

A R R I V A L

A05

**Analyzing “Arrival” Through
the Lens of NLP**

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Introduction

The film Arrival is not your usual extraterrestrial film. Instead than focusing on battle or action, it delves further into how we communicate and how language influences our thoughts, relationships, and even our view of time. As an AI and NLP student, what struck me the most was the importance of language throughout the story. Dr. Louise Banks, a linguist, is brought in to help decipher the language of the Heptapods, aliens who arrived on Earth in gigantic, strange ships. Her quest involves more than just translating signals; it's also about decoding an entirely new style of thinking—and this is where I found genuine connections to the issues we face in NLP today.



NLP Challenges

Ambiguity

One of the film's pivotal moments occurs when the Heptapods utilize the words "offer weapon." This raises concern among military and political leaders, but Louise wonders if the term "weapon" means "tool" or something significant in their language. This is exactly the type of difficulty we see in NLP: word sense disambiguation. A word like "bank" can refer to a financial institution or the margin of a river. Without adequate context, NLP algorithms can readily mistake messages, just as humans nearly did in the film.

Idiomatic and figurative language

The Heptapods do not use linear grammar or structure, as we do. Their symbols reflect full ideas, not just words, and their meaning varies depending on how they are combined. This reminded me of how challenging it is for NLP models to handle idioms, metaphors, and figurative speech, particularly in translation assignments. For example, if the model is unaware that "break a leg" is an idiom, she may translate it literally.

NLP Challenges

Pragmatics and context

Louise begins with simple terms like "human" and "Louise," which anchor the language in context and shared meaning—a challenging procedure in NLP. Louise struggles to impart meaning without knowing how the Heptapods read the world, just as chatbots can misinterpret user intent when given no context.

Cultural and Cognitive Differences

What blew my mind was how learning the alien language altered Louise's view of time. The film is based on the Sapir-Whorf Hypothesis, which states that the structure of a language influences our thinking. In NLP, we sometimes forget how language is linked to culture and cognition, especially when models trained in English struggle to understand non-Western languages. This prompted me to examine more deeply about what "understanding language" actually entails.



Communication Methods

Movie Method

Louise uses a rule-based approach, assigning symbols to meanings one-by-one

NLP Equivalent

Early rule-based NLP like ELIZA

She builds a dictionary and observes patterns

Similar to symbolic NLP and lexicon building

Ian uses mathematical logic and science-based reasoning

Mirrors statistical NLP

They use computers to visually decode the symbols and look for recurring shapes

Like OCR (Optical Character Recognition) + NLP

Louise learns through interaction and feedback

Reinforcement learning in conversational AI

They interpret meanings based on symbol shape, structure, and position

Similar to how transformer models use attention to determine meaning from position in a sentence

Communication Methods

Analysis:

Louise employs semiotic analysis and constructs a vocabulary through frequent organized interaction, akin to unsupervised learning in NLP.

Ian, the physicist, favors a statistical approach, similar to how NLP progressed from symbolic AI to statistical ML and finally deep learning.

What stood out to me was how human the process was. It required trial and error, intuition, emotion, and even dreams. Today's NLP models are powerful, but they still lack this type of natural, contextual reasoning.

