



**CLASS OF  
INTELLIGENT  
AGENTS**



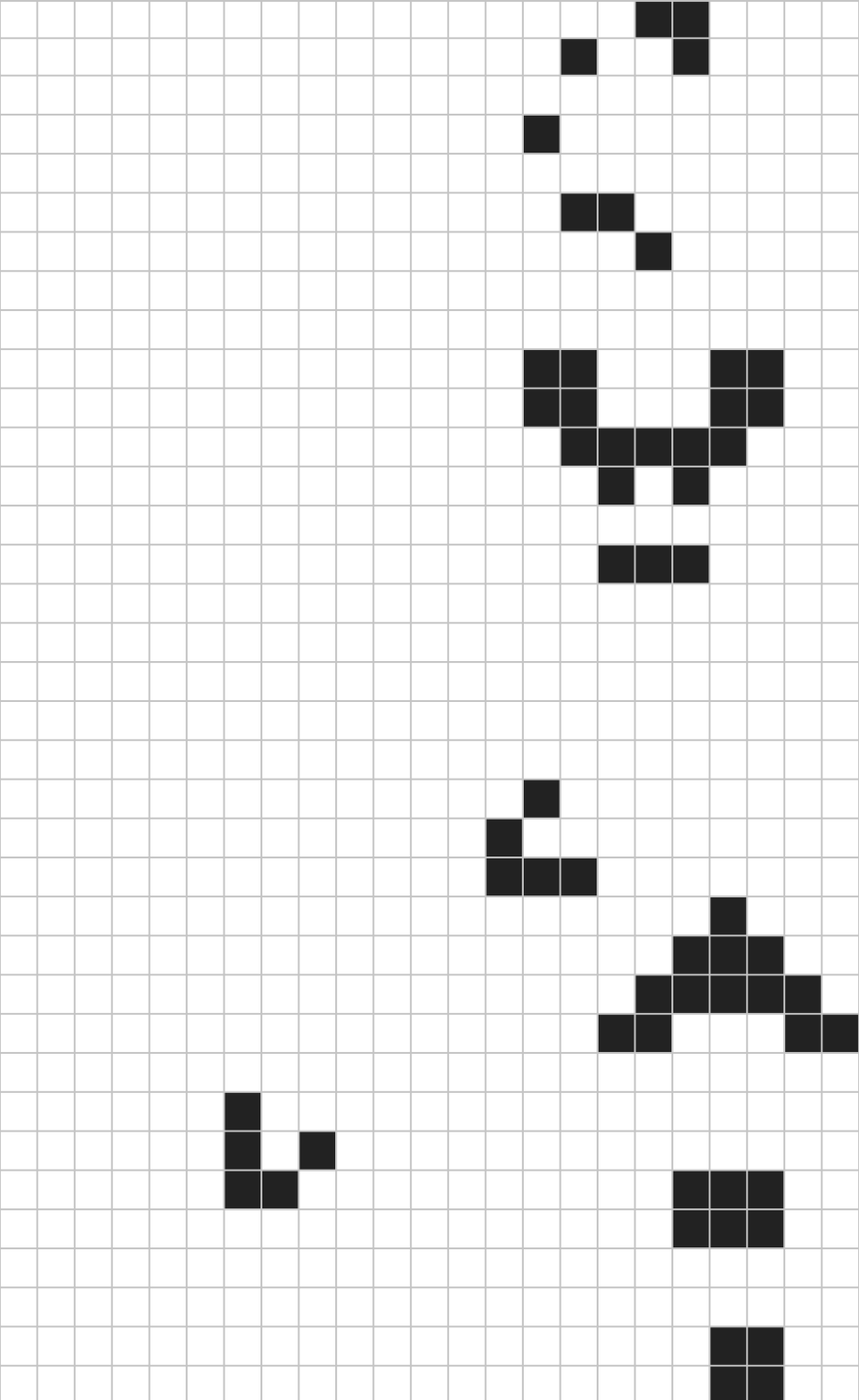
**PROF. ALEXIEI DINGLI**



An **AGENT** is a person or entity that acts on behalf of another to produce a specific effect

The word is derived from the Latin "agere," meaning "to set in motion, drive forward, to do, perform, or keep in movement"





# WHY AGENTS?

All agents are programs, but not all programs are agents

Properties:

- Autonomy
- Mobility
- Communication
- Cooperate
- Proactivity
- Reactivity
- Learning



