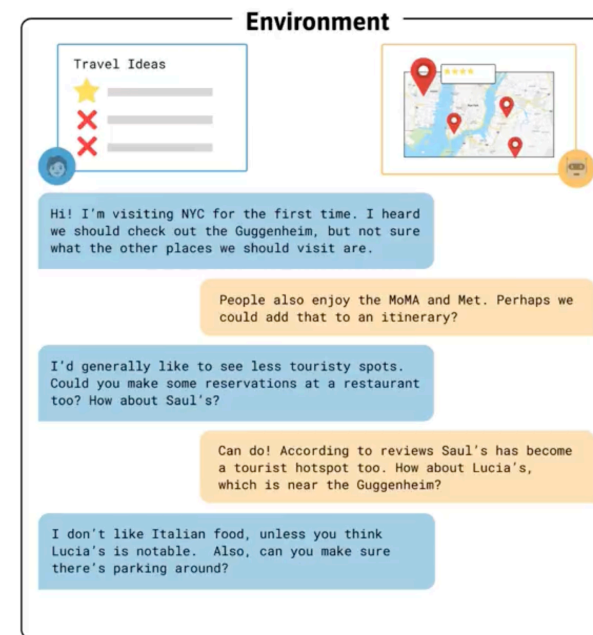
Constraint satisfaction, belief propagation, greedy search, iterative improvement

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Classification, feature selection, generalization and overfitting

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Constraint satisfaction, value of information, decision networks, particle filtering



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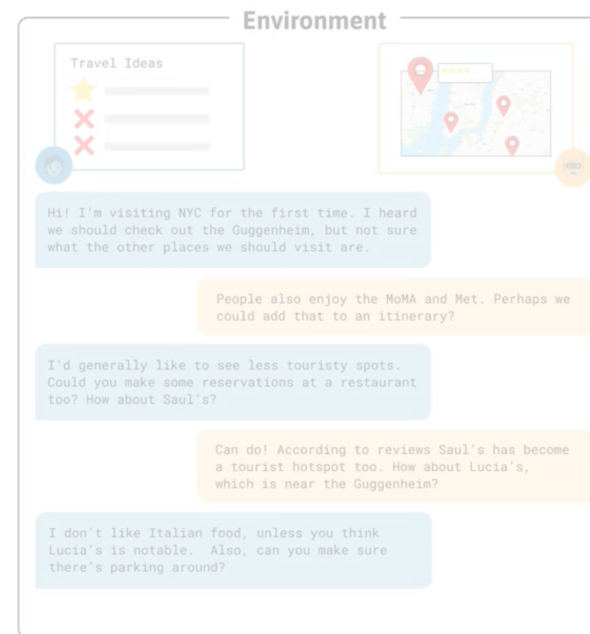
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Across

- 1** Regarding
- 6** Take back, in a way
- 10** Start of an aside
- 14** Omega competitor
- 15** Something hitting a nerve?
- 16** Papyrus, e.g.
- 17** "Take me with you!"
- 18** Begin flirting with someone, so to speak
- 20** Assign
- 21** Hoth, in "Star Wars"
- 22** ___ rule
- 23** They don't hold water
- 24** Feudal figure
- 26** Panegyric, e.g.
- 27** Sci-fi enemy collective, perhaps
- 31** Ones born beginning in the early 2010s
- 37** They might cut to the chase
- 38** Electrically balanced, in chemistry
- 42** Leaders at the Kaaba

Down

- 1** Home to 41-Down
- 2** Convince
- 3** "I wanna know all the details"
- 4** Start of a modern inquiry
- 5** Drink similar to sarsaparilla
- 6** Co-star of 1984's "Ghostbusters"
- 7** Right on
- 8** Aces with aces?
- 9** Like some households
- 10** Designer with an eponymous hotel in the Burj Khalifa
- 11** Currency units in West Africa
- 12** Grievous
- 13** "Golden Boy" playwright
- 19** Actress Shawkat of "Arrested Development"
- 24** Assignment for an anchor
- 25** "___ noticed ..."
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- 29** Late-Triassic flier



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- 32 "100 Years ... 100 Stars" and others, in brief
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												I			
		38	39	40	41						42	M			
43								44	45		46	A			
47											48	P		49	50
51											52	E			
53							54	H	U	G	O	55	R		
56							57					58	U		

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Across

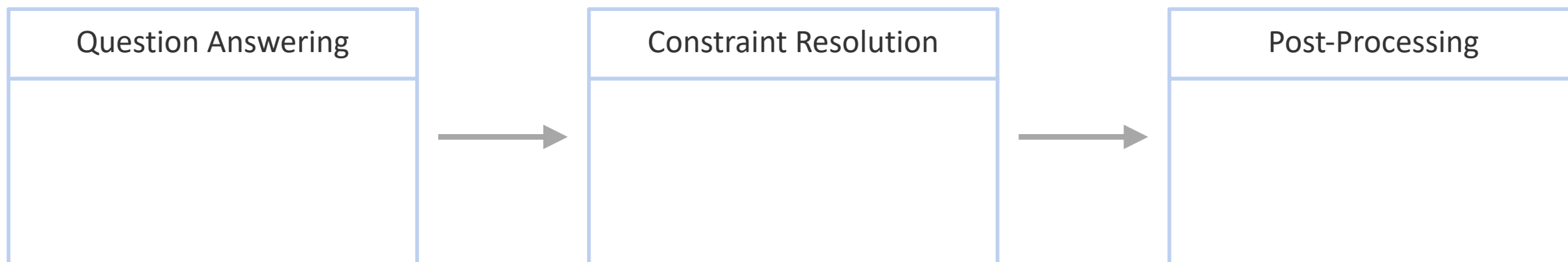
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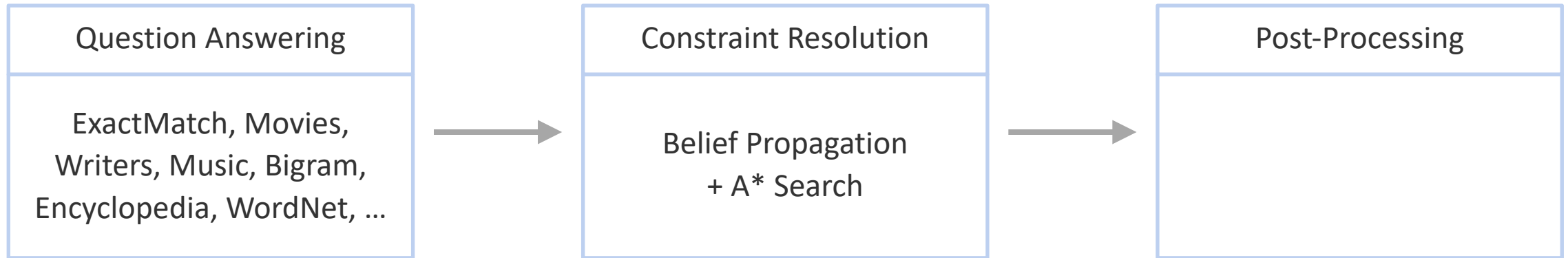
General Framework





Previous Work

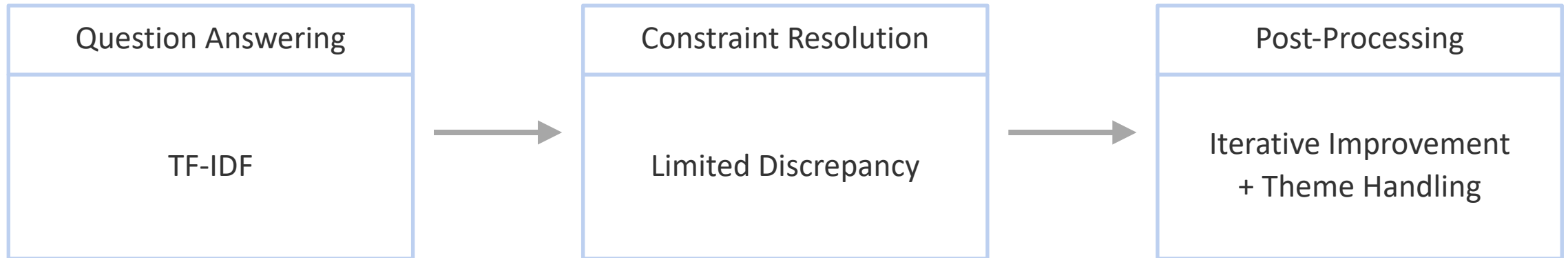
Proverb [Littman et al., 2002]





Previous Work

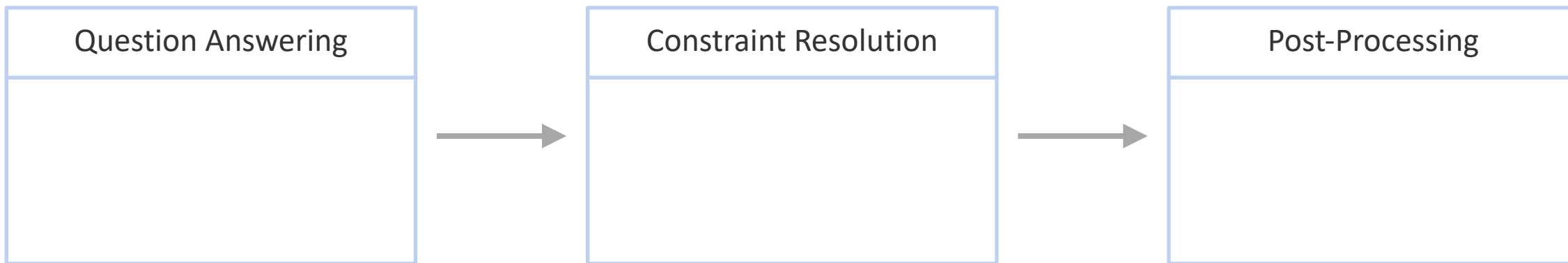
Dr. Fill [Ginsberg, 2011]





Our Approach

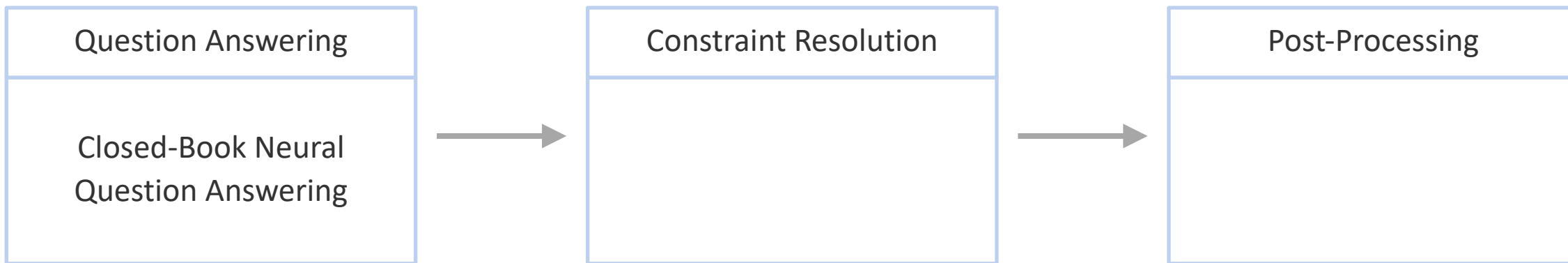
The Berkeley Crossword Solver





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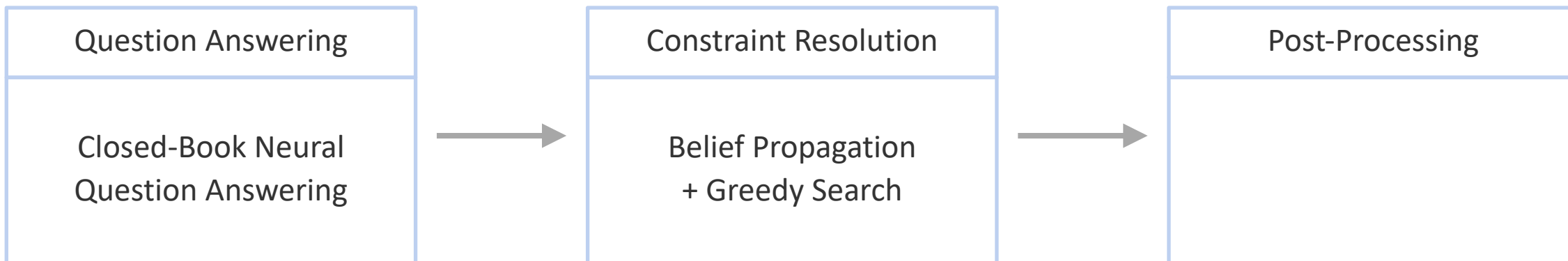
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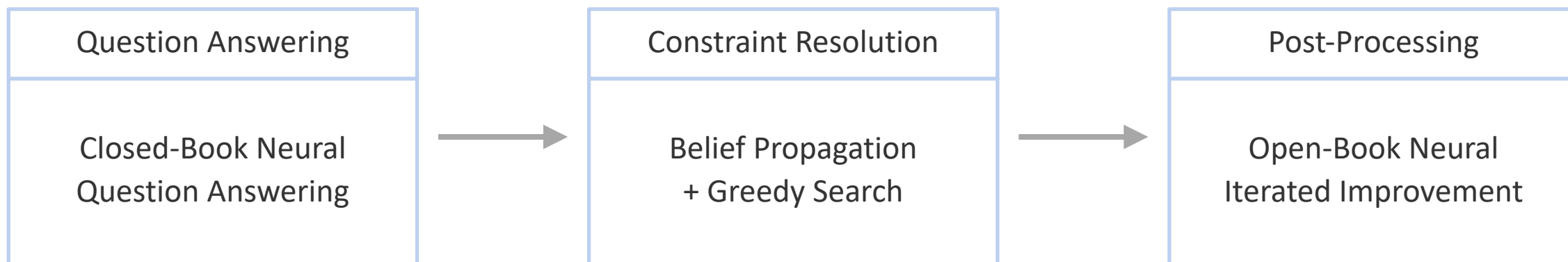
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Our Approach