Louise Learns to Think Like a Model

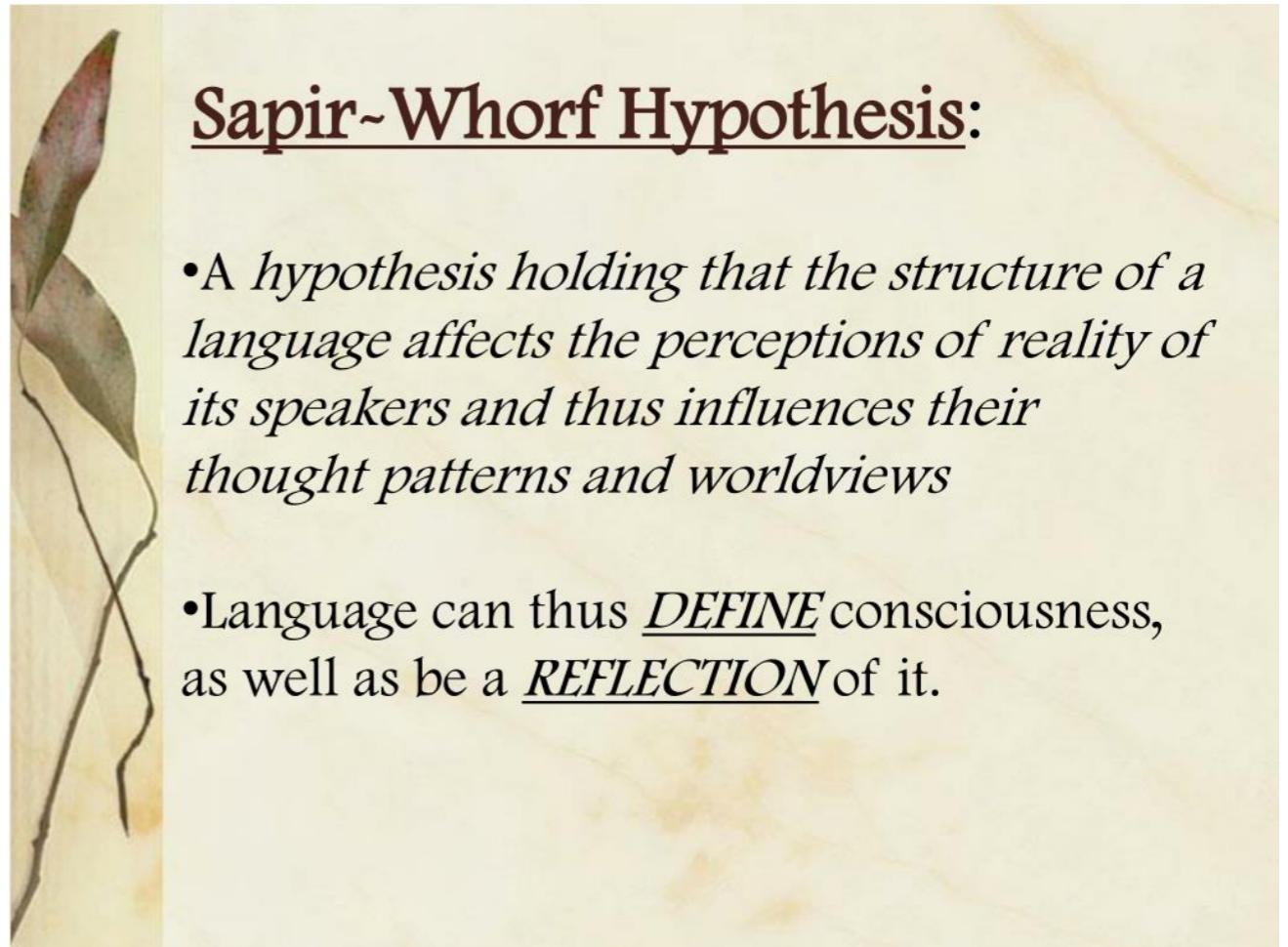
Louise eventually develops an instinctive understanding of the alien language, even dreaming it. This is similar to deep NLP, particularly transformers, which learn from large datasets to create contextual embeddings. Louise's brain, like BERT or GPT, is "fine-tuned" on the Heptapod data until she can generalize meaning in real time.



Language Shapes Thought

The film supports the Sapir-Whorf Hypothesis, which states that language influences perception.

Louise's thinking shifts when she learns the Heptapod language. In NLP, this has ramifications for how AI "thinks" because models trained on toxic, biased, or narrow data can adopt those perspectives. It emphasizes the need for ethical language modeling.



Sapir-Whorf Hypothesis:

- A hypothesis holding that the structure of a language affects the perceptions of reality of its speakers and thus influences their thought patterns and worldviews
- Language can thus DEFINE consciousness, as well as be a REFLECTION of it.

Reflections

Watching Arrival caused me to reconsider what it means to "understand" language. Modern NLP has come a long way, but much of it still focuses on predicting words rather than understanding meaning. The film demonstrated how language is more than simply a tool for communicating; it influences how we think, remember, and even perceive time. It made me ponder if a machine can actually "understand" if it does not have the same experiences as humans.

Also, the ethical concerns struck a chord with me. Misunderstanding a single sentence ("offer weapon") nearly resulted in war. This is precisely why AI safety and explainability are so important in NLP—misinterpretation can have serious ramifications in fields such as healthcare, law, and international relations.

Human Centered NLP

Despite modern technology, empathy, patience, and human intuition are key to Arrival's success. Similarly, today's NLP systems must account for emotion, tone, and cultural context. As we progress toward emotion-aware chatbots and inclusive AI, this film reminds us that comprehending meaning requires knowing people.

