

# Modeling Human Motives and Emotions from Personal Narratives

## Using External Knowledge And Entity Tracking

Prashanth Vijayaraghavan and Deb Roy

# Importance of Narratives

Stories present different facets of the social world and their pervasiveness has led several theorists and researchers to suggest how stories exert a powerful influence on social cognition.

**Narrative is the fundamental means by which we organize, understand and explain the world**

— Patrick Winston  
*Strong Story Hypothesis*



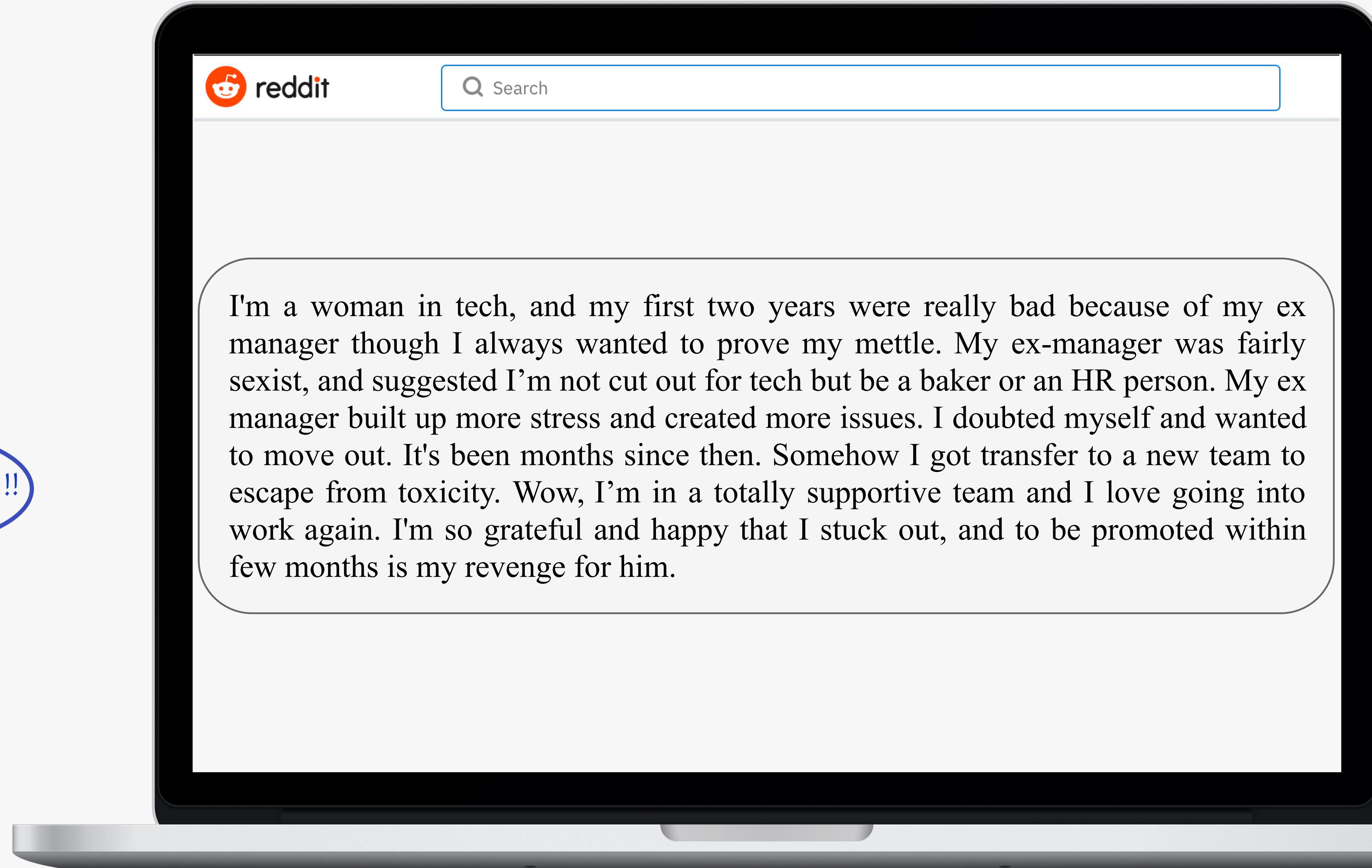
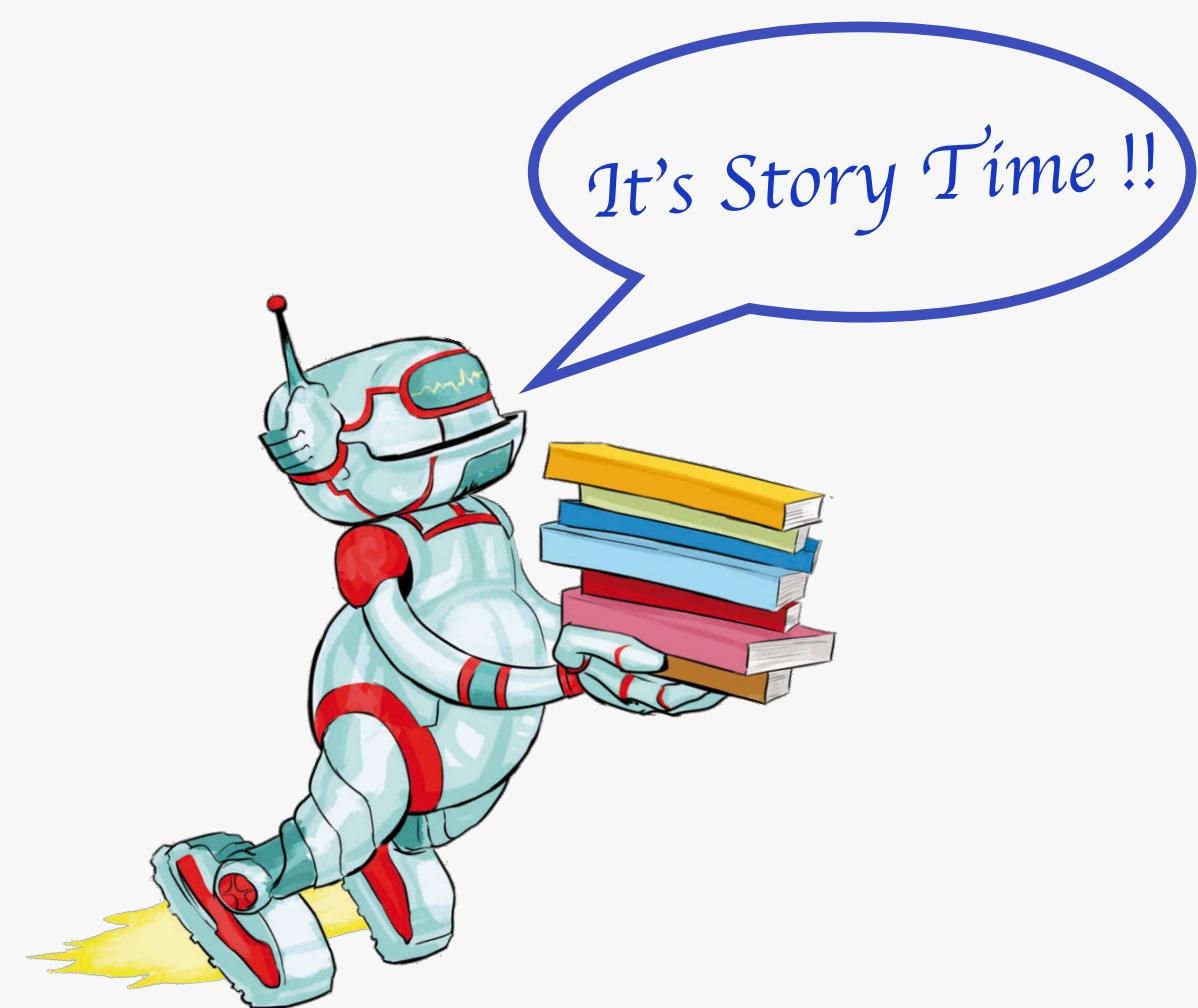


Jerome Bruner — Act of Meaning, 1990

“A narrative is composed of a unique sequence of events, mental states, happenings involving human beings as characters or actors. These are its constituents... Their meaning is given by their place in the overall configuration of the sequence as a whole....”

# Example Story from Social Media

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The image shows a smartphone displaying a reddit post. The top of the screen features the reddit logo and a search bar. The main content is a text box containing the following story:

I'm a woman in tech, and my first two years were really bad because of my ex manager though I always wanted to prove my mettle. My ex-manager was fairly sexist, and suggested I'm not cut out for tech but be a baker or an HR person. My ex manager built up more stress and created more issues. I doubted myself and wanted to move out. It's been months since then. Somehow I got transfer to a new team to escape from toxicity. Wow, I'm in a totally supportive team and I love going into work again. I'm so grateful and happy that I stuck out, and to be promoted within few months is my revenge for him.

# Elements of a Narrative

Events

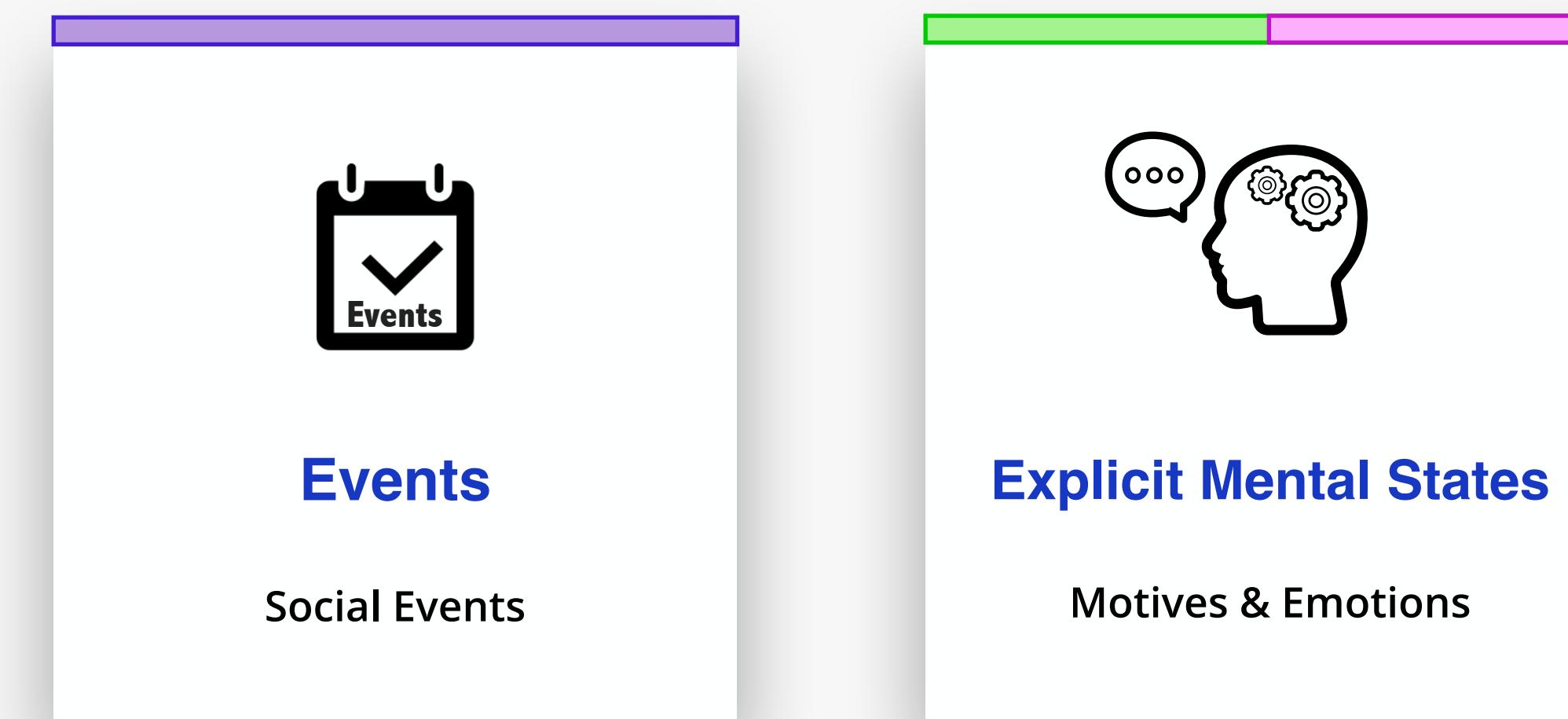
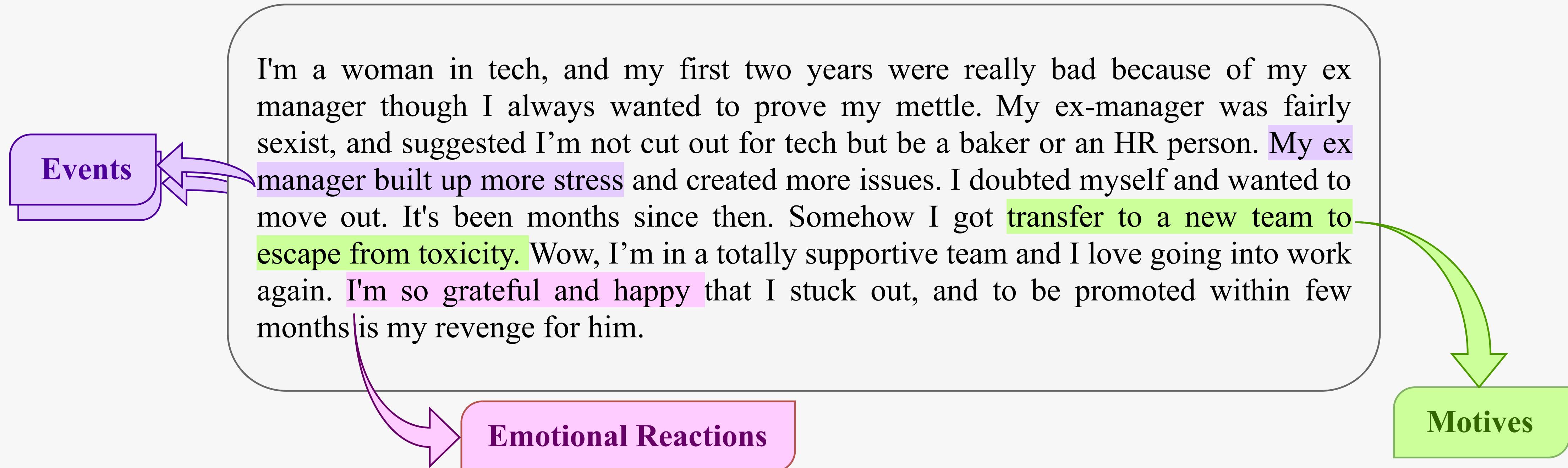
I'm a woman in tech, and my first two years were really bad because of my ex manager though I always wanted to prove my mettle. My ex-manager was fairly sexist, and suggested I'm not cut out for tech but be a baker or an HR person. My ex manager built up more stress and created more issues. I doubted myself and wanted to move out. It's been months since then. Somehow I got transfer to a new team to escape from toxicity. Wow, I'm in a totally supportive team and I love going into work again. I'm so grateful and happy that I stuck out, and to be promoted within few months is my revenge for him.



