A person with a backpack is standing on a grassy hill, looking out over a vast landscape of rolling green hills and a large, conical volcano in the distance under a blue sky with scattered clouds.

To Run Where the Brave Dare Not Go: **The Future of Human-AI Systems**

Dr. Ting-Hao (Kenneth) Huang
Pennsylvania State University



What do we work on?

- Intersection of **Human-Computer Interaction (HCI)** and **Artificial Intelligence (AI)**.
- Enable practical, efficient, and robust collaboration between **humans** and **intelligent systems**.
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Like What?

- **Human-Like, Open Conversation**
- **Creative Writing**
- **Visual Storytelling**
- **Community Empowerment**

Like What?

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Chorus (HCOMP'16, HCOMP'17), *Evorus* (CHI'18),
InstructableCrowd (Human Computation Journal'19), ...

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Heteroglossia (CHI'20, NAACL'21)

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Outline

- **Human-Like, Open Conversation**

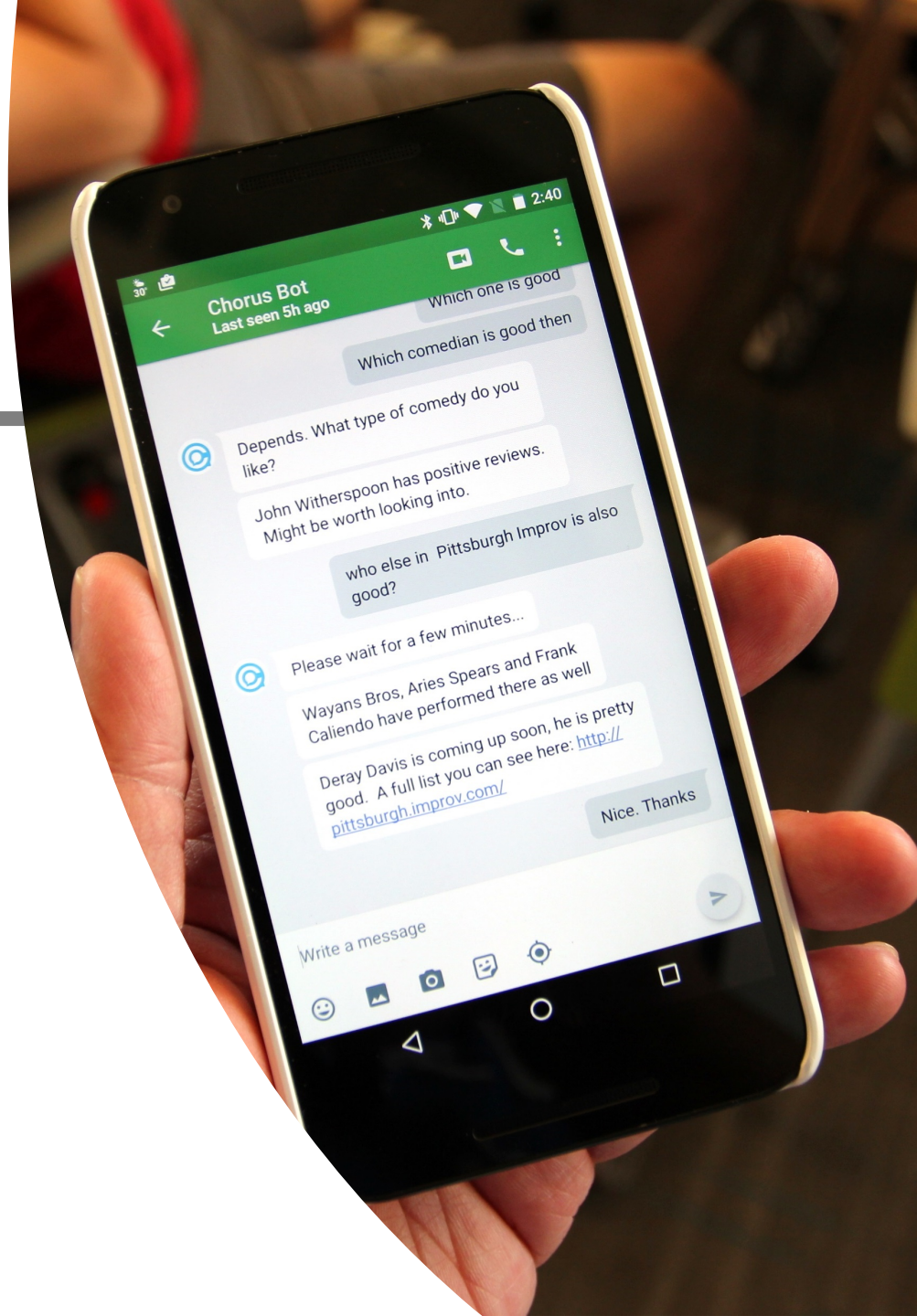
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A Crowd-Powered Conversation Assistant





Chorus Bot
Active 4h ago



10

Hi



What can I help you with? I'll be able to chat in a few minutes.

I'm at CHI 2018 conference now

9:44 AM

I'll have two free day on Friday and Saturday here

What should I do



That;s great.

Are you interested in watching movies?

Not really. I want to do something local or some sightseeing

Not really. I want to do something local or some sightseeing



Okay. Give me a minute.

Have you visited the Botanical Garden?

No. What is that



Declared a National Historic Site of Canada in 2008, the gardens attract nearly 700,000 visitors each year and boast vast collections and impressive facilities. They are one of four nature attractions under the city of Montreal's Space for Life (Espace Pour la Vie) umbrella, the others being the Biodome, the Rio Tinto Alcan Planetarium and the Insectarium.

year and boast vast collections and impressive facilities. They are one of four nature attractions under the city of Montreal's Space for Life (Espace Pour la Vie) umbrella, the others being the Biodome, the Rio Tinto Alcan Planetarium and the Insectarium.

Oh wow

So this is the top recommendation?

Is it indoor or outdoor? What's the weather like on Fri and Sat?



Notre-Dame Basilica is also worth checking out

Its Outdoor.

Its Outdoor.

I've visited Notre-Dame Basilica...
So what's the weather on
Fri and Sat

Will it rain? If it's outdoor...



There's a slight chance of raining.

How about temperature?



~8 degrees

Well that's not to bad

I'm from Pittsburgh hahaha

I think that is good for me now

Thanks

I think that is good for me now

Thanks



You're welcome.

You can check out this: https://www.visitacity.com/en/montreal?campaignid=358308965&gclid=EAlaIQobChMIkP7cIYbT2gIVCh4rCh0uoAC1EAAYASAAEgKsB_D_BwE

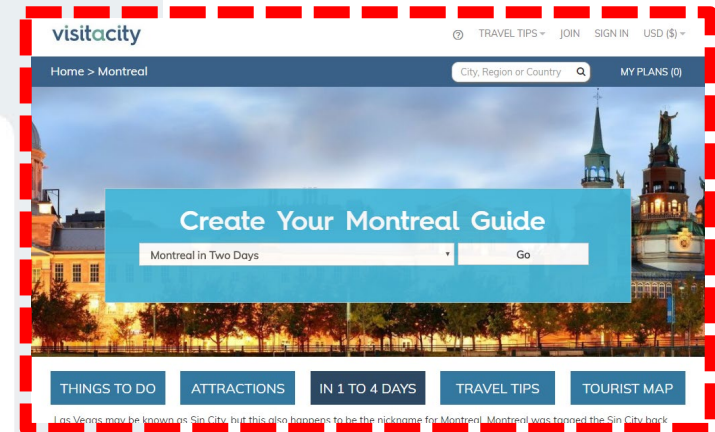
Is there anything else you'd like to ask?

No that's it I think

Thanks!