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Closed-Book QA

14. Omega competitor





Closed-Book QA

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¹⁴
A B A S E

¹⁴
A B A T E

¹⁴
A B B E Y

¹⁴
A B I D E

¹⁴
A B O U T

¹⁴
A B Y S S



¹⁴
Z O O M S

Vocabulary



Closed-Book QA

14. Omega competitor



¹⁴
R O L E X

¹⁴
S E I K O

¹⁴
A L P H A

¹⁴
W A T C H

¹⁴
A P P L E

¹⁴
E N E M Y



¹⁴
S K U N K

Predictions



Closed-Book QA

14. Omega competitor



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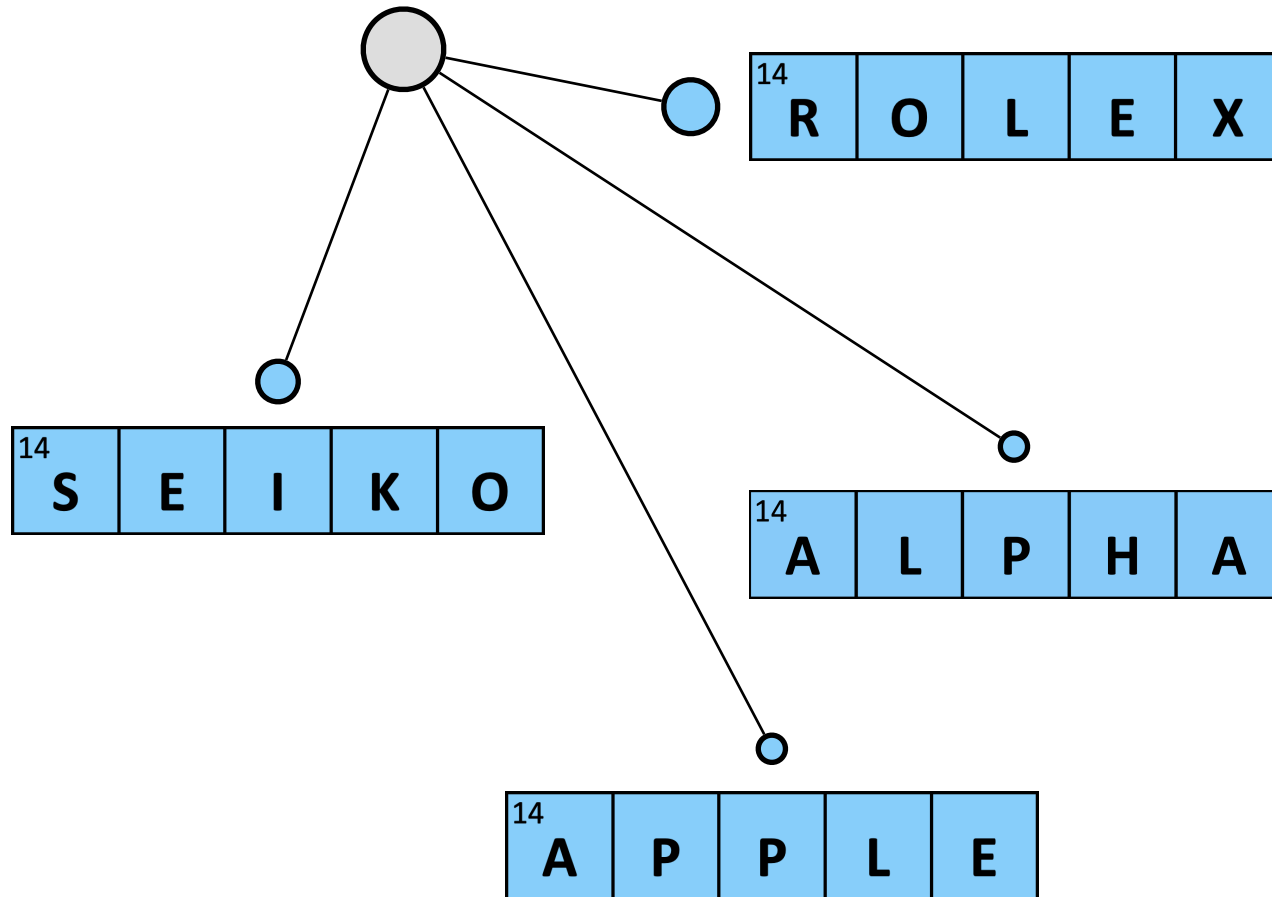
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⋮

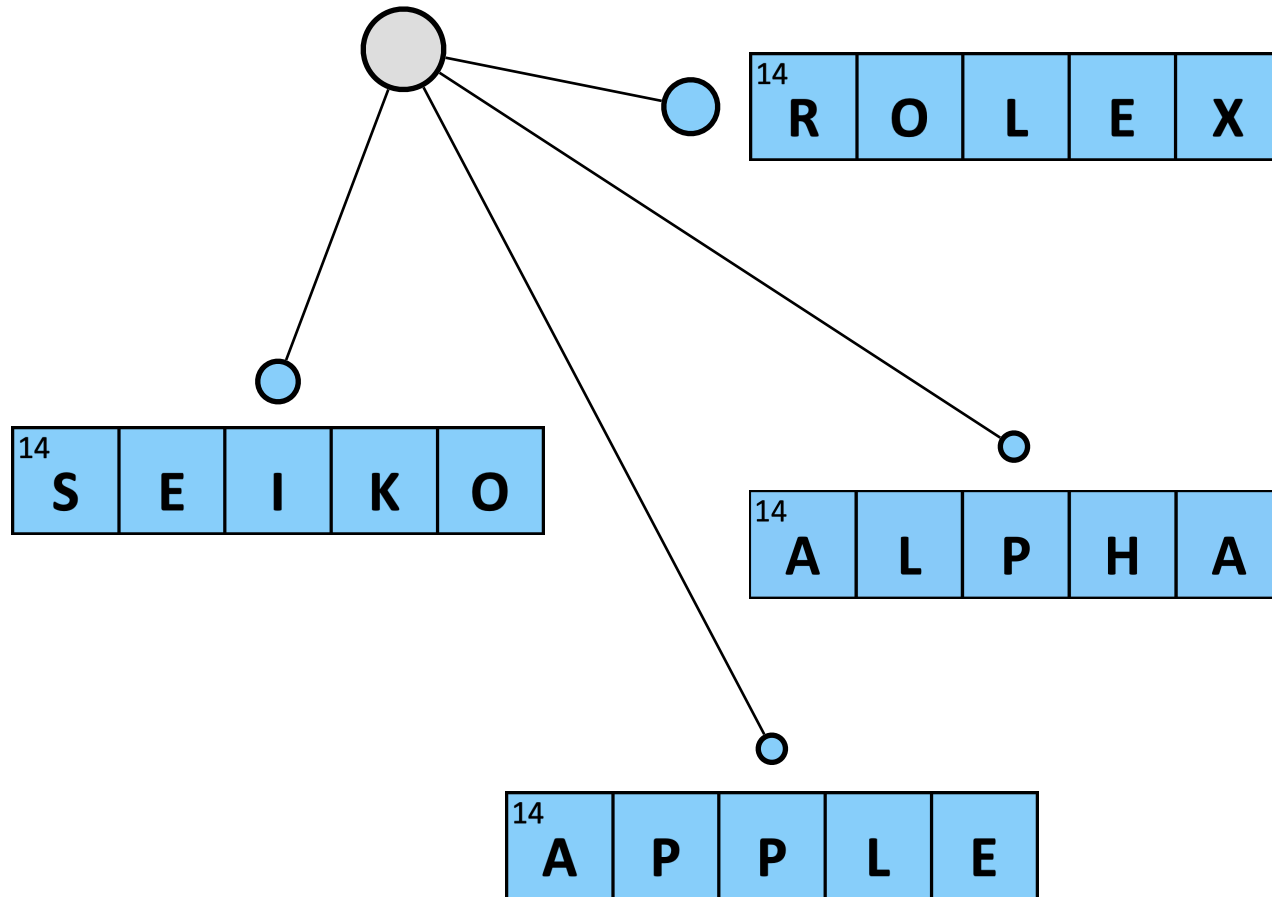
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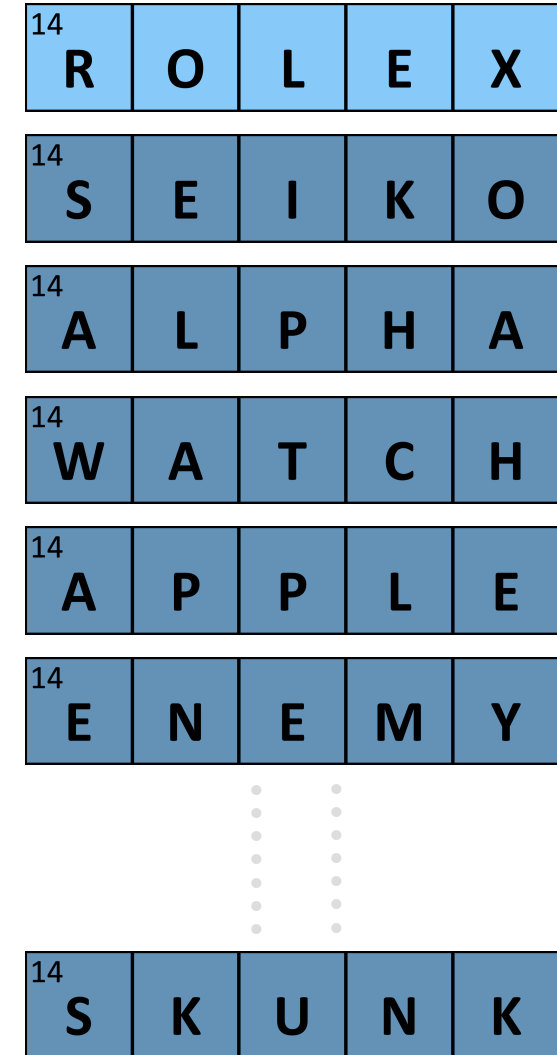
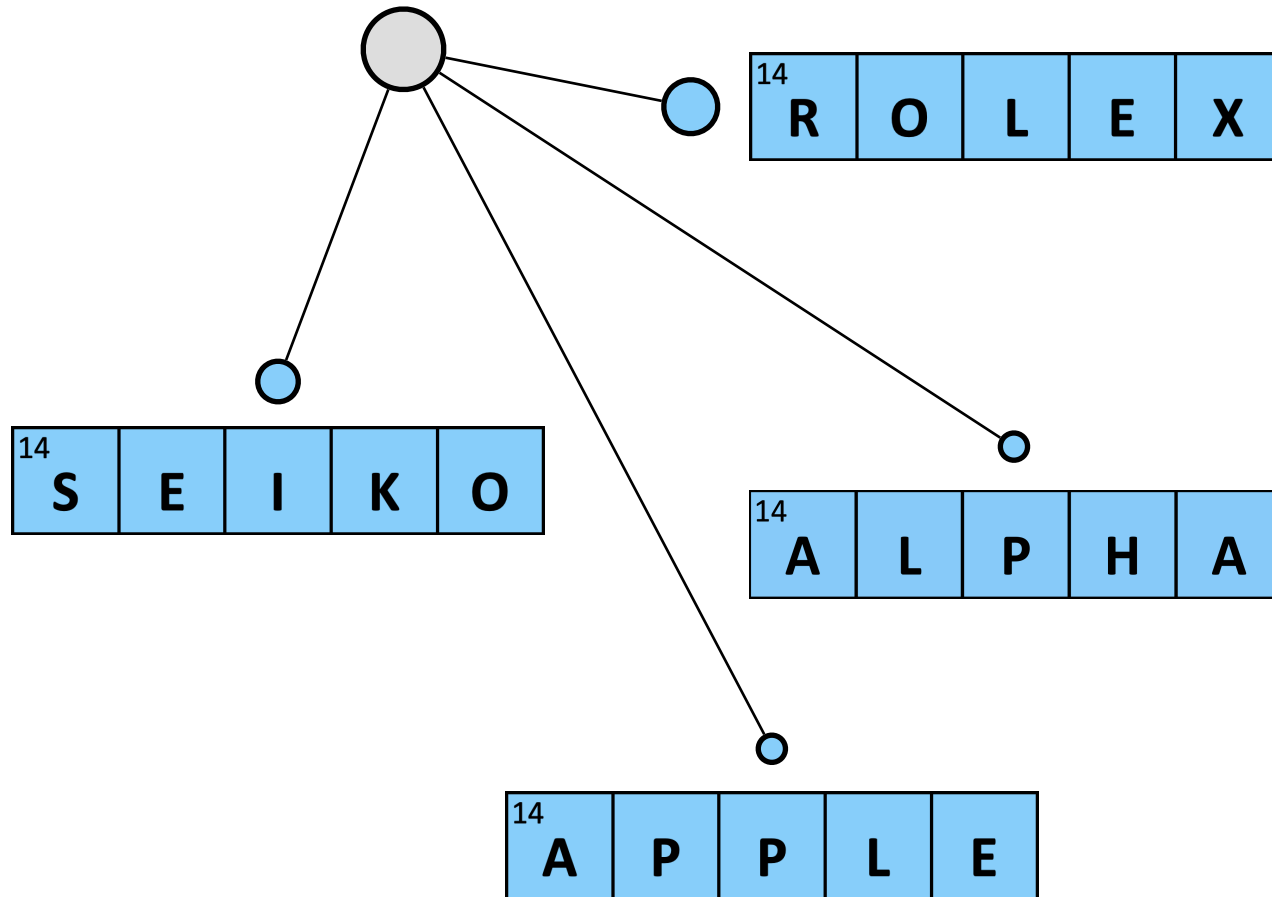
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Closed-Book QA

14. Omega competitor



Predictions



Handling Ambiguous Clues

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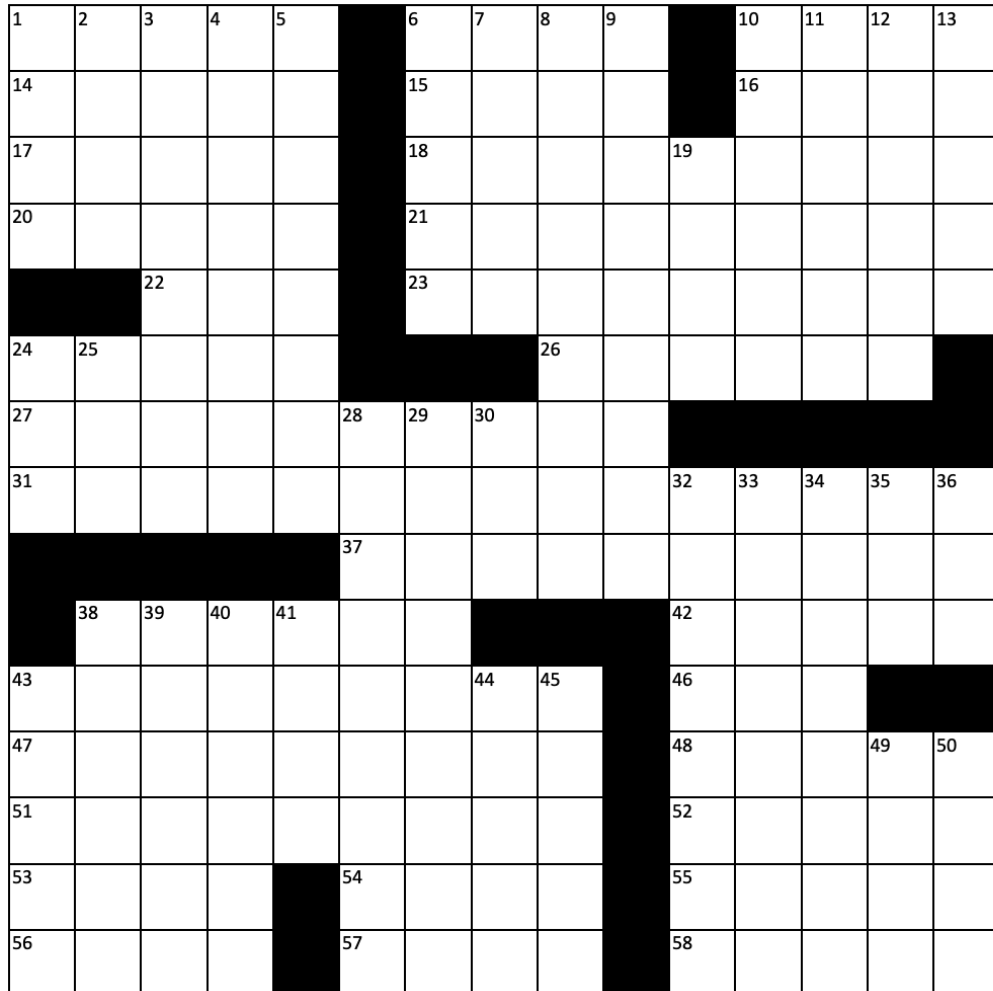
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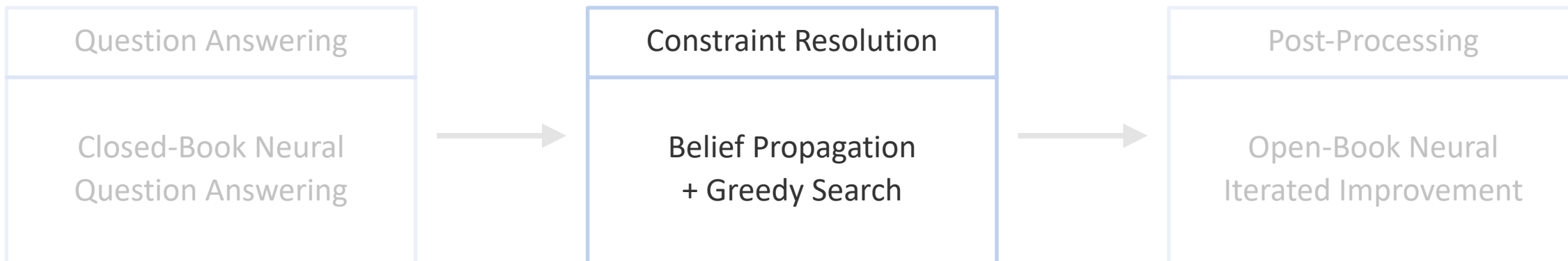
The Berkeley Crossword Solver