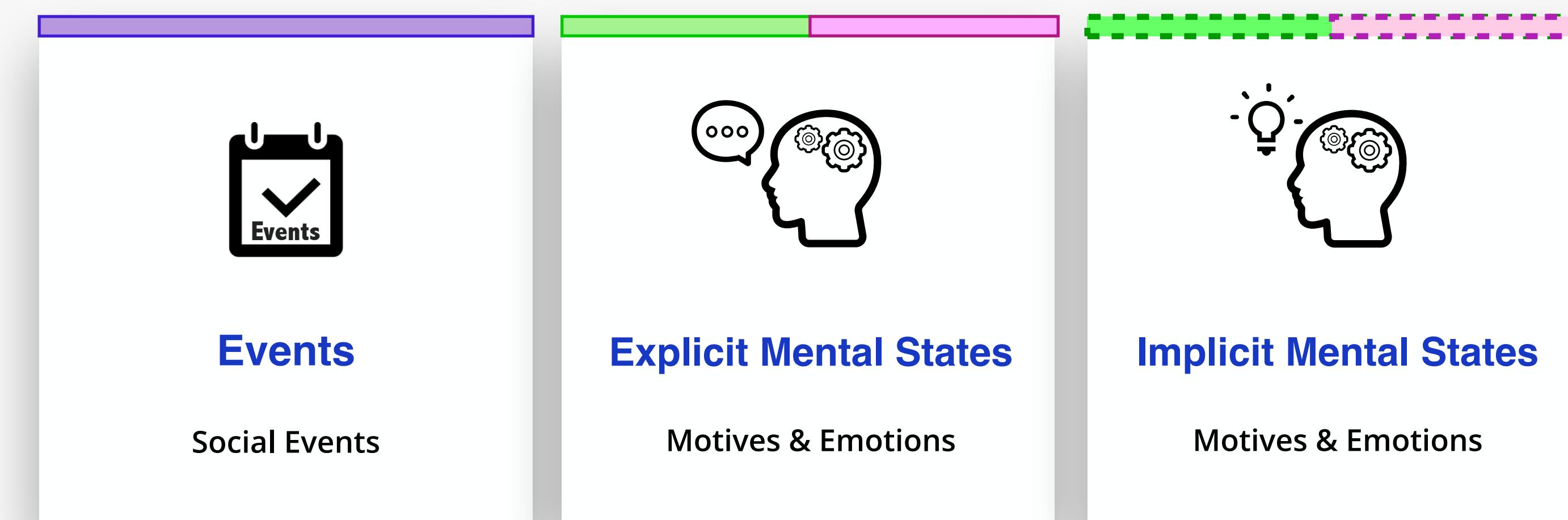
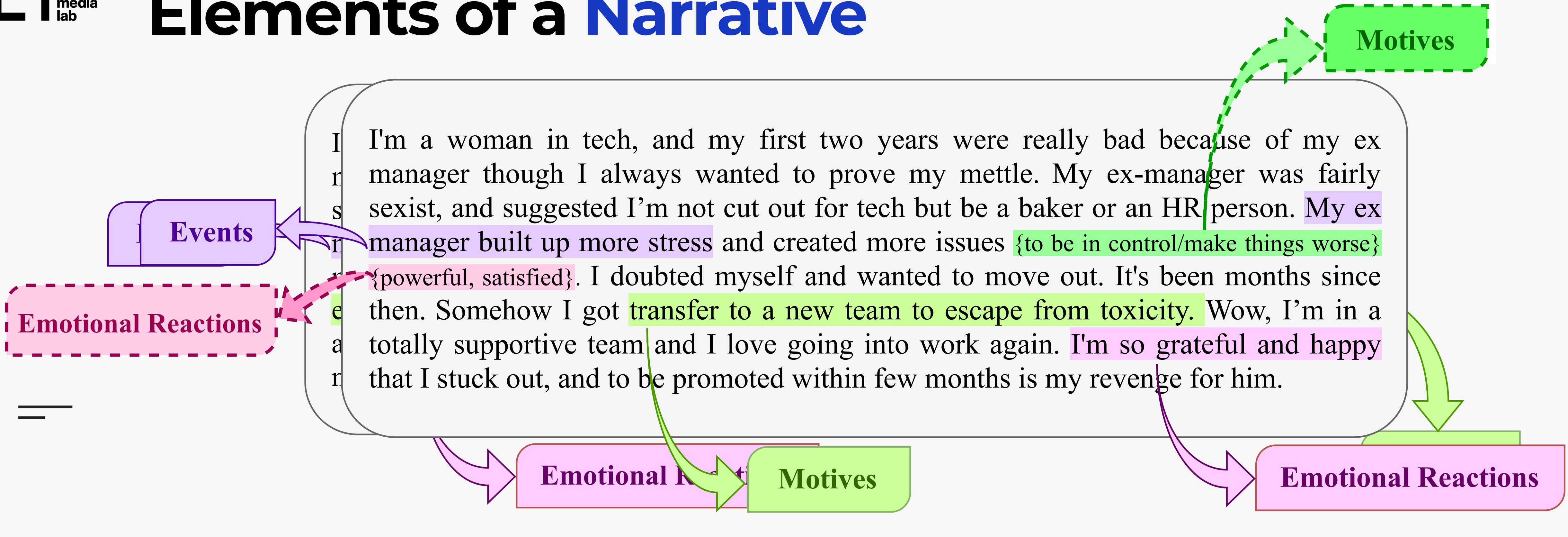
Events

Social Events

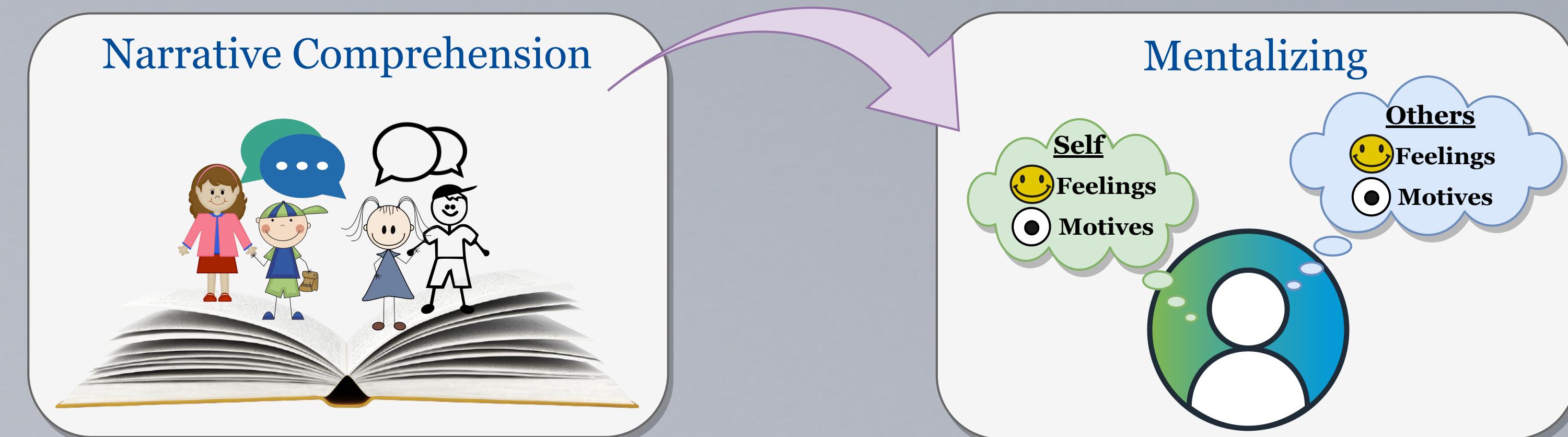
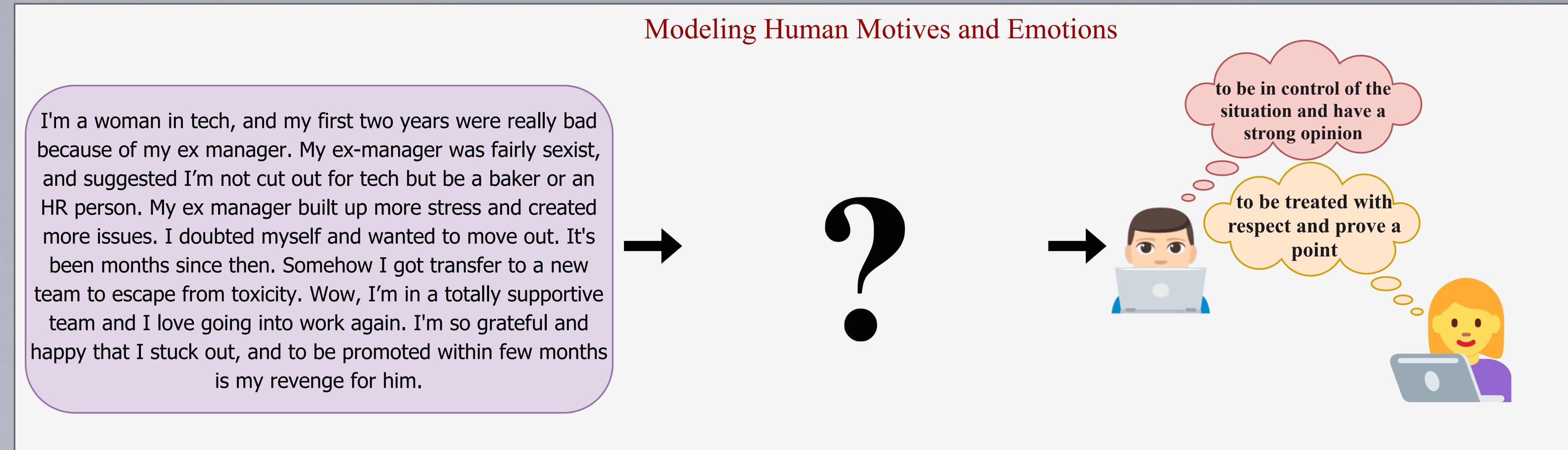
# Elements of a Narrative



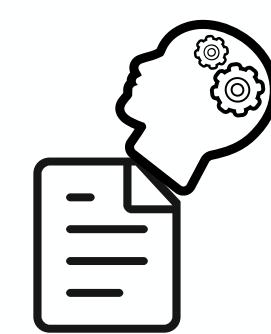
# Elements of a Narrative



# Research Problem

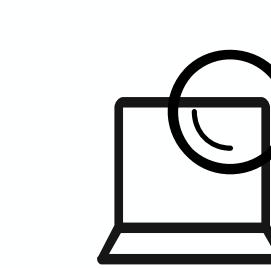


# Dataset Collection



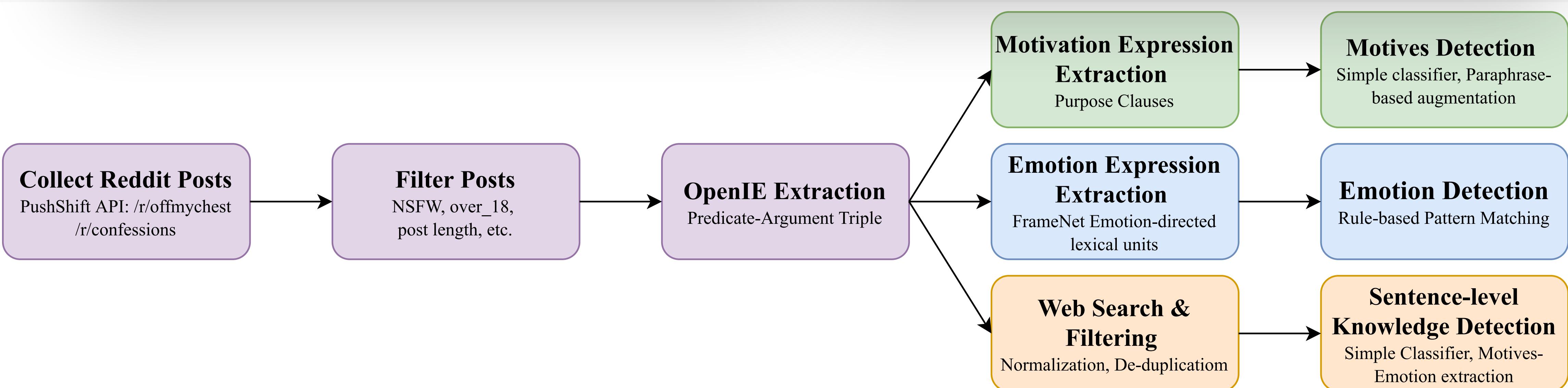
## Personal Narratives Corpus

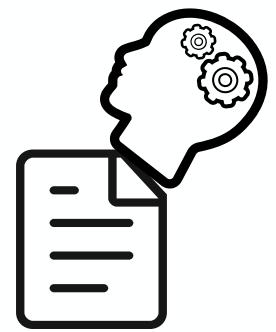
Explicit/States expressions of motives and emotional reactions considering the story context.



## SB-SCK Dataset

Search-based social commonsense knowledge containing sentence-level implicit mental states





# Personal Narratives Corpus

Explicit/States expressions of motives and emotional reactions considering the story context.

- Extract OpenIE Propositions from text.
- Motivation Expressions: Purpose clauses, Emotion Expressions: FrameNet Lexical Units (Emotion-directed)
- Remove trivial extractions with a logistic classifier.
- Data Augmentation: Paraphrases from Back-translation

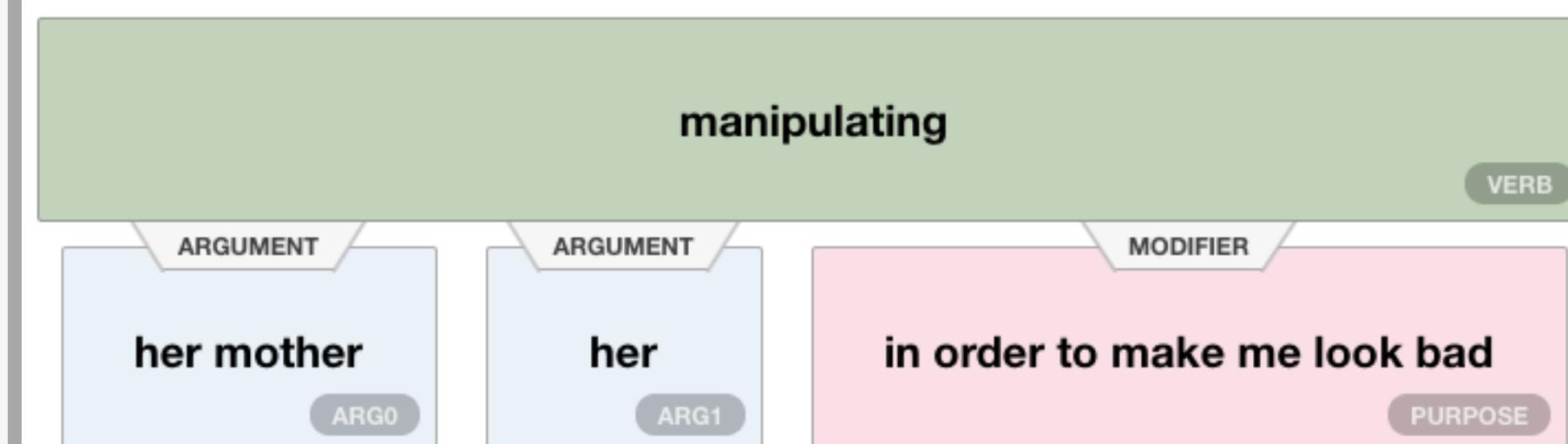
Intents	I haven't been able to get my degree, and it's killing me. I don't know where to start or how to do it. I put my job in stand by <b>in order to finish my degree.....</b>
Intents	My best friend had a really bitter break up. She constantly breaks down and gets lost in thought. I advised her to go to the gym. Now, she has been sweating at the gym daily. <b>She is trying so hard so as to divert attention in tough times....</b>
Emotions	... My mother sends a birthday card to my girlfriend, but not me. This birthday, I asked my girlfriend if I could rip the card as she had a bad day. <b>She said yes, because she felt irritated when she received it.....</b>

### Dataset Statistics

#total narratives	439,408
#avg characters per story	2.02
#narratives w/ mappings	85,587
#sents w/ motives	167,256
#sents w/ emotions	318,872
% first-person motives	48.01%
% first-person emotions	58.26%

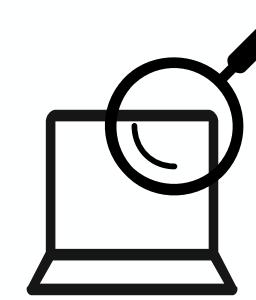
### Motivation Expressions: Purpose Clauses

My girlfriend doesn't know that her mother is manipulating her in order to make me look bad



manipulating: My girlfriend does n't know that [ARG0: her mother] is [V: manipulating] [ARG1: her] [ARGM-PRP: in order to make me look bad]

Purpose Clause Form: [ (In order) + To-Infinitive ]  
ARG0: Agent, ARGM-PRP: Motivation Expression



## SB-SCK Dataset

Search-based social commonsense knowledge containing sentence-level implicit mental states

- ① Process Reddit posts in Personal Narrative Corpus.
- ② Extract **OpenIE Propositions** from text.
- ③ Perform **Web-search** for plausible intents and emotions using purpose clauses and FrameNet lexical units.
- ④ Remove poorly extracts facts using a logistic classifier.

### Dataset Statistics

#events w/ motives	103,357
#events w/ emotions	69,584
#unique social roles	586

Search-based Social Commonsense Knowledge		
Social Roles	Event Phrases	Motives
Politicians	use social media	to woo voters
Activists		to create a movement
Police		to connect with residents and solve crime
Workers	gather around table	to solve business problems
Priests		to pray to god, share wine and bread
Friends		to share a meal, conversation

### Samples Search Results

"doctor visits his clinic to"

All Images Videos News Shopping More Settings Tools

2 results (0.29 seconds)

[www.hindustantimes.com](#) › lucknow › using-sacred-thr... Using sacred thread to create bond with voters | Hindustan ...

Feb 11, 2017 — Kishan Lal (57), an ayurvedic doctor, visits his clinic every morning in Hundalkheda to examine patients after which he leaves for nearby ...

"police use social media to"

All News Images Videos Shopping More Settings Tools

About 8 results (0.45 seconds)

[www.govtech.com](#) › public-safety › Tavares-Fla-Police... Tavares, Fla., Police Use Social Media to Connect With ...