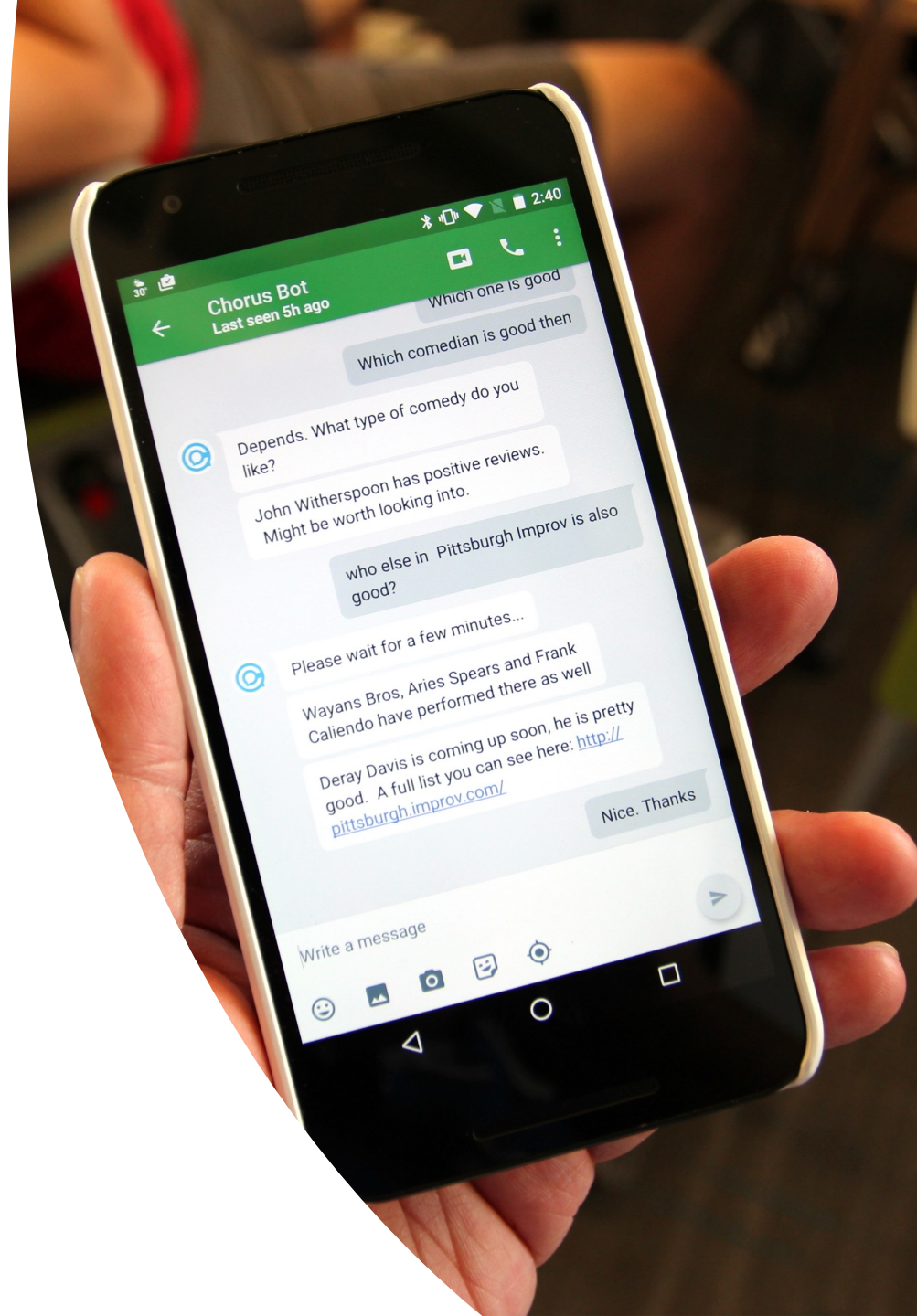


Goodbye. Have a wonderful time!

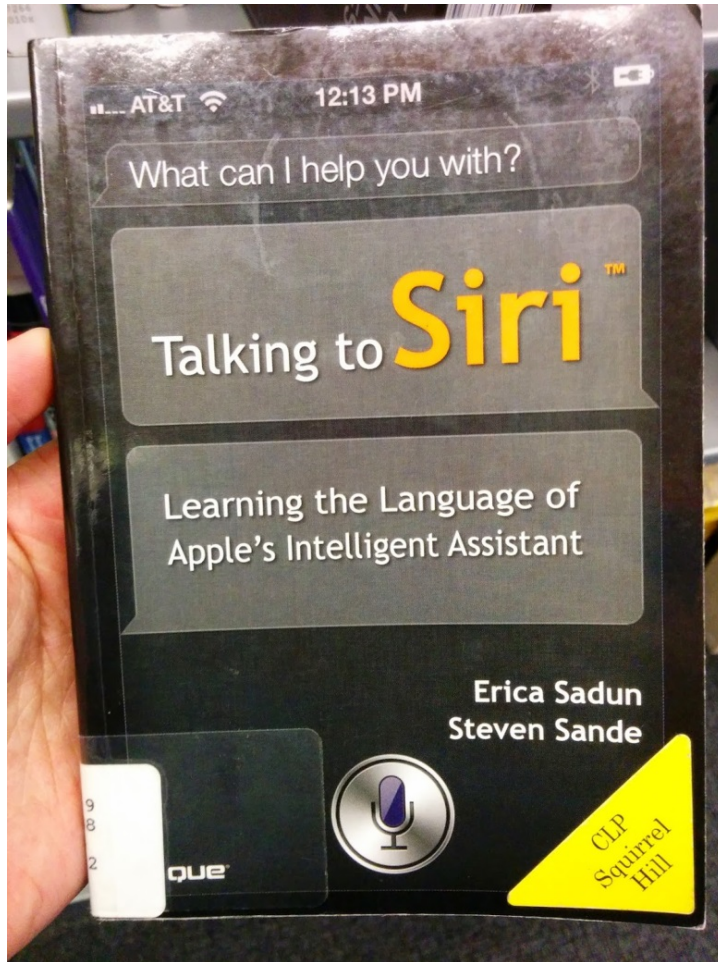


What just happened?

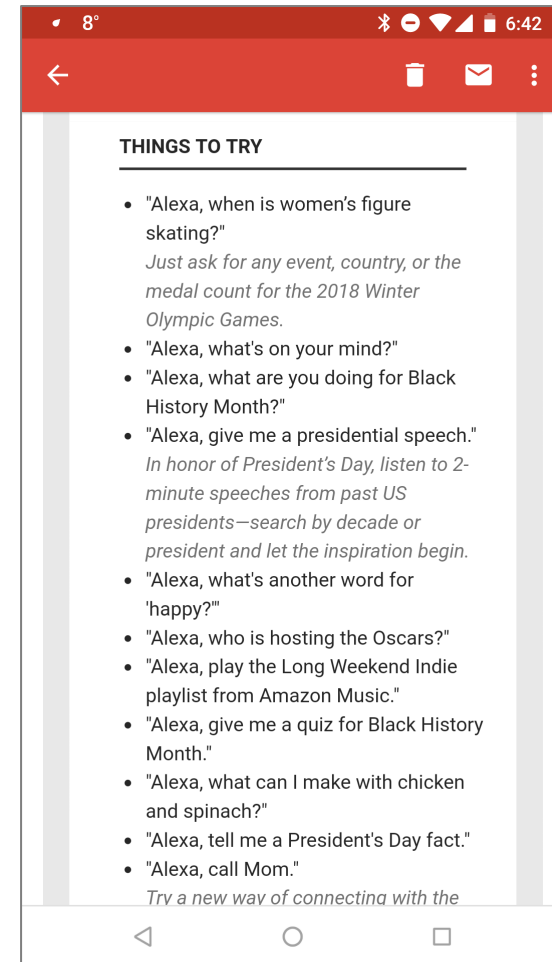
- **Open Conversation**
 - Multi-turn interaction
 - Multiple domains
 - Personalized
 - Coherent dialog
 - Mix of task-oriented and social conversation



Today's Conversational Assistants...



“Talking to Siri”



**Weekly Newsletter on
How to Talk to Alexa**

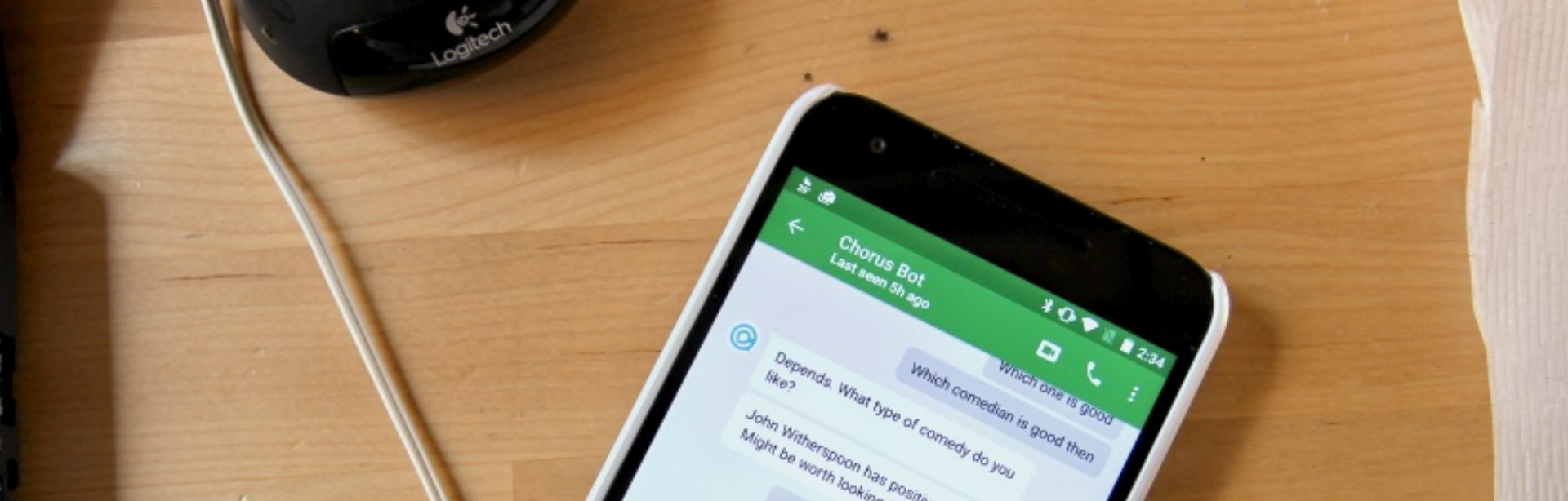
Existing Approaches to Open Conversation