# RISE OF THE WWW

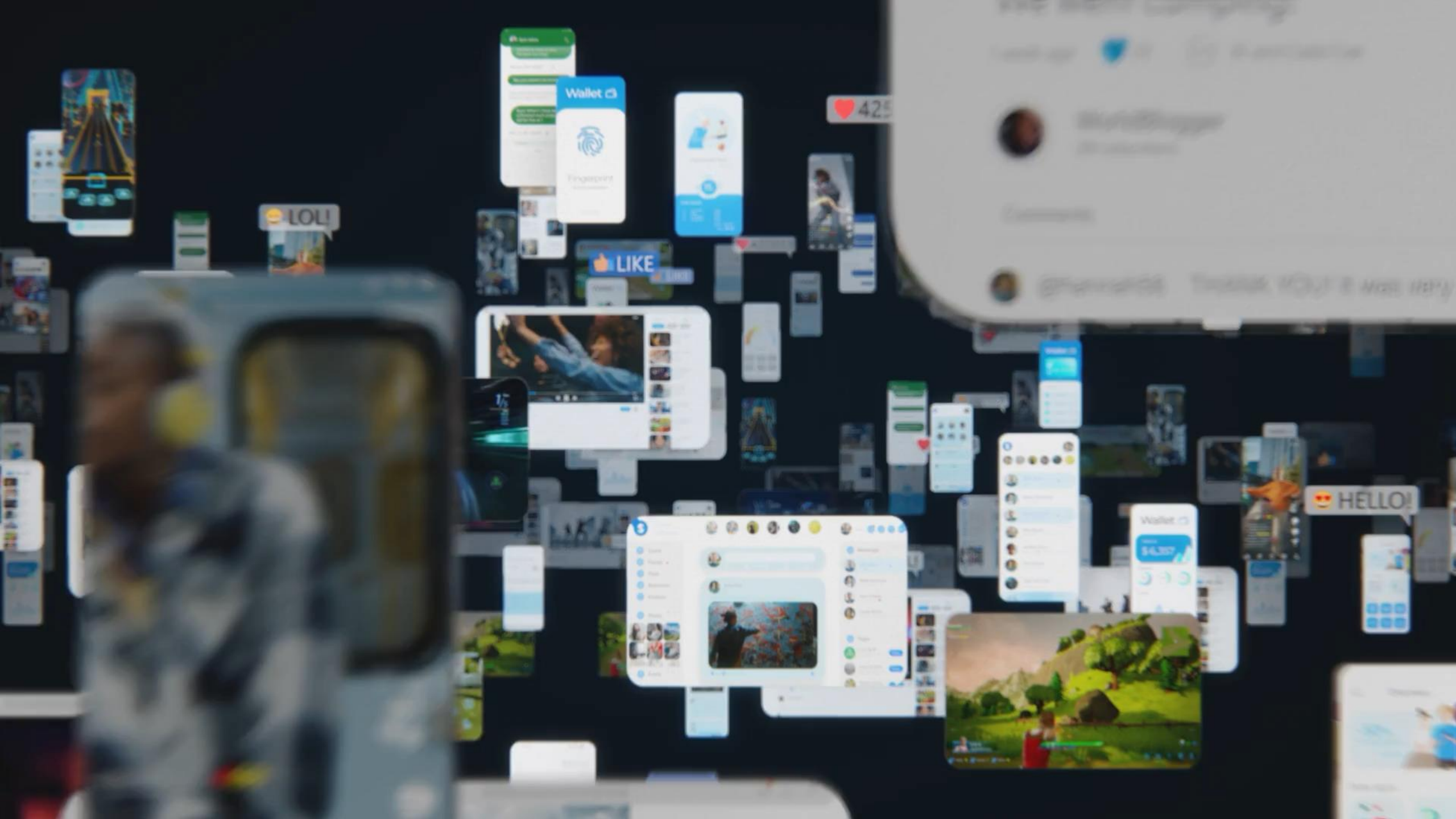


Vannevar Bush  
1945



Tim Berners-Lee  
1989







"I have a dream for the Web in which computers become capable of analysing all the data on the Web – the content, links, and transactions between people and computers.

A ‘Semantic Web’, which makes this possible, has yet to emerge, but when it does, the day-to-day mechanisms of trade, bureaucracy and our daily lives will be handled by machines talking to machines.”

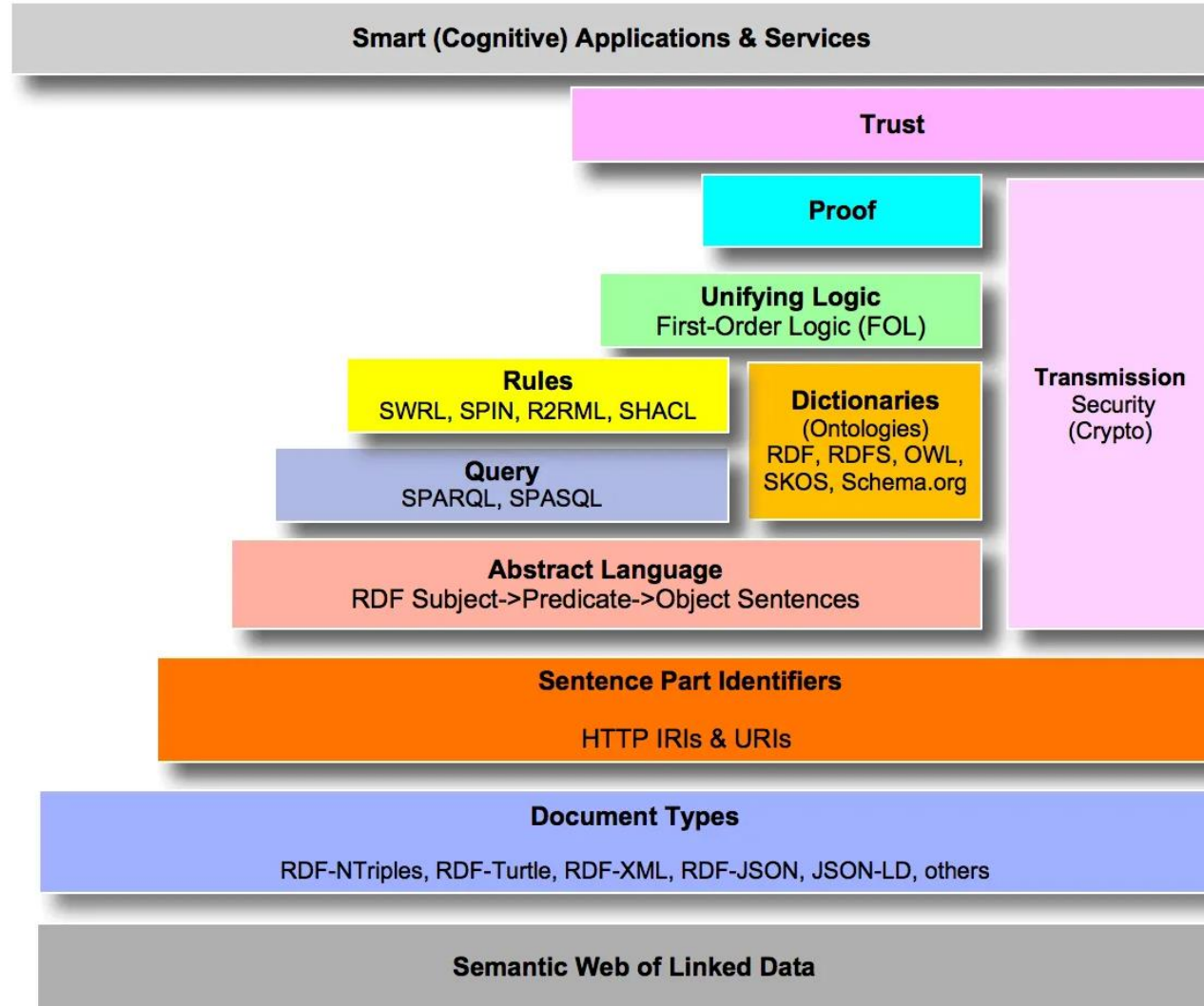
**Sir Tim Berners-Lee (2001)**

# COMPARISON

	Original WWW (1991)	Social Web (Web 2.0)	Semantic Web (2001)
<b>Definition</b>	Static content sharing via hypertext links.	Interactive web with user-generated content and social media.	Web where data is structured for machine understanding and processing.
<b>Content Creation</b>	Centralised, by webmasters.	Decentralised, user-generated content.	Decentralised, focused on semantic data structuring.
<b>Interaction</b>	Minimal, content consumption.	High, social interaction and content creation.	Machine-to-machine, enabling smarter applications.
<b>Data Structure</b>	Unstructured hypertext.	Structured for social interaction.	Highly structured using ontologies and semantic standards.
<b>Technologies</b>	HTML, basic HTTP.	Web technologies like AJAX, HTML5, APIs.	Semantic web technologies like RDF, OWL, SPARQL.
<b>Examples</b>	Early static websites (e.g., CERN's first site).	Social media platforms like Facebook and YouTube.	Intelligent agents, linked data projects.
<b>Challenges</b>	Lack of interactivity.	Data privacy, misinformation.	Complexity, standardisation issues.



