

Context over Categories: Implementing the Theory of Constructed Emotion with LLM-Guided User Analysis

Nils Klüwer, Irina Nalis-Neuner, Julia Neidhardt

TU Wien Informatics
Institute of Information Systems Engineering
Research Unit Data Science
CD Lab for Recommender Systems

Overview & Contributions

Problem: Current approaches to emotion analysis rely on oversimplified categories (e.g., Ekman's universal emotions), neglecting context and individual differences [1].

Our Approach: We integrate most recent advancements in cognitive and emotion studies, by operationalization Lisa Feldman Barrett's Theory of Constructed Emotion, which emphasizes the crucial role of context in shaping emotions.

Key Contributions:

- Novel Framework: A context-aware emotion analysis pipeline using advanced LLM guidance.
- "Context Sphere": A new data construct representing a user's complete online behavior and interactions.
- LLM Adaptation: Demonstrates how to use LLMs for nuanced, context-sensitive emotion analysis.
- Focus: Content moderation and personalized systems.

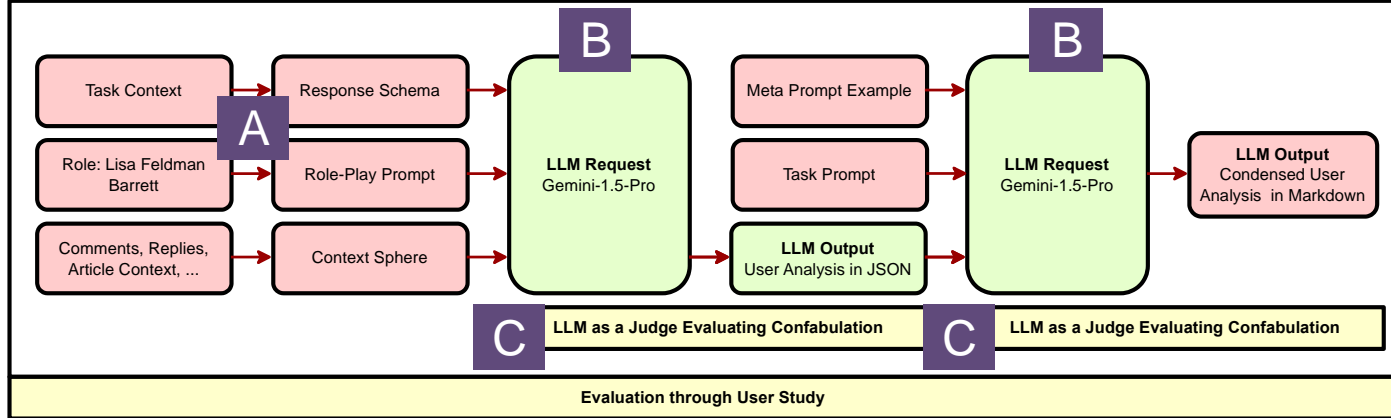


Figure 2: Pipeline from Preprocessing to Final Output - Please note: User Study not part of this Late-Breaking Work Submission.

Methodology

C: Evaluation

Uses LLM-as-a-Judge (GPT-4o, Claude / Haiku 3.5, Gemini 1.5 Flash) to assess LLM output

- Detecting *confabulations* [4] (hallucinations) – confident but misleading outputs.
- Enables rapid, iterative development and refinement of the LLM pipeline.

Cost: Initial JSON analysis: ~\$0.035 per user. Full pipeline (including Markdown report): ~\$0.072 per user. Complete pipeline, including confabulation checks: ~\$0.462.

Upcoming User Study not part of this Late Breaking Work

Research Question

How can we leverage Large Language Models (LLMs) to analyze emotions in a way that reflects their complex, constructed nature, rather than relying on predefined categories?

Methodology

A. Context Sphere Building

Data Source: "Der Standard" online newspaper comments and related articles (May 2019, 23,925 users).

Goal: Create a comprehensive "context sphere" for each user, encapsulating:

- All comments made by the user.
- Surrounding context (article metadata, conversation threads).
- Interactions with other users (replies, etc.).

Key Features:

- Selective Pruning:** Includes relevant conversation threads up to the user's last comment, balancing context with efficiency.
- Privacy-Preserving:** Excludes usernames and gender to minimize bias.
- Markdown Format:** Optimized for readability by both humans and LLMs.

B: LLM-Guidance

Core Idea: Combine the Theory of Constructed Emotion with advanced LLM techniques.

Key Techniques:

- Role-Play Prompting [7]:** The LLM (Gemini-1.5 Pro) impersonates Lisa Feldman Barrett. (Include a small, simplified version of Figure 2 if space allows).
- Controlled Generation:** A JSON schema guides the LLM's output, ensuring a structured analysis.
- Meta-Prompting [9]:** A second LLM request generates a concise, human-readable Markdown report using a generalized template to adapt to specific instances.

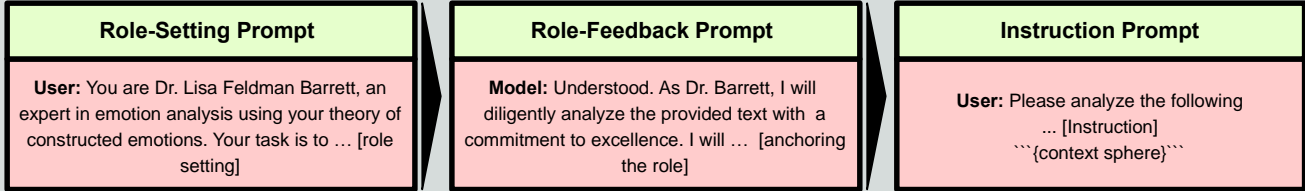


Figure 1: Example of Role-Play Prompting, where the LLM takes on the persona of Lisa Feldman Barrett [7].