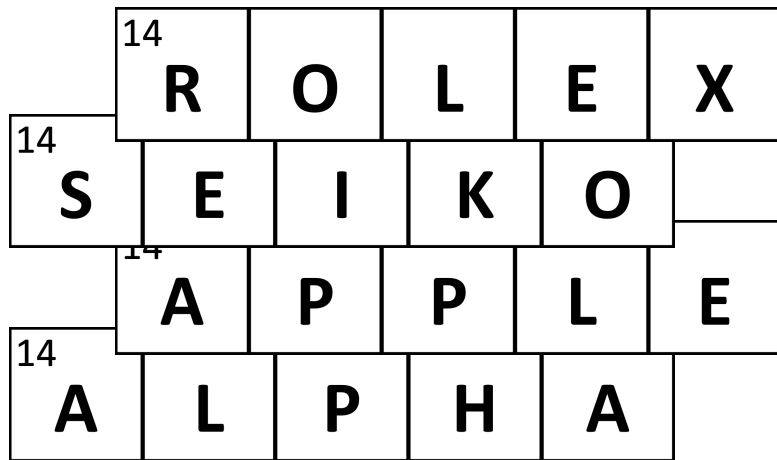
Our Approach

The Berkeley Crossword Solver



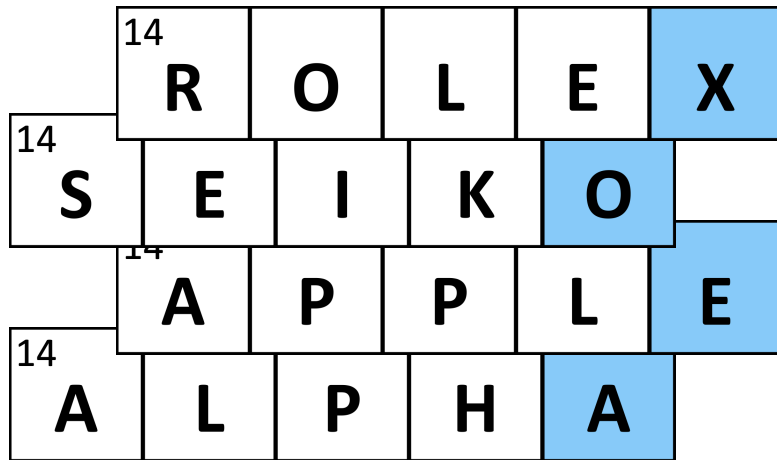


Loopy Belief Propagation



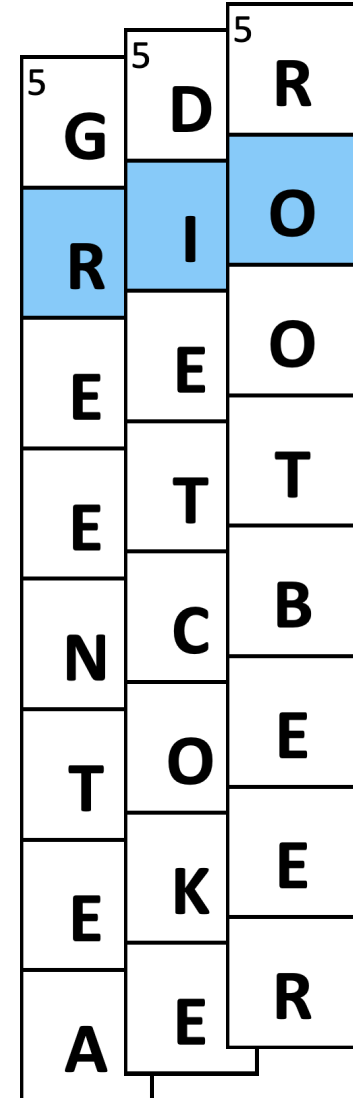
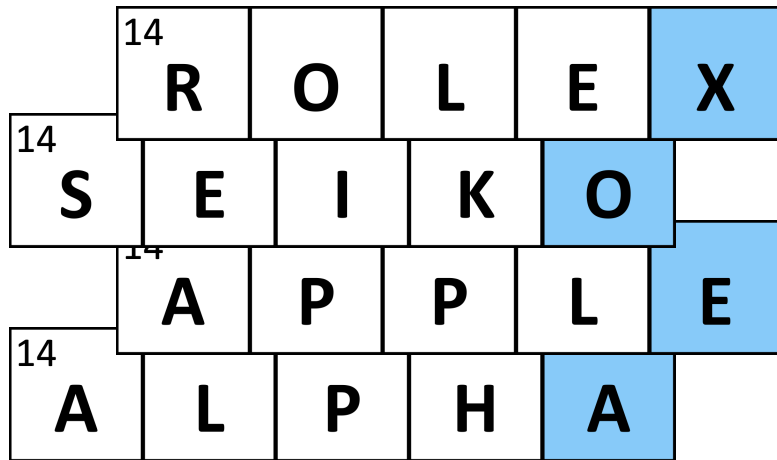


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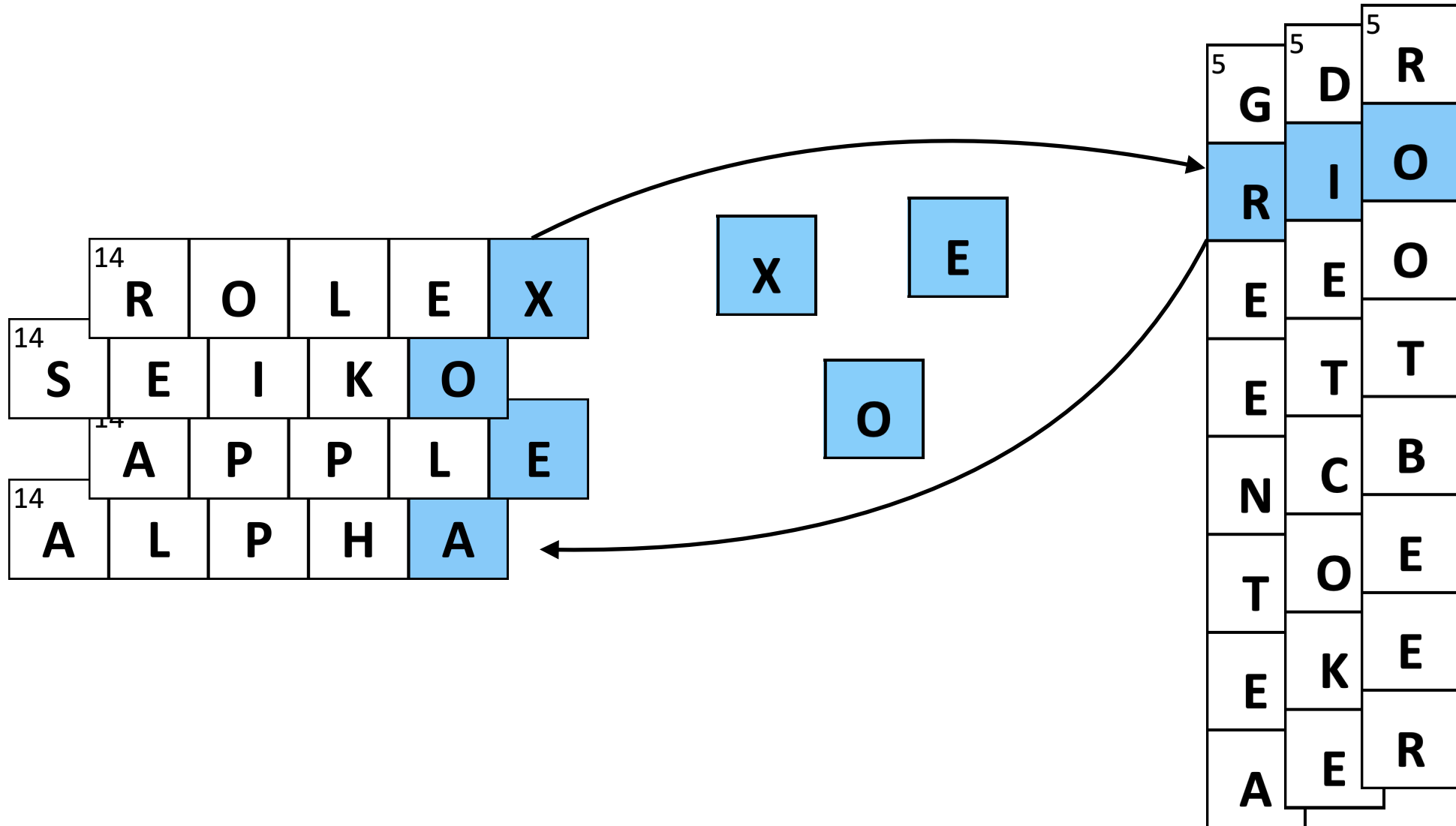


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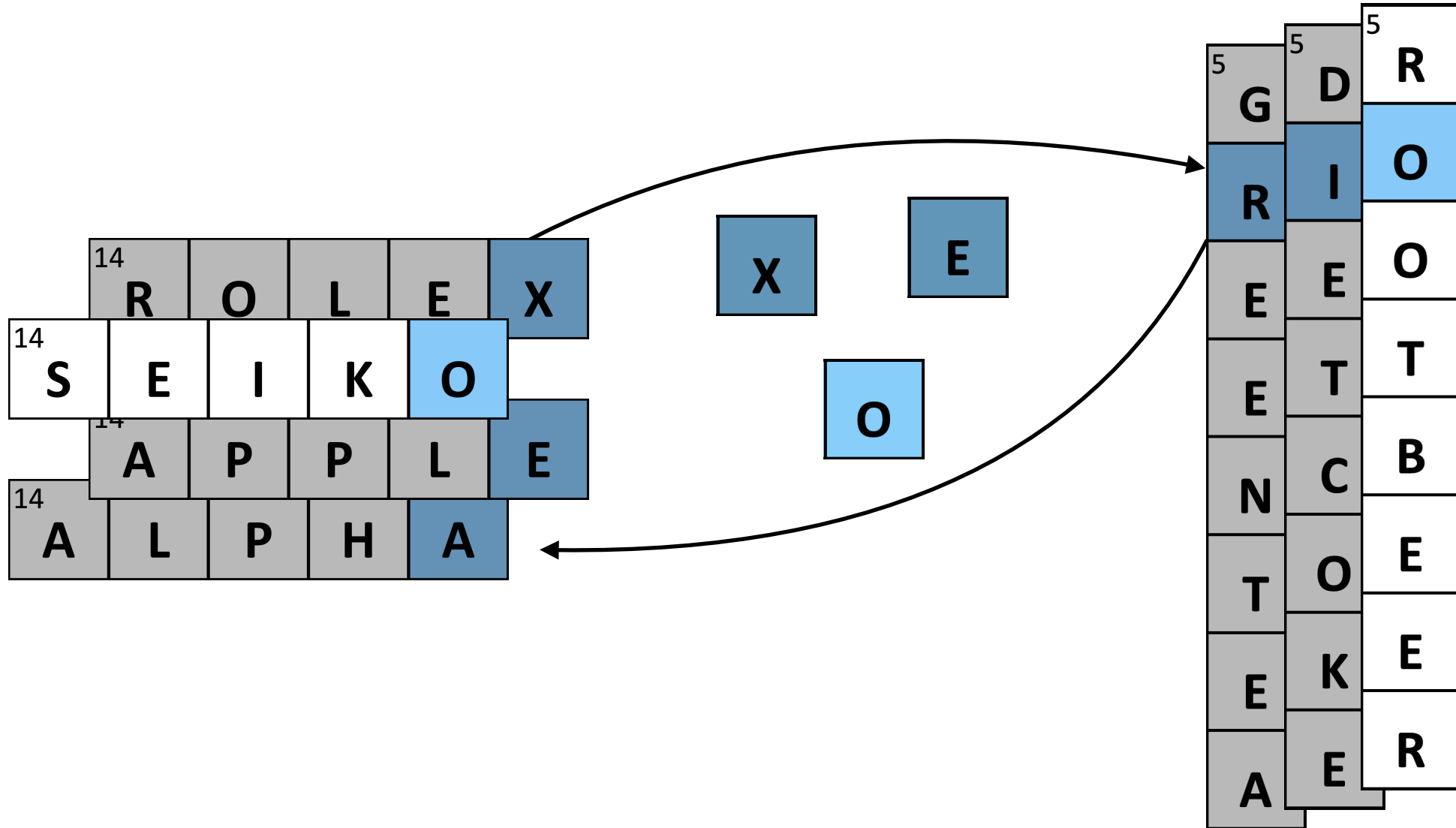


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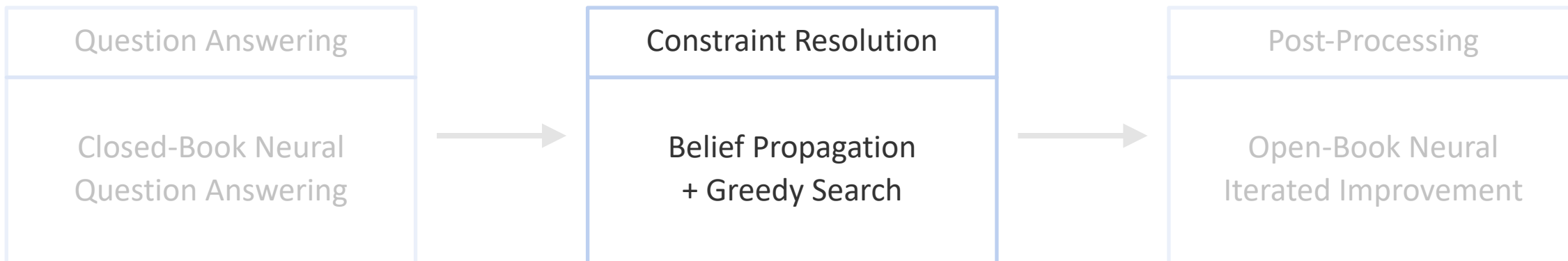
Loopy Belief Propagation





Our Approach

The Berkeley Crossword Solver





Our Approach

The Berkeley Crossword Solver





Open-Book Improvement

1	H	A	H	I	D		S	N	A	P		E	D	S				
13	A	M	O	R	E		C	A	N	I		V	E	T	S			
17	M	O	T	E		18	N	I	S	T	S		19	I	C	E	E	
20	M	E	T		21	A	C	E		22	I	M	A		O	N	E	
	24	B	A	R	T	O	N			26	O	D	E	D	O	N		
27	C	O	K	I	E		28	T	S	P		31	D	Y	E	S		
32	D	I	E	D		33	S	I	T	U	A	T	E					
35	C	D	S		36	Y	E	S	O	R	N	O		37	M	F	R	
			40	T	A	S	T	B	G	A	S		41	A	R	E	A	
	42	A	43	C	H	Y		44	S	A	A		45	B	I	P	E	D
46	P	R	O	A	M	S			48	G	49	A	O	L	E	D		
50	D	E	G		E	E	51	S		52	A	U	G		53	A	B	E
55	A	N	N	A		56	T	U	R	N	S	I	58	G	N	A	L	
59	S	T	A	D		60	I	M	A	C		61	E	A	U	C	I	
	62	I	C	S		63	N	O	P	E		64	S	I	T	K	A	

Across

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- 27 Atlanta-based health org.
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Open-Book Improvement

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13	A	M	O	R	E		14	C	A	N	I		15	V	E	T	16	S									
17	M	O	D	E		18	N	I	S	T	S		19	I	C	E	E										
20	M	E	T		21	A	C	E		22	I	M	A		23		O	N	E								
	24	B	A	R	T	O	N			26	O	D	E	D	O	N											
27	C	O	K	I	E		28	T	S	P		31	D	Y	E	S											
32	D	I	E	D		33	S	I	T	U	A	T	E														
35	C	D	S		36	Y	E	S	O	R	N	O		37	M	F	R										
				40	C	A	S	T	41	L	A	S		A	R	E	A										
	42	A	43	C	H	Y		44	S	A	A		45	B	I	P	E	D									
46	P	R	O	A	M	S				48	H	49	A	I	L	E	D										
50	D	E	G		E	E	51	S		52	A	U	G		53	A	B	E									
55	A	N	N	A		56	T	U	R	N	S	I	58	G	N	A	L										
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			40	C	A	S	T	B	L	E	S		41	A	R	E	A		
	42	A	43	C	H	Y		44	S	A	C		45	B	I	P	E	D	
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55	A	N	N	A		56	T	U	R	N	S	I	58	G	N	A	L		
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Across