# THE SEMANTIC WEB







“ The real power of the Semantic Web will be realized when people create many programs that collect Web content from diverse sources, process the information and exchange the results with other programs. ”

Tim Berners-Lee, James Hendler, Ora Lassila  
May 2001



# SEMANTIC WEB CASE STUDY





Mom needs to see a specialist and then must have a series of physical therapy sessions. Biweekly or something. I'm going to have my agent set up the appointments.



## THE AGENT ...

1. Retrieved information about Mom's prescribed treatment from the doctor's agent
2. Looked up several lists of providers and checked for the ones in-plan for Mom's insurance within a 20-mile radius of her home and with a rating of excellent or very good on trusted rating services
3. Began trying to find a match between available appointment times and her children's busy schedule







The suggestion was not good

1. Hospital found was far
2. Appointment was during rush hour

Send his agent to

1. Redo the search
2. Stricter preferences on location & time
3. Received his sister's agent's full trust and assistance (certificates & data) for this task



## THE AGENT PRESENTS ...

1. A new plan with a much closer hospital & earlier time
2. But there were two warnings:
  1. A minor yet conflicting appointment had to be rescheduled
  2. Insurance company list did not cover this hospital but was verified through other means





# WHY DID THE SEMANTIC WEB FAIL?

- **Too Complicated:** Building the Semantic Web was too complex and time-consuming
- **Hard to Grow:** Connecting all internet data was difficult to scale
- **No Immediate Benefits:** Companies didn't see enough benefits to justify the effort
- **Trust Issues:** Ensuring data quality and reliability was very challenging
- **Language Complexity:** Human language's nuances make machine understanding difficult

**THE SEMANTIC WEB WAS AN IDEA AHEAD OF IT'S TIME**



TWENTY

YEARS

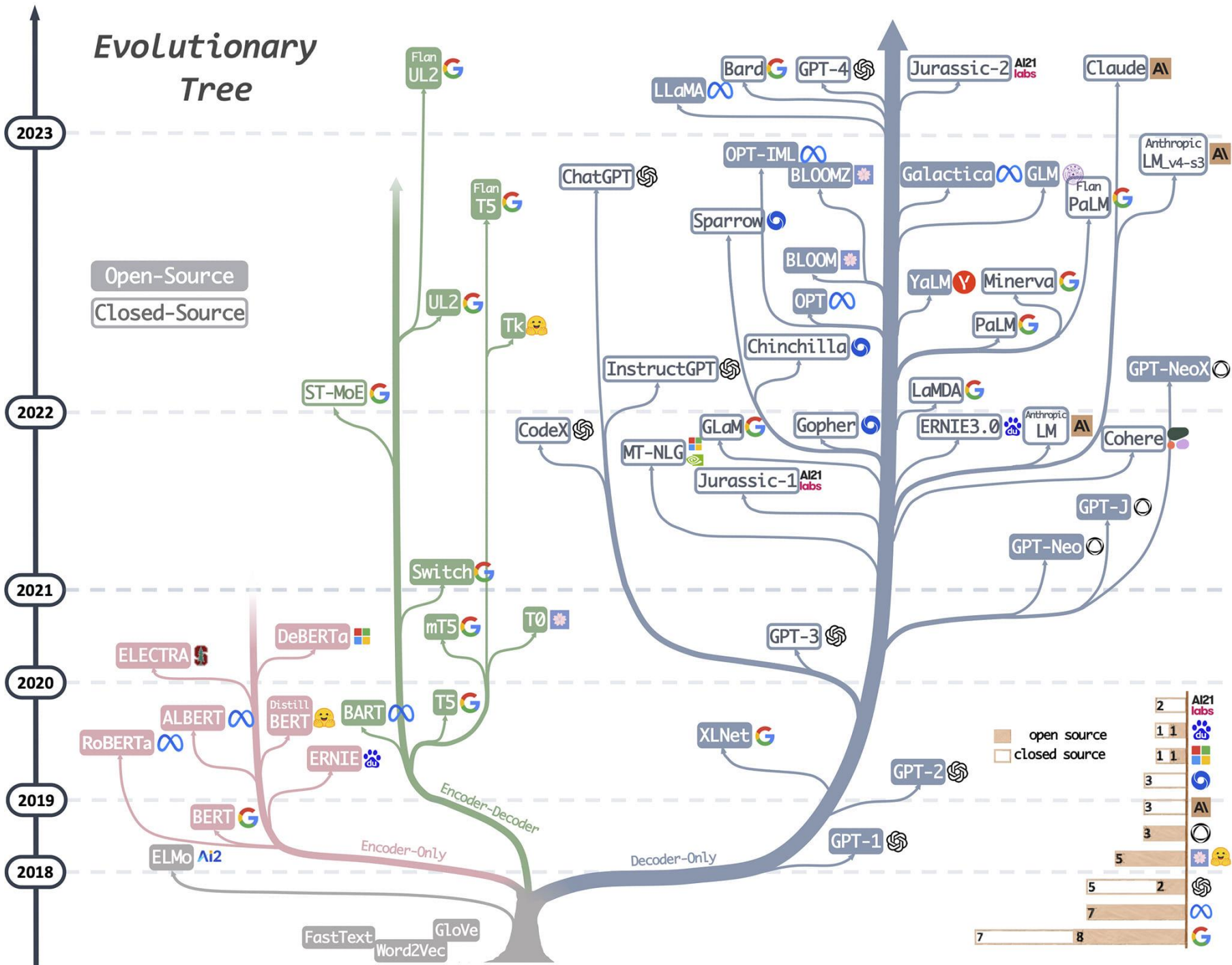
LATER ...



A close-up, dramatic shot of the faces of Optimus Prime and Megatron from the Transformers movie. Optimus Prime is on the right, with his blue and silver face partially illuminated. Megatron is on the left, with his dark, metallic face also partially illuminated. The background is dark, and a red light streak is visible on the right side.

