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EmoDynamiX: Emotional Support Dialogue Strategy Prediction by Modelling MiXed Emotions and Discourse Dynamics

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Motivation

- **End-to-end chatbots** based on LLMs tend to overly rely on certain dialog strategies, and lack social cognitive ability, transparency and controllability.
- We decouple strategy prediction from generation, and present **a dialog strategy prediction framework** using explicit cognitive modeling.

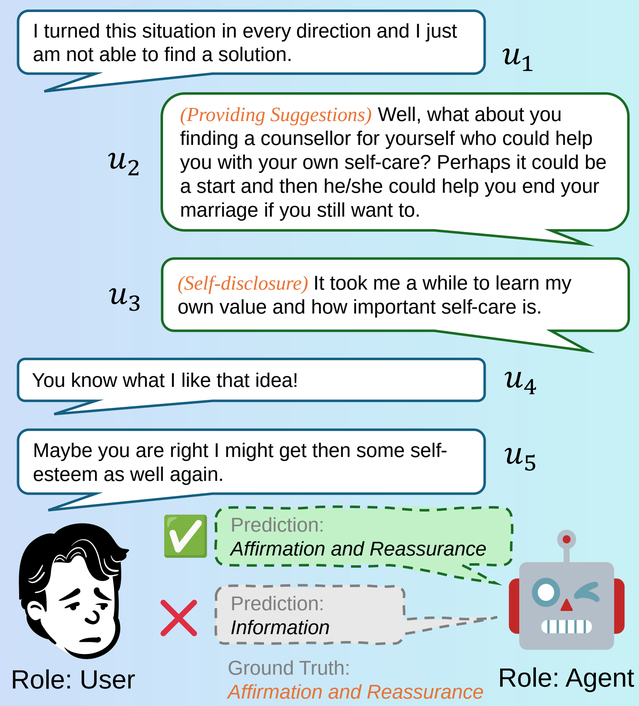
Task

Input: Dialog History
- Dialogue context
- The past strategies applied by the agent

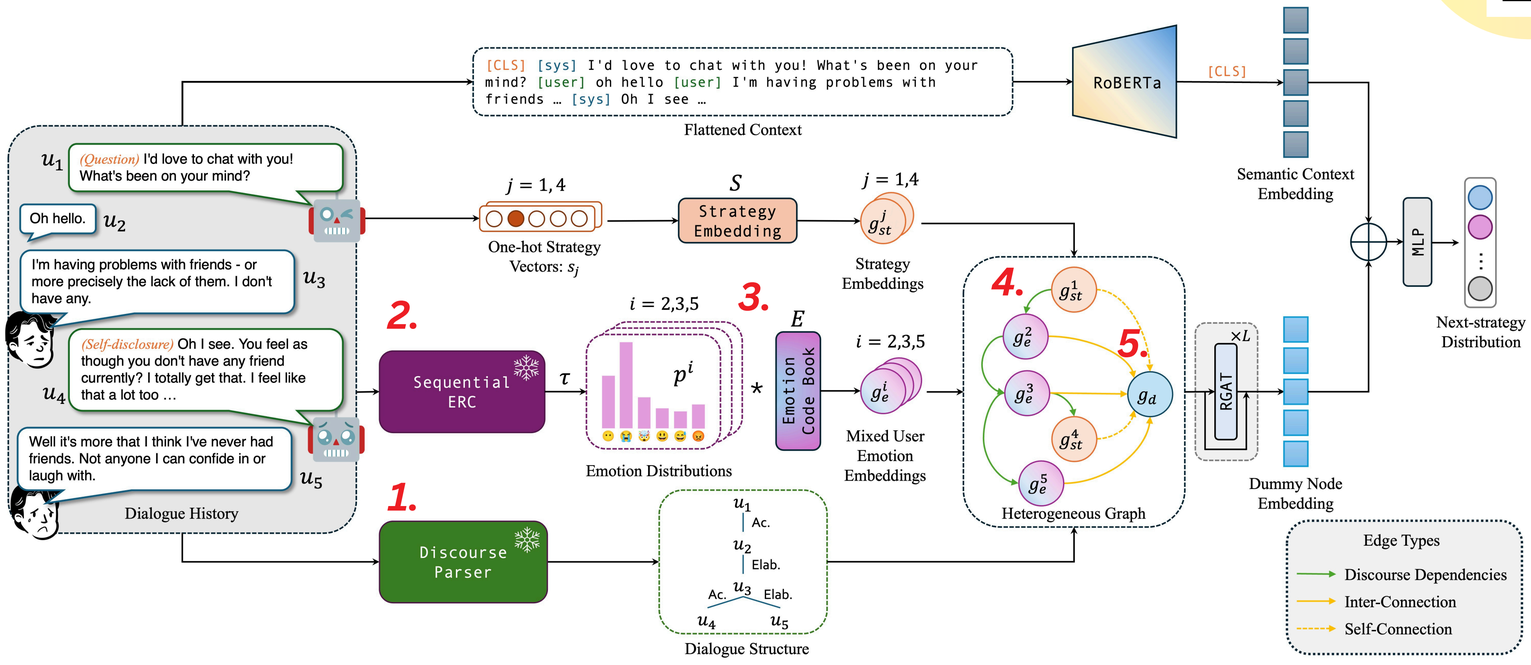
Output: Next dialog strategy for controlling the generation of the agent's next response