- Combining **multiple task-oriented dialog systems**
 - DialPort (Zhao, *et al.*, 2016)
- **End-to-end** framework for dialogue systems
 - Serban, et al. 2016; Li, et al. 2017
- **Adapting** a model to many other domains
 - Walker, *et al.*, 2007; Sun, *et al.*, 2016
- **Chit-chat** systems (social bot)
 - Hold social conversations (Banchs, *et al.*, 2012)

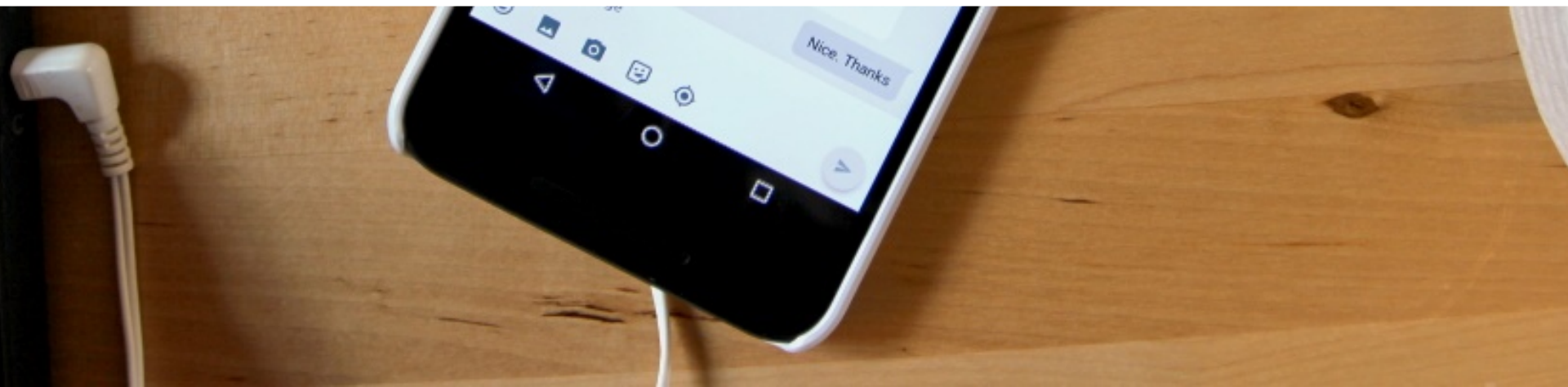
- **Still a very hard problem...**

The Alexa Prize

A \$500,000 prize will be awarded to the team selected for creating the best socialbot. The second- and third-place teams will receive prizes of \$100,000 and \$50,000, respectively. Additionally, a \$1 million research grant will be awarded to the winning team's university if their socialbot achieves the grand challenge of conversing coherently and engagingly with humans for 20 minutes with a 4.0 or higher rating.



Chorus: A Crowd-Powered Conversation Assistant

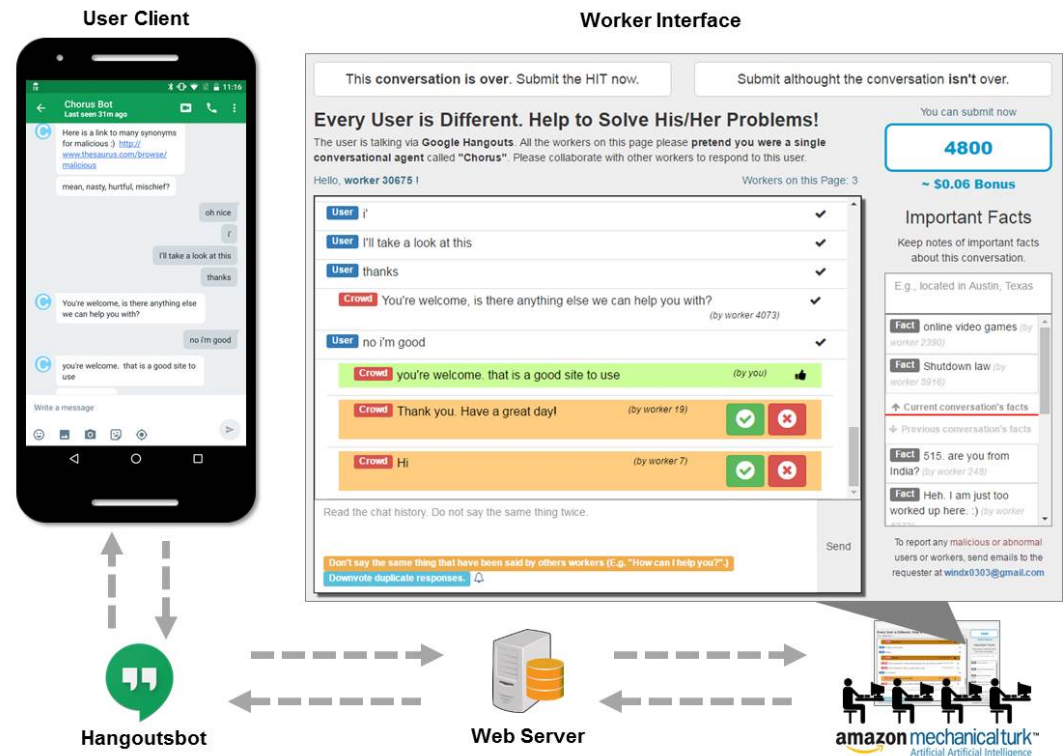


Chorus: A Crowd-Powered Conversation Assistant

- Crowd workers collectively hold a conversation by:

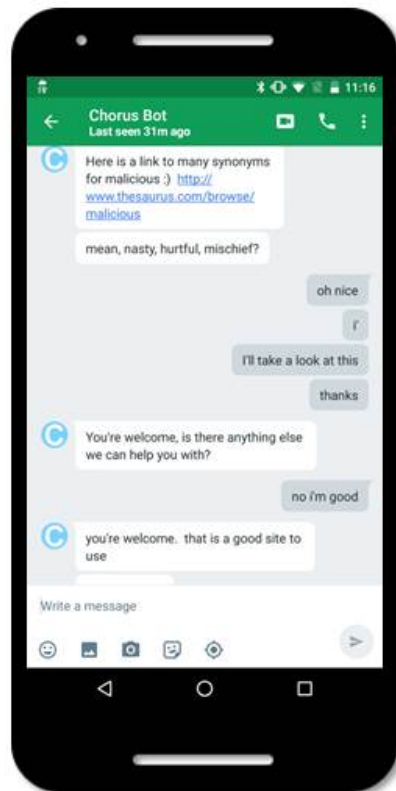
1. Propose Responses
2. Vote Responses
3. Take Notes