# AGE OF TRANSFORMERS

# Evolutionary Tree



Open-Source  
Closed-Source

Legend for source types and contributor counts:

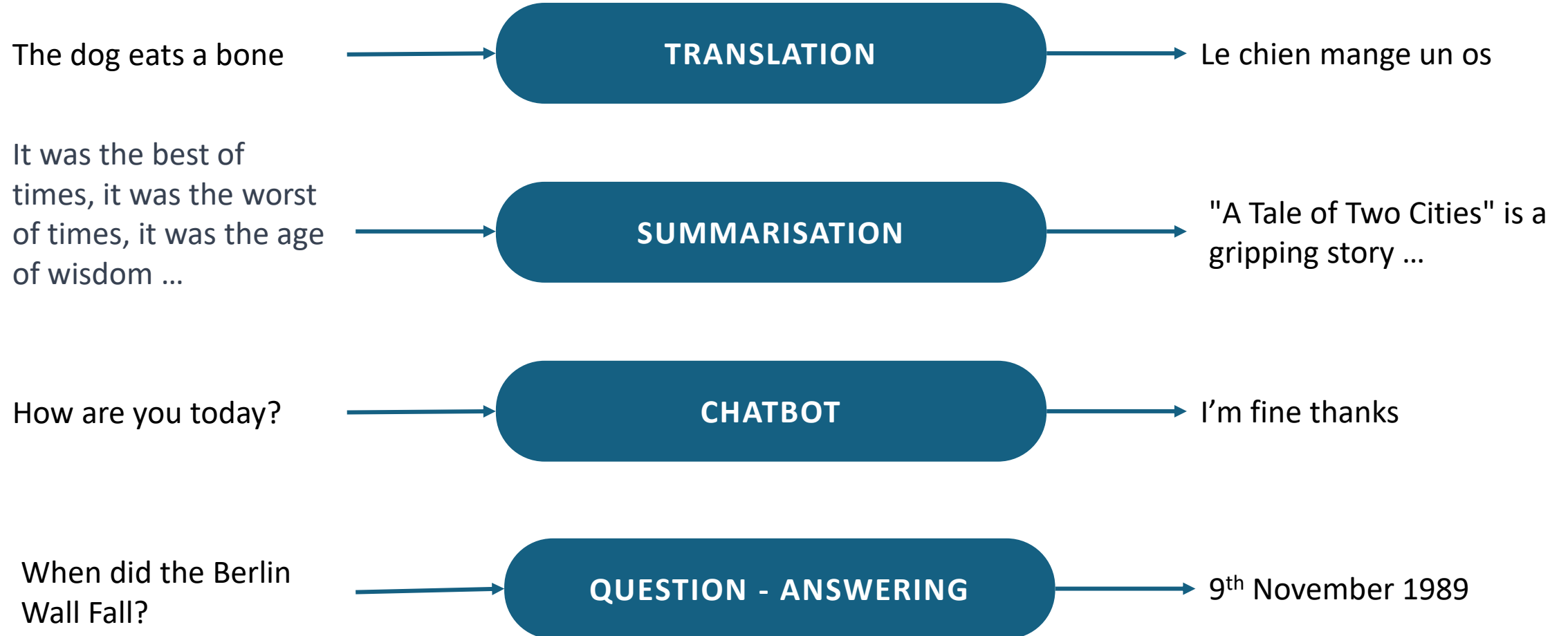
- Open Source (Brown box)
- Closed Source (White box)

Contributor counts for various models:

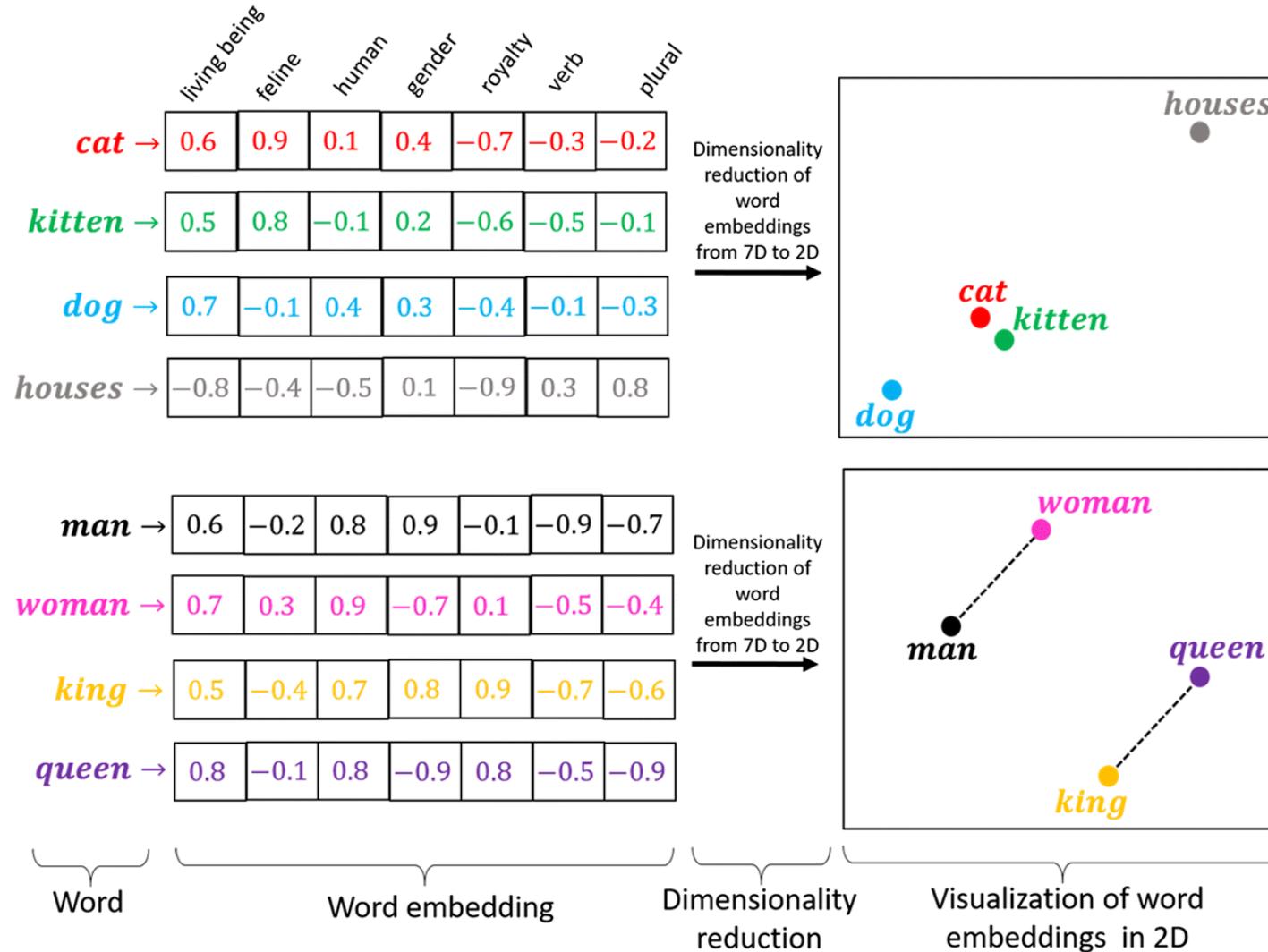
- AI21 labs: 2
- Anthropic: 1, 1
- Baidu: 1, 1
- ByteDance: 3
- Google: 3
- Meta: 3
- Microsoft: 5
- OpenAI: 5, 2
- Stanford: 7
- Various others: 7, 8