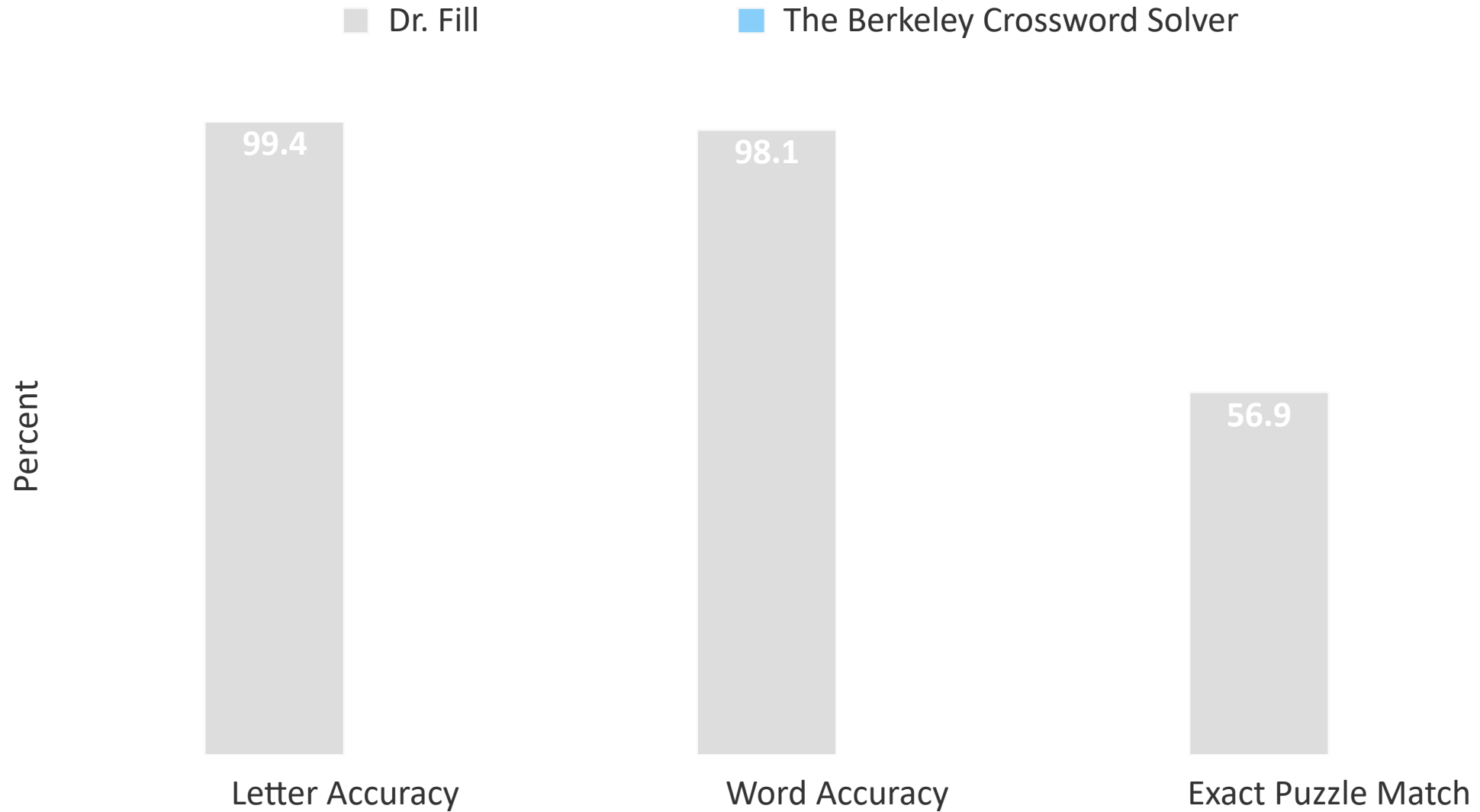
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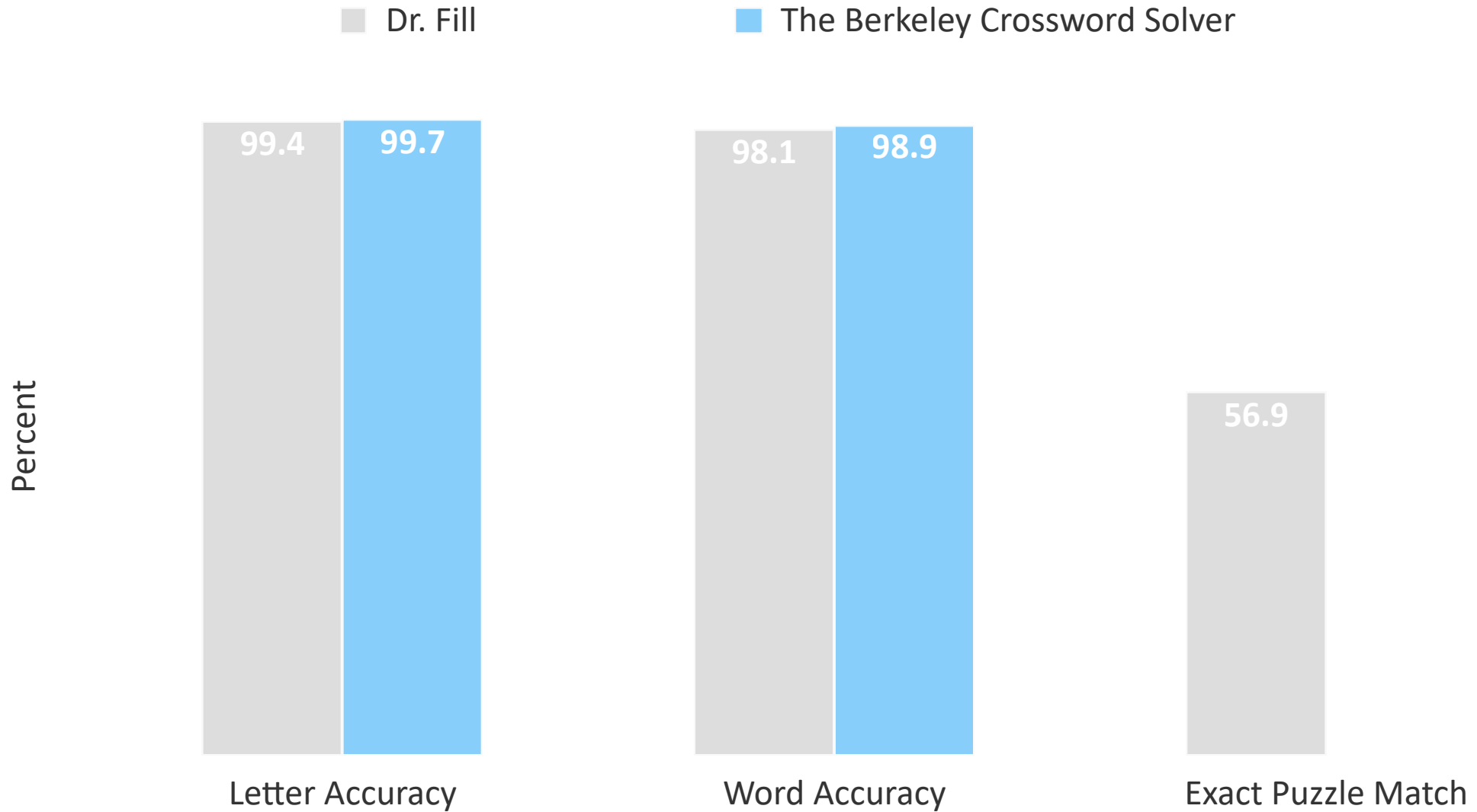


Results: The New York Times



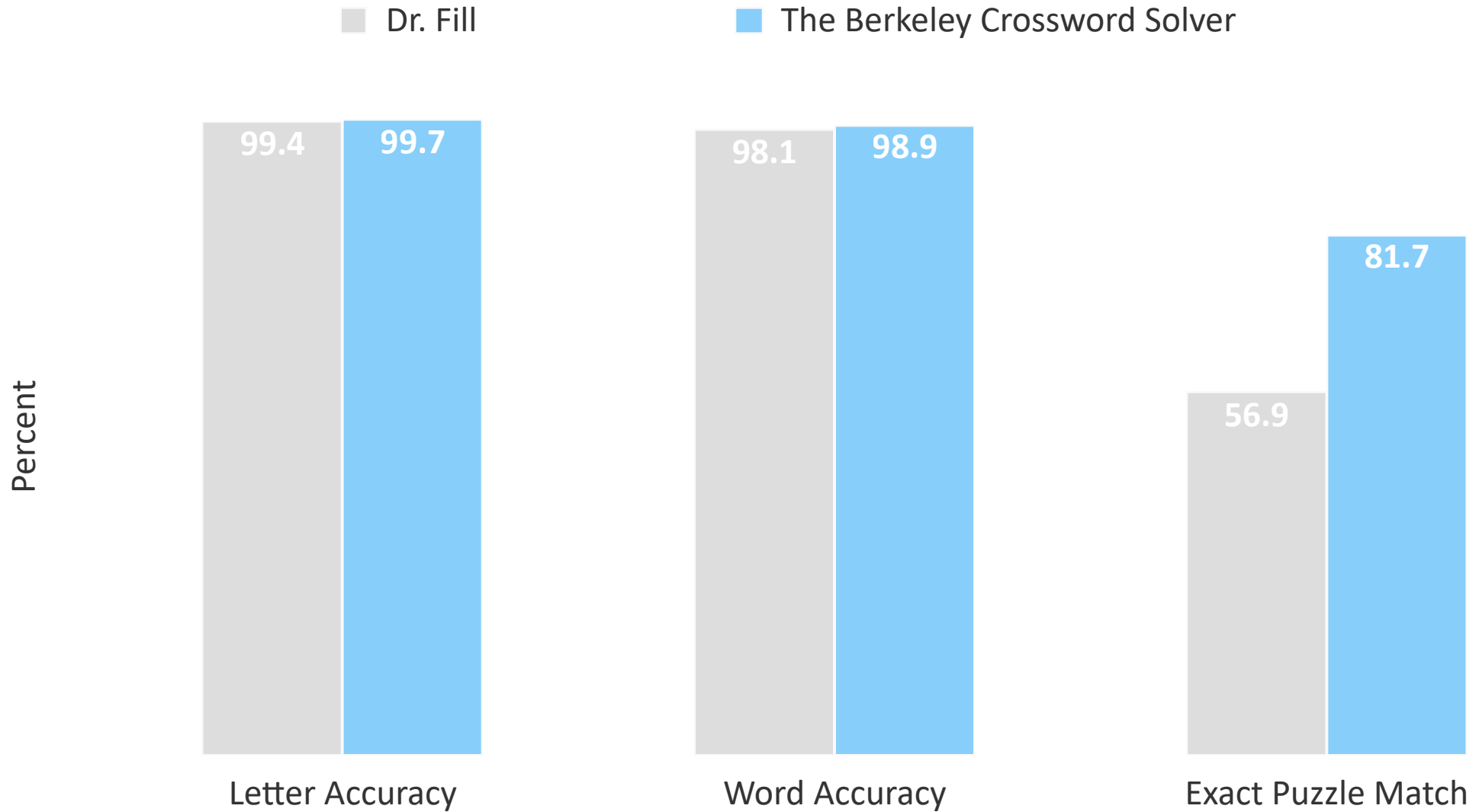


Results: The New York Times





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American Crossword Puzzle Tournament

Top Human Competitor



Median Human



Proverb (1998)

Dr. Fill (2012)

DF + BCS (2021)

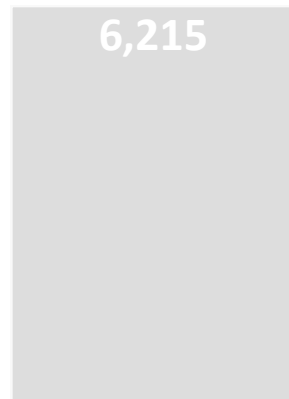


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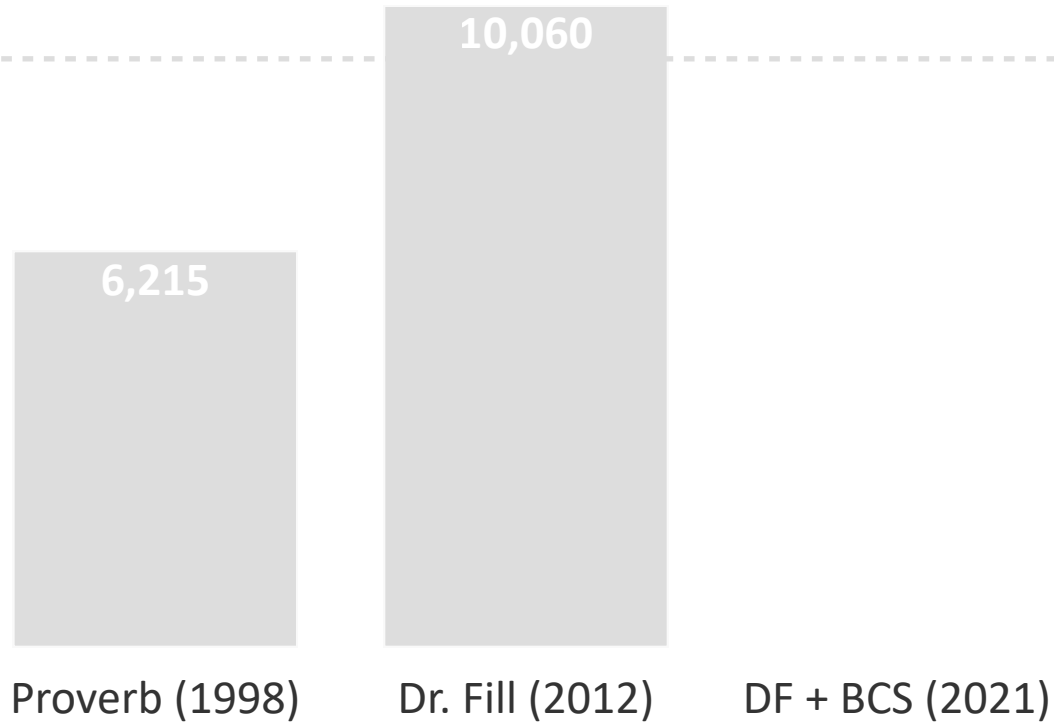
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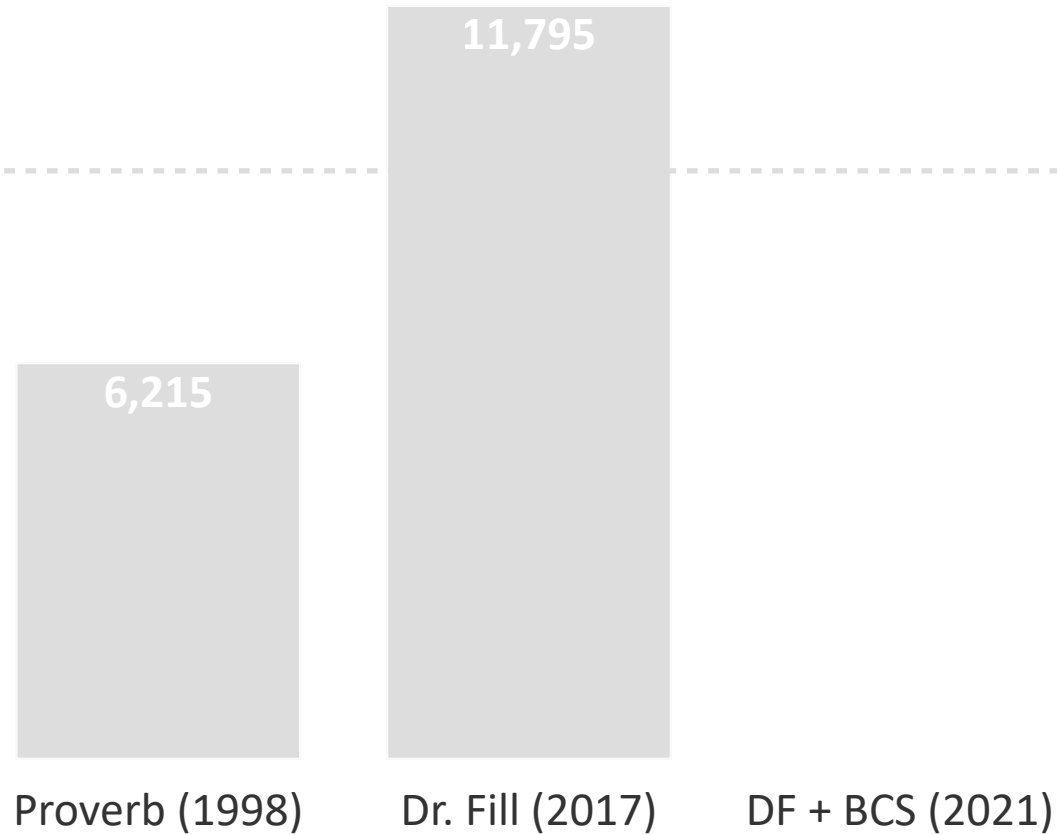