Reward points for each action



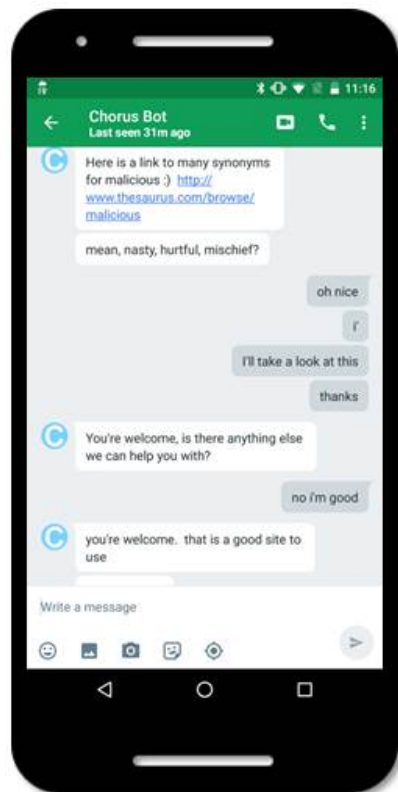
User Interface

User Client

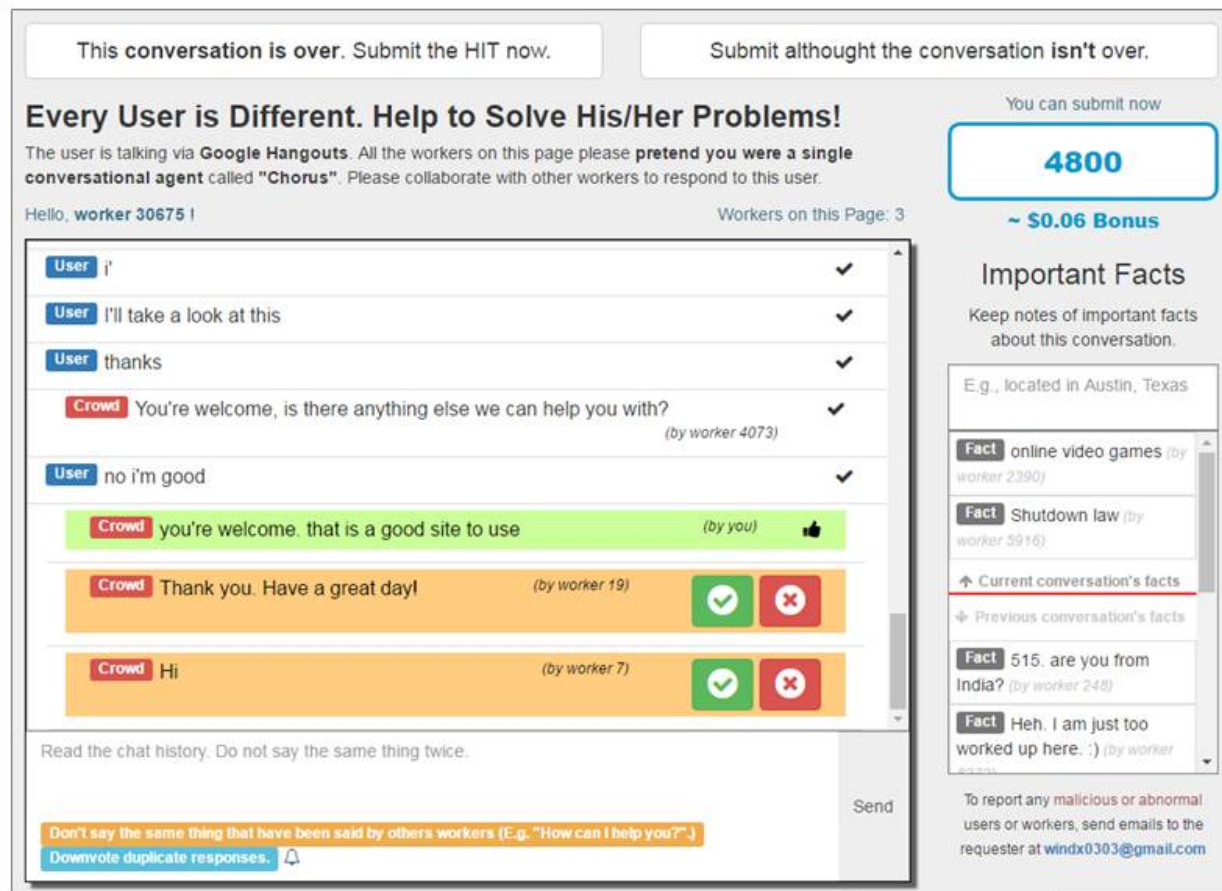


User & Worker Interface

User Client



Worker Interface



Hangoutsbot

Web Server





We Deployed Chorus

- Launched on May 20th, 2016
 - On Google Hangouts
 - **2200+** conversations, **420+** users
- **TalkingToTheCrowd.org**

JS

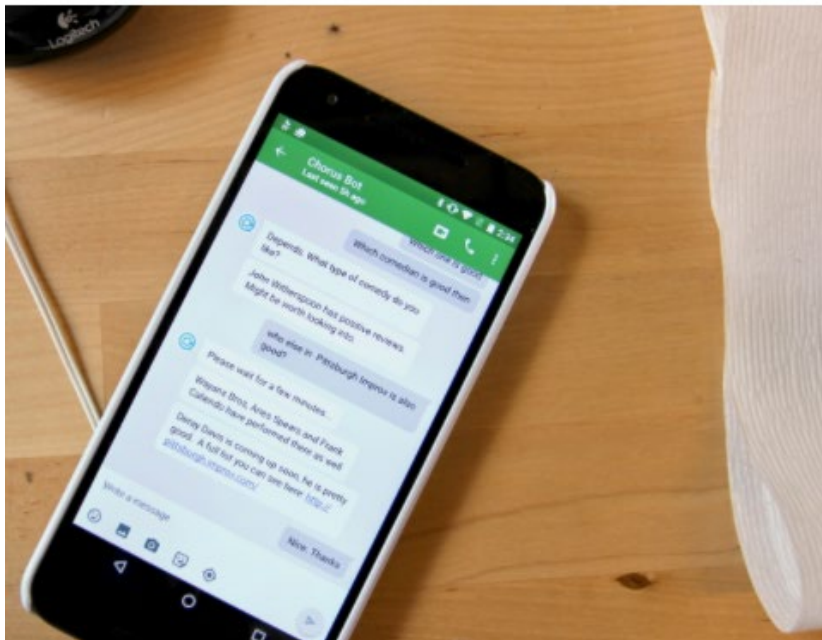
Home

Try It Now

FAQ

Papers

Team



A Conversational Age Powered by Crowdsourcing

Chorus is a Google Hangouts chatbot powered by crowdsourcing. A group of crowd workers will chat with you and try to solve your problems. Chorus on Google Hangouts for anything and everything.

Inside Chorus, we created **Evorus**, a Crowd-sourced bot that **automates Chorus over time**. Evorus won a Mention Award (top 5%) at CHI 2018.

[Tweet](#) [分享](#)

Gift Suggestion

Can you suggest some birthday present for one of my friend?