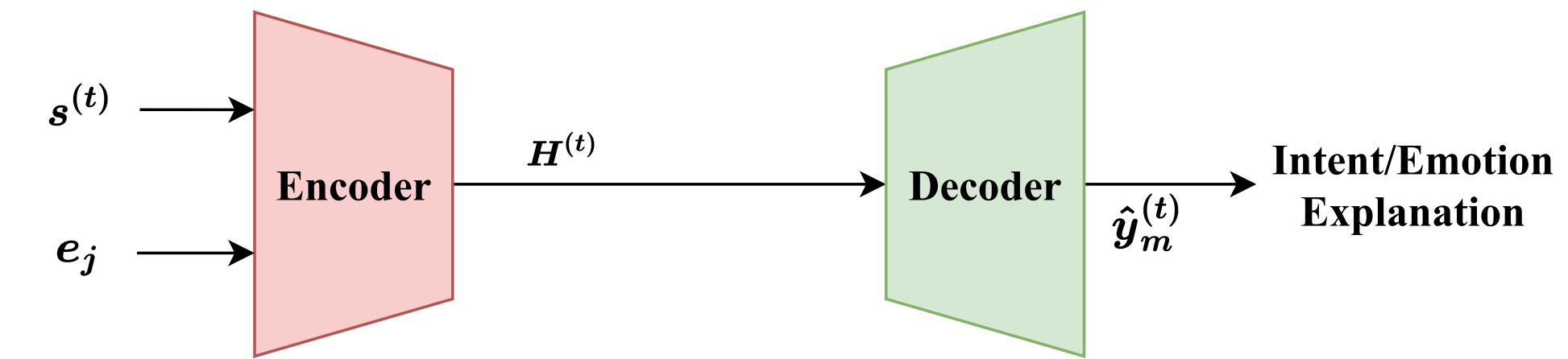
Jun 15, 2017 — Tavares, Fla., Police Use Social Media to Connect With Residents, Solve Crime. Officers have taken to using hashtags like ...

# Simple Encoder-Decoder

- Encoder: Transformer-based Encoder to produce entity-aware representation taking current story sentence and entity information as input.

- Decoder: Transformer-based autoregressive decoder to produce intent or emotion explanation.

I'm a woman in tech, and my first two years were really bad because of my ex manager. My ex-manager was fairly sexist, and suggested I'm not cut out for tech but be a baker or an HR person. He built up more stress and created more issues. I doubted myself and wanted to move out. It's been months since then. Somehow I got transfer to a new team to escape from toxicity. Wow, I'm in a totally supportive team and I love going into work again. I'm so grateful and happy that I stuck out, and to be promoted within few months is my revenge for him.



My ex-manager was fairly sexist, and suggested I'm not cut out for tech but be a baker or an HR person.

to be a baker  
to make a good impression

He built up more stress and created more issues.

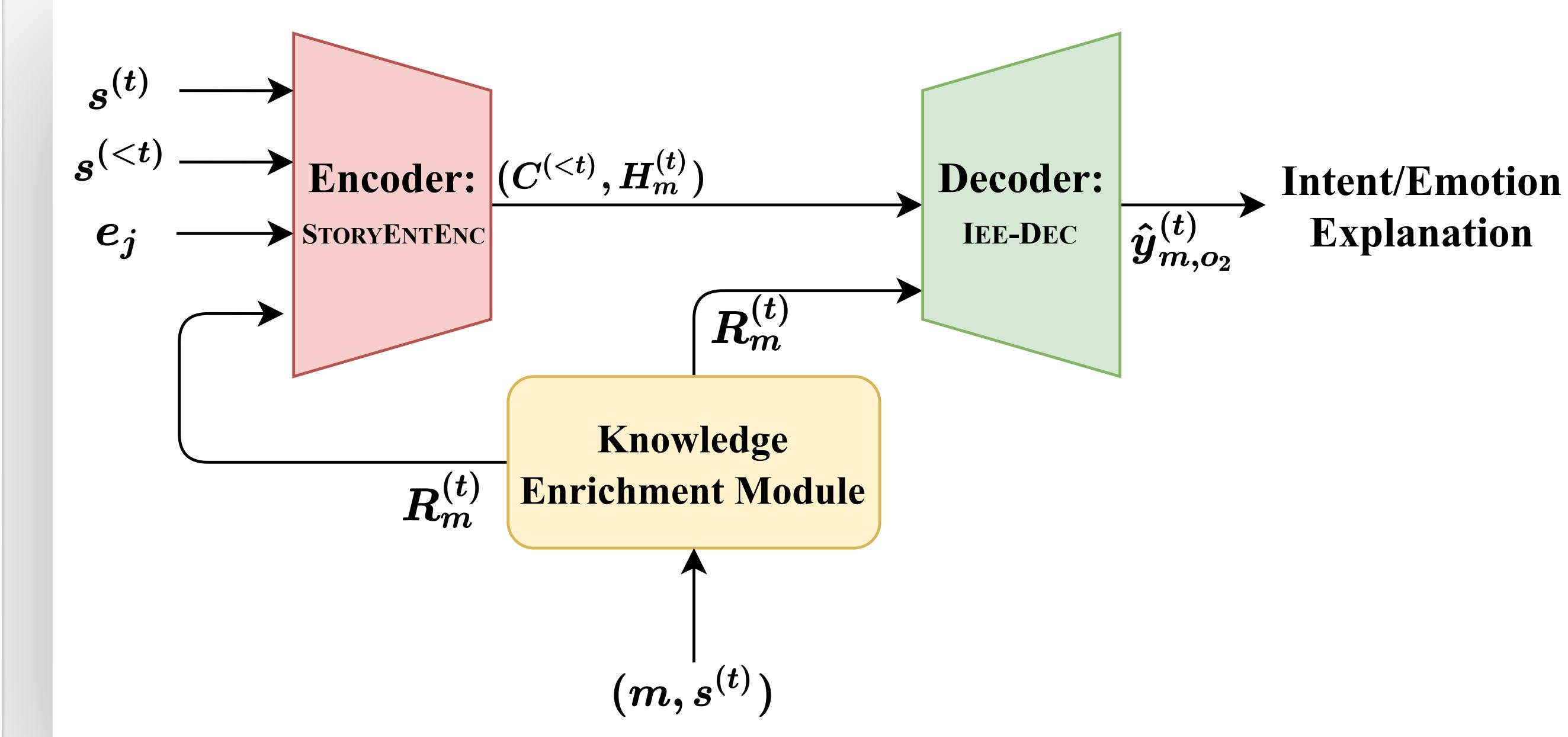
to be stressed  
to take a break

I doubted myself and wanted to move out.

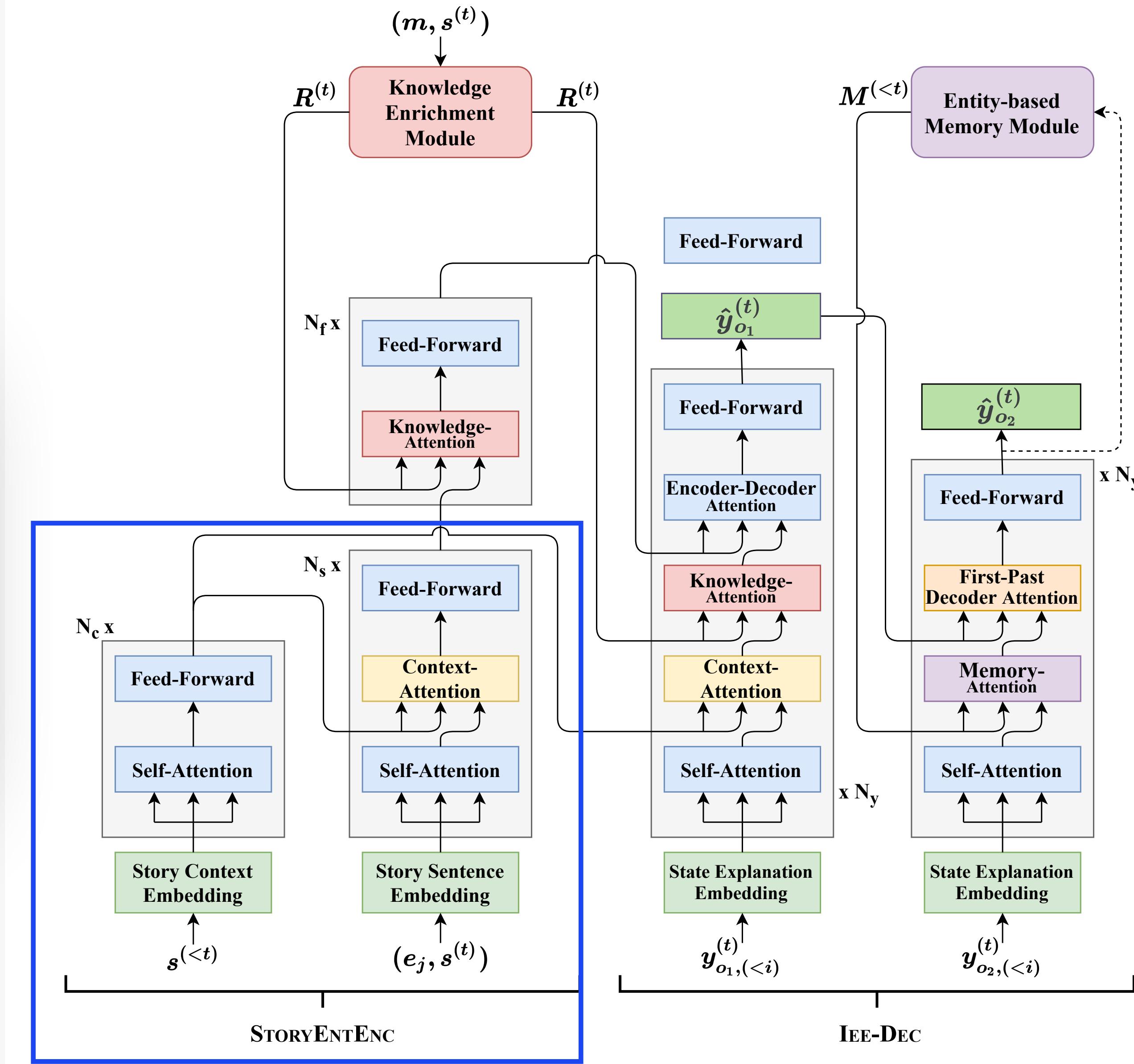
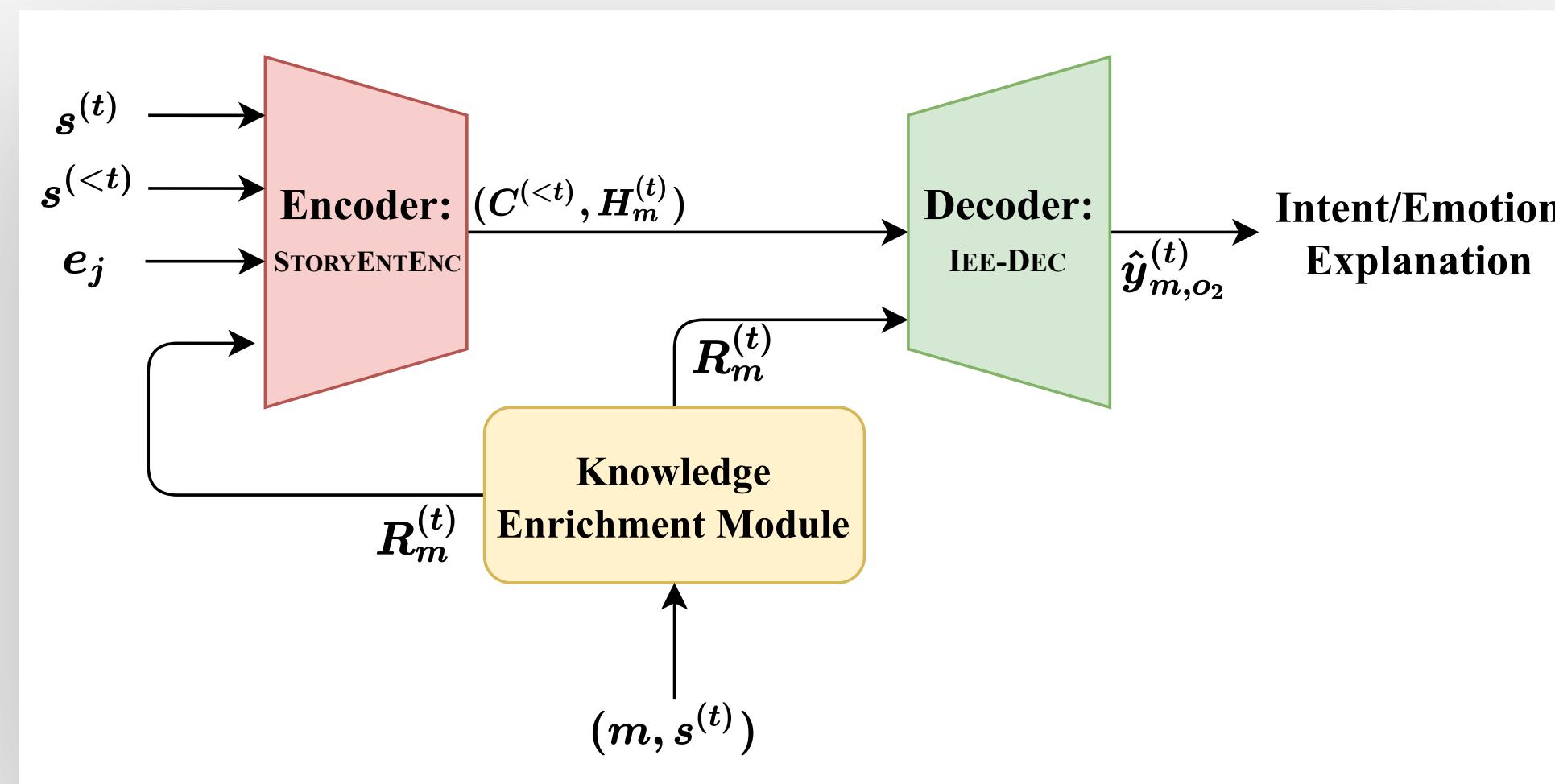
to be independent  
to find a new place to live