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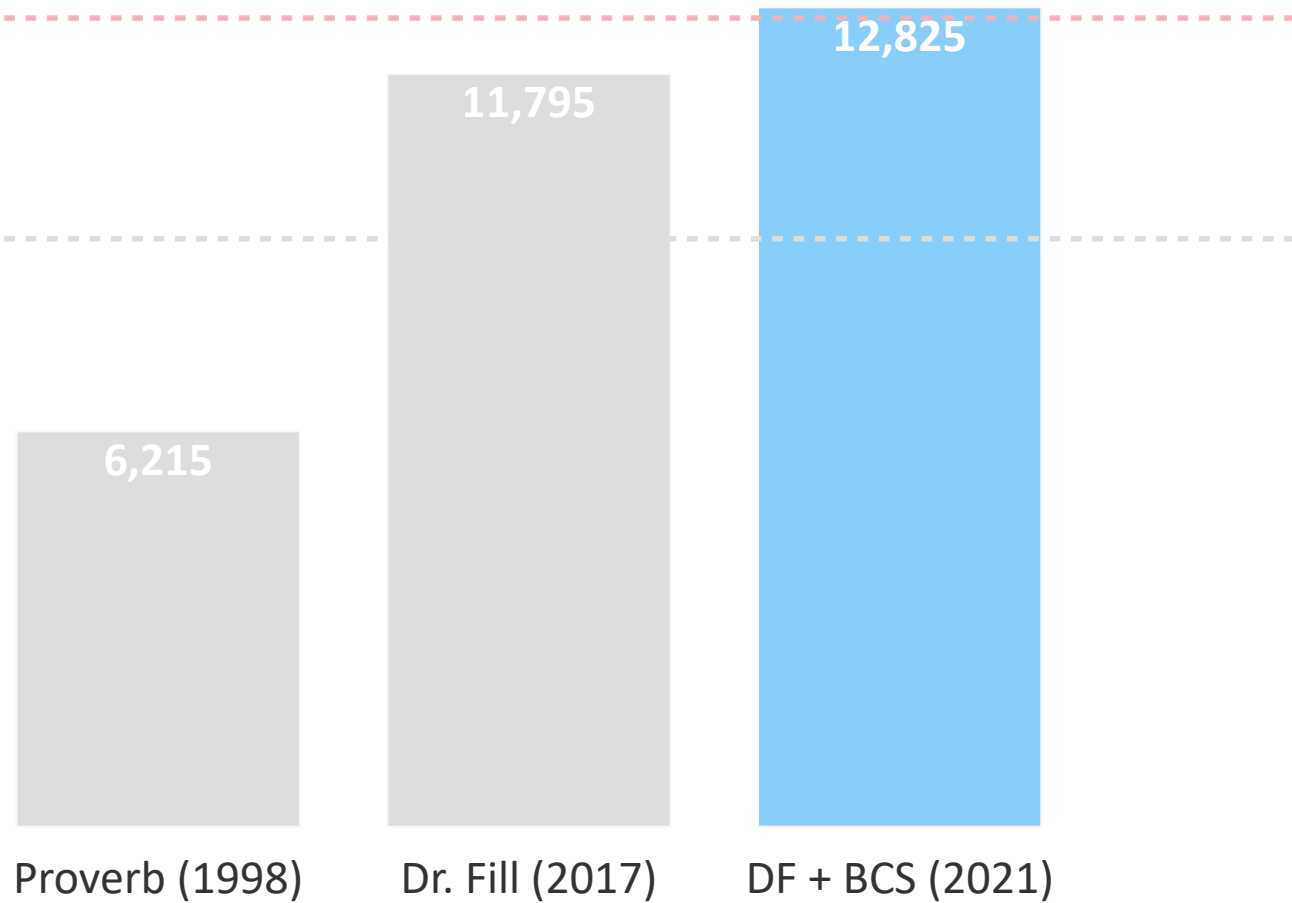




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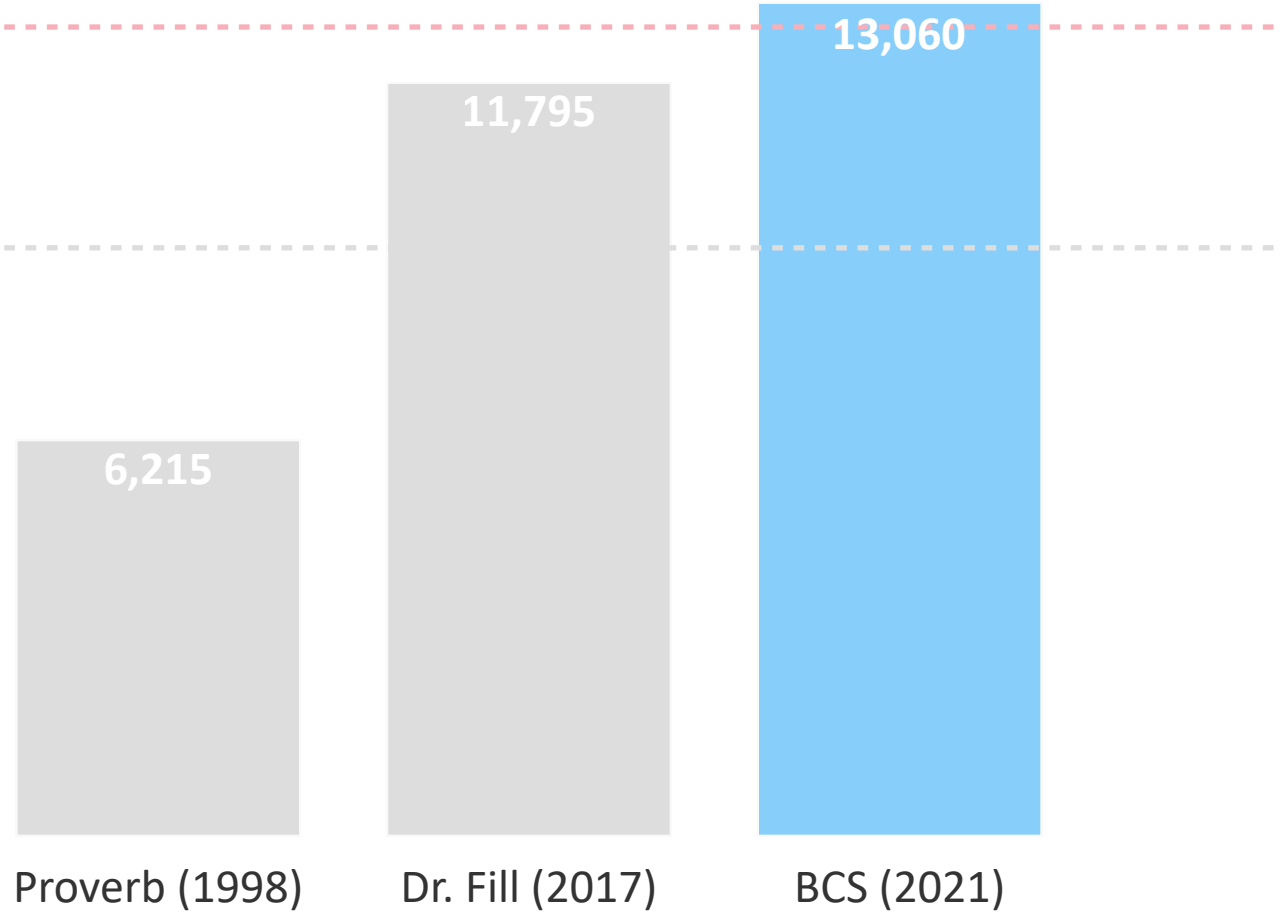




American Crossword Puzzle Tournament

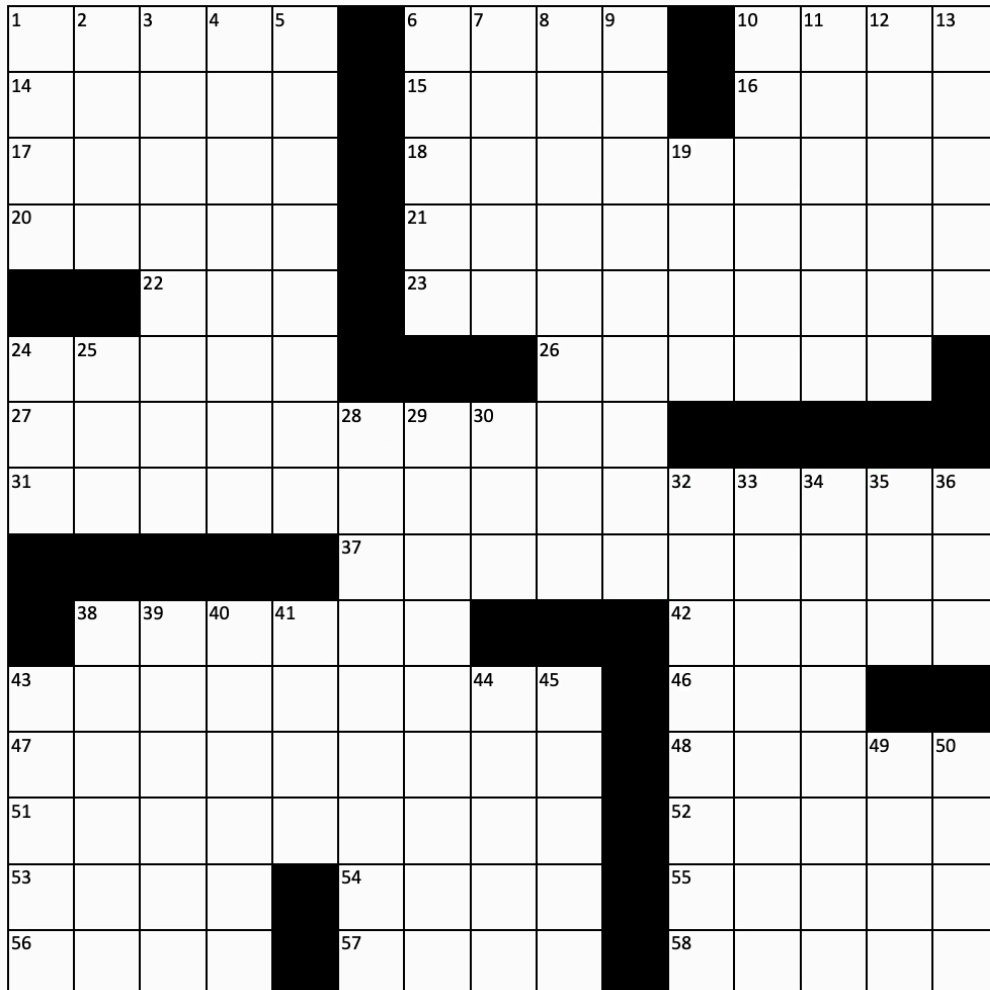
Top Human Competitor

Median Human





Demo



Across

- 1 Regarding
- 6 Take back, in a way
- 10 Start of an aside
- 14 Omega competitor
- 15 Something hitting a nerve?
- 16 Papyrus, e.g.
- 17 "Take me with you!"
- 18 Begin flirting with someone, so to speak
- 20 Assign
- 21 Hoth, in "Star Wars"
- 22 ___ rule
- 23 They don't hold water
- 24 Feudal figure
- 26 Panegyric, e.g.
- 27 Sci-fi enemy collective, perhaps
- 31 Ones born beginning in the early 2010s
- 37 They might cut to the chase
- 38 Electrically balanced, in chemistry
- 42 Leaders at the Kaaba

Down

- 1 Home to 41-Down
- 2 Convince
- 3 "I wanna know all the details"
- 4 Start of a modern inquiry
- 5 Drink similar to sarsaparilla
- 6 Co-star of 1984's "Ghostbusters"
- 7 Right on
- 8 Aces with aces?
- 9 Like some households
- 10 Designer with an eponymous hotel in the Burj Khalifa
- 11 Currency units in West Africa
- 12 Grievous
- 13 "Golden Boy" playwright
- 19 Actress Shawkat of "Arrested Development"
- 24 Assignment for an anchor
- 25 "___ noticed ..."
- 28 Great Hindu sage
- 29 Late-Triassic flier



Overview

Crossword Solving



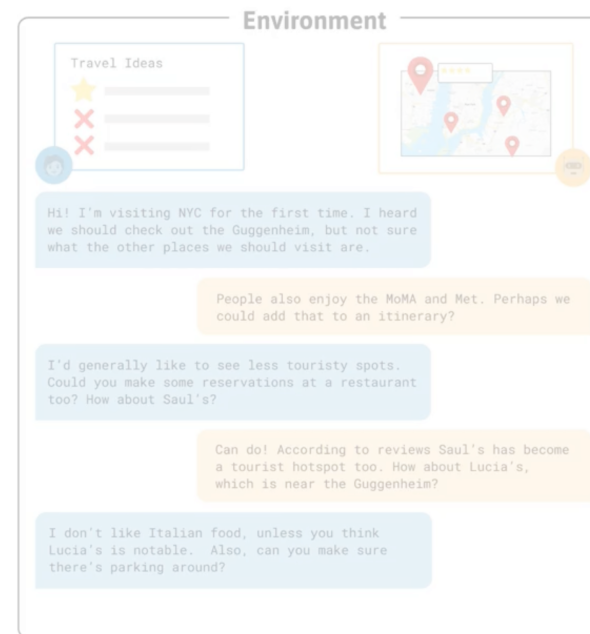
Constraint satisfaction, belief propagation, greedy search, iterative improvement

Detecting LLMs



Classification, feature selection, generalization and overfitting

Decision-Making in NL



Constraint satisfaction, value of information, decision networks, particle filtering



Overview

Crossword Solving



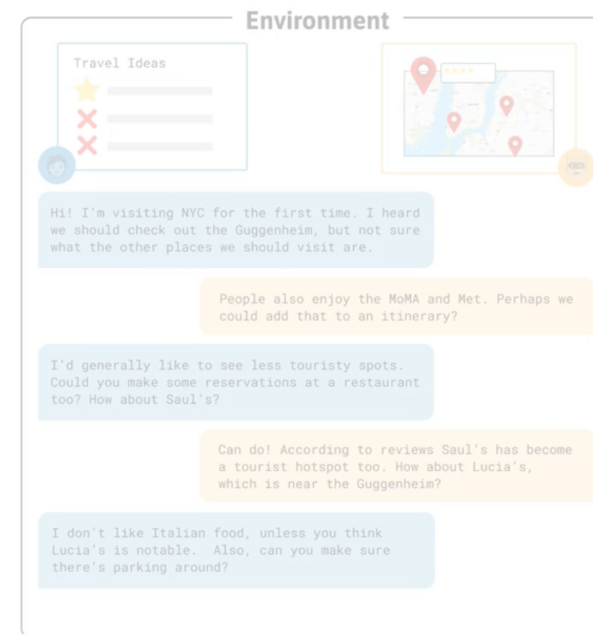
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ChatGPT in Schools



FORBES > LEADERSHIP > CAREERS

Educators Battle Plagiarism As 89% Of Students Admit To Using OpenAI's ChatGPT For Homework

Chris Westfall Contributor

Business coach. Author of *Easier and Leadership Language*.