female, computer science
PhD student in Texas



Sure! **What types of things does your friend like?**

we're going to visit her this weekend from Pittsburgh

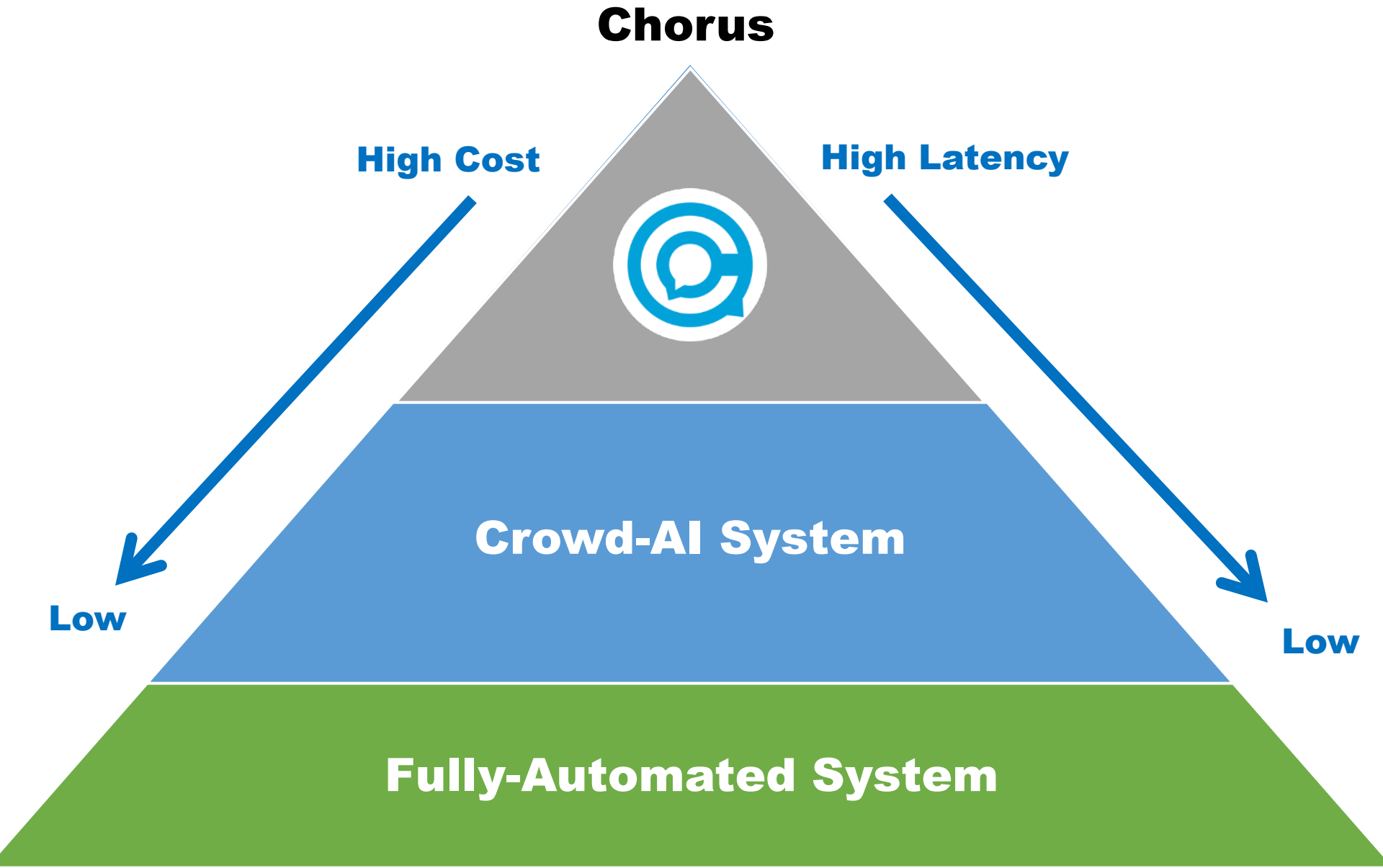


She's in Austin



Does she have any favorite TV shows, movies, or video games?


A Top-Down Approach





Evorus: A Crowd-Powered Conversational Assistant Built to Automate Itself Over Time

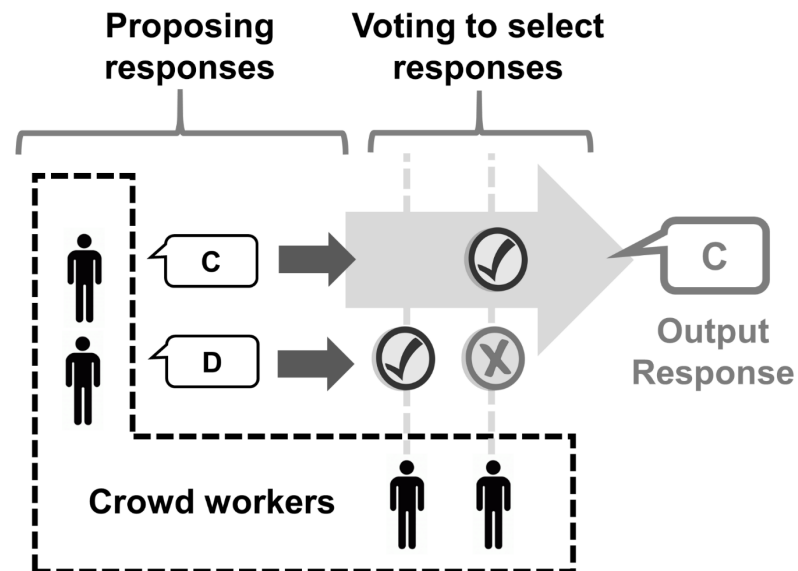


NEW ON 

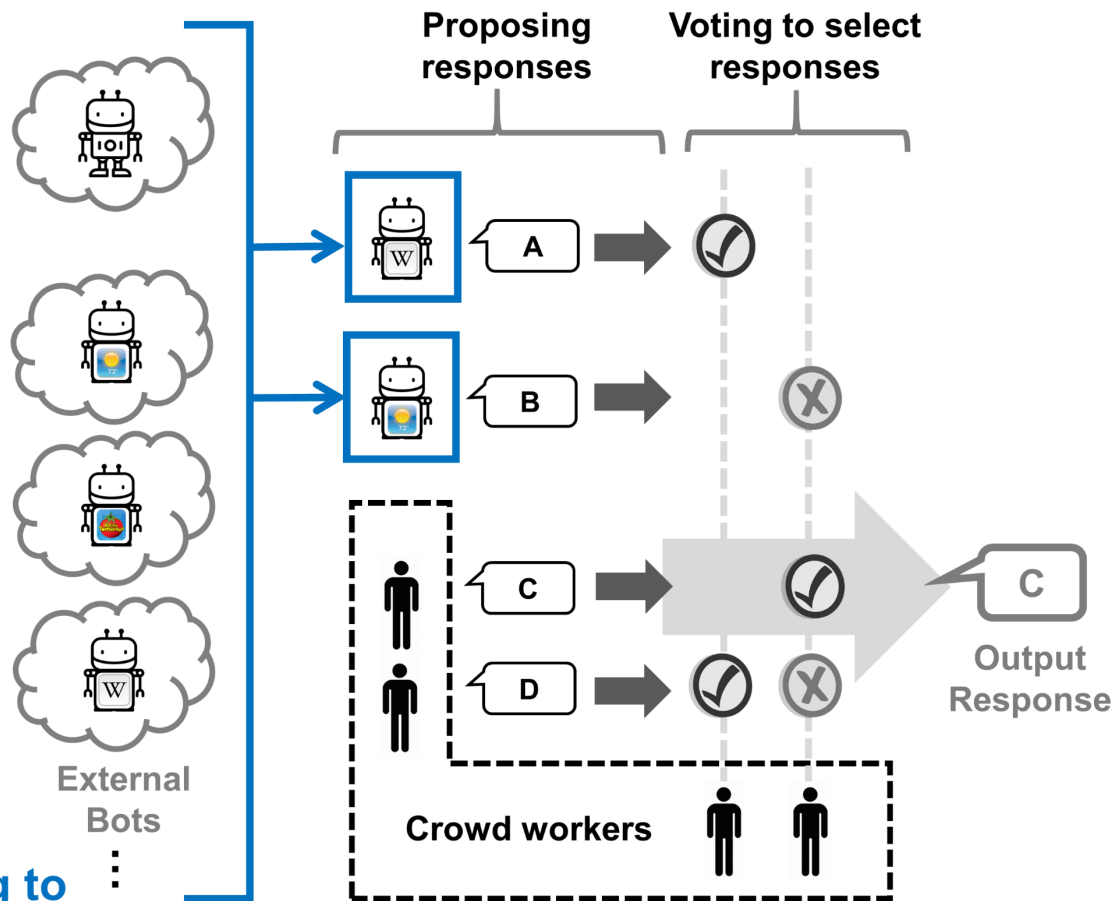
JOINING THE CONVERSATION
CMU CREATES CHATBOT SYSTEM