# Knowledge-Enriched Encoder-Decoder

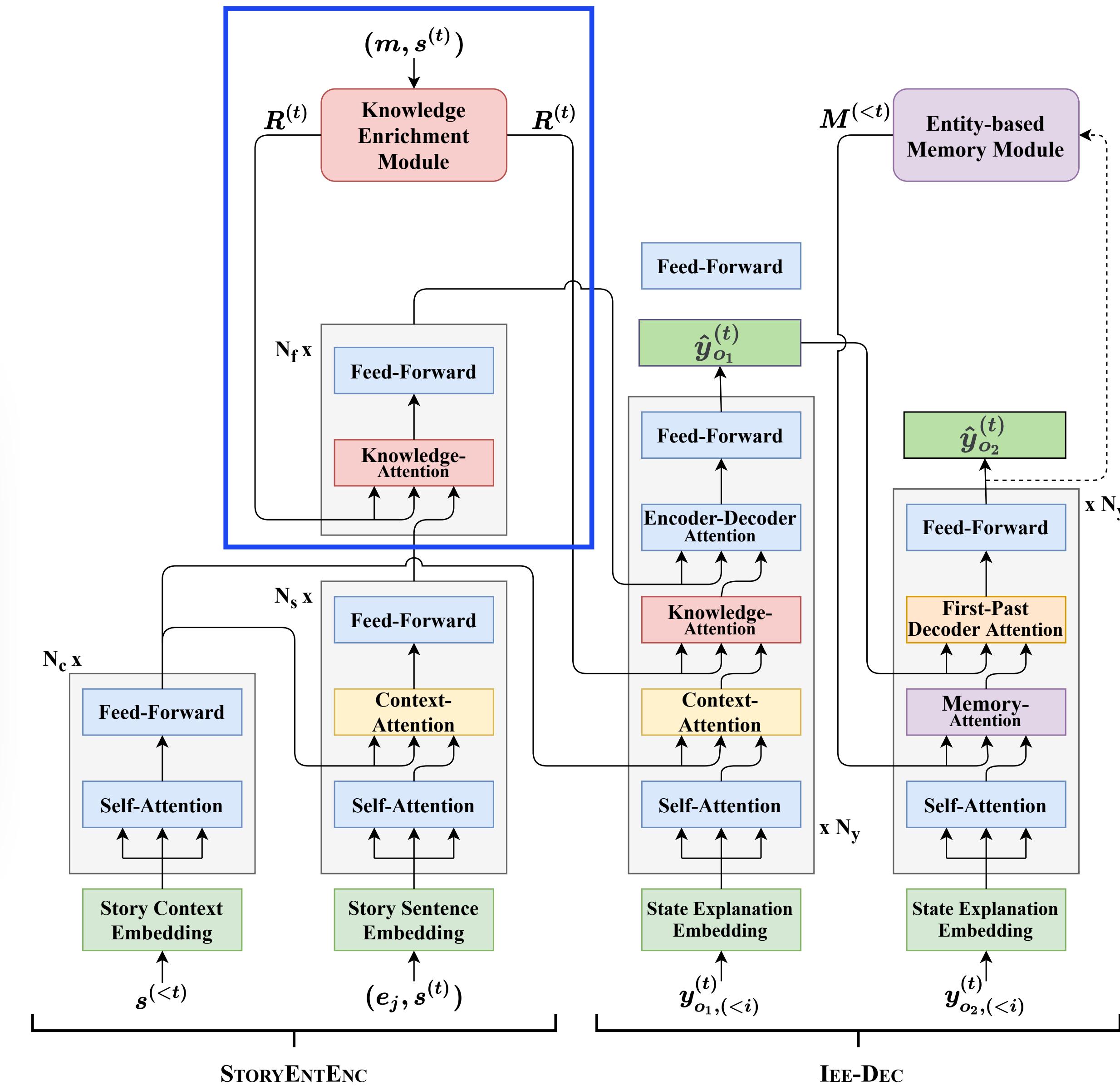
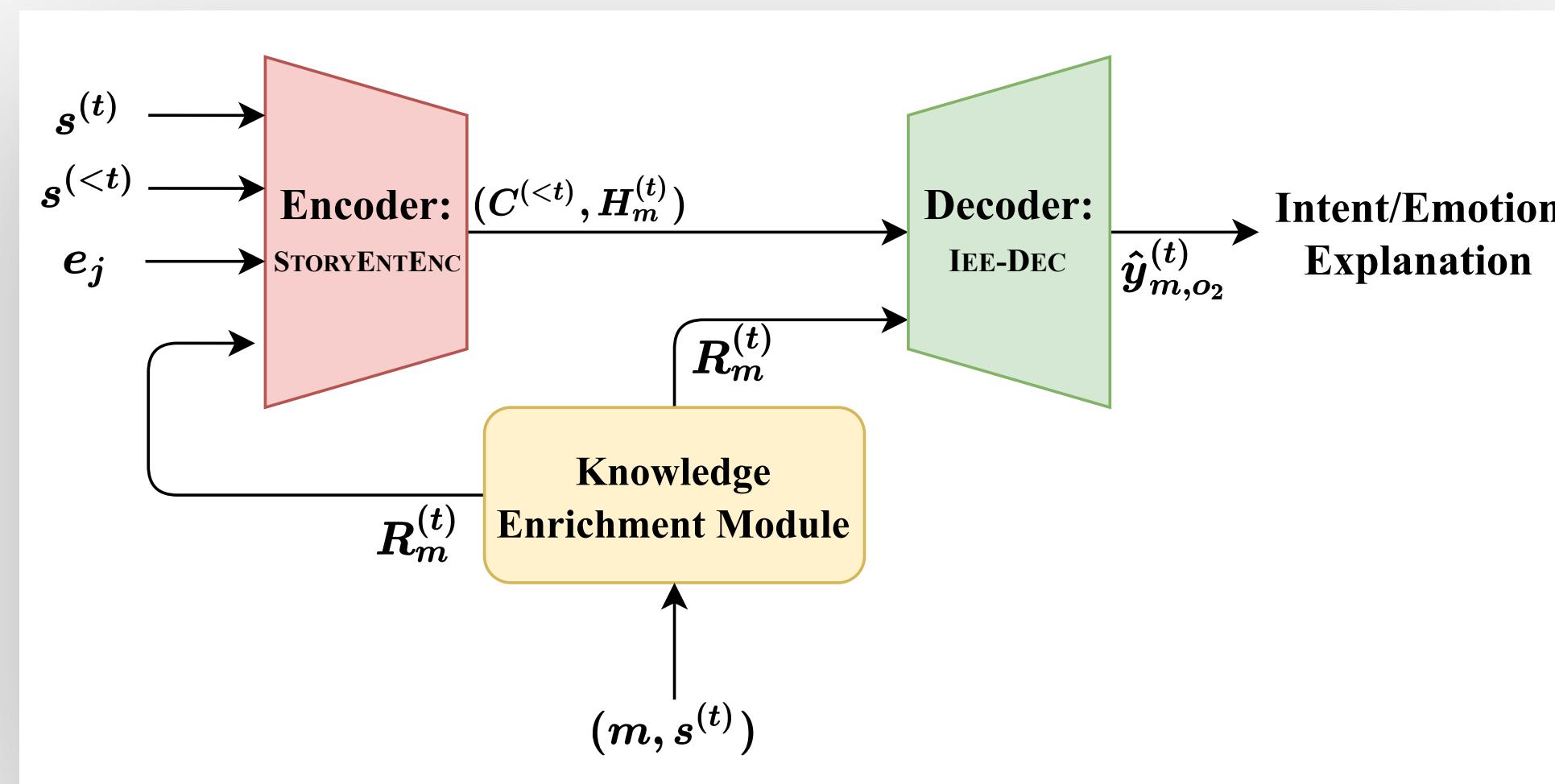
- **Encoder:** Transformer-based Encoder to produce entity-aware representation taking current story sentence, prior sentence and entity information as input.
- **KEM:** Our pretrained EventBERT to get pragmatics-enriched sentence-level social event embedding.
- **Decoder:** Transformer-based Encoder to produce entity-aware representation taking current story sentence, prior sentence and entity information as input.



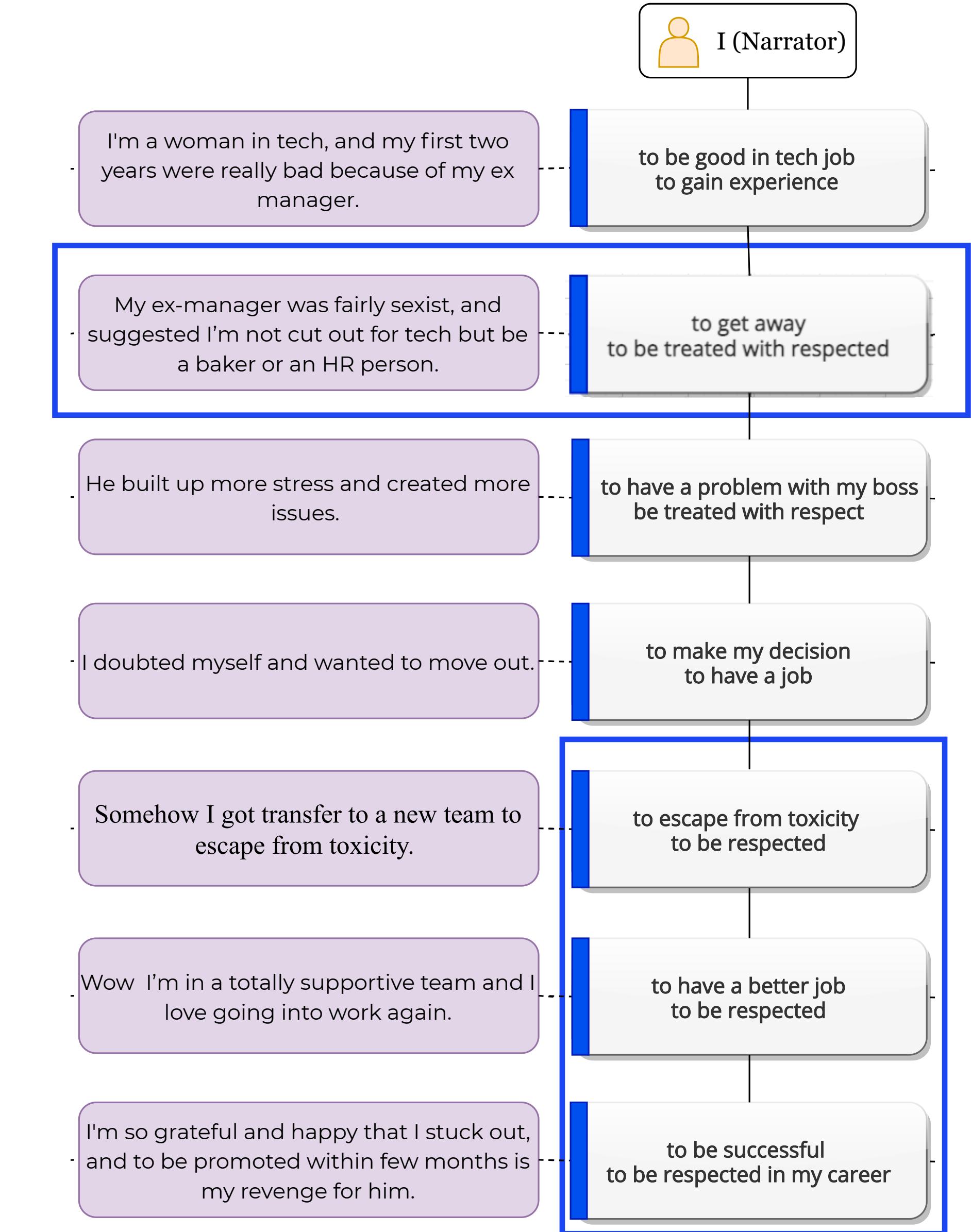
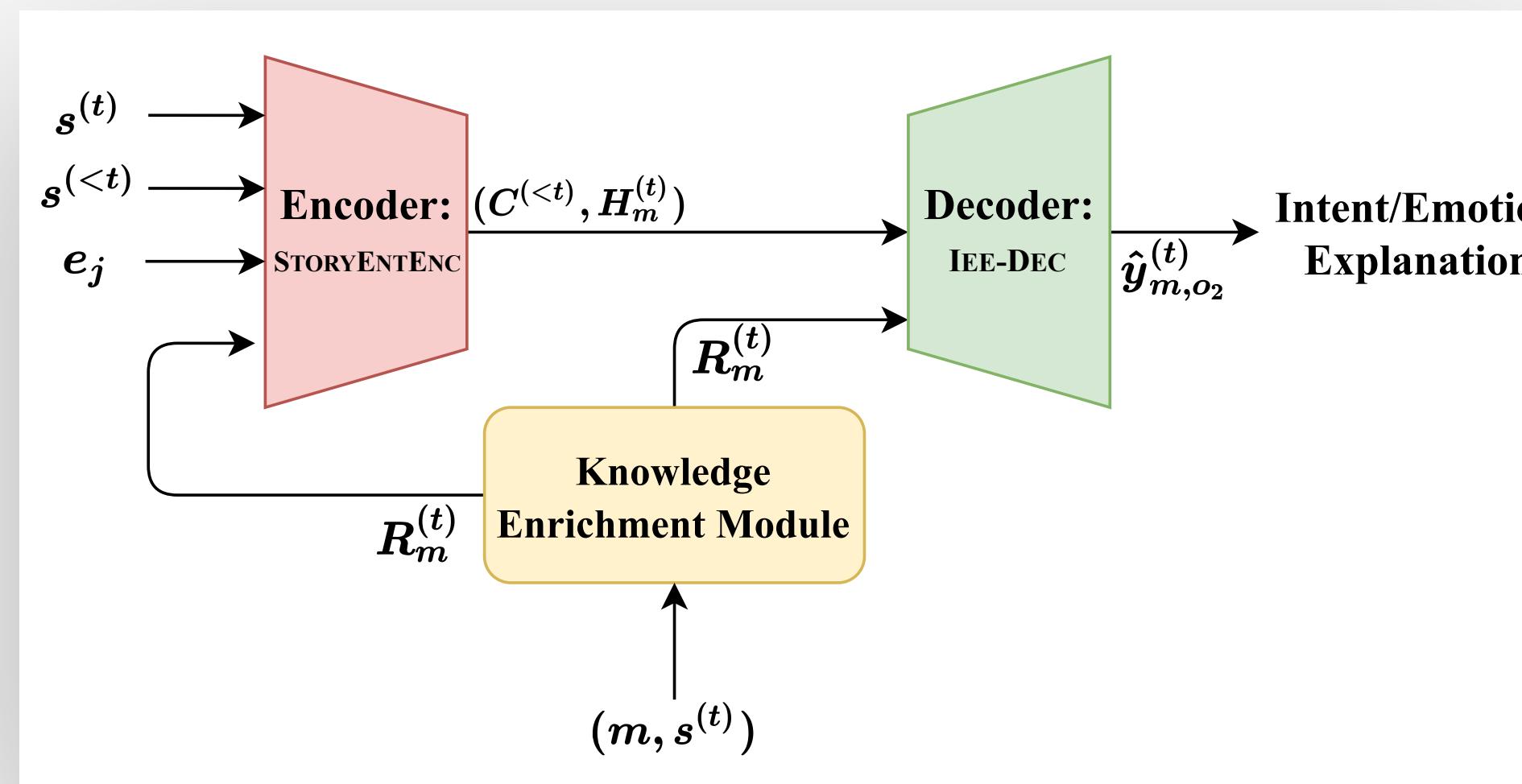
# Knowledge-Enriched Encoder-Decoder