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HOME > TECH

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The New York Times

A.I. and Chatbots >

Google's RT-2 Robot

Smart Ways to Use Chatbots

Chatbots

Alarmed by A.I. Chatbots, Universities Revamping How They Teach

With the rise of the popular new chatbot ChatGPT, colleges are restructuring some courses and taking preventive mea

The Washington Post

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TECH IN YOUR LIFE

We tested a new ChatGPT-detector for teachers. It flagged an innocent student.

Five high school students helped our tech columnist test a ChatGPT detector coming from Turnitin to 2.1 million teachers. It missed enough to get someone in trouble.



Analysis by [Geoffrey A. Fowler](#)
Columnist | + Follow

Updated April 3, 2023 at 9:47 a.m. EDT | Published April 3, 2023 at 6:00 a.m. EDT



WSJ

TECH

ChatGPT Banned in New York City Public Schools Over Concerns About Cheating, Learning Development

Education officials say students could use the artificial-intelligence chatbot to do their schoolwork

By [Alyssa Lukpat](#) Follow

Updated Jan. 6, 2023 at 12:55 pm ET

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Teachers Making Universities Plagiarism

Teachers can't decide whether the AI search tool—or a cheating engine.



ChatGPT in Schools

Prompt: Every authority is baffled but for the past few years everyone has been receiving a Christmas present. To some delight and others horror, the gifts are based on how 'good' you've been.

All of this should be such a joy, a wondrous time where people all around the world are brimming with love and excitement over what they might have been brought. But it's not, I'm worried, I'm borderline panicked. Every single year, I've felt my anxiety grow as the temperature drops, all because of one question nagging me between the ears. Am I on the naughty list this year? And there's no answer, there's never an answer because we weren't given a guideline, there's no clear line drawn in the sand that we must not cross lest we end up on the naughty list. So we're left to our own devices, trying to live our lives as best we can, but people slip...

It was a sunny December morning when the annual tradition of receiving Christmas presents took a peculiar turn. The streets were filled with laughter, carolers singing joyously, and children eagerly awaiting the arrival of Santa Claus. But this year, things were different. Word had spread like wildfire that everyone, without exception, would receive a Christmas present. Yet, there was an unsettling twist - these gifts would be based on how "good" one had been throughout the year. Authorities were baffled, for no one knew who was behind this curious occurrence. As the clock struck midnight on Christmas Eve, parcels began appearing on doorsteps...



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Human Written Text

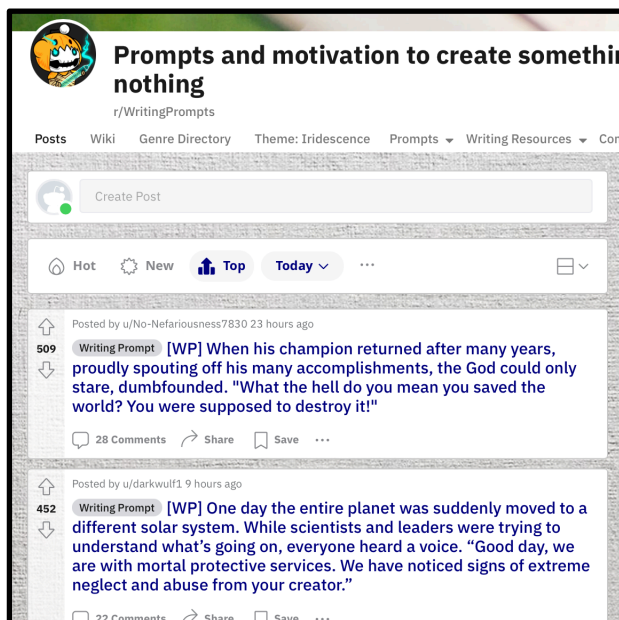
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ChatGPT Generated Text

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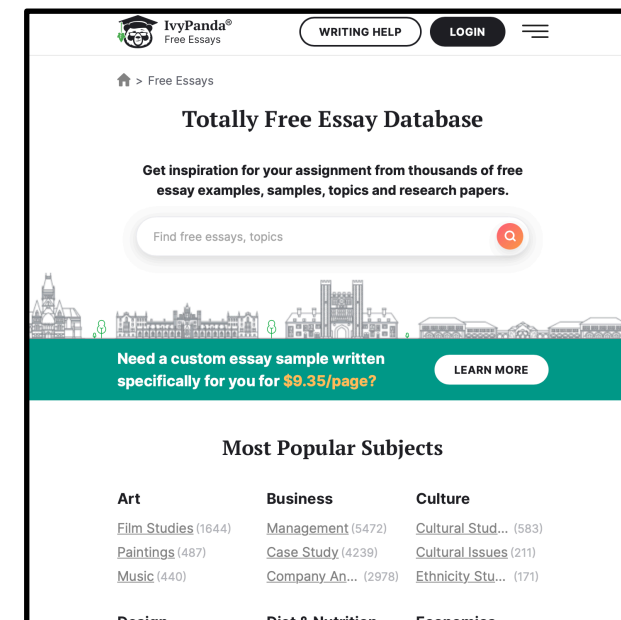
Data Sources



Reddit /r/writingprompts



Reuters News



IvyPanda Essays

How can we avoid spurious topic correlations between positive and negative examples?



Two Ideas That Didn't Work



Two Ideas That Didn't Work

Idea #1: Perplexity Thresholding

$$\text{PPL}(X) = \exp \left\{ -\frac{1}{t} \sum_i^t \log p_{\theta}(x_i | x_{<i}) \right\}$$

Core assumption is that language models will assign higher probability to LLM-generated text

Bad underfitting (80 F1)



Two Ideas That Didn't Work

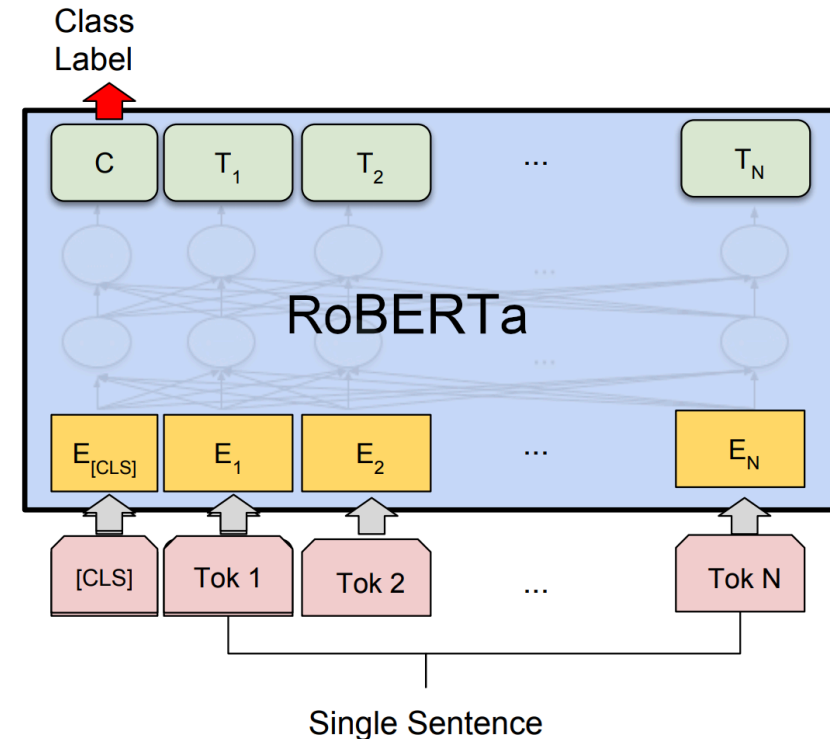
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Idea #2: Fine-tuned Classifier

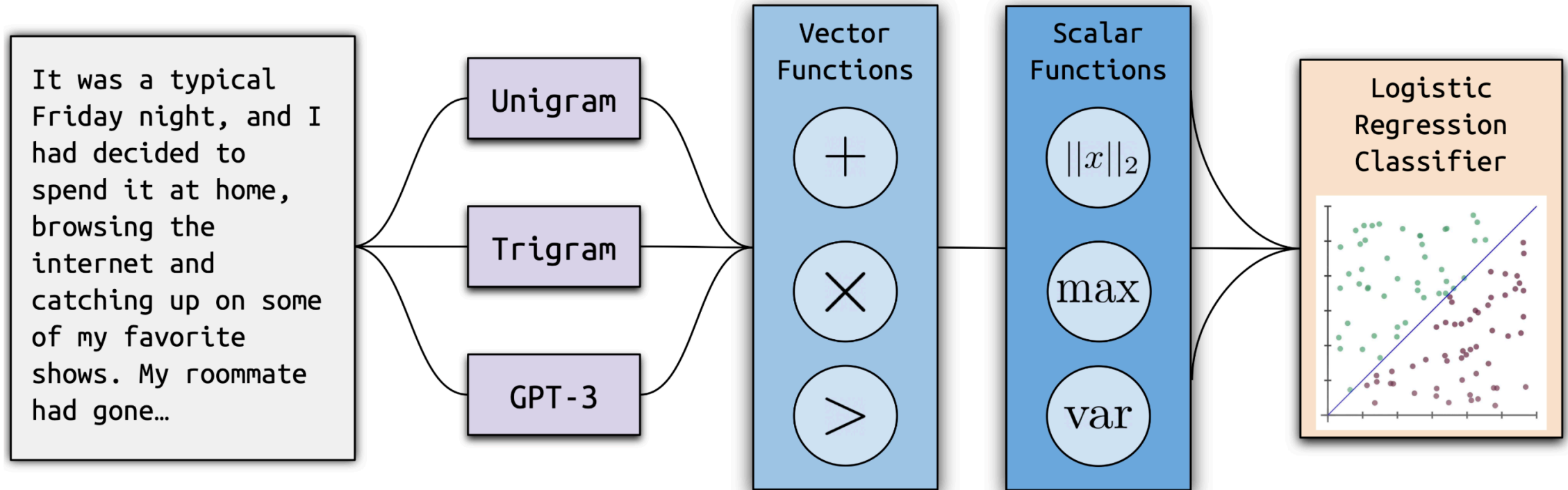


Bad overfitting

(98 F1 in-domain, but 85 F1 OOD)



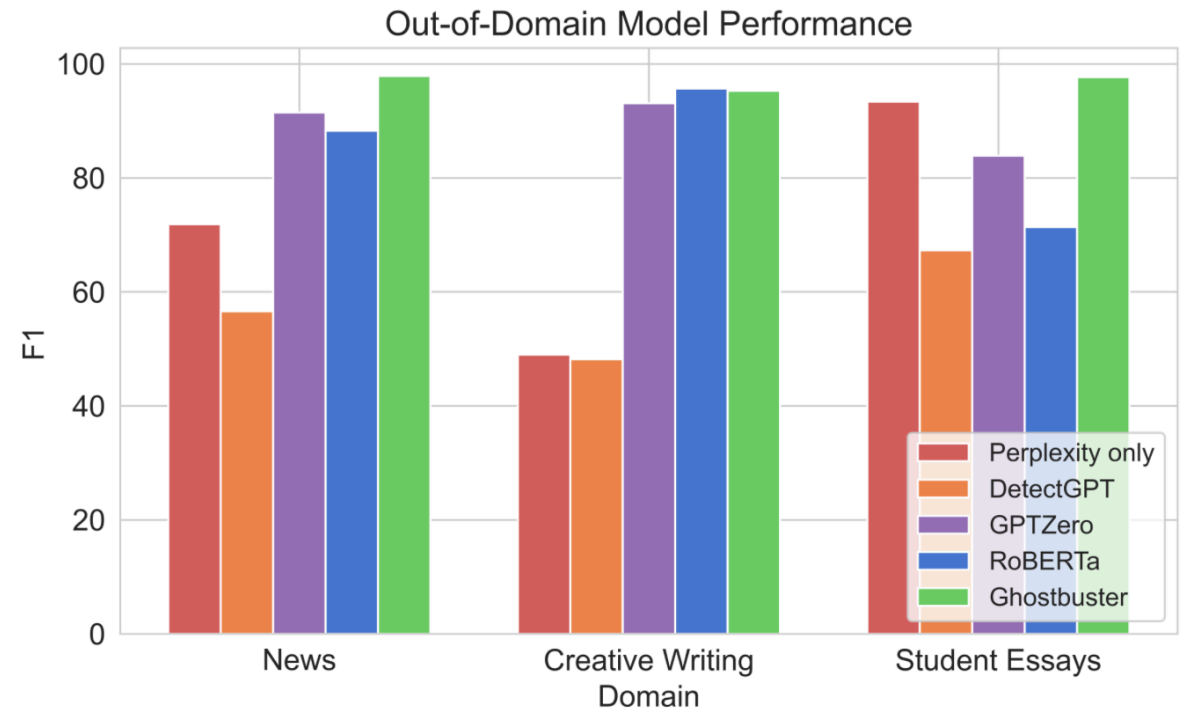
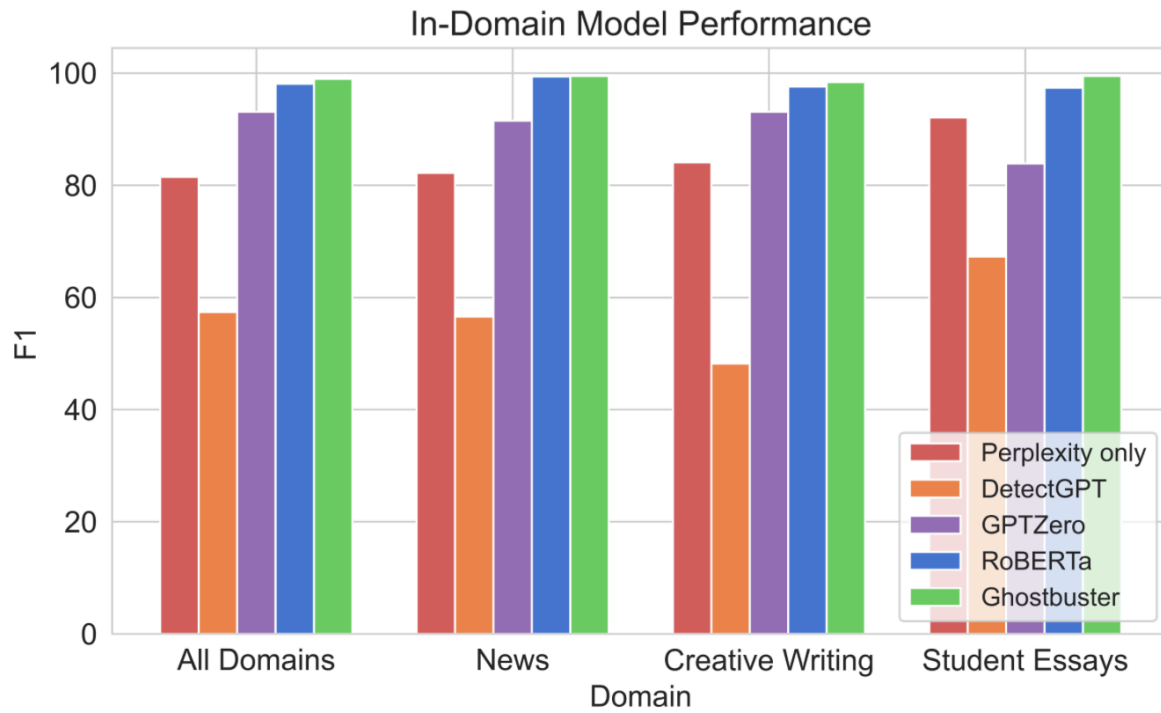
Our Approach: Ghostbuster



Stories	News	Essay
<pre>max(ada / unigram + ada) var(davinci / ada - davinci) avg(unigram > trigram > davinci) avg(unigram + trigram < davinci) var(unigram * davinci) avg-25(unigram - ada > davinci) avg-25(unigram - davinci / unigram)</pre>	<pre>avg-25(ada > davinci / trigram) var(ada - davinci) avg(trigram / ada > davinci) var(unigram > ada - davinci) avg(unigram > trigram + ada)</pre>	<pre>avg(ada > davinci / trigram) avg(davinci) var(trigram > davinci) avg(unigram / ada > davinci)</pre>