PITTSBURGH'S
ACTION NEWS 4

Automating Chorus Over Time

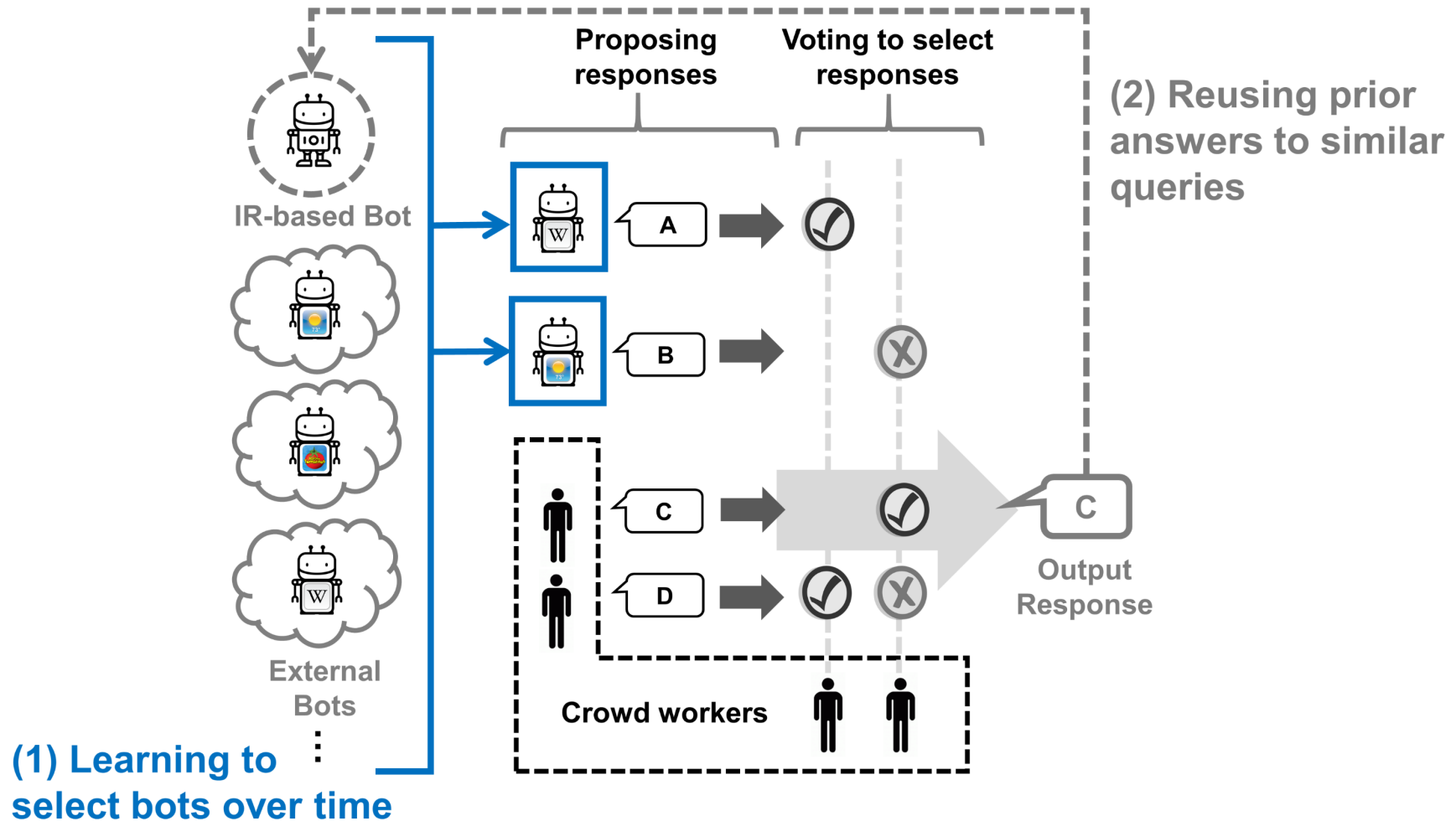


Automating Chorus Over Time

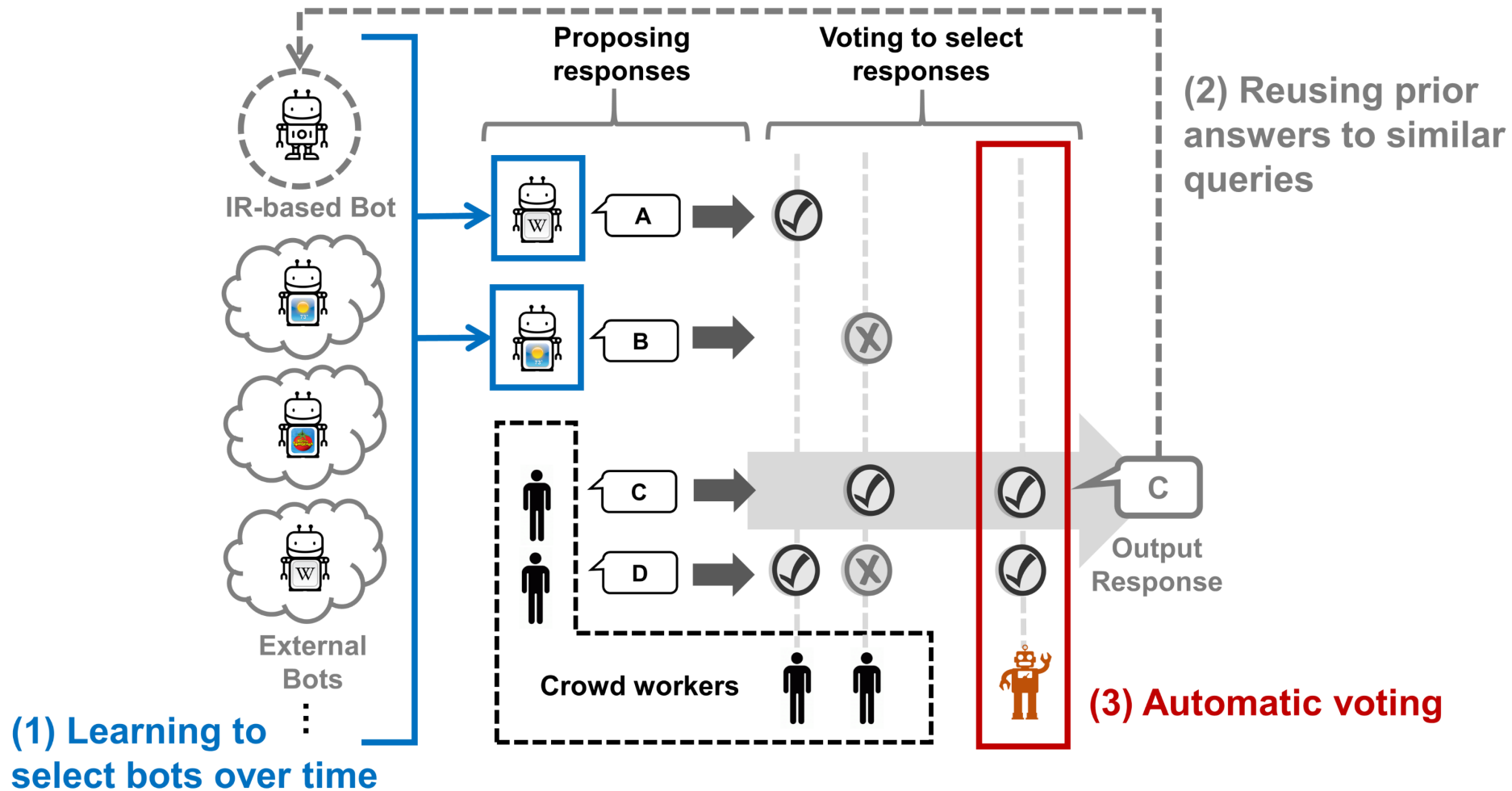


(1) Learning to
select bots over time

Automating Chorus Over Time



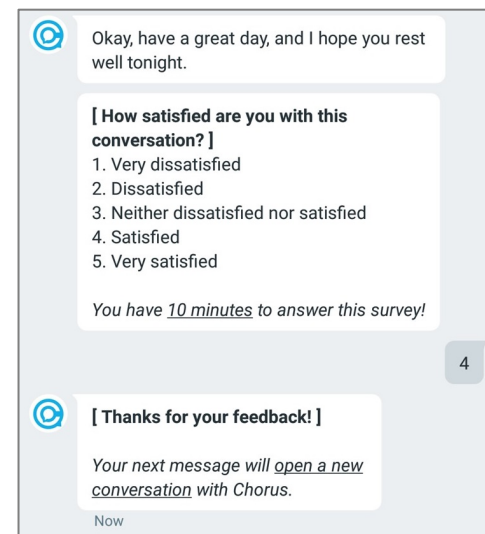
Automating Chorus Over Time





Automating Open Conversations

- **Setup**
 - A 5-month-long deployment, 80 Users
 - 4 chatbots + 1 voting bot
- **Result**
 - Automated **responses** were chosen **12.44%** of the time.
 - Human **upvotes** were reduced by **13.81%**.
 - The **cost of each message** is reduced by **32.76%**.
- **Conversation quality and user satisfaction level remains.**
 - Conversation Quality: Satisfaction, Clarity, Responsiveness, Comfort
(*Liu, et al., 2010*)



What did we learn?

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Start with a **human-in-the-loop system** and **automate it over time!**

Outline

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Heteroglossia (CHI'20, NAACL'21)



Heteroglossia: In-Situ Story Ideation with the Crowd

[CHI 2020]