# WHY TRANSFORMERS?



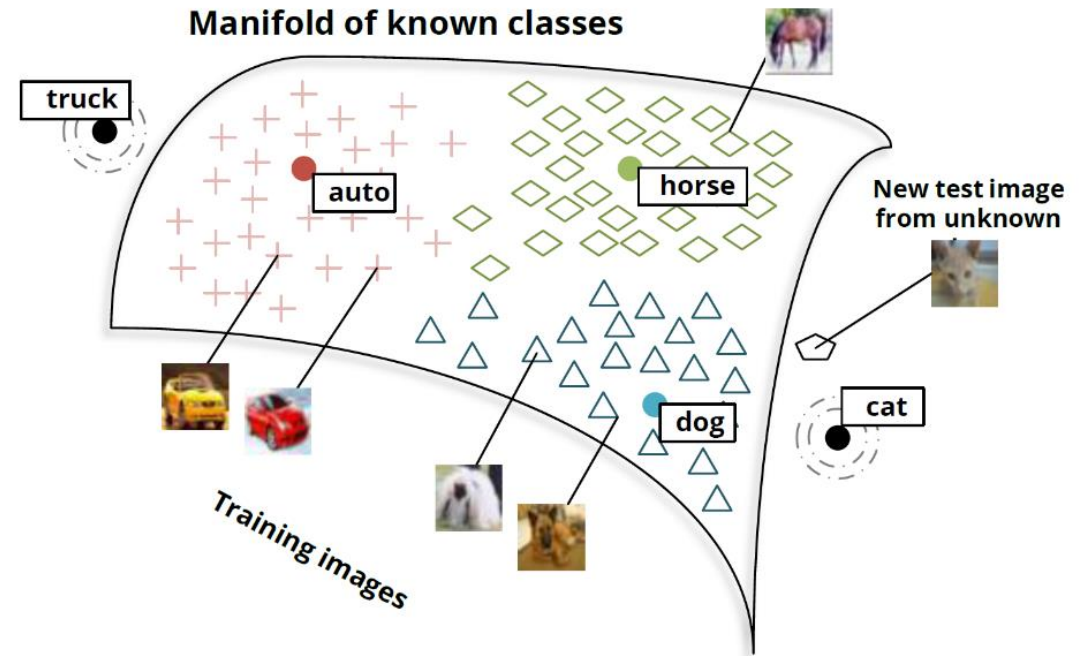
# MEANING (WORD EMBEDDINGS)





# USING EMBEDDINGS

- So far we've dealt with words
- But what about images?
  - Images of dogs, horses and automobiles are mapped next to their word vector
- What happens with new classes such as cats?
  - They are mapped close to the dog vector
  - But a little distant from it



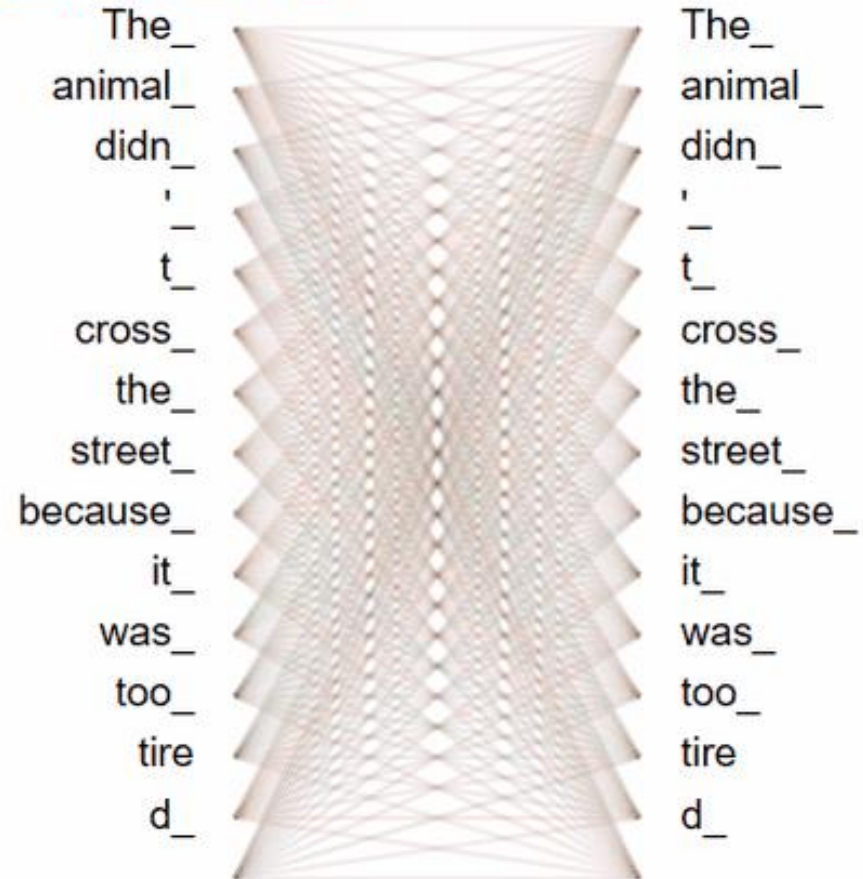
# DISAMBIGUATION

- The **trophy** would not fit in the suitcase because it was too **big**.
- The trophy would not fit in the **suitcase** because it was too **small**.