# Knowledge-Enriched Encoder-Decoder

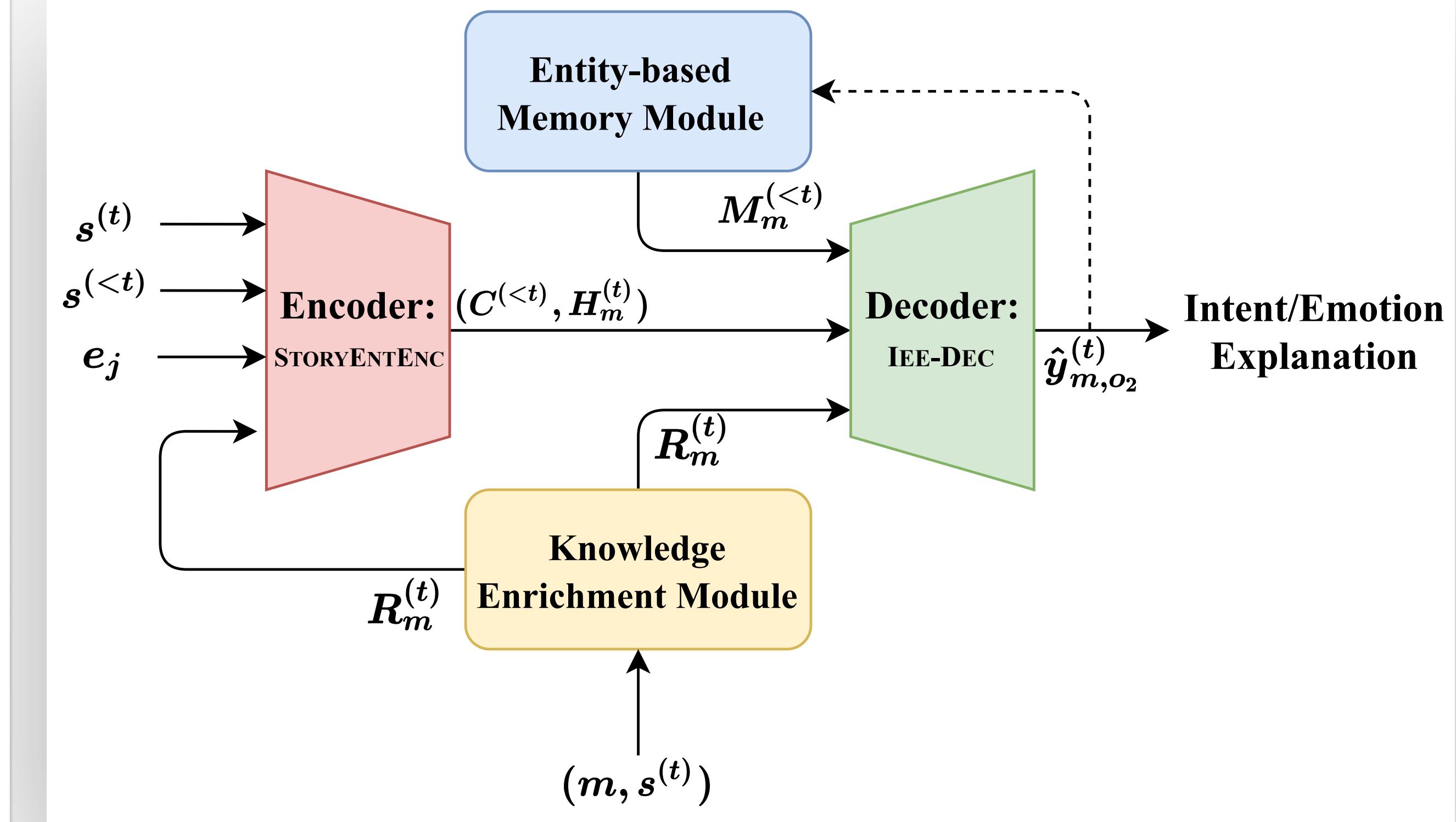


# Knowledge-Enriched Encoder-Decoder

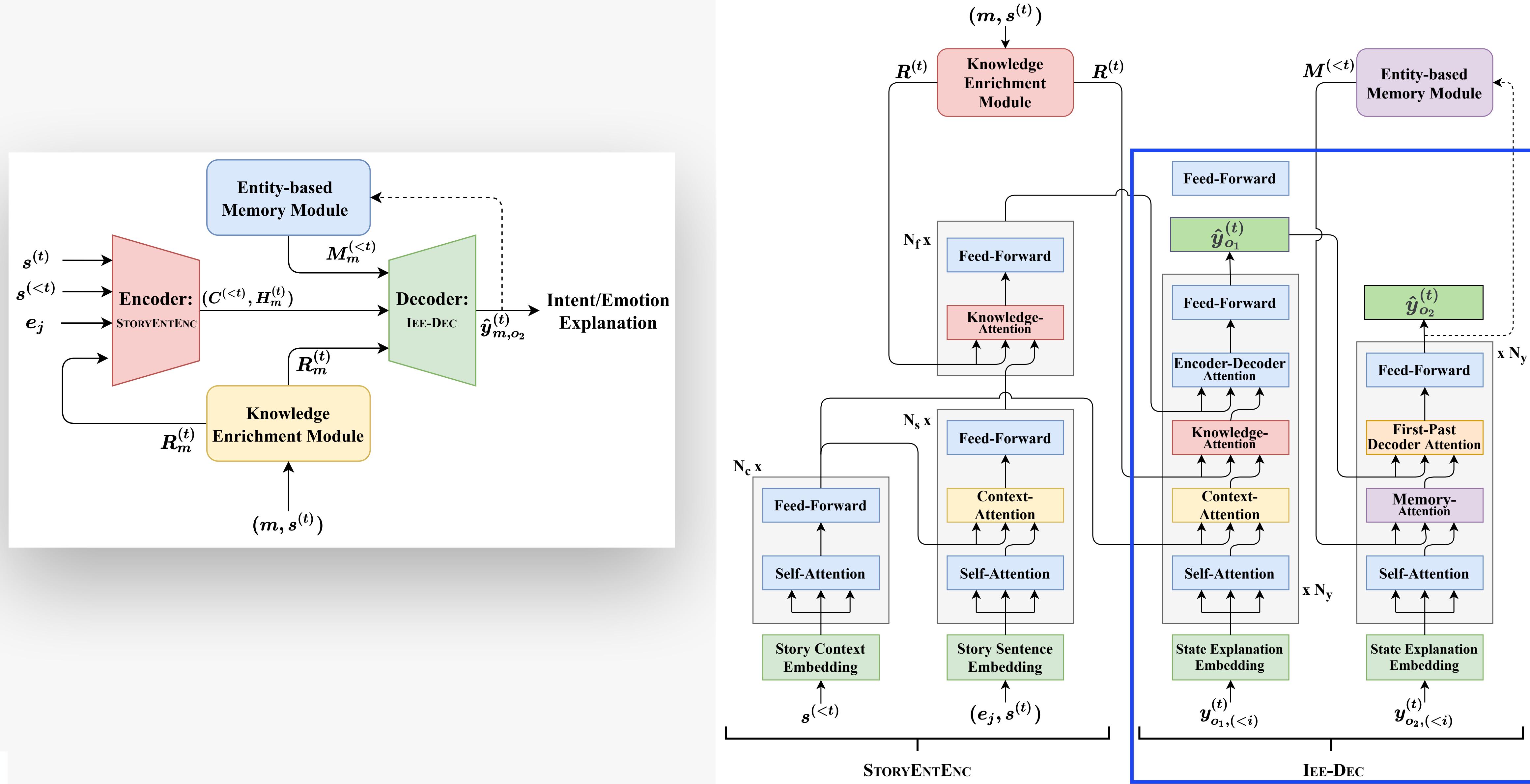


# NEMO: Proposed Model

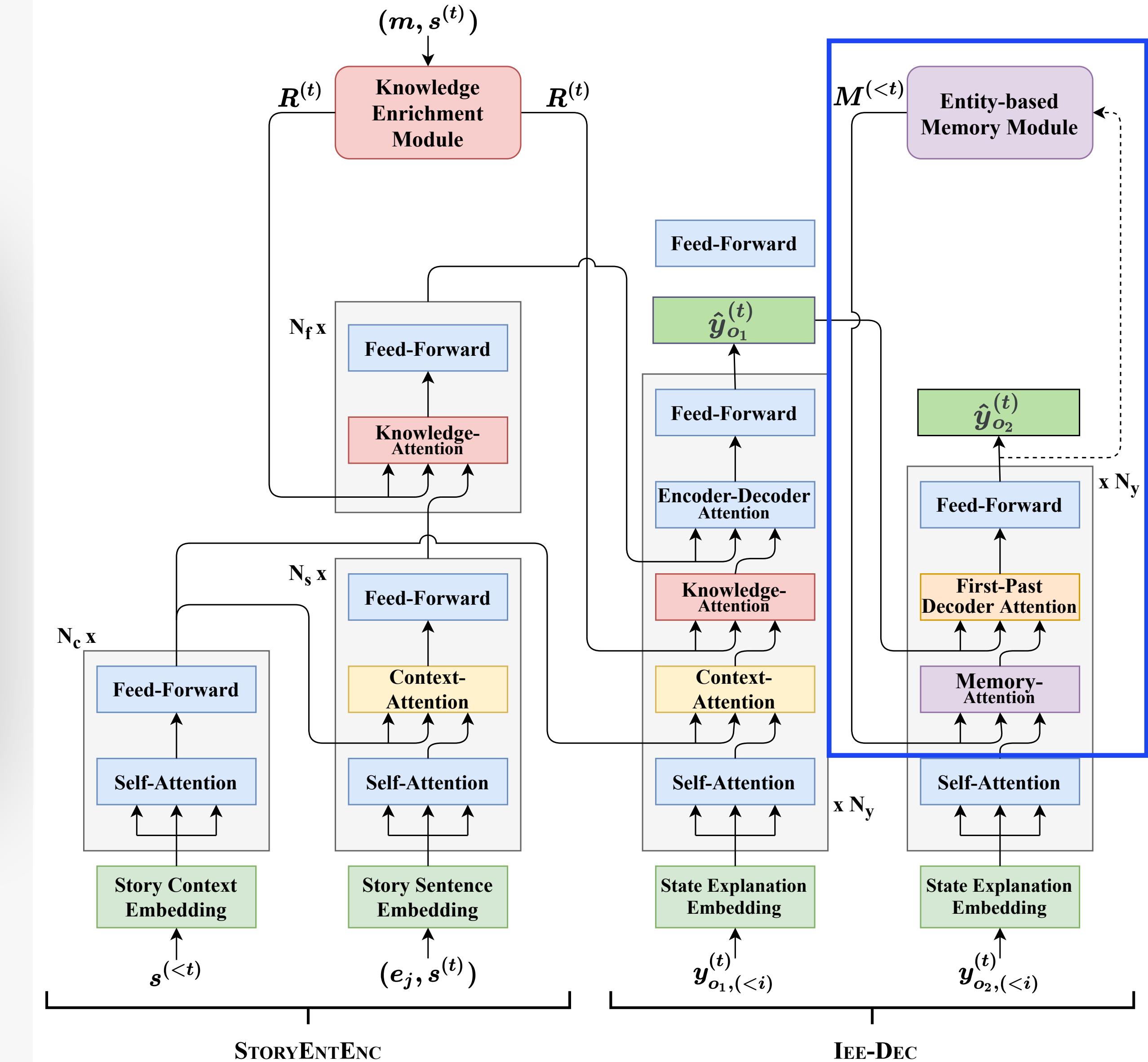
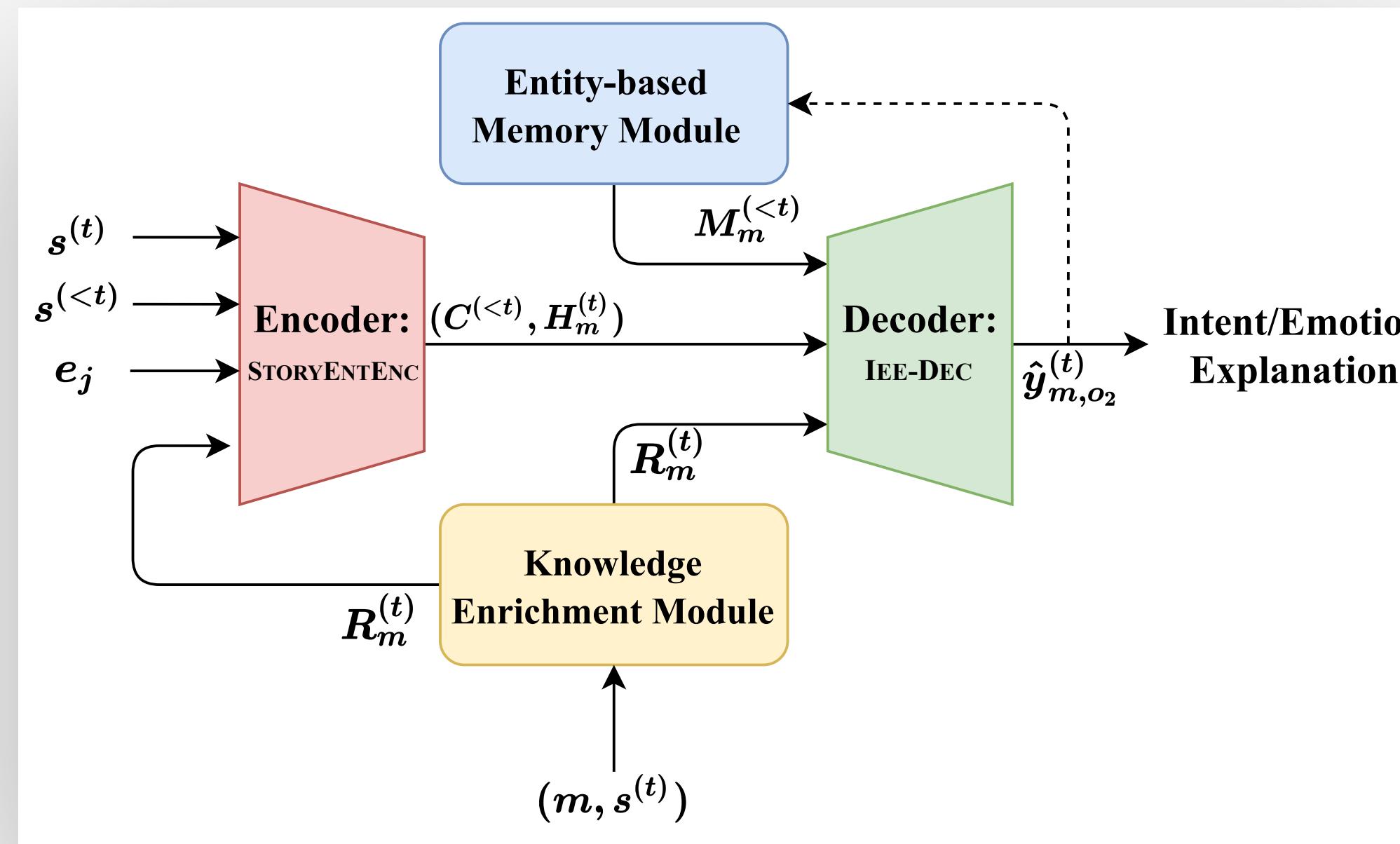
- ◎ **Encoder:** Transformer-based Encoder to produce entity-aware representation taking current story sentence, prior sentence and entity information as input.
- ◎ **KEM:** Our pretrained EventBERT to get pragmatics-enriched sentence-level social event embedding.
- ◎ **IEE-Decoder<sup>1</sup>:** Transformer-based Deliberation Decoder to produce entity-aware representation taking current story sentence, prior sentence and entity information as input.
- ◎ **EMM:** Dynamically track entity's prior mental states based on our own prediction/generation



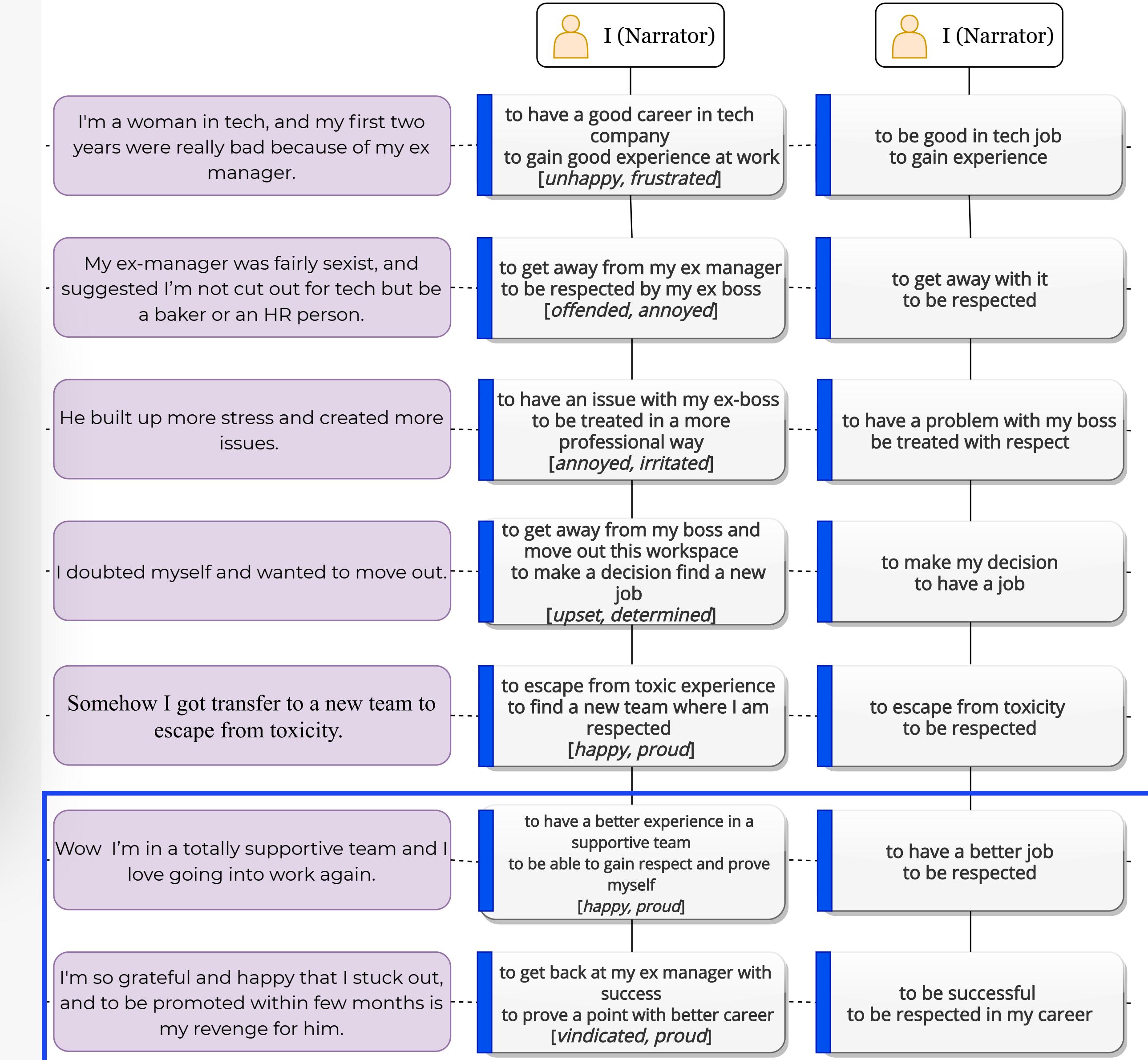
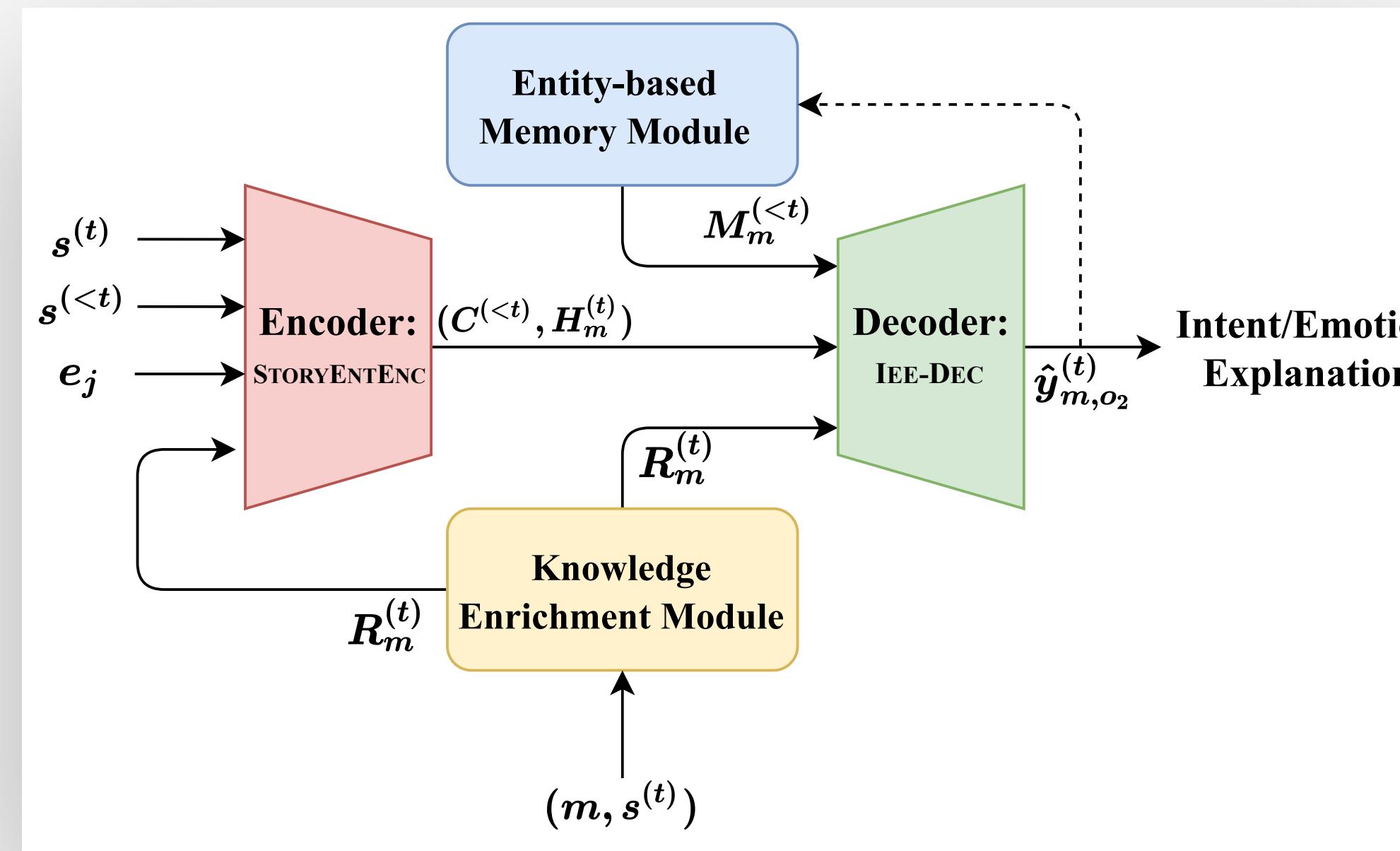
# NEMO: Proposed Model



