



GROUP 2DEEP2LEARN - FEB 2025

Arrival and the Frontiers of Natural Language Processing



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Prepared for

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Agenda

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Intro

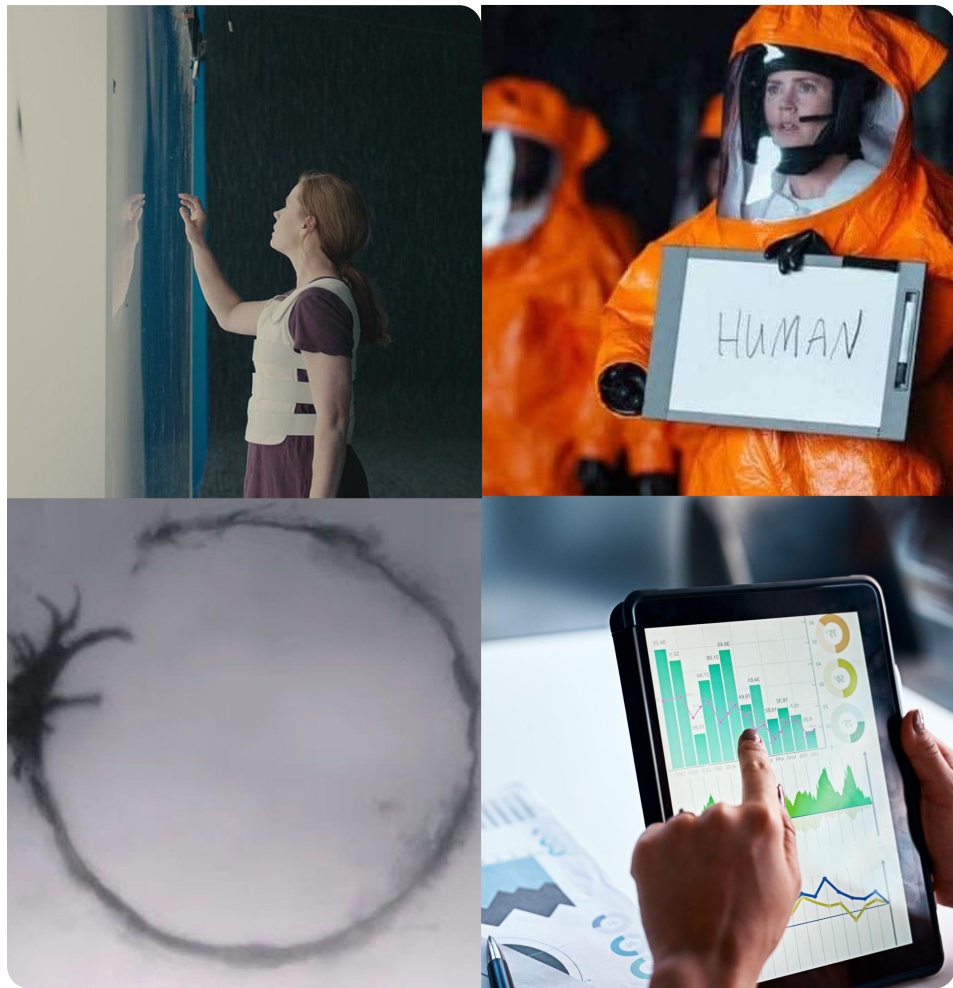


The Thesis

“Arrival challenges us to rethink language as a nonlinear, cultural, and cognitive tool—a frontier NLP must confront.”



Plot Overview



The Core Conflict



Humans vs. heptapods'
non-linear language.

The core conflict in "Arrival" centers on the struggle to bridge the communication gap between humans and the Heptapods. These extraterrestrial beings possess a fundamentally different way of perceiving time and language. Unlike humans, who experience time in a linear fashion (past, present, future), the Heptapods experience time non-linearly, meaning they see all moments simultaneously.



Non-Linear Language

The Heptapods' written language, called "Heptapod B," is composed of complex circular symbols that convey meaning holistically rather than sequentially. Understanding this language requires a radical shift in thinking for humans.