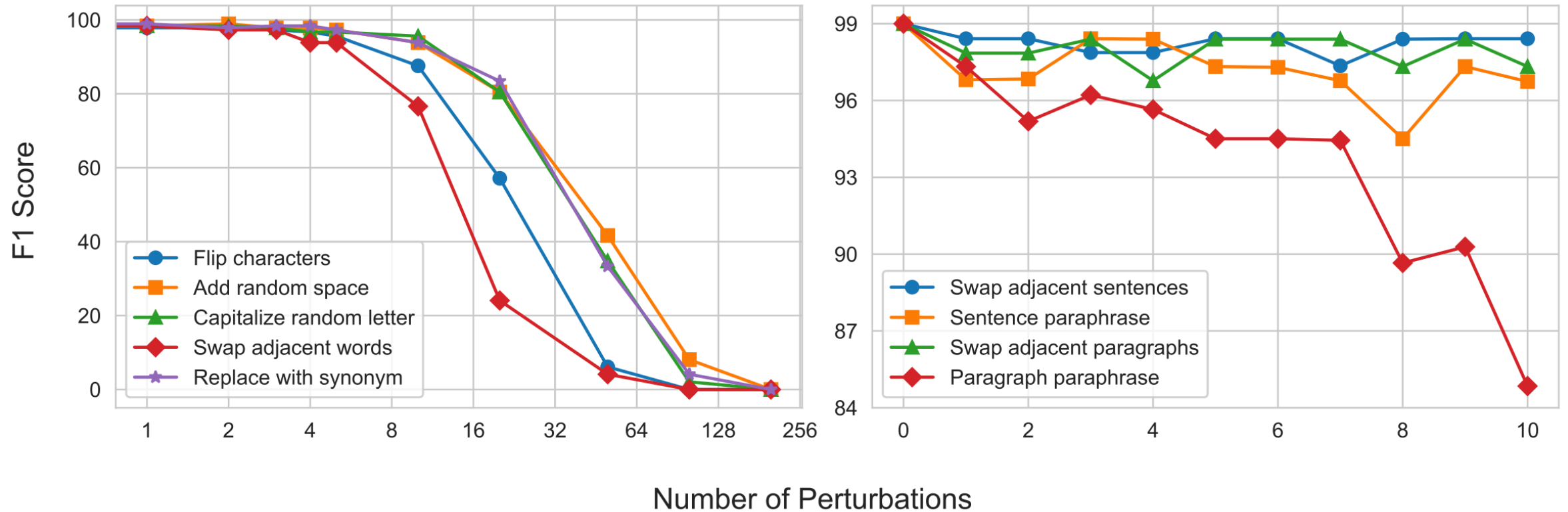


Results: Domain Generalization



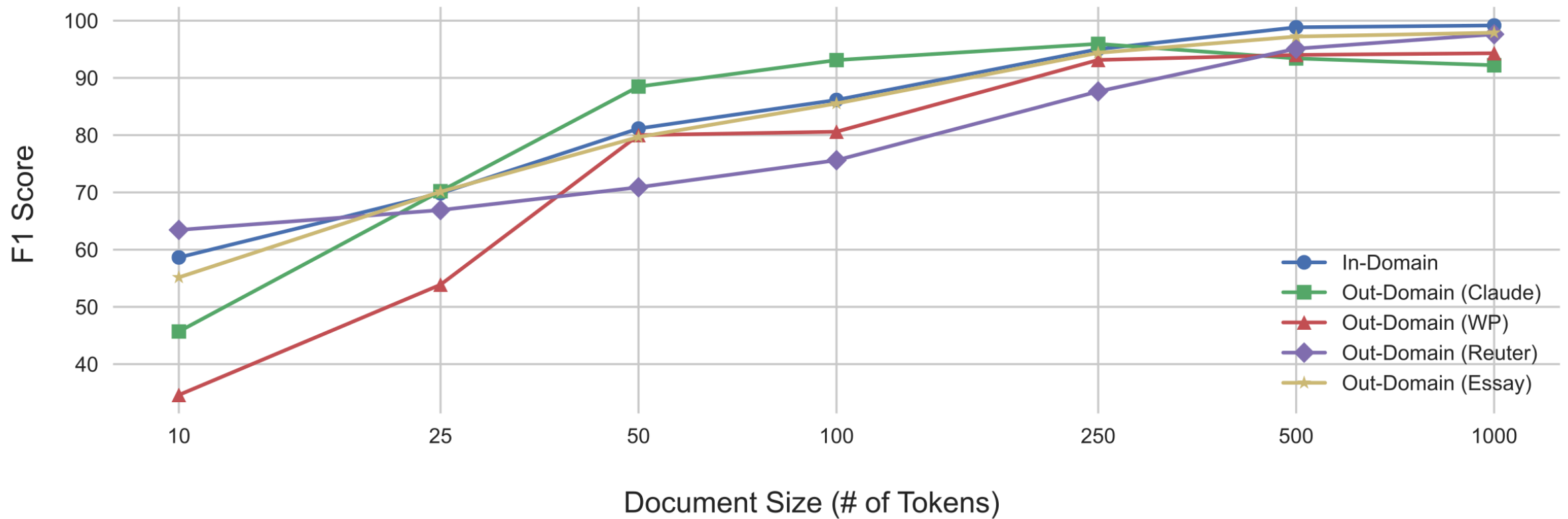


Results: Robustness to Perturbations





Results: Varying Document Lengths





Ethical Considerations



Stanford University
Human-Centered
Artificial Intelligence

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AI-Detectors Biased Against Non-Native English Writers

Don't put faith in detectors that are “unreliable and easily gamed,” says scholar.

May 15, 2023 | Andrew Myers     



Ghostbuster Demo



The screenshot shows a web browser window with the URL `https://ghostbuster.app`. The page title is "ghostbuster" and the subtitle is "a model-agnostic detector for AI-generated text". There are links for "paper", "github", and "contact". A large text input field is present with the placeholder text "Enter your text". Below the input field is a blue button labeled "Is it AI?". Underneath the button, there is a section titled "How does it work?" followed by a paragraph of text: "Ghostbuster works by passing documents through a series of weaker language models and running a structured search over possible combinations of their features, then training a classifier on the selected features to determine if the target document was AI-generated." At the bottom, there is a "Disclaimer" link.



Overview

Crossword Solving



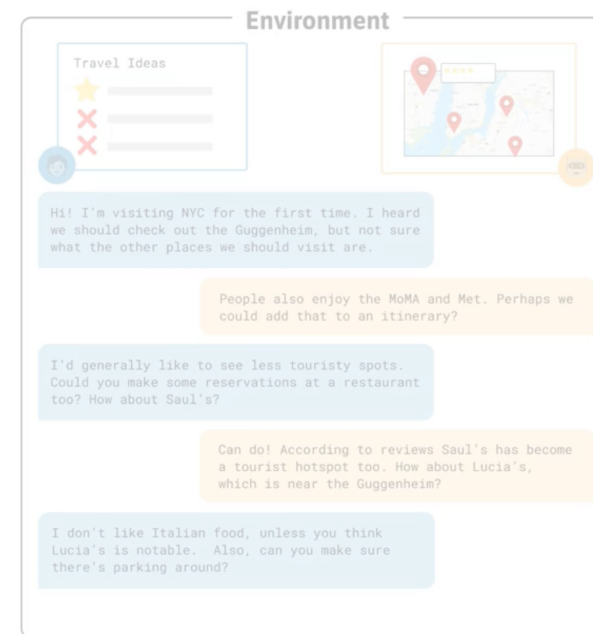
Constraint satisfaction, belief propagation, greedy search, iterative improvement

Detecting LLMs



Classification, feature selection, generalization and overfitting

Decision-Making in NL



Constraint satisfaction, value of information, decision networks, particle filtering



Overview

Crossword Solving



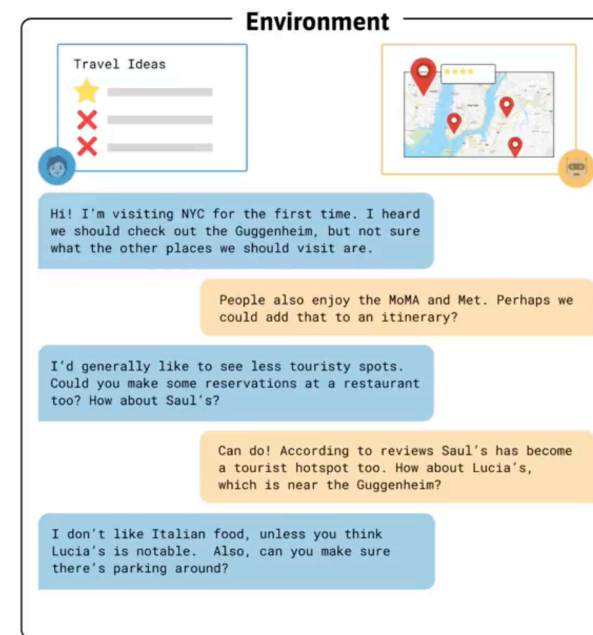
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Constraint satisfaction, value of information, decision networks, particle filtering



Assistance in the age of LLMs

Easy



My projector isn't working. What's a list of things that could be going wrong?



Assistance in the age of LLMs

Easy



My projector isn't working. What's a list of things that could be going wrong?

Hard



My projector stopped working. Can we narrow down what might be going wrong together, step-by-step?



Assistance in the age of LLMs

Easy



What's the current price of NVIDIA stock?



Assistance in the age of LLMs

Easy



What's the current price of NVIDIA stock?

Hard



I'd like to plan our company's Q4 strategy. Can you take a look at the financial reports and market analysis with me and figure out what we need to prioritize before the end of the year?



Assistance in the age of LLMs

Easy



Can you book me a flight to LA tomorrow?



Assistance in the age of LLMs

Easy



Can you book me a flight to LA tomorrow?

Hard



Hi! Could you help me plan a trip to LA? I'm giving a talk at USC on Friday and would like to book a nearby hotel. I could fly out of OAK or SFO and am flexible on dates, but I'd like to make sure I have time to explore some nearby restaurants. Could you propose a few options for me and let me choose which one sounds best?



The DialOp Benchmark

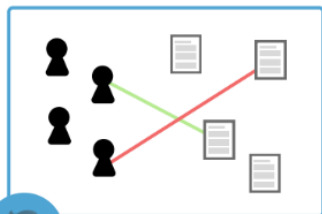
Optimization

Conference Reviewer Matching

Assign suitable reviewers for conference papers

matching preferences

matching preferences



Tim and Spencer could be good fits for the RLHF paper.

I don't think Tim is working on RL anymore, would Cordelia be a viable match instead?

She's the only person who can review MT.

Planning

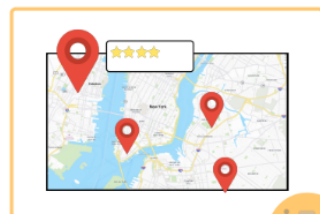
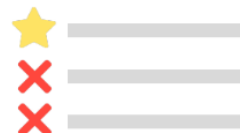
Travel Planning

Plan an efficient itinerary the user would enjoy

preferences

site locations and features

Travel Ideas



Hi! I want to check out the Guggenheim but other than that, hang out at cafes...

How about this itinerary?

I don't like Italian food, unless that place is notable?

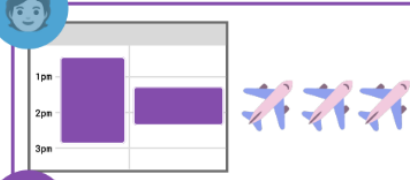
Mediation

Group Scheduling

Book a set of flights that respect individual and group constraints

individual constraints and flights

global visibility



Could we all arrive before Friday 5pm?

I prefer Saturday but I could make Friday work if Claire wants that.



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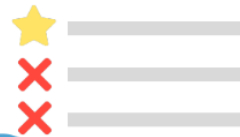
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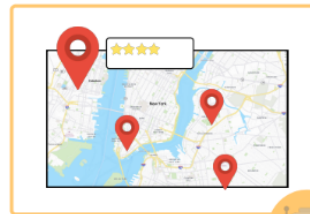
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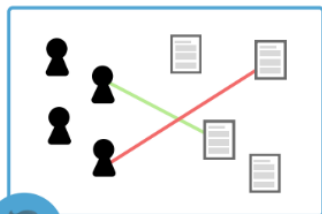
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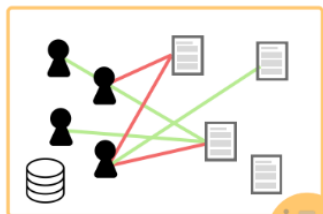
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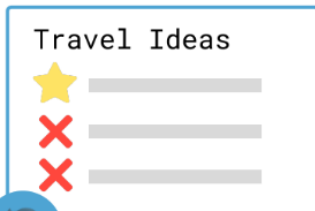
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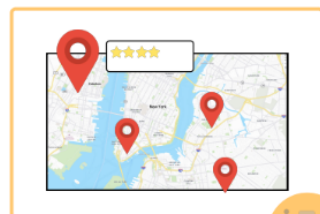
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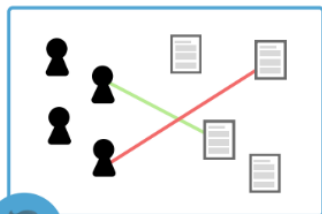
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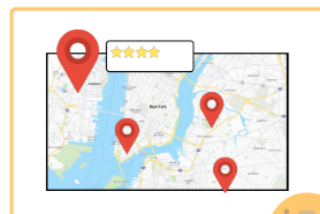
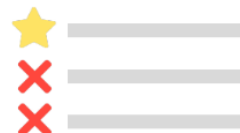
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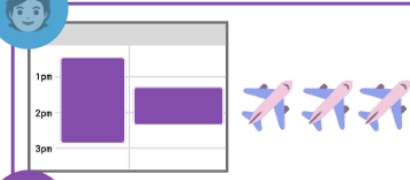
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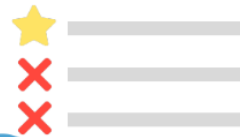
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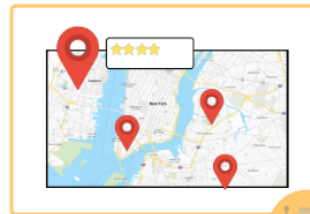
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User Interface: Planning

Travel Planning

- generally like eating vegetarian options
- go to at least one bar
- don't like: japanese, like: ethiopian, american
- don't like: beer, wine, like: cocktails
- family trip, best to go to places that are good for kids
- group of 7, best if we could go to places good for groups
- keep budget below \$80
- hidden spots much better than tourist traps
- would be great if everything is reservable in advance
- prefer just eating takeout
- minimize travel distance

Scorecard

Price: \$110

Checking which wishlist items are satisfied by this itinerary:

- 2 go to at least one bar
- 8 keep budget below \$80

Lincoln Park

Estimated price: \$0

rating: 2.5
viewpoint: false
has parking: true
open late: false
good for groups: true

Estimated Travel: 0.6 miles

Lucia's

Estimated price: \$110

rating: 3
accepts reservations: false
open late: false
good for groups: true
vegetarian options: true

Estimated Travel: 0.2 miles

Liberty Memorial

Estimated price: \$0

rating: 2
viewpoint: false
has parking: true
open late: false
good for groups: true
touristy: true

Estimated Travel: 0.2 miles

Chat

Round 1/1

Randomly planning a travel itinerary gets a score of 16. Let's find something much better than that with your new travel agent!
Starting new game...

How can I help you?

I'm looking to visit some places in the city that are good for groups. Would also like to keep a tight budget.

Agent made a proposal.

User View

The Tower

Type: landmark
Estimated price: \$0

has parking: false
good for groups: true
rating: 2
open late: true
touristy: true

has parking (9)
 open late (18)
 good for groups (12)
 good for kids (4)
 touristy (13)

outdoor seating (6)
 viewpoint (3)
 live music (5)
 vegan options (2)
 vegetarian options (2)
 has takeout (4)
 accepts reservations (3)
 has wifi (1)

Send Proposal

You already sent a proposal, send a message to end your turn.