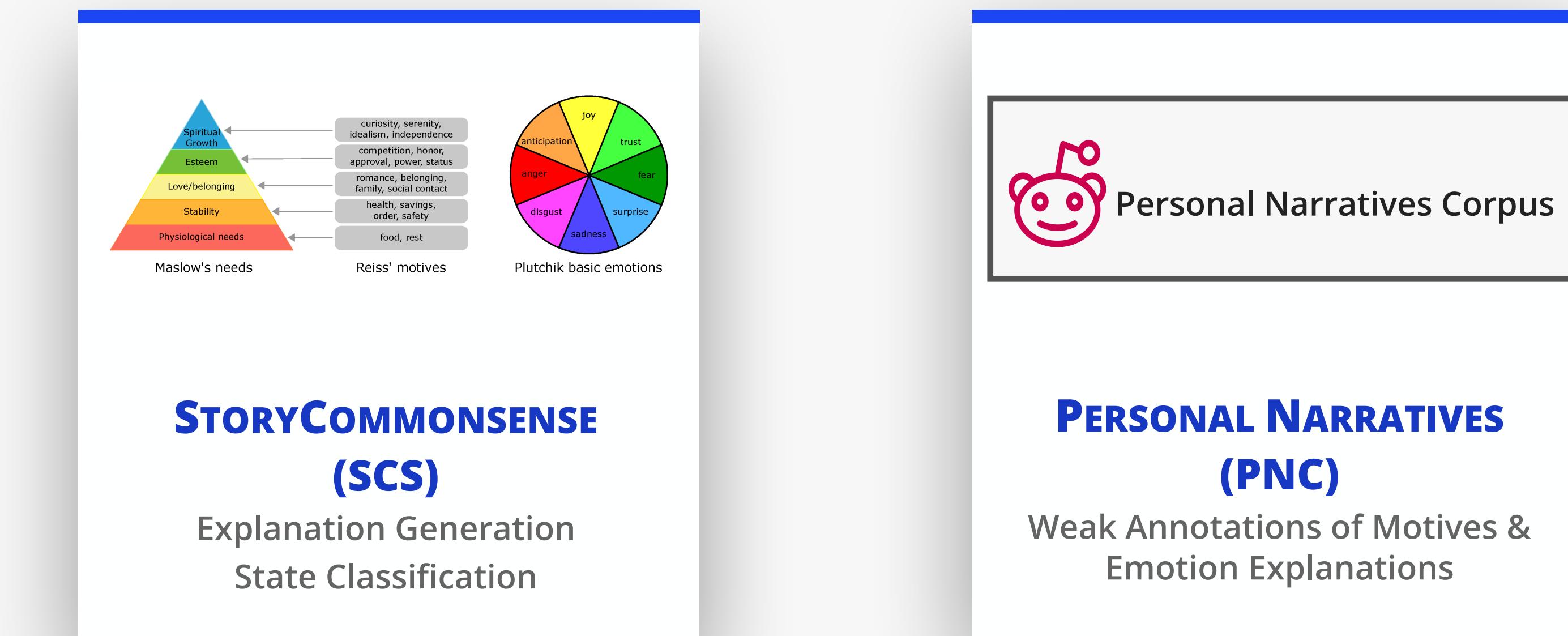
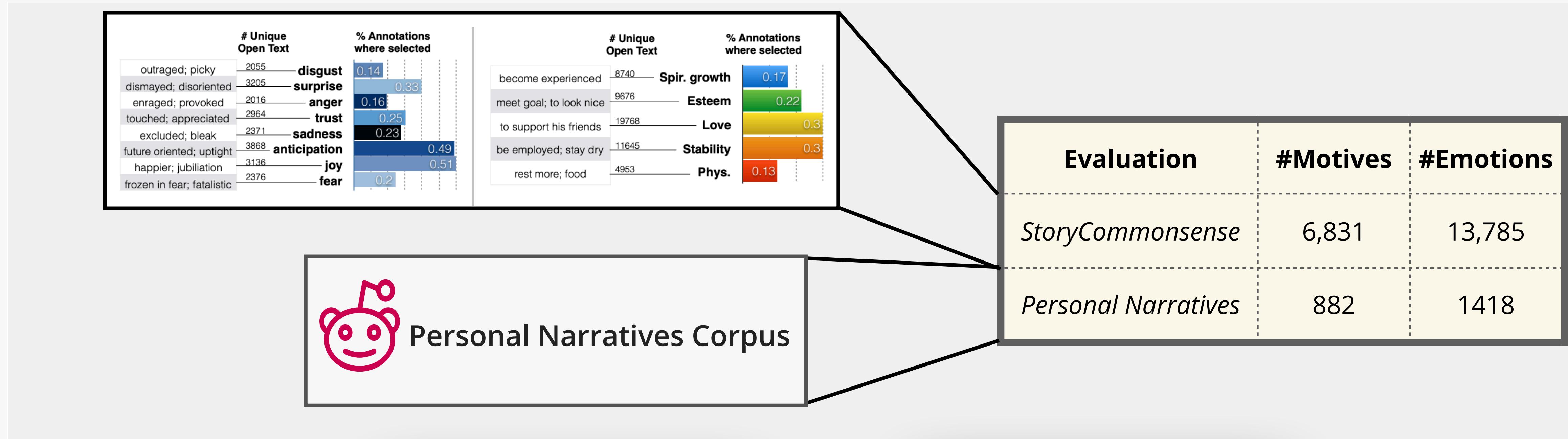
# NEMO: Proposed Model



# NEMO vs. Variants



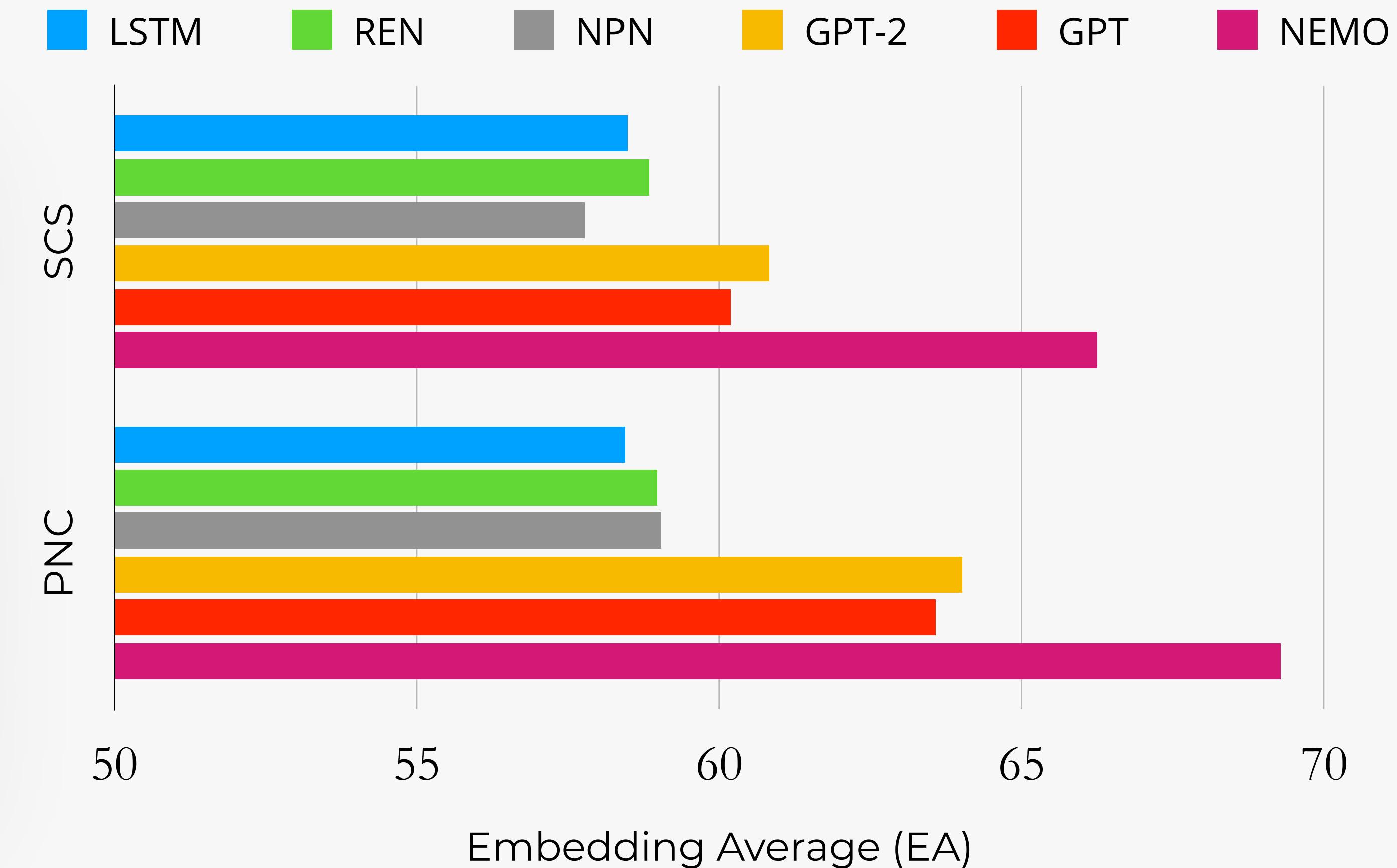
# Evaluation Setup



# Explanation Generation Results

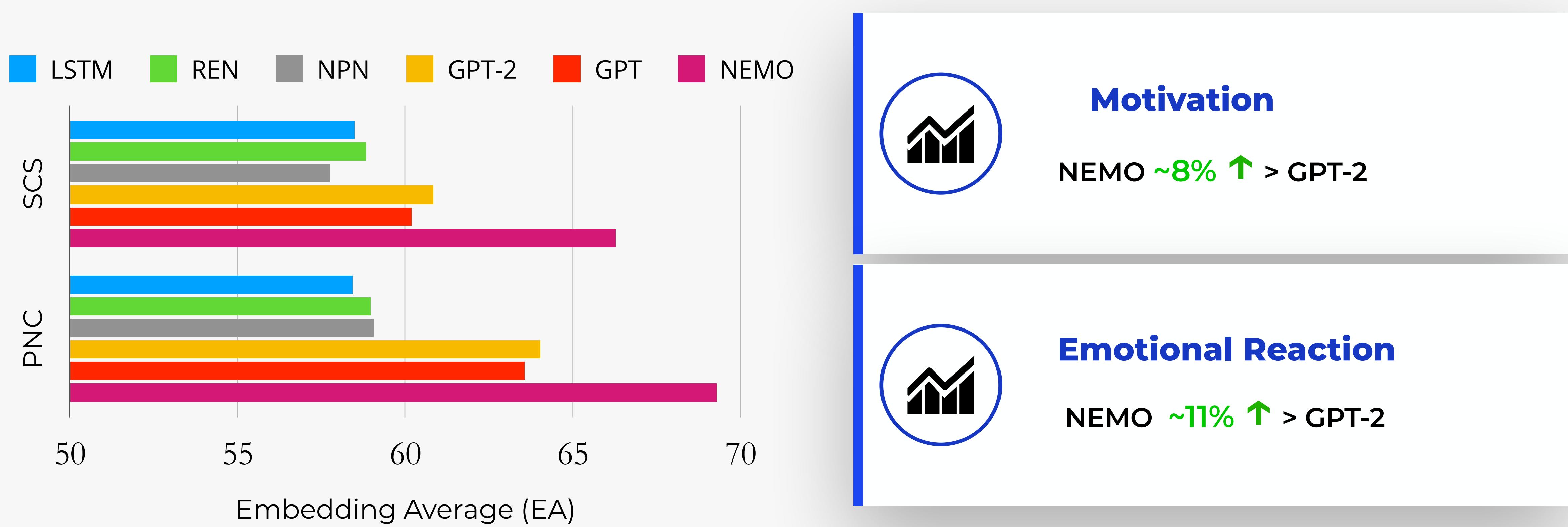
## Baselines

- LSTM
- REN<sup>1</sup>: Recurrent Entity Network
- NPN<sup>2</sup>: Neural Process Network
- GPT<sup>3</sup>, GPT-2<sup>4</sup>
- NEMO: Our Model



1. Henaff, Mikael, et al. "Tracking the world state with recurrent entity networks." *arXiv preprint arXiv:1612.03969* (2016).
2. Bosselut, Antoine, et al. "Simulating action dynamics with neural process networks." *arXiv preprint arXiv:1711.05313* (2017).
3. Radford, Alec, et al. "Improving language understanding by generative pre-training." (2018).
4. Radford, Alec, et al. "Language models are unsupervised multitask learners." *OpenAI blog 1.8* (2019): 9.