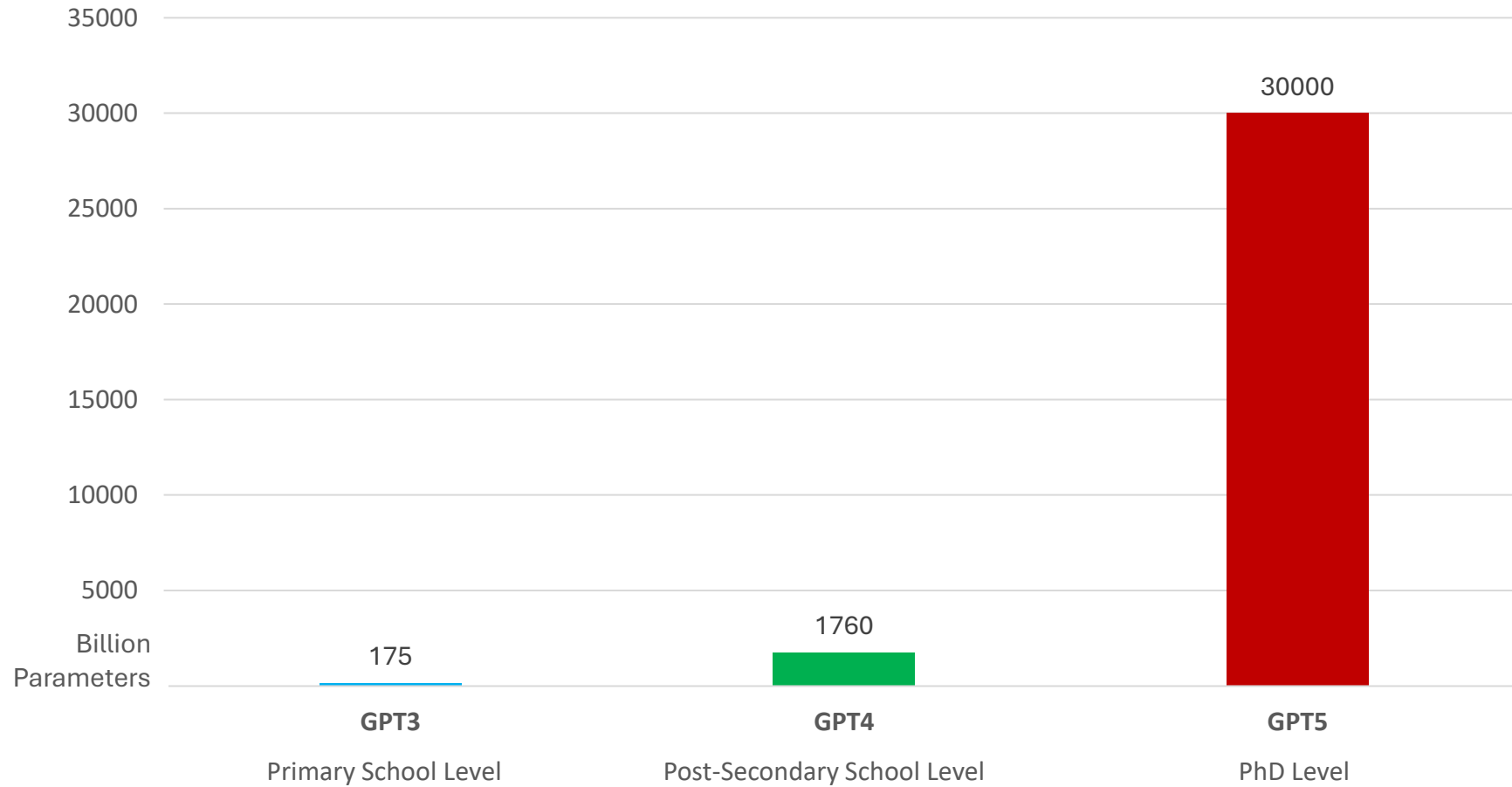


# ATTENTION

Layer: 0 ▾ Attention: Input - Input ▾



# SIZE OF LANGUAGE MODELS





# THE WORD CHAIN GAME



# THE WORD CHAIN GAME INSTRUCTIONS

1. Start with a phrase: "I have"
2. The next player repeats and adds a word: "I have a"
3. Continue this pattern: "I have a cat", "I have a cat named", etc
4. If a player makes a mistake, they're out



# WELCOME TO SMALLVILLE



*This is a pre-computed replay of a simulation that accompanies the paper entitled "Generative Agents: Interactive Simulacra of Human Behavior." It is for demonstration purposes only.*

Current Time:

Tuesday, August 1, 2023 at 12:00:30 AM

▶ Play   || Pause



# SMALLVILLE WORLD



**Family House**

- Bathroom
- Kitchen
- Common room
- Bedrooms
- Garden

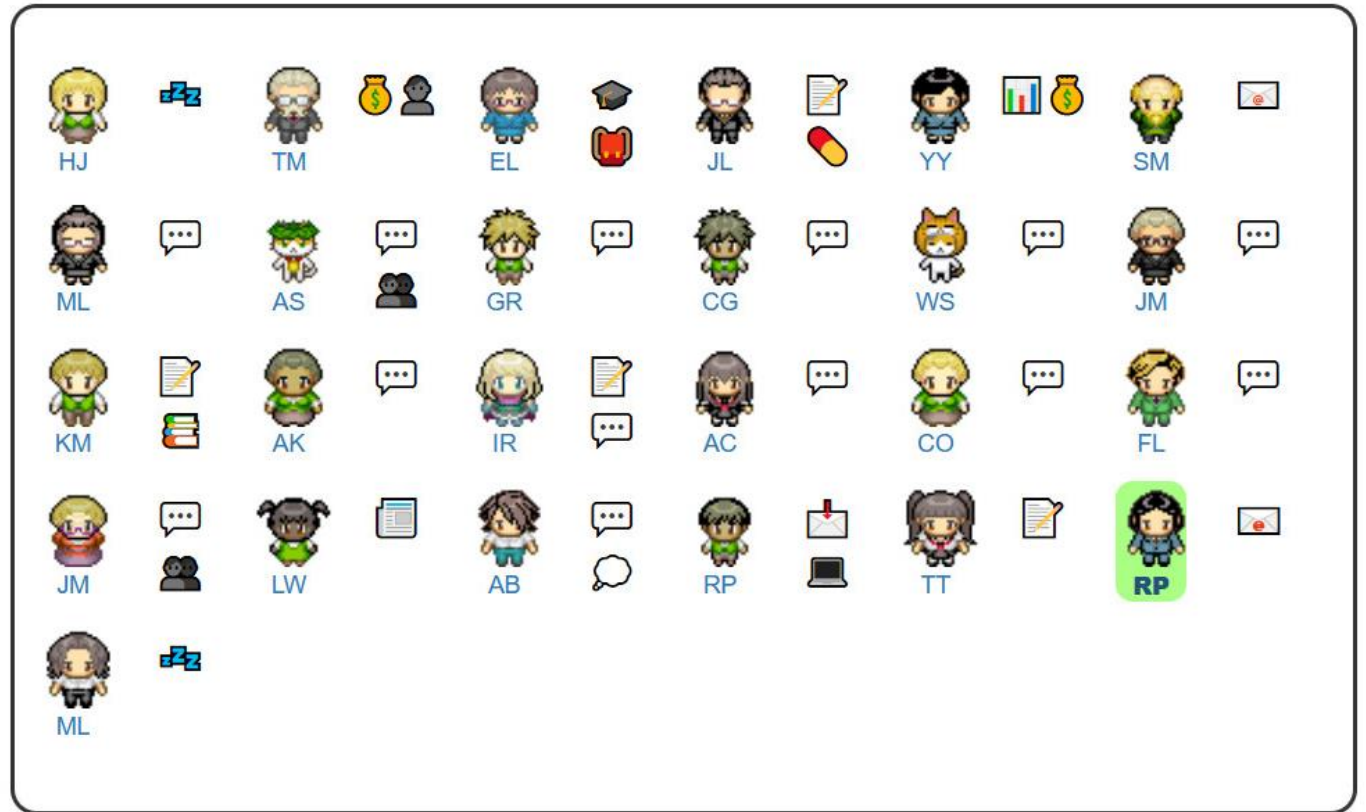


**Common Room**

- Book Shelf
- Table



# SMALL PEOPLE



## Ryan Park [State Details](#)



### Current Action:

waking up and completing his morning routine (checking emails)

