Justin Li (Occidental)

Takeaway

Diverse memory mechanisms should be understood as attempts to mitigate agent uncertainty

Problem and Approach

- Cognitive architectures have adopted diverse long-term memory mechanisms
- We lack a theory that explains why mechanisms are necessary
- Rational analysis accounts for environmental regularities, but ignores agent computational bounds
- Approach: analyze memory in terms of uncertainties and how mechanisms mitigate them by using additional sources of information

Conclusion



- Can depict influences to memory retrievals over time
- No theoretical reason sources of information must be mediated through memory mechanisms
- Globally optimal algorithm using all sources of information may exist

Architectural Mechanisms for Mitigating Uncertainty during Long-Term Declarative Knowledge Access Nate Derbinsky (Wentworth) Shiwali Mohan (PARC) Steven Jones (Michigan)

Boundedness

Retrieval Decision

The agent may not know whether a retrieval is necessary, or if relevant knowledge will be found



Representation

The agent may incorrectly represent the situation due to partialobservability or errors or incompleteness of knowledge

On Spreading Activation

- Standard explanation of spreading activation as correlation does not match implementation
- Current architectures do not track correlation, nor construct any causation network
- Structure of memory plays questionable role under this narrative

Mechanisms



- Instead, spreading on structure compensates for potential errors in knowledge representation
- Mirrors how kernel density estimation compensates for sensor noise

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Information Source

Retrieval History

When each element was previously retrieved is stored as metadata; it is assumed that the past patterns of retrieval are representative of future retrievals

Retrieval Context

The contents of working memory at the time of retrieval, potentially including the current goal of the

Knowledge Structure

The relationship between concepts in long-term memory; used for inference but may also indicate