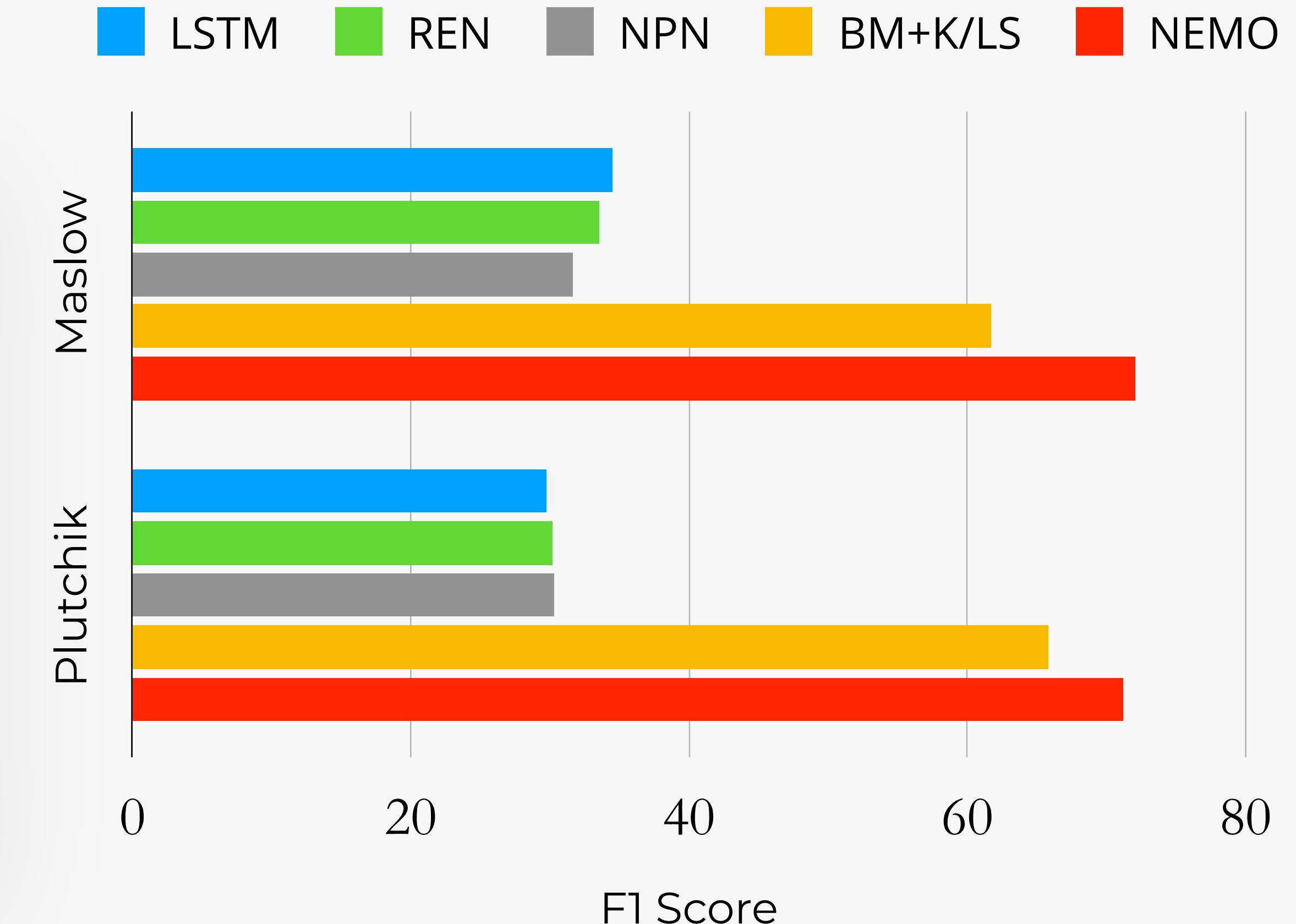
# Explanation Generation Results



# State Classification Results

## Baselines

- LSTM
- **REN<sup>1</sup>:** Recurrent Entity Network
- **NPN<sup>2</sup>:** Neural Process Network
- **Motives Only<sup>3</sup>:** BM+K — Multi-hop Knowledge
- **Emotion Only<sup>4</sup>:** Label Semantics (LS)
- **NEMO:** Our Model



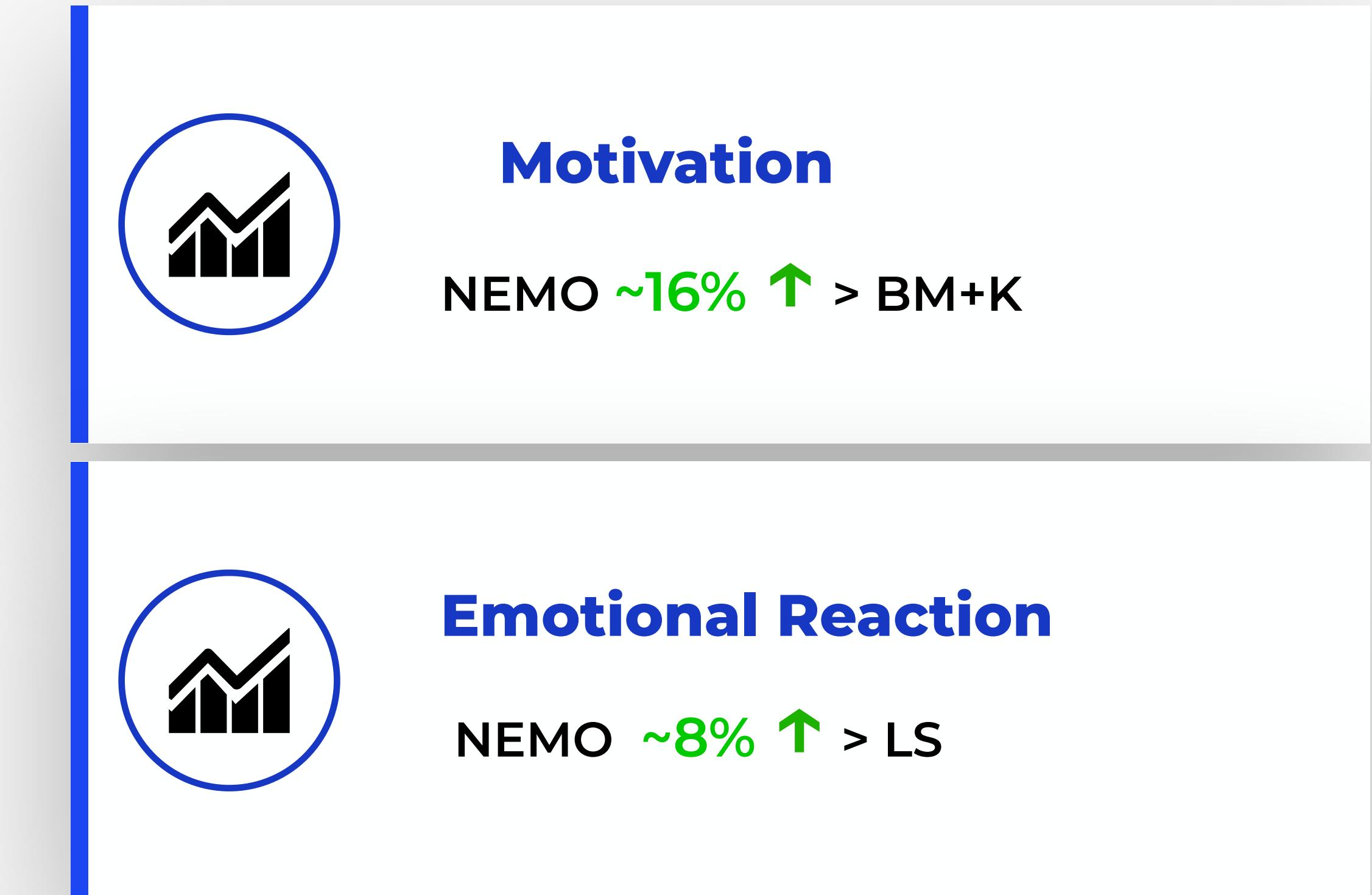
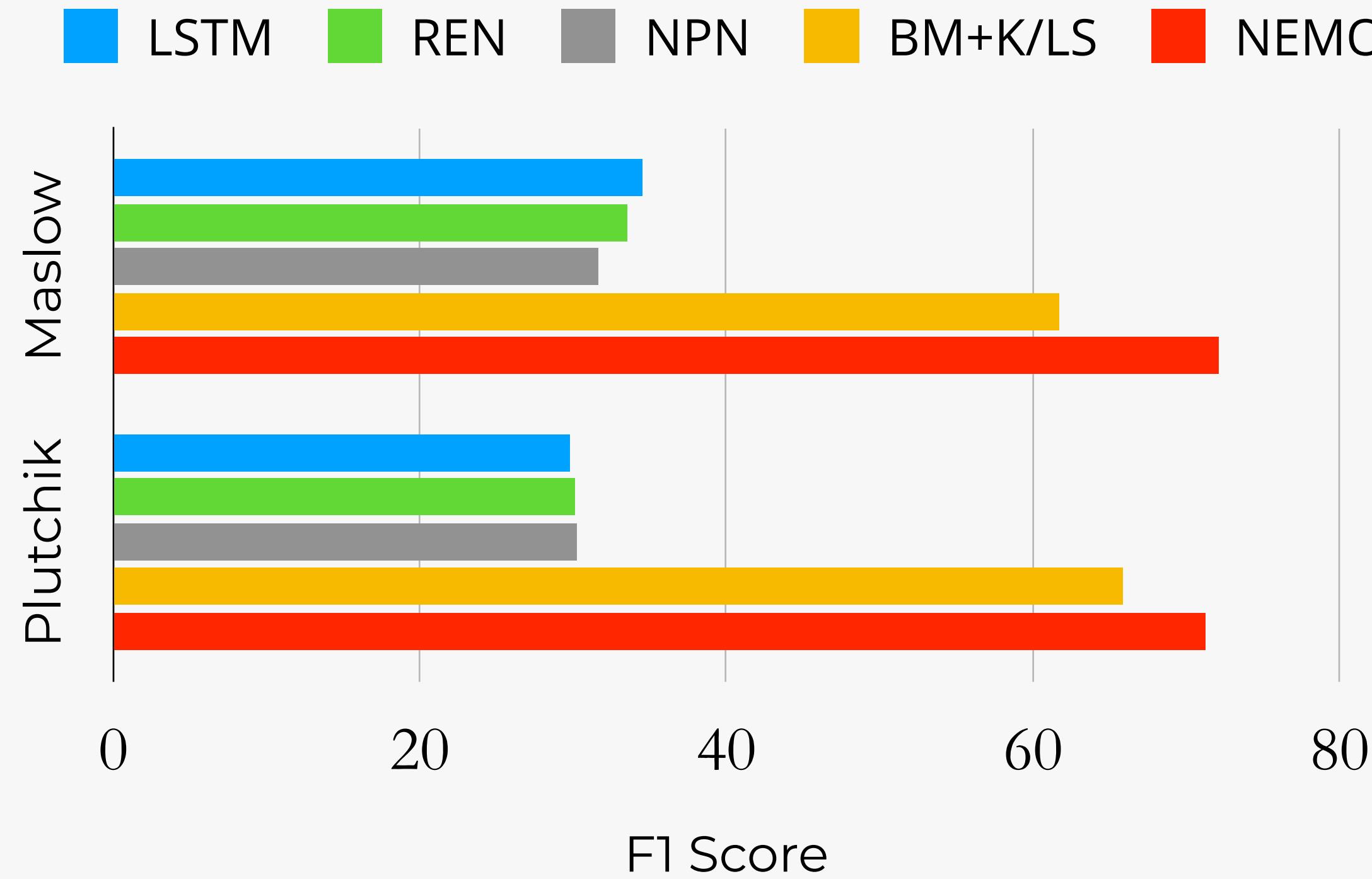
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2.Bosselut, Antoine, et al. "Simulating action dynamics with neural process networks." *arXiv preprint arXiv:1711.05313* (2017).

3.Debjit Paul and Anette Frank. 2019. Ranking and selecting multi-hop knowledge paths to better predict human needs. *arXiv preprint arXiv:1904.00676* (2019).

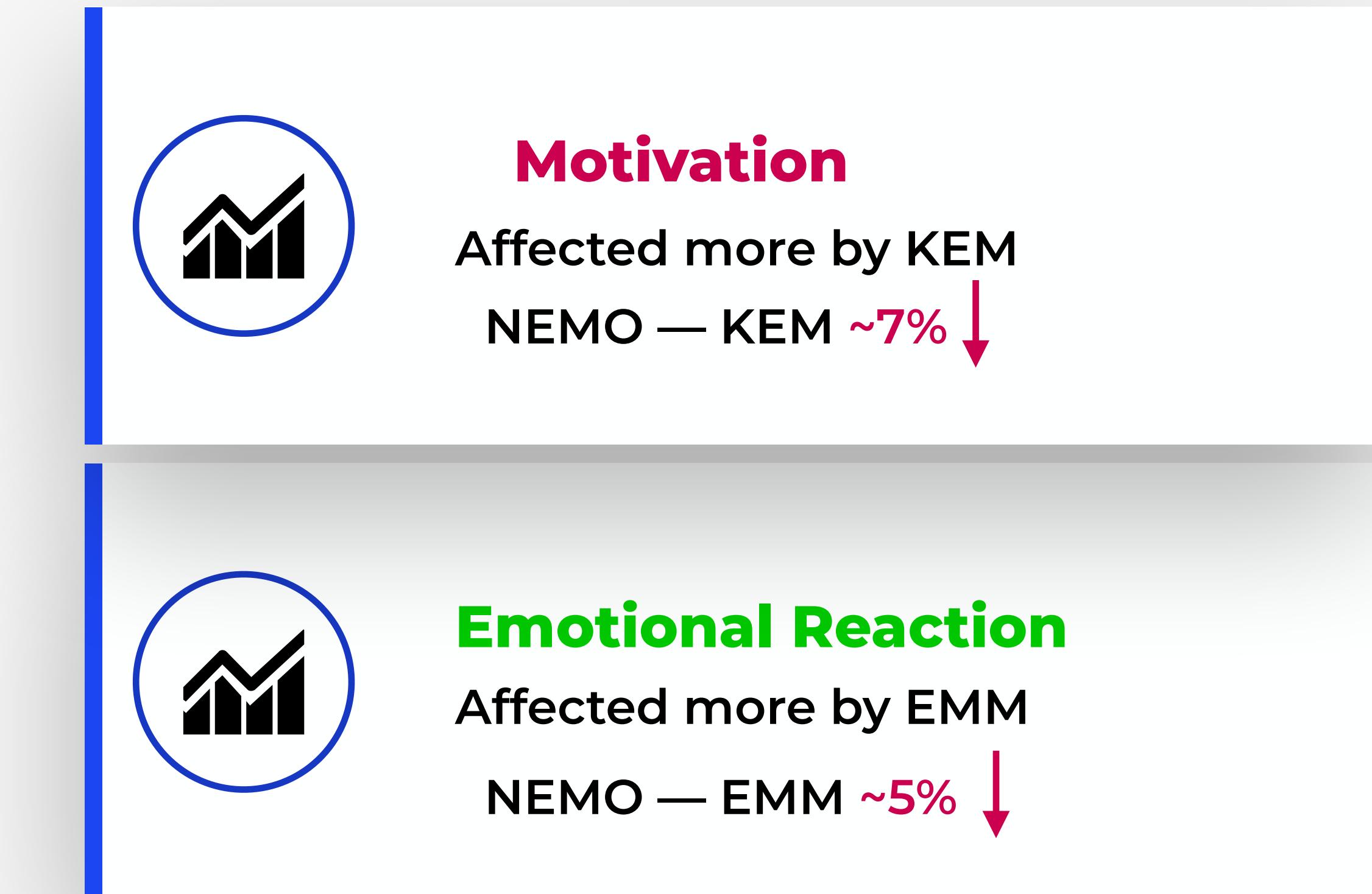
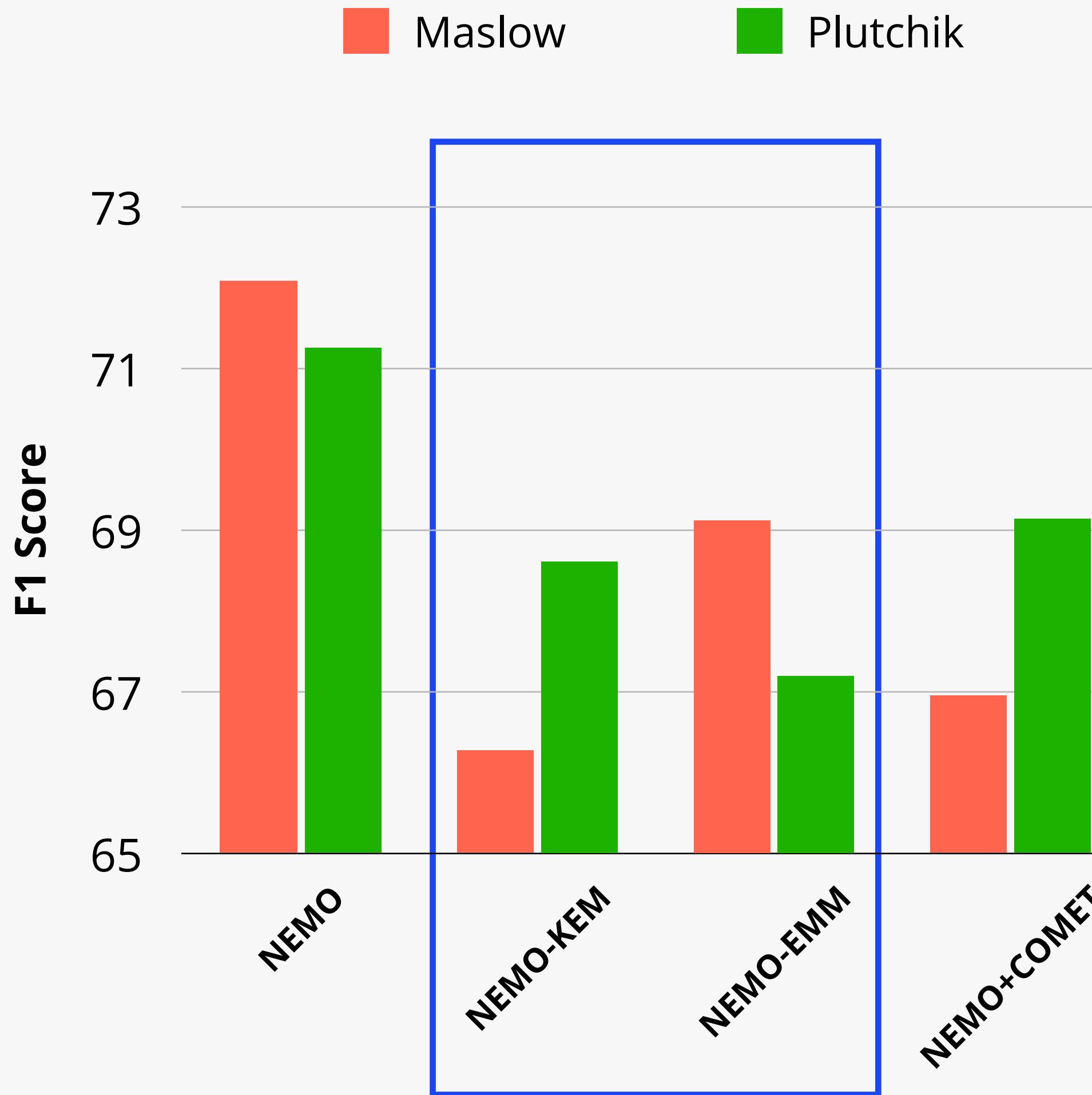
4.Radhika Gaonkar, Heeyoung Kwon, Mohaddeseh Bastan, Niranjan Balasubramanian, and Nathanael Chambers. 2020. Modeling label semantics for predicting emotional reactions.*arXiv preprint arXiv:2006.05489* (2020).