### Location:

the Ville:Ryan Park's apartment:main room:computer desk

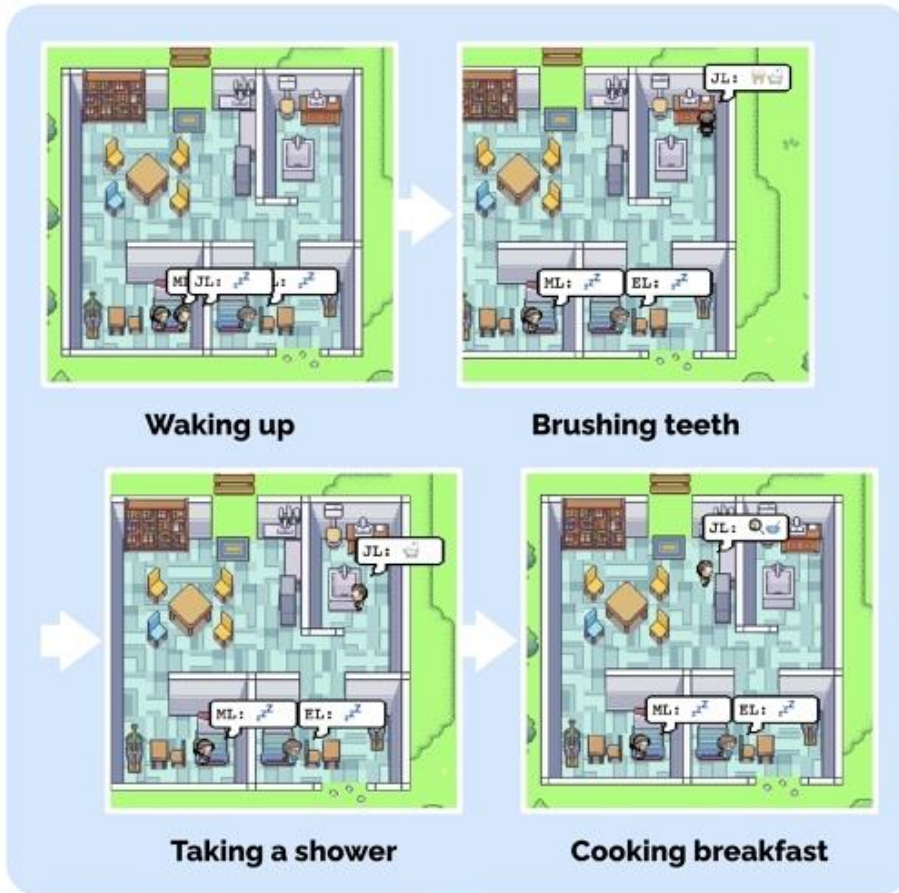
### Current Conversation:

*None at the moment*



# A DAY IN THE LIFE OF A SIM

## Morning routine



## Catching up



## Packing



## Beginning workday



6:00 am

...

7:30 am

7:45 am

8:00 am

# A DAY IN THE LIFE OF A SIM

**John** : Good morning Eddy. Did you sleep well?

**Eddy** : Good morning dad. Yeah, I slept great.

**John** : That's good. What are you working on today?

**Eddy** : I'm working on a new music composition for my class. It's due this week, so I'm trying to get it finished. But I'm having so much fun with it!

**John** : That sounds great!

Soon after Eddy heads out, Mei wakes up and joins John. Mei asks about her son, and John recalls the conversation they just had:

**Mei** : Did Eddy already leave for school?

**John** : Yes, he just left. He's working on a music composition for his class.

**Mei** : Oh, that's wonderful! Tell me about it.

**John** : I think he's really enjoying it! He said he's having a lot of fun with it.

**Mei** : That's great! I'm so proud of him.

# EMERGENT SOCIAL BEHAVIOUR

Sam and Tom meet at the grocery store and Sam tells Tom about his candidacy in the local election:

**Sam** : Hey Tom, how's it going?

**Tom** : Good, thanks. What's up?

**Sam** : Well, I wanted to talk to you about something. I'm actually running for mayor in the upcoming local election.

**Tom** : Really? That's great news! Why are you running?

**Sam** : I've been involved in local politics for years now, and I really feel like I can make a difference in our community. Plus, I want to bring new ideas and perspectives to the table.

Later that day, after Sam left, Tom and John, who heard the news from another source, discuss Sam's chances of winning the election:

**John** : I heard that Sam Moore is running for mayor in the local election. Do you think he has a good chance of winning?

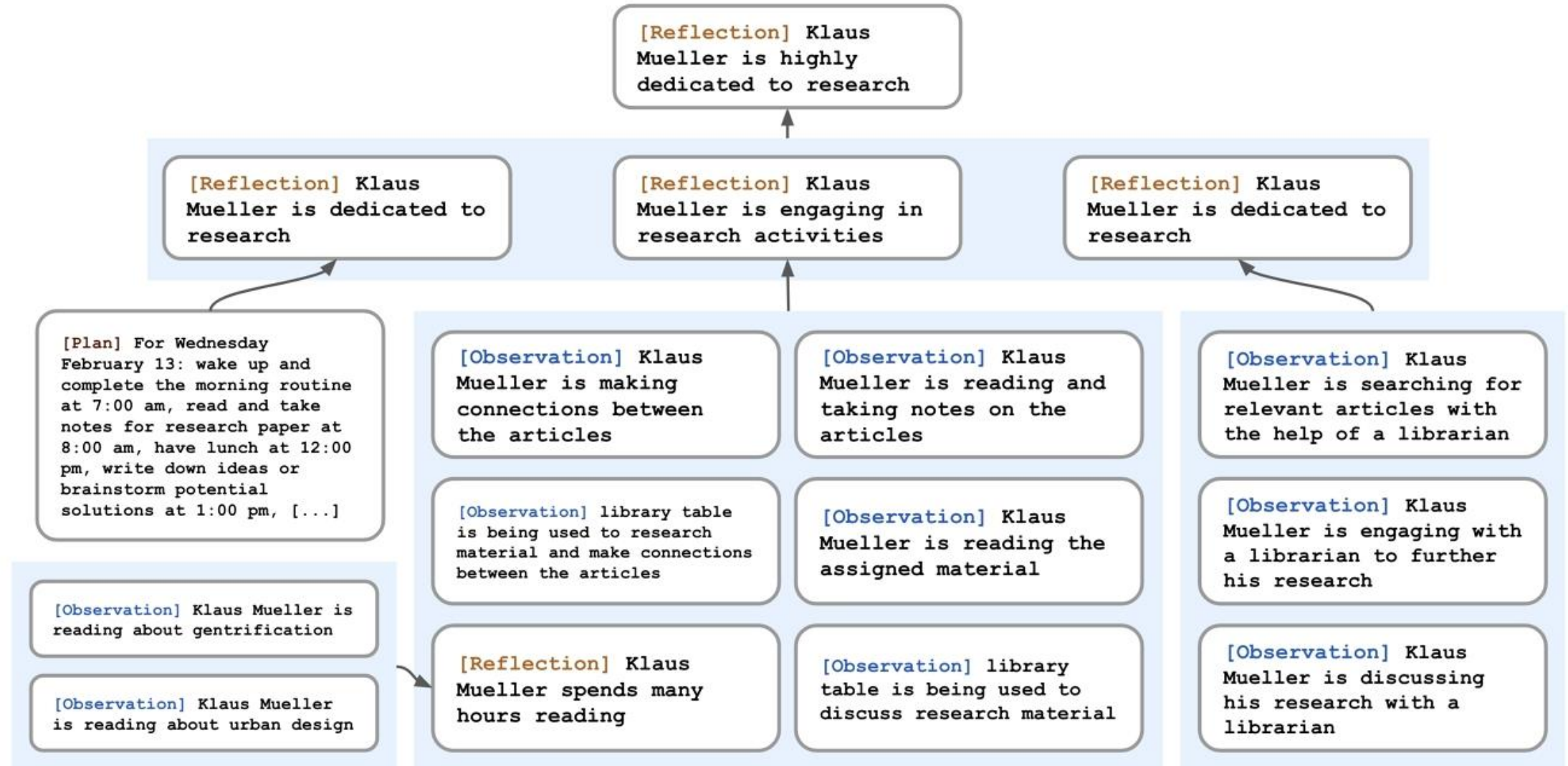
**Tom** : I do think he has a good chance. He's been working hard in the community and I think he will get a lot of support. What do you think?