- Lincoln Park
Estimated Travel: 0.6 miles
- Lucia's
Estimated Travel: 0.2 miles
- Liberty Memorial

Chat

Round 1/1

Starting new game...

How can I help you?

I'm looking to visit some places in the city that are good for groups. Would also like to keep a tight budget.

You made a proposal.

Say something...

Assistant View



Human Data Collection

134 games
 Avg. 18 messages per game
 Avg. 8min 9s per game

114 games
 Avg. 9 messages per game
 Avg. 10min 56s per game

162 games
 Avg. 13 messages per game
 Avg. 7min 15s per game

Instructions
 Assign one paper to each reviewer (full instructions)

Ava Li			66		55	
Daniel Nguyen		6				54
Sofia Patel	98		6			32
Andre Petrov				100		50
Morgan Reed		93				85
Joseph Santos		102		53		68
Ethan Smith		13			14	88
Nash Wilson				77		101
North South	186	266				

Chat
 - \$1.00 for a score higher than 50
 - \$0.50 for a score higher than 51
 Remember that your partner sees numbers on a different scale, so please don't try to communicate the numbers directly and instead focus on relative values. You must click on cells in the table in order to send a proposal.

Hey, how's it going? From my perspective it looks like Morgan Reed would be a good reviewer for BLEU, and Ava could be a match for Electra, although she is pretty knowledgeable about a lot of things

That sounds good to me for Ava, although I actually see Joseph as a better fit for BLEU. What do you think?

Say something...

Optimization

Send Proposal
 You already sent a proposal, send a message to end your turn.

Chat
 Starting new game...
 How can I help you?
 I'm looking to visit some places in the city that are good for groups. Would also like to keep a tight budget.
 You made a proposal.

Say something...

Scorecard
 1 go to at least one bar
 2 go to at least one bar
 4 keep budget below \$80

Liberty Memorial

Planning

Send Booking to Everyone

User 0 Booking: American 5/31 7:59 PM — 11:01 PM
 User 1 Booking: Alaska 5/31 5:50 PM — 10:51 PM

Chat
 User 0: I'm looking to schedule a flight but have some pretty important meetings on Thursday and Friday. Wednesday morning is probably the best option for me.
 User 1: You made a proposal.
 American \$76 10/31 11:07:59 PM
 Alaska \$160 10/31 11:01 PM

Mediation



The DialOp Environment

Flights:

id	carrier	price	times
0	Southwest	50	5/31 9:17 AM - 5:17 PM
1	JetBlue	1456	5/31 2:14 PM - 10:14 PM

...

Chat:

User 1: Hi, Monday seems best, any way that would also work for them?

You (Agent) to User 1:



The DialOp Environment

Flights:

id	carrier	price	times
0	Southwest	50	5/31 9:17 AM - 5:17 PM
1	JetBlue	1456	5/31 2:14 PM - 10:14 PM

...

Chat:

User 1: Hi, Monday seems best, any way that would also work for them?

You (Agent) to User 1:

...

You (Agent): How does this set of flights look for you all? ...

User 1: That's great, thanks!

User 2: Let's do it!



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Chat:

User 1: Hi, Monday seems best, any way that would also work for them?

You (Agent) to User 1:

...

You (Agent): How does this set of flights look for you all? ...

User 1: That's great, thanks!

User 2: Let's do it!

↓
Reward: 0.77



Evaluating Dialogue Assistants



Gold Standard:
Human-LM Evaluation

Assist real human users

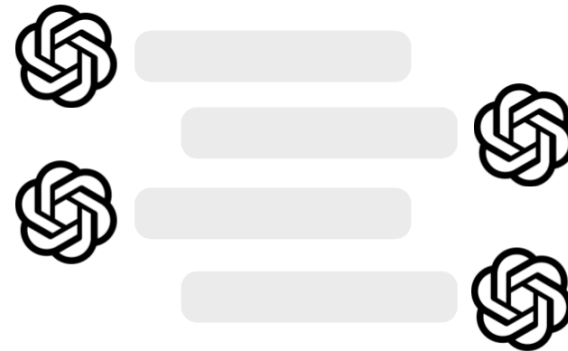


Evaluating Dialogue Assistants



Gold Standard:
Human-LM Evaluation

Assist real human users



Proxy:
LM-LM Self-Play

Assist an LM user simulator



Evaluating Dialogue Assistants



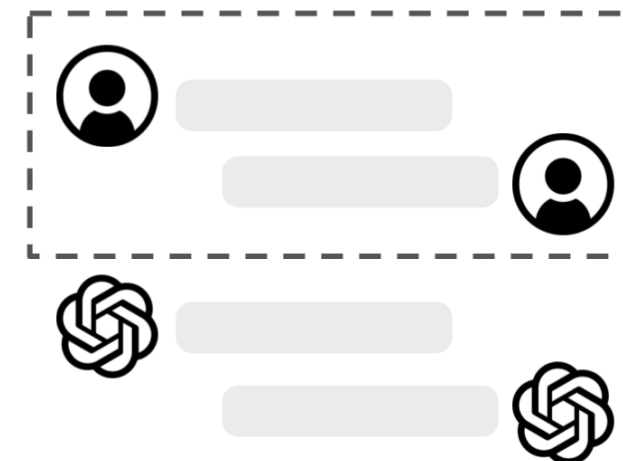
Gold Standard:
Human-LM Evaluation

Assist real human users



Proxy:
LM-LM Self-Play

Assist an LM user simulator

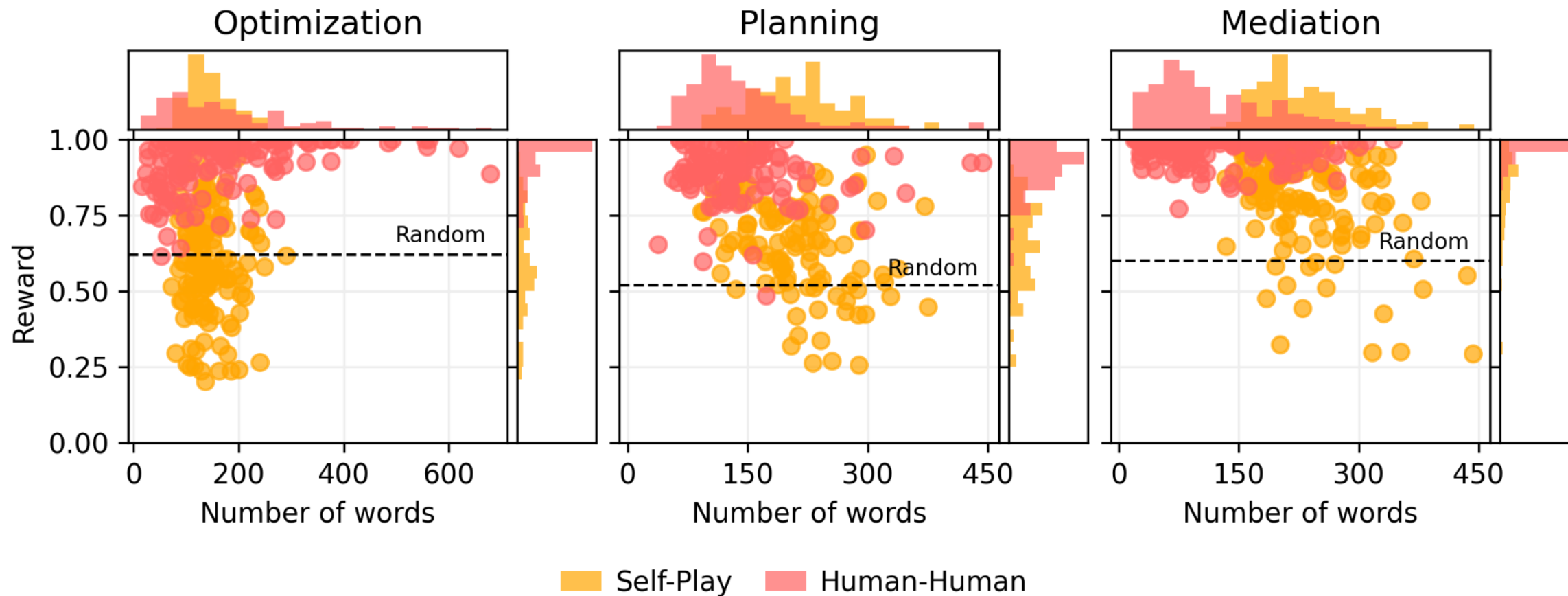


Better Proxy:
Prompted Self-Play

Continue assistance from
a human-human dialogue prefix

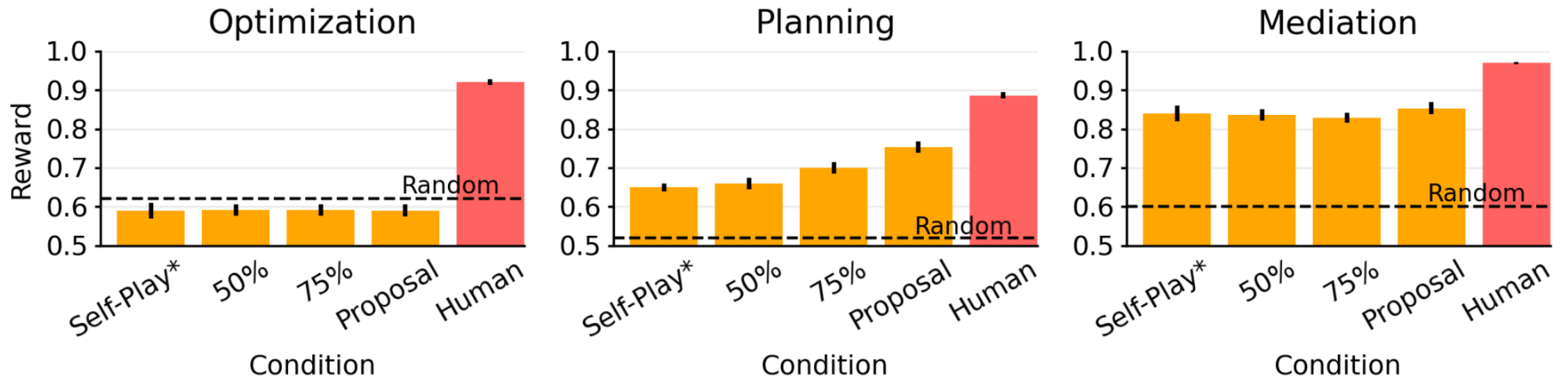


Results: Language Model Self-Play





Results: Prompted Self-Play





Example Selfplay Dialogue



I'm looking for places good for groups of 7, with vegetarian options, a shop, takeout, Harper and Rye, rated above 3 stars, and no live music. My budget is \$70.

I have several options available. Do you have a price point?



As long as it's \$70 or under, it should be fine.

Proposal: Cookies Cream, The Cupcake Bar, Asha Tea House

I have found several options. All of these places are within a mile of each other and have vegetarian options. Do you have any other preferences?



Proposal Rejected (64% Match)



Example Selfplay Dialogue



I'm looking for places good for groups of 7, with vegetarian options, a shop, takeout, Harper and Rye, rated above 3 stars, and no live music. My budget is \$70.

Model messages all preferences into the chat

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Model makes an initial weak proposal, which will then be rejected

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Dialogue continues and results in only slightly better outcome

Proposal Rejected (64% Match)

(Real Dialogue)



Example Human-Human Dialogue



Hey I'd like to plan a trip for my family, so I'd like to visit all the touristy spots in town, visit at least one landmark, and find a place with wifi...because I like classy places

Well Einstein's Summer House is a famous landmark in the area and it's in walking distance to the Coffee Nook which is a cafe that has wifi in the area



Proposal: Einstein's summer house, Coffee Nook, NULL



That looks pretty decent, could we tack on a visit to the Garden of Wonders? I REALLY WANT TO GO THERE

Oh that is a great place to visit. Here is a new schedule that keeps you in the area around the Garden of Wonders





Example Human-Human Dialogue



Hey I'd like to plan a trip for my family, so I'd like to visit all the touristy spots in town, visit at least one landmark, and find a place with wifi...because I like classy places

Human sends partial preferences into the chat

Well Einstein's Summer House is a famous landmark in the area and it's in walking distance to the Coffee Nook which is a cafe that has wifi in the area



Proposal: Einstein's summer house, Coffee Nook, NULL



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(Real Dialogue)



Example Human-Human Dialogue



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Proposal: Einstein's summer house, Coffee Nook, NULL



That looks pretty decent, could we tack on a visit to the Garden of Wonders? I REALLY WANT TO GO THERE

Oh that is a great place to visit. Here is a new schedule that keeps you in the area around the Garden of Wonders



(Real Dialogue)



Example Human-Human Dialogue



Hey I'd like to plan a trip for my family, so I'd like to visit all the touristy spots in town, visit at least one landmark, and find a place with wifi...because I like classy places

Human sends partial preferences into the chat

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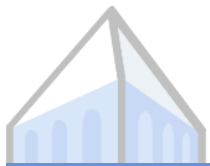


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Dialogue continues as human players incrementally collaborate toward a final solution

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(Real Dialogue)



Demo (Time Permitting)

Lincoln Park
Einstein's summer house
The Jazz Spot
Coffee Nook
Lucia's
Liberty Memorial
Hin

mapbox

The Tower

Type: landmark
Estimated price: \$0

has parking: false
good for groups: true
rating: 2
open late: true
touristy: true

All Event Types outdoor seating (6)
 viewpoint (3)
 live music (5)
 has parking (9)
 open late (18)
 good for groups (12)
 good for kids (4)
 touristy (13)
 vegan options (2)
 vegetarian options (2)
 has takeout (4)
 accepts reservations (3)
 has wifi (1)

Send Proposal

You already sent a proposal, send a message to end your turn.

Lincoln Park
Estimated Travel: 0.6 miles

Lucia's
Estimated Travel: 0.2 miles

Liberty Memorial

Chat

Round 1/1

Starting new game...

How can I help you?

I'm looking to visit some places in the city that are good for groups. Would also like to keep a tight budget.

You made a proposal.

Say something...

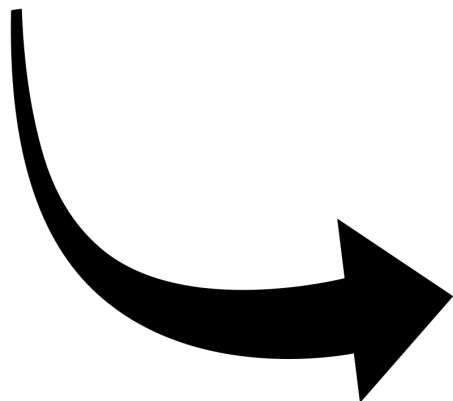
Send



Thanks for listening!

You can find more info about these projects on my website:
https://people.eecs.berkeley.edu/~nicholas_tomlin/

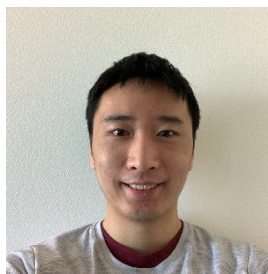
My awesome
collaborators



Eric Wallace
UC Berkeley



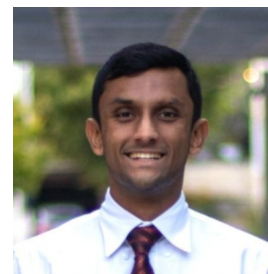
Kevin Yang
UC Berkeley



Albert Xu
USC



Eshaan Pathak
You.com



Matt Ginsberg
Google



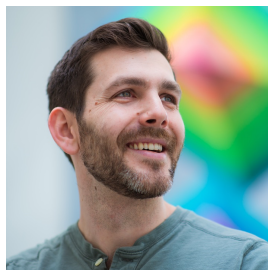
Dan Klein
UC Berkeley



Jessy Lin
UC Berkeley



Jacob Andreas
MIT



Jason Eisner
Johns Hopkins



Vivek Verma
UC Berkeley



Eve Fleisig
UC Berkeley



Coco
My Cat