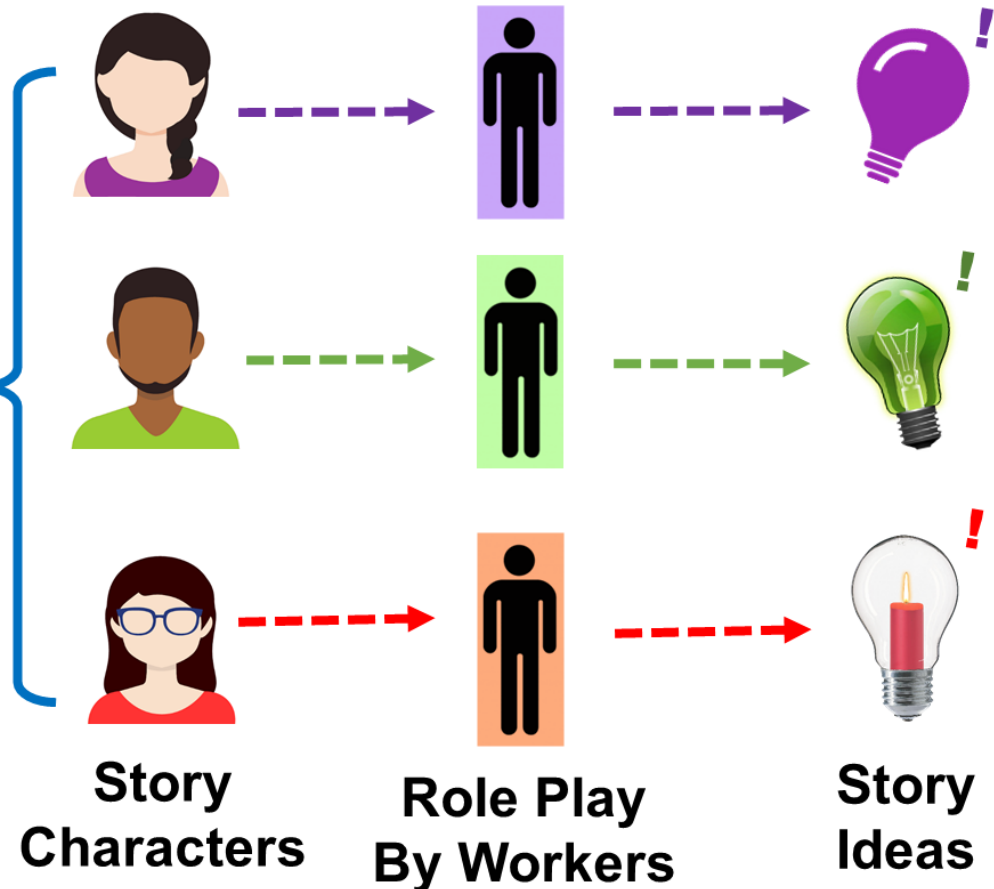
Role-Play Crowd Ideation

mind-numbing enough. Sister Bridget at Saint Brendan's I'd handle with an absentee note typed up on my sister's Underwood, Da's signature traced using his fountain pen. That wouldn't work with Ma and I needed to stay out of her path, and how. Hanging from a branch was my lunch pail—baloney and liverwurst sandwich, an apple, and a nickel for milk. I wouldn't go hungry and could wait it out. The nickel was better spent on an ice-cold bottle of soda anyways.

"Jack's faster than a speeding bullet," I said out loud. Opening my arms wide I became an airplane, buzzing low over the house and the corn fields beyond—flying over to Manhattan, circling the Empire State Building and the Statue of Liberty, then buzzing Ellis Island before cruising all the way to Southend-on-Sea, England, and Jack. Then I put my head back in my book: *Treasure Island*.

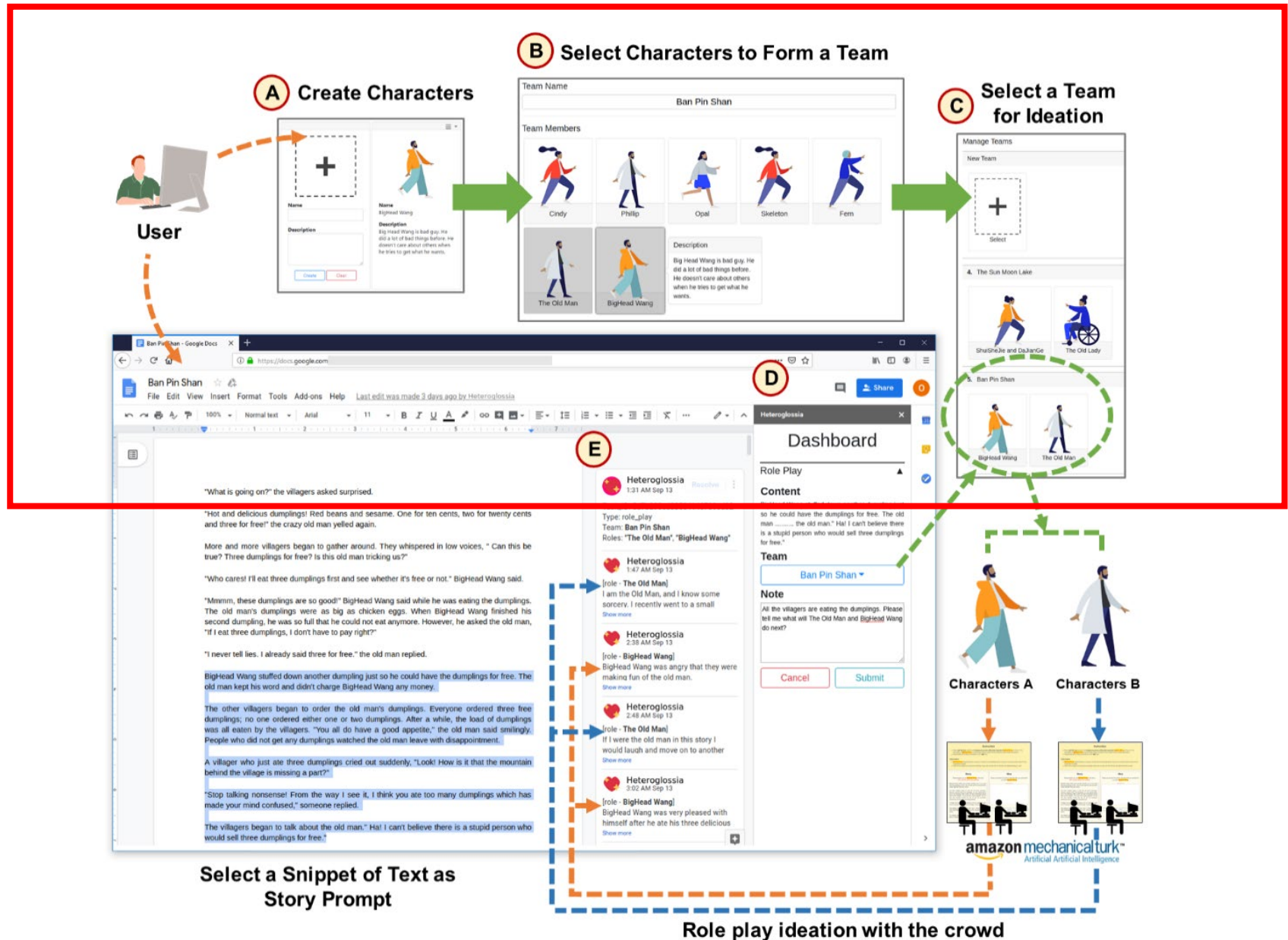
By the time I climbed out of the tree, hours later, my head was filled with pirates and treasure and I'd plum forgot about the telegram.