**John** : I think it's great that he's running. I'm curious to see how the election will turn out.

Gradually, Sam's candidacy becomes the talk of the town, with some supporting him and others remaining undecided.



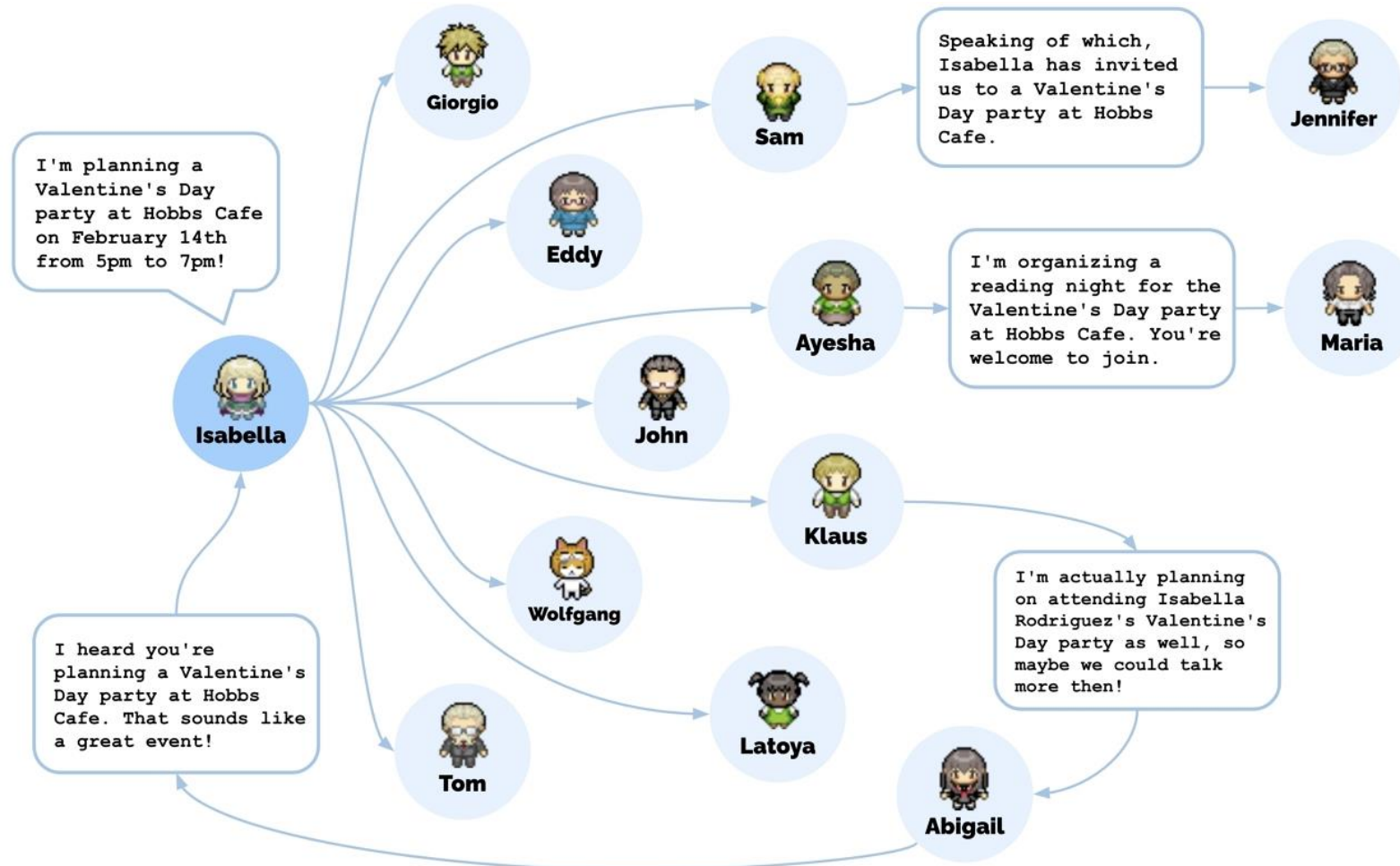
# REFLECTIONS



# LIVING THE LIFE ...



# AND ORGANISING PARTIES ...





# CHATDEV

Communicative Agents for Software Development



Task:



File Upload

File uploaded  
( JosGalMan\_DefaultOrgan  
ization\_20230922165036.  
log ). Please click  
"Replay" to show  
ChatDev's development

Replay

Replaying Speed

↶ version\_updates

▮ num\_code\_files

🖼️ num\_png\_files

📄 num\_doc\_files

# CLASS GPT



# THE AGENT ECONOMY









Agents are not only going to change how everyone interacts with computers. They're also going to upend the software industry, bringing about the biggest revolution in computing since we went from typing commands to tapping on icons.

Bill Gates (Microsoft)



AI agents will become the primary way we interact with computers in the future. They will be able to understand our needs and preferences, and proactively help us with tasks and decision making.

Satya Nadella (Microsoft)



AI agents will become our digital assistants, helping us navigate the complexities of the modern world. They will make our lives easier and more efficient.

Jeff Bezos (Amazon)



# THANK YOU!

## Questions?

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