# State Classification Results



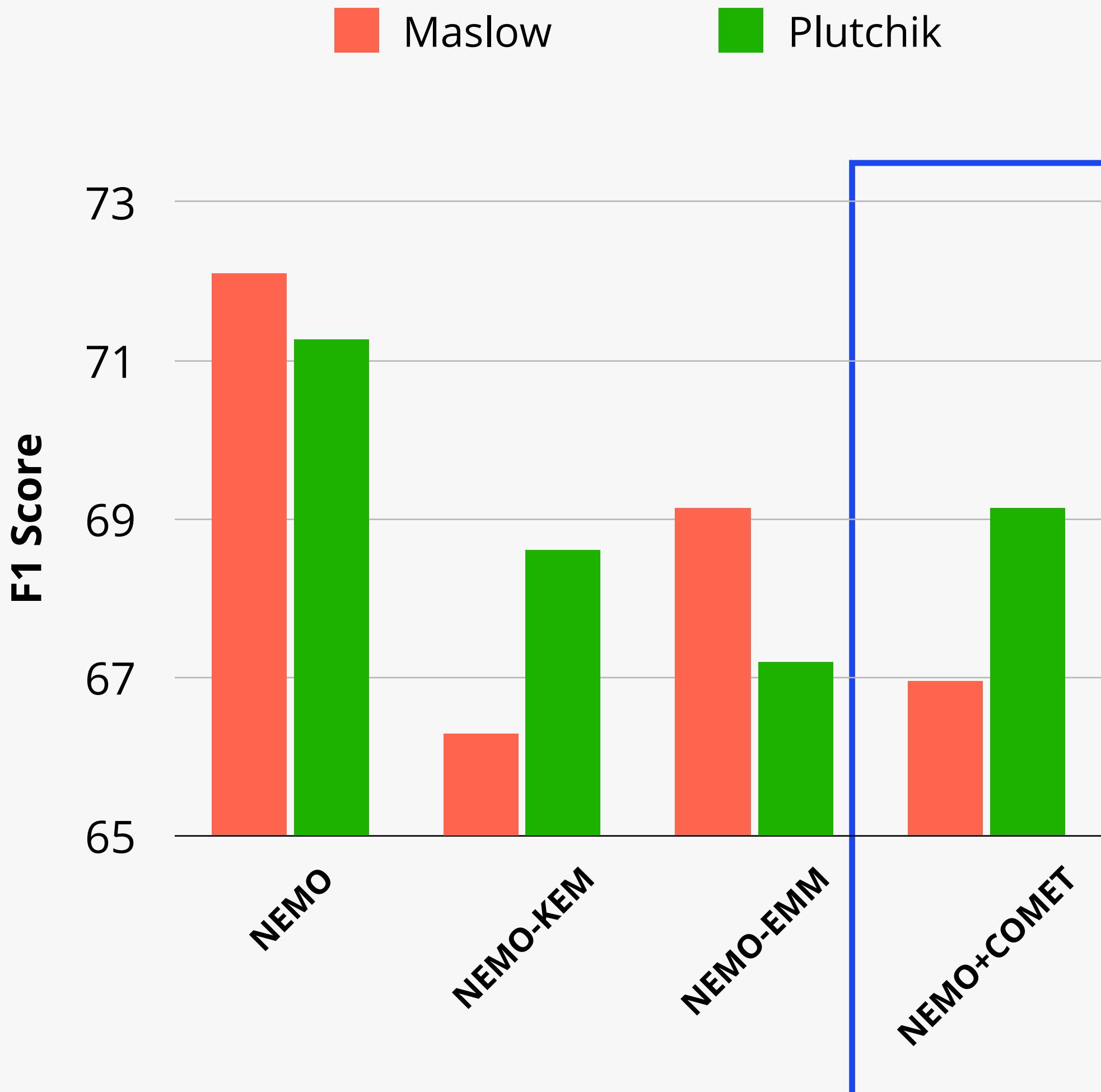
# Ablation Results

## Effect of Architectural Choices



# Ablation Results

## Effect of Knowledge Embeddings



 Addition of COMET to NEMO-KEM gives only ~1% improvement vs ~7% with KEM

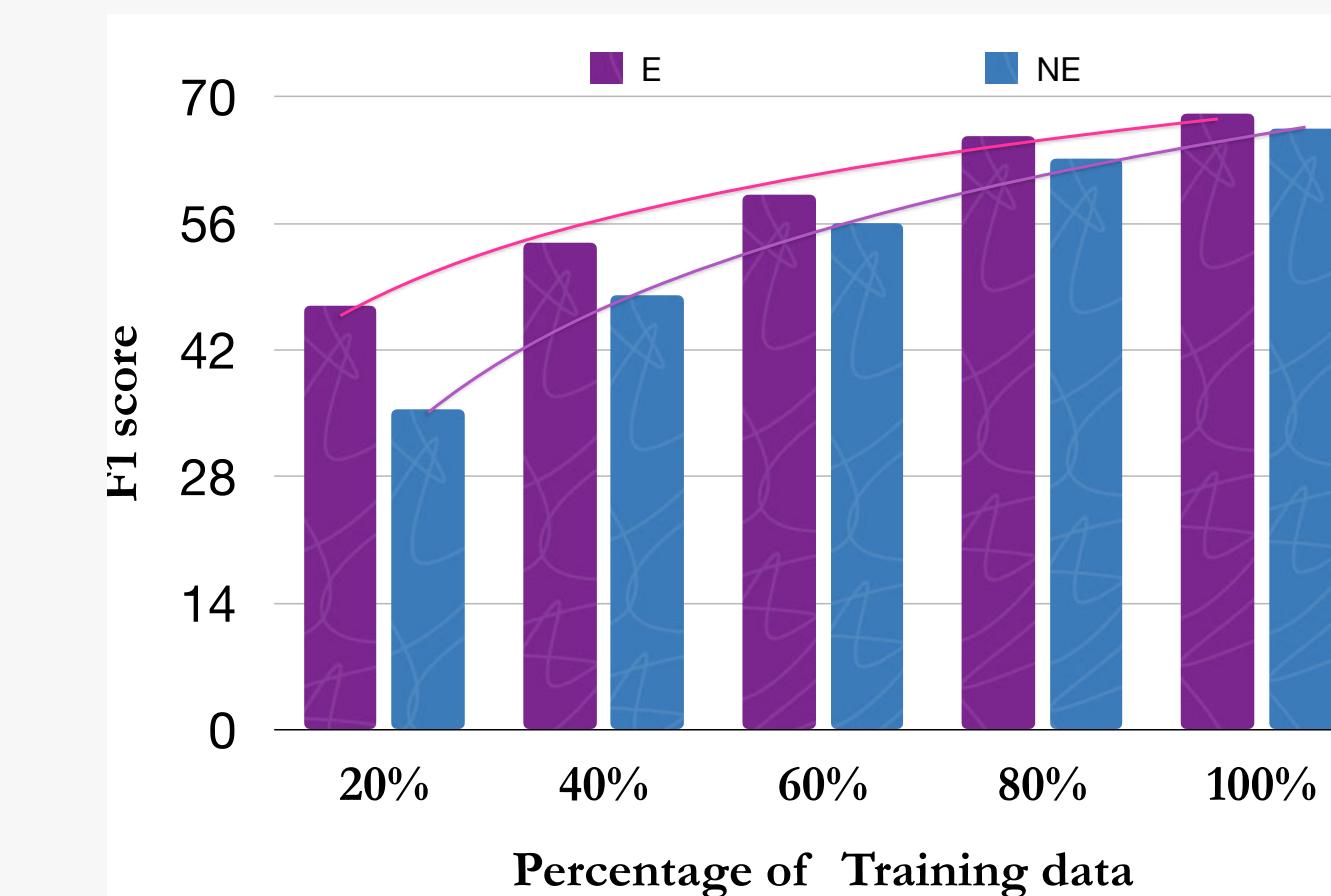
 COMET-replaced NEMO made mistakes in ~24.5% cases containing stories with more than 1 social role information

# Applications & Future Work

**Contact:** [pralav@mit.edu](mailto:pralav@mit.edu)

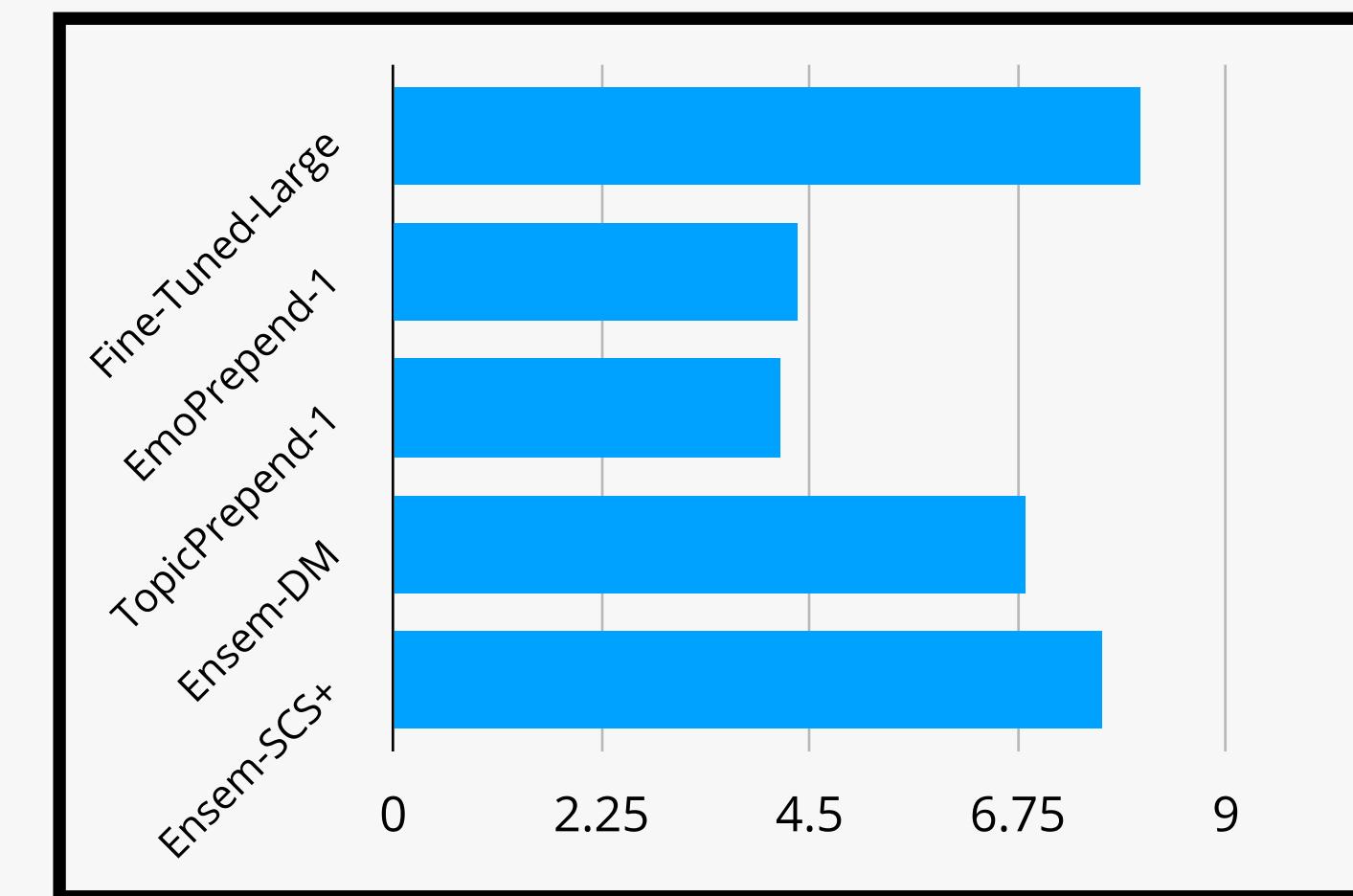
**Project Page:**

<https://pralav.github.io/intemo/>



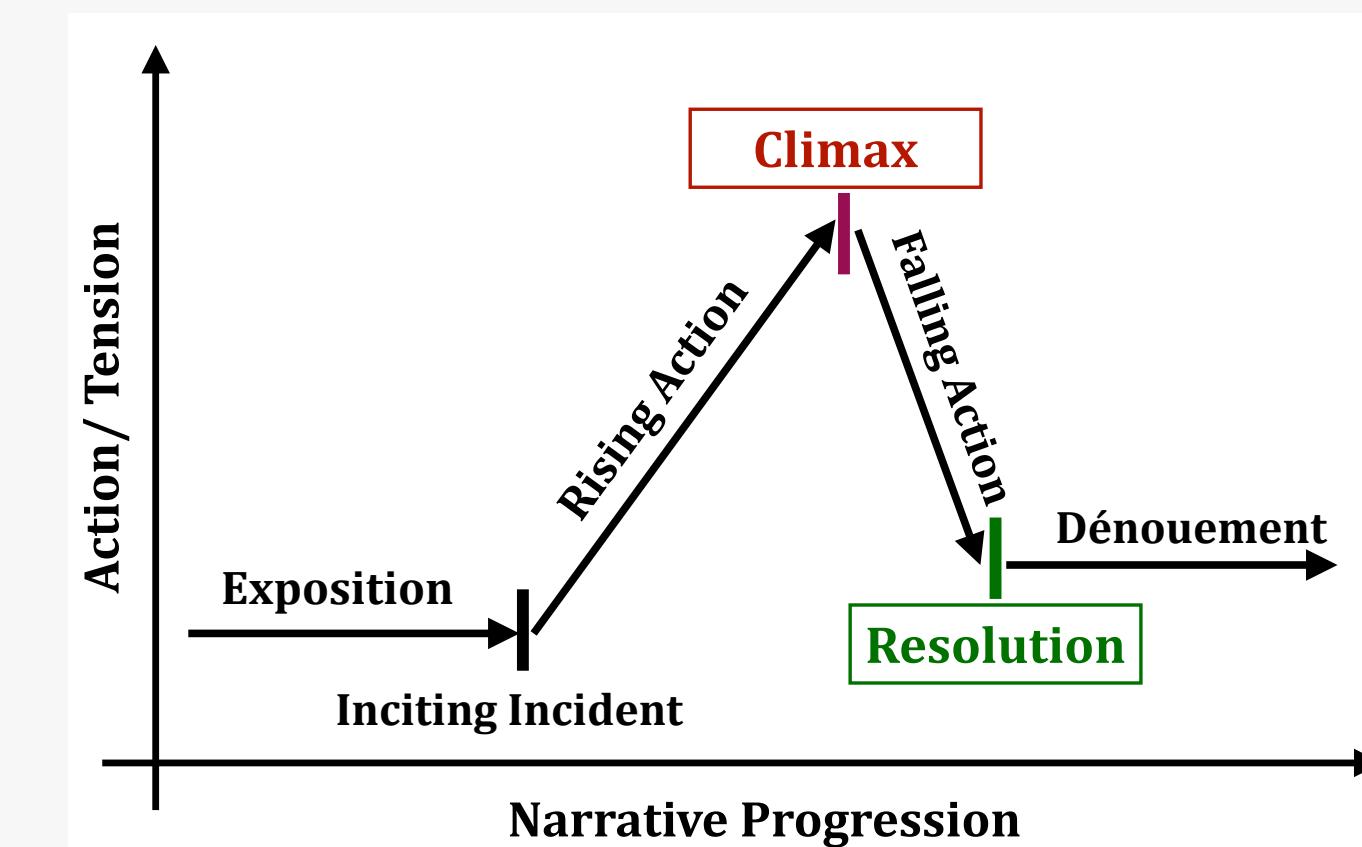
## Low-Resource Regimes

Adapt to other short narratives extracted from domains with limited training data



## Empathetic Dialogue Generation

Generate empathetic responses in conversations using intents of emotions of the participants



## Narrative Structures

Automatically detect key elements of narrative structure in stories