Story Draft

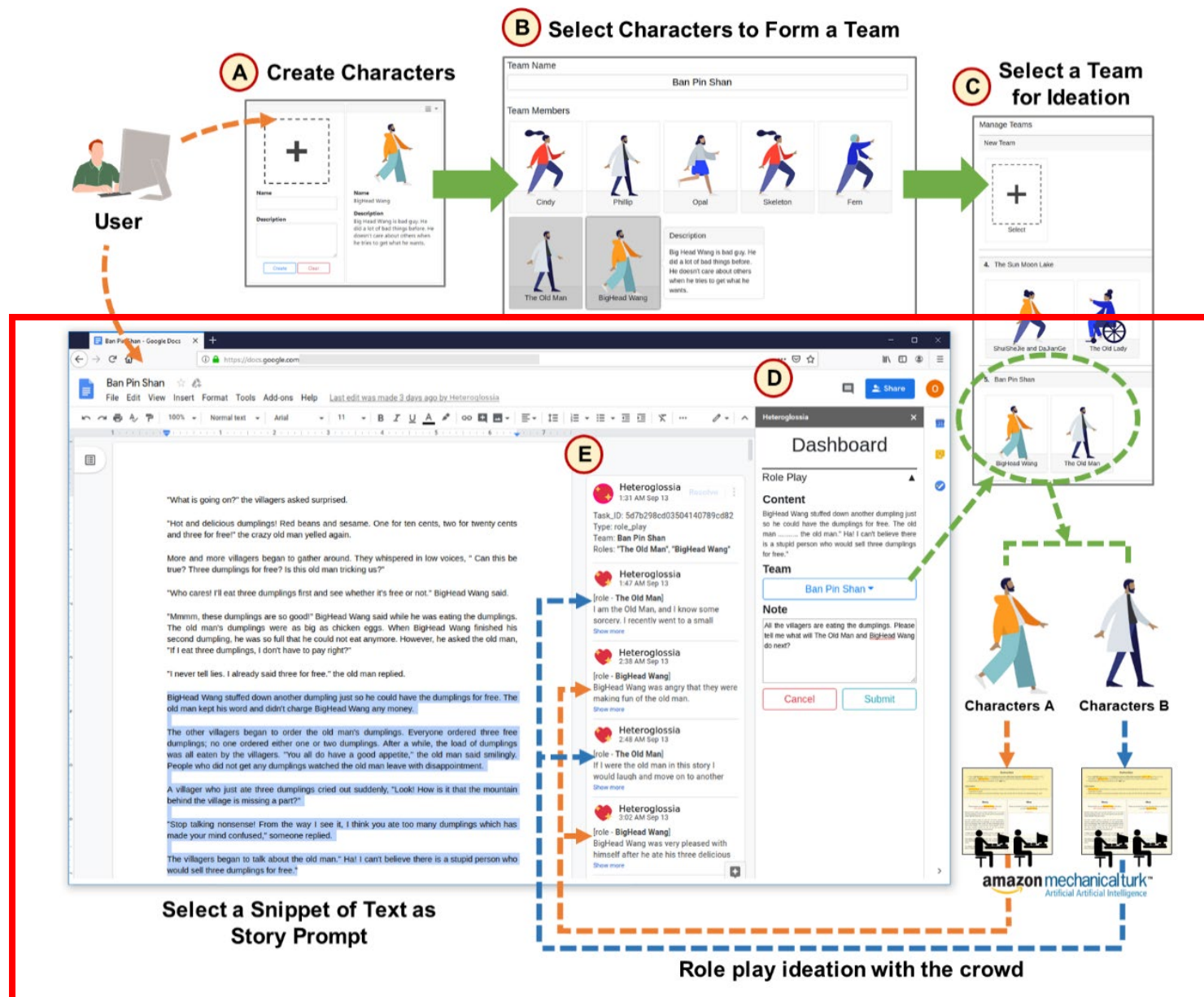


Heteroglossia System





Eliciting Ideas from the Crowd



Worker Interface

Select Characters to Form a Team

The screenshot displays the 'Select a Team for Ideation' interface. On the left, a 'Ban Pin Shan' team is shown with four characters: 'Play', 'Old', 'Shen', and 'Fan'. A green arrow points from this team to a 'Manage Teams' section on the right. Below this, a 'Dashboard' shows a list of role plays, including 'The Old Man', 'The Old Man', 'The Old Man', and 'The Old Man'. A blue arrow points from the dashboard to a 'Role Play' section, which shows a 'Note' about the role play and a 'Submit' button. The interface is labeled 'amazon mechanical turk' at the bottom.

Role play ideation with the crowd

Instruction

- Please **read the story** carefully and **imagine you are one of the main characters, BigHead Wang**, in the story. The information of **BigHead Wang** is shown below. Please consider the story based on the provided information.
- Please briefly tell us what you would do in the **"Idea"** box.

Information

- BigHead Wang**: BigHead Wang is a bad guy. He did a lot of bad things before. He doesn't care about others when he tries to get what he wants.
- Note: All the villagers are eating the dumplings. Please tell me what will The Old Man and BigHead Wang do next?

Story

Please imagine you are **BigHead Wang** in the story.
Then read the whole story carefully.

BigHead Wang stuffed down another dumpling just so he could have the dumplings for free. The old man kept his word and didn't charge BigHead Wang any money.

The other villagers began to order the old man's dumplings. Everyone ordered three free dumplings; no one ordered either one or two dumplings. After a while, the load of dumplings was all eaten by the villagers. "You all do have a good appetite," the old man said smilingly. People who did not get any dumplings watched the old man leave with disappointment.

A villager who just ate three dumplings cried out suddenly, "Look! How is it that the mountain behind the village is missing a part?"

"Stop talking nonsense! From the way I see it, I think you ate too many dumplings which has made your mind confused," someone replied.

The villagers began to talk about the old man. "Ha! I can't believe there is a stupid person who would sell three dumplings for free."

Idea

Please use at least 50 words to describe what you would do if you were **BigHead Wang**.

Word Count: 0

Submit

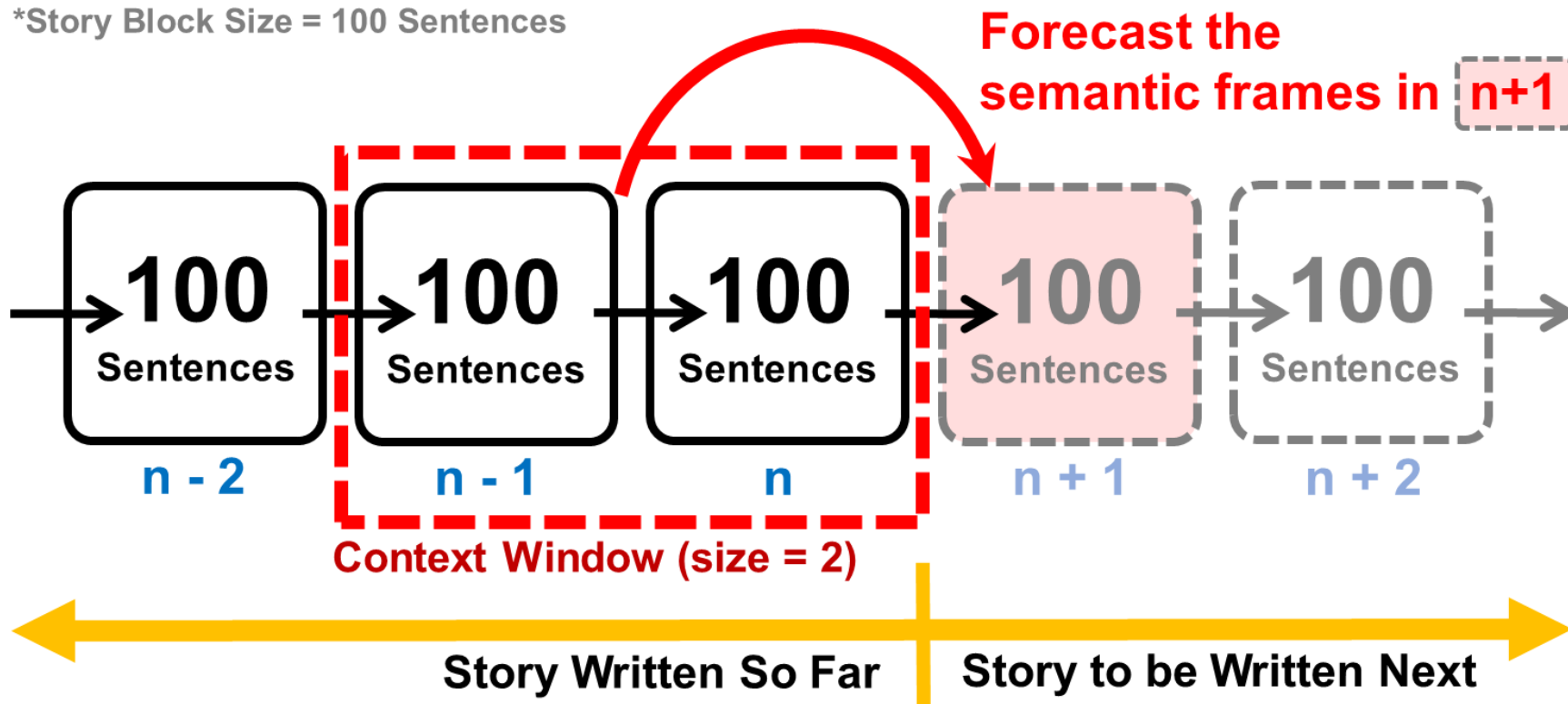
Demo

42



What's Next?

*Story Block Size = 100 Sentences



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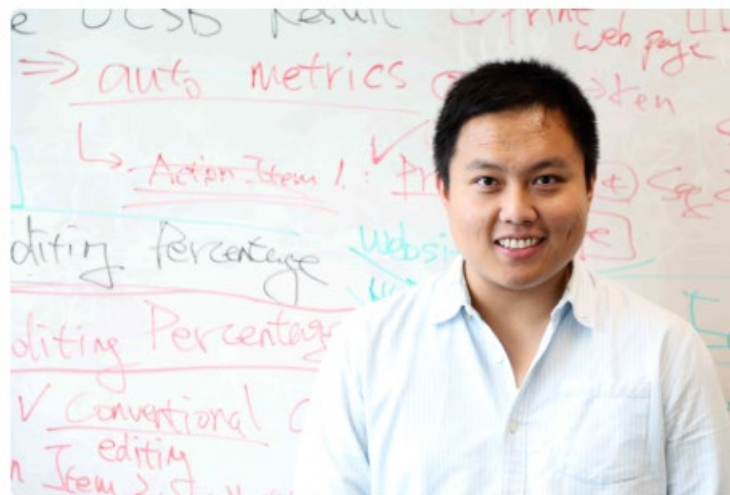


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Thank you!

Kenneth Huang
IST, Penn State University



@windx0303



KennethHuang.cc