Label: one ground-truth strategy per dialog snippet

Metrics:
- Proficiency: Weighted & Macro F1
- Preference Bias score (Kang et al., 2024)



Methodology



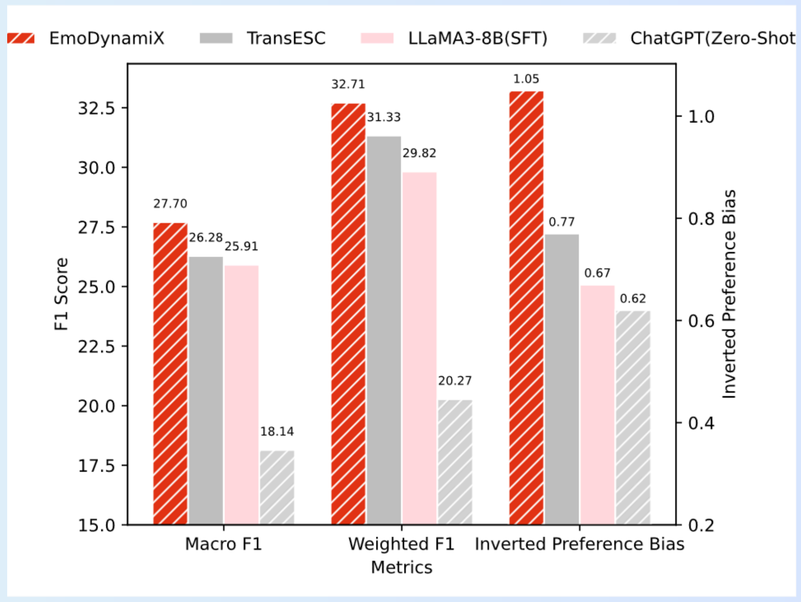
arXiv Paper
Code

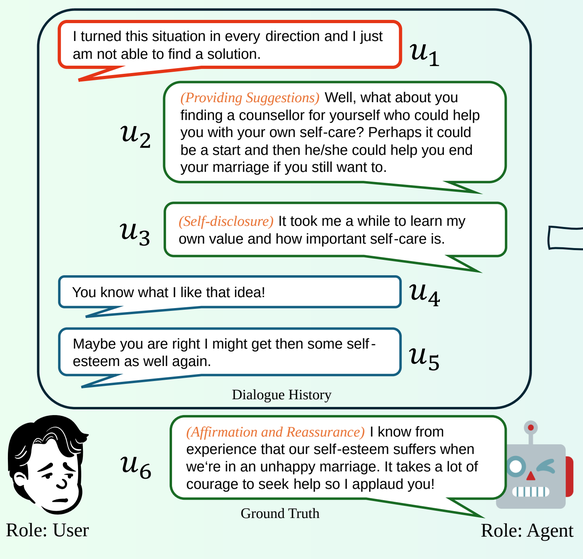
1. **Pre-trained discourse parser** for mining the dependencies between speaker turns.
2. **Pre-trained emotion recognition model** for mental state inference.
3. Fine-grained mental states are represented with mixed emotions: **temperature-controlled emotion distributions**
4. **Graph neural network** for representing the speaker-aware conversational dynamics.
5. **Dummy node** for information aggregation.

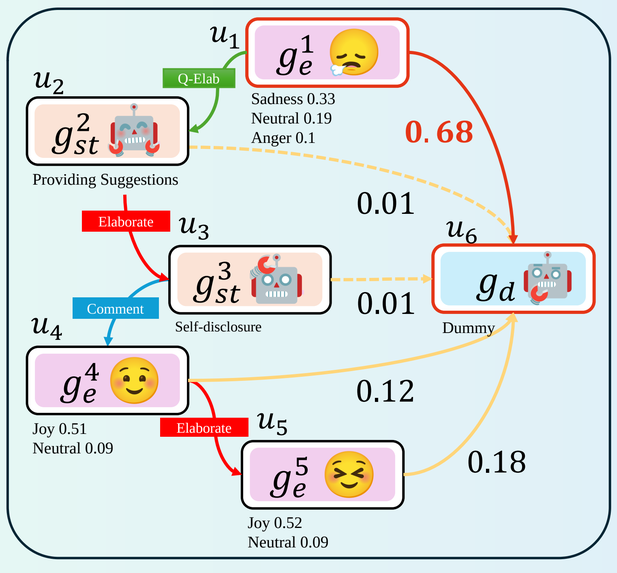
Experiments & Case Study

EmoDynamiX outperforms:
- **SOTA ESC frameworks**: TransESC (Zhao et al., 2023), etc.
- **Finetuning SOTA LLMs**: LLaMA3-8B (Meta, 2024), etc.
- **Prompting SOTA LLMs**: ChatGPT (OpenAI, 2023), etc.

Across all metrics on **ESConv** (Liu et al., 2021) and **AnnoMI** (Wu et al., 2022).







- Extra transparency are provided with back-tracing attention weights.
- Mixed-emotion module can model a large set of subtle emotional expressions by combining primary emotions.