The Turning Point



Global breakdown due to mistranslation

As the world races to understand the Heptapods' language and intentions, tensions are high. Countries like the United States, China, Russia, and others work independently, trying to decipher the messages from the alien visitors. During one of the communication sessions with the Heptapods, Louise Banks (Amy Adams) and her team receive a message that includes the word "weapon." The Heptapods' symbol is interpreted as "offer weapon." This translation causes panic, as many interpret the word "weapon" as a sign of hostility and a threat to humanity.



NLP Challenges



NLP Challenges

Ambiguity & Context



Parallel: Human misinterpretation of logograms ↔ NLP struggles with sarcasm/idioms.

Example: "Bank" (financial vs. river) vs. "offer weapon" mistranslation.

Provocation: Can models ever grasp context without lived experience?



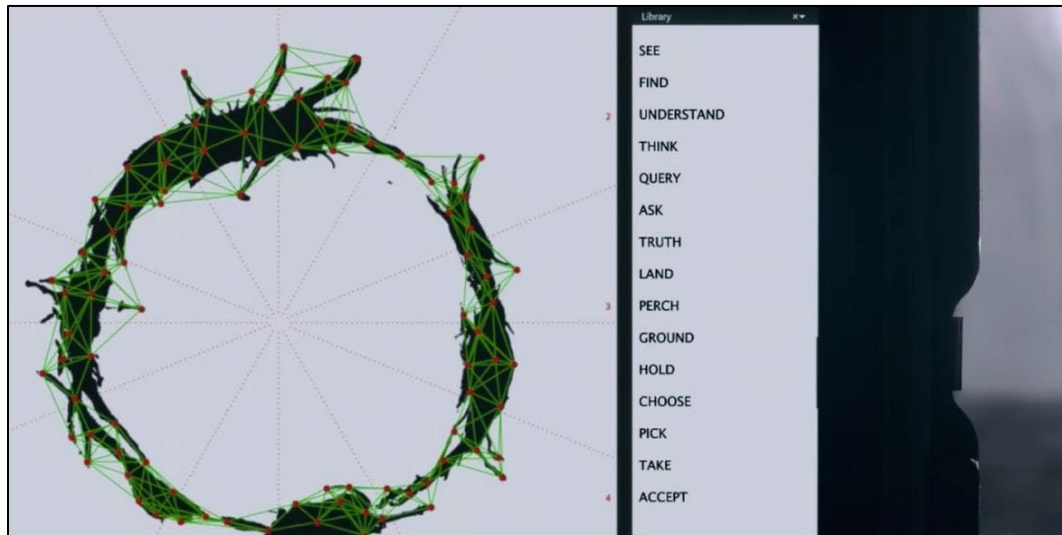
NLP Challenges

Cultural Relativity

Parallel: Heptapods' lack of human senses ↔ Low-resource language datasets.

Example: Idioms like “break a leg” require cultural fluency rule-based systems lack.

Provocation: Is “universal” NLP a myth?