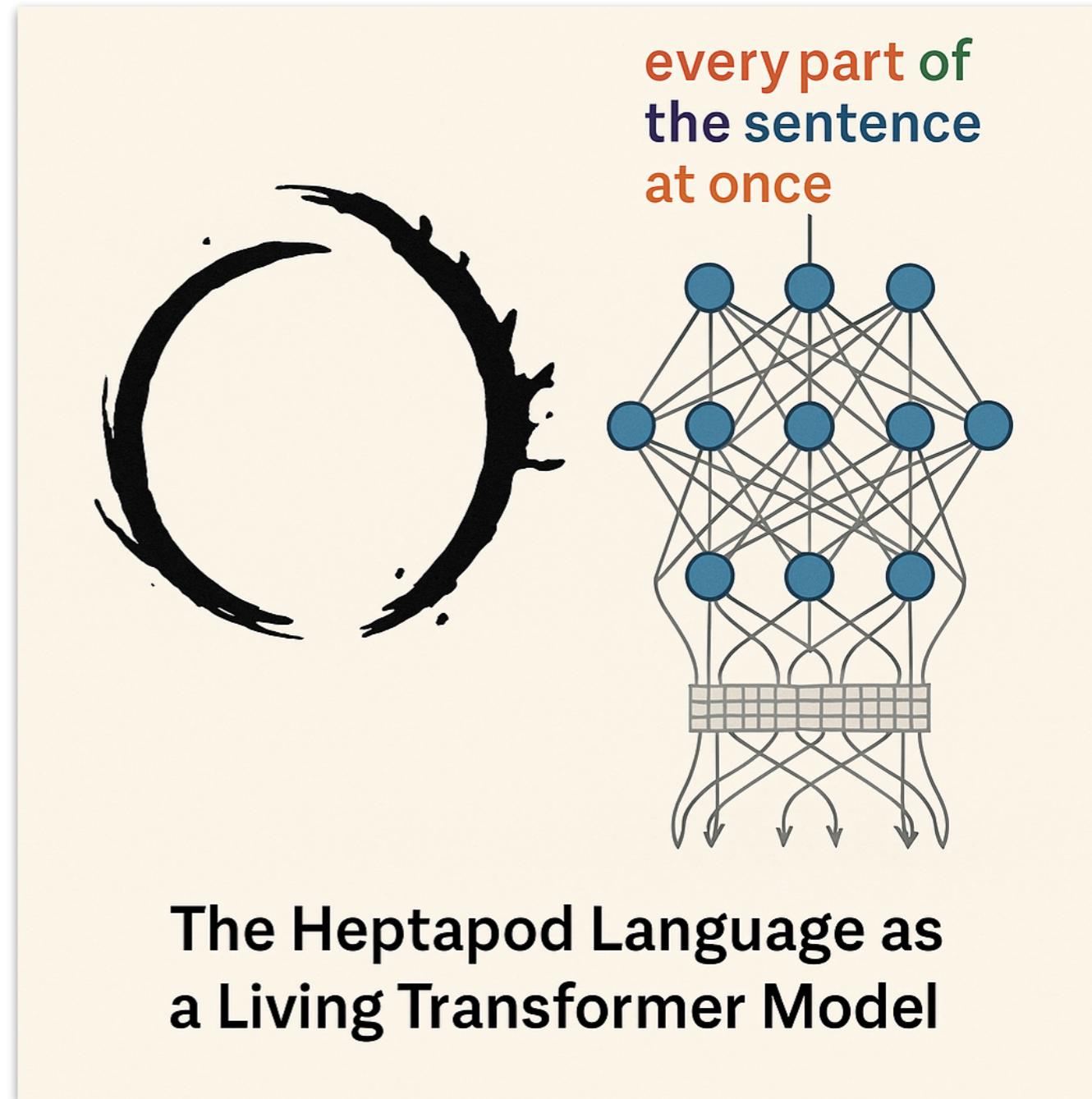


Parallel's

I made a parallel between the Heptapods' circular writing and nonlinear sentence production. Just as their language encodes a full notion at once, we could envisage an NLP model that creates entire thoughts rather than guessing one word at a time. It's like going from walking step by step to taking a jump.



One cool idea we came up with while watching Arrival was imagining what an NLP model would look like if it worked more like the Heptapods' language. Instead of generating sentences word-by-word like most AI models do now, this new kind of model could create a whole sentence—or even a full thought—all at once, kind of like how the Heptapods write in complete, circular symbols that represent entire meanings. It would be like the model “seeing” the full picture instead of guessing one piece at a time. This might help make communication with AI more natural, especially in situations where context and meaning are more important than just grammar or word order.



Q&A

Q1: How realistic is the film's method to interpreting alien languages?

A: While dramatized, Louise's step-by-step decoding method is based on real linguistics and semiotics. She begins with fundamental identification, creates a lexicon, and then uses context to grasp structure, similar to how low-resource languages are processed in NLP.

Q2: Can AI grasp a language as sophisticated and nonlinear as the Heptapods'?

A: Yes, especially given developments in multimodal and nonsequential models. To properly grasp a language like theirs, AI would need to break away from linear token prediction and acquire a sense of meaning as a whole, something we are still a long way from achieving.

Q&A

Q3: What is the most real-world NLP challenge depicted in Arrival?

A: I believe that is semantic ambiguity. Misunderstanding "weapon" almost resulted in calamity. This demonstrates how fragile communication may be when the context is unclear—something that even today's greatest NLP systems struggle with.

Q4: What did you take away from the film?

A: Language is more than just communication; it is about connection, comprehension, and how we perceive the world. It made me realize how powerful (and perilous) AI language models may be, and how critical it is to create them ethically.

Final Thoughts

Arrival did more than just entertain me; it made me think carefully about how we train technology to understand humans. It reminded me that communication is difficult, even between people. When we incorporate AI into the mix, we must be cautious, innovative, and collaborative, just as Louise was.

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