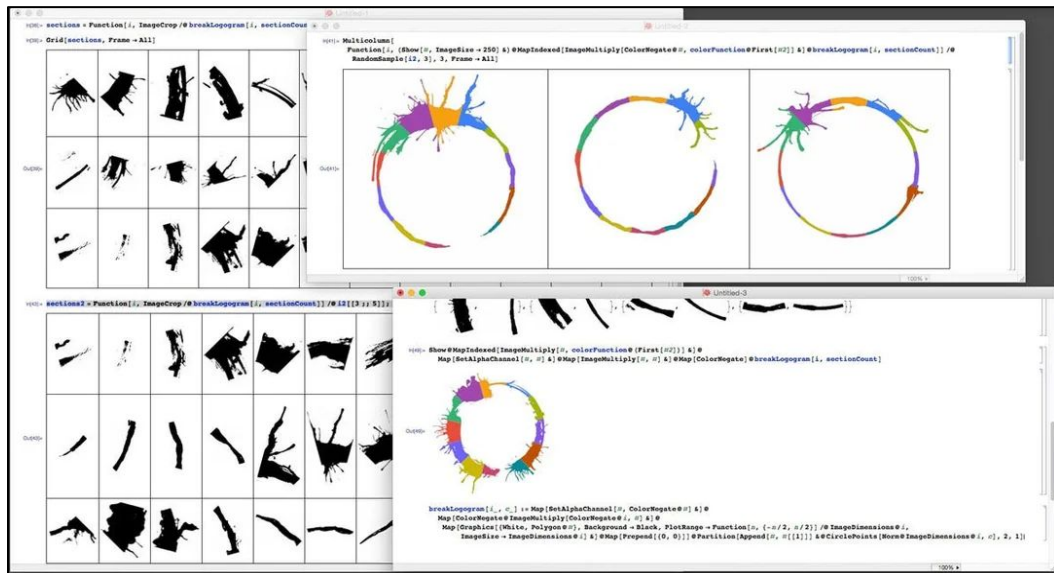
NLP Challenges

Syntax vs. Semantics

Parallel: Logograms (semantic wholes) ↔ Transformer models (attention mechanisms).

Example: “Dog bites man” vs. nonlinear heptapod sentences.

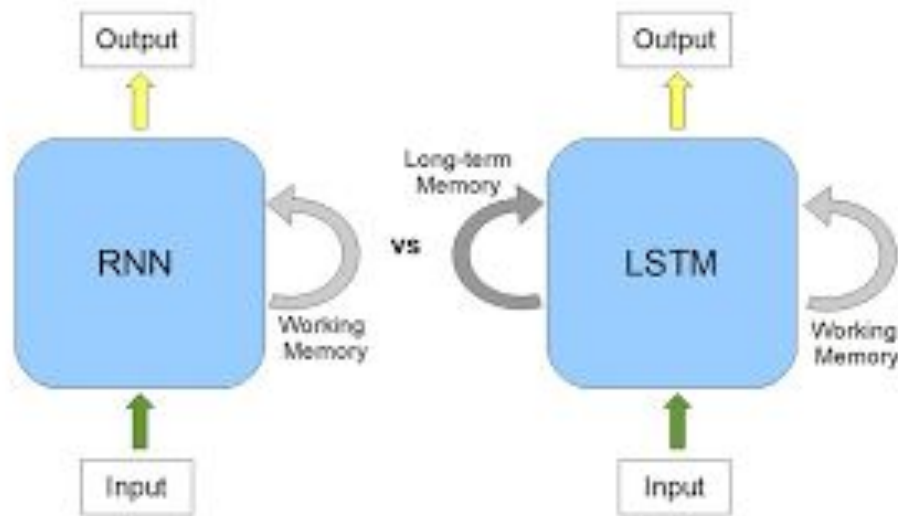
Provocation: Should NLP prioritize intent over structure?





NLP Challenges

Temporal Dynamics



Parallel: Non-linear time perception
↔ RNNs' context window limitations.

Example: GPT-4's struggle with long-term coherence vs. Louise's precognition.

Provocation: Could recursive neural networks mimic temporal holism?



Communication Methods

NLP Approaches



Rule-Based Foundations

Film: Louise's initial vocabulary drills ↔ ELIZA (1966).

NLP Today: Transition to statistical → neural models.



Empathy as a Tool

Film: Louise's focus on intent
("What is your purpose here?")
↔ BERT's contextual
embeddings.

NLP Today: Bias
mitigation in sentiment
analysis.



Collaborative Frameworks

Film: Global data silos

Multilingual projects like No Language Left Behind (Meta).

NLLB-200 model



Reflections

Ethical Implications



Expanding NLP Paradigms

Does Arrival critique AI's "hostile attribution bias"?

The movie emphasizes that learning and understanding different perspectives can prevent harmful assumptions. AI programs can misinterpret signals, highlighting the importance of thoughtful communication and design to avoid bias and misjudgments.



The Future of Human-Machine Dialogue

Will NLP ever achieve Louise's "universal language"?

“Language is the foundation of civilization. It is the glue that holds people together.”

– Louise Banks



“Language is a process of free creation; its laws are determined by the nature of the mind.”

– Noam Chomsky

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Thank you!

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