Output Structure: A multi-class JSON with five main fields the LLM must generate its response into:

- Core Affect Analysis
- Cognitive Appraisal & Conceptualization
- Cultural & Social Context
- Emotion Construction Analysis
- Emotional Dynamics & Changes

Each field includes sub-fields like "Thought Process," "Analysis," "Observable Patterns," "Anomalous Behaviour" and "Rationale."

Results

- Contextualized Emotion Analysis:** The LLM successfully analyzes emotions considering individual user contexts (see Table 1 examples).
- Beyond Simple Categories:** Captures nuanced emotional dynamics, going beyond traditional categorical approaches.
- Efficient Processing:** Demonstrates efficient processing of large text volumes (21,671 tokens in ~60 seconds for ~\$0.035), showcasing scalability.

Table 1: Examples output from first LLM request		
Field	Sub-Field	Output
Core Affect Analysis	Arousal	Generally high, fluctuating between agitated and calmly contemptuous. [...]
Cognitive Appraisal & Conceptualization	Analysis	[...] The user's interpretations are often filtered through a lens of skepticism and cynicism, particularly towards opposing political views. [...]
Cultural & Social Context	Thought Process	I will examine the cultural and social context by considering the platform ("Der Standard"), the political climate of Austria in May 2019 (pre-election period), and the specific topics discussed (immigration, politics, media). [...]
Emotion Construction Analysis	Rationale	[...] Their negative emotional responses are often amplified by their pre-existing beliefs and the context of the online forum. The occasional deviations from this pattern [...]
Emotional Dynamics & Changes	Anomalous Observations	The user's positive comment about Fendrich deviates from their usual negative pattern, suggesting a momentary shift in emotional state. [...]

Conclusion

- Advances Emotion Analysis:** Bridges cognitive science [2] and computational systems.
- Context-Aware Applications:** Enables nuanced emotion analysis.
- Operationalizes Barrett's Theory:** Uses "context sphere" and LLM guidance (role-play, controlled generation).
- Implications:** More accurate and effective development of human-centered technologies.
- Ethical Implications:** Reduces Bias, Addresses risks [5], Aligns with responsible AI (Digital Humanism) [8].






Captures the complexity and context of human emotions far more effectively than models rooted in Ekman's assumptions of universal emotions [6].



Limitations and Future Work

- Evaluation Difficulty:** Dynamic emotions lack a definitive "ground truth" [3] for standard metrics.
- LLM-as-a-Judge:** Current evaluation [10] is pragmatic but lacks human validation.
- Framework:** Trade-off between theoretical flexibility avoiding predefined categories and the practical need for computational structure.
- Future Work:** Validate LLM analyses with human judgement; Compare against lexicon-based and Ekman's category methods; Address large datasets; Overgeneralization; Excessive granularity.
- Addressing Failure Modes:** Mitigate potential overgeneralization or excessive granularity.

Ultimately, this future work aims to create more robust, reliable, and human-centered systems for understanding and responding to human emotion.

Contact

 **Nils Klüwer**
 e12229263@student.tuwien.ac.at
 www.linkedin.com/in/nilsklue/
 **Irina Nalis-Neuner**
 recsys-lab.at/team/irina-nalis-neuner/

 **Julia Neidhardt**
 recsys-lab.at/team/julia-neidhardt/

Acknowledgement:



References

- [1] Lisa Feldman Barrett. 2017. How Emotions Are Made: The Secret Life of the Brain. Pan Macmillan. <https://books.google.at/books?id=vjvDQAAQBAJ> Google-Books-ID: vjvDQAAQBAJ.
- [2] Lisa Feldman Barrett. 2022. Context reconsidered: Complex signal ensembles, relational meaning, and population thinking in psychological science. *American Psychologist* 77, 8 (Nov. 2022), 894–920. doi:10.1037/amp0001054
- [3] Lisa Feldman Barrett and Christiana Westlin. 2021. Navigating the science of emotion. In *Emotion measurement*. Elsevier, 39–84.
- [4] Elijah Berberette, Jack Hutchins, and Amir Sadovnik. 2024. Redefining "Hallucination" in LLMs: Towards a psychology-informed framework for mitigating misinformation. doi:10.48550/arXiv.2402.01769 arXiv:2402.01769 [cs] version: 1.
- [5] Kate Crawford. 2021. The Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence. Publisher: American Psychological Association.
- [6] Paul Ekman and Wallace V. Friesen. 1971. Constants across cultures in the face and emotion. *Journal of Personality and Social Psychology* 17, 2 (1971), 124–129. doi:10.1037/h0030377 Place: US
- [7] Aohe Kong, Shiwan Zhao, Hao Chen, Qicheng Li, Yong Qin, Ruiqi Sun, Xin Zhou, Enzhi Wang, and Xiaohang Dong. 2024. Better Zero-Shot Reasoning with Role-Play Prompting. doi:10.48550/arXiv.2308.07702 arXiv:2308.07702 [cs].
- [8] Hannes Werthner. 2024. Digital Transformation, Digital Humanism: What Needs to Be Done. Hannes Werthner, Carlo Ghezzi, Jeff Kramer, Julian Nida-Rümelin, Bashar Nuseibeh, Erich Prem (2024), 115.
- [9] Yifan Zhang, Yang Yuan, and Andrew Chi-Chih Yao. 2024. Meta Prompting for AI Systems. doi:10.48550/arXiv.2311.11482 arXiv:2311.11482 [cs].
- [10] Lianmin Zheng, Wei-Lin Chiang, Ying Sheng, Siyuan Zhuang, Zhenhao Wu, Yonghao Zhuang, Zi Lin, Zhuohan Li, Dacheng Li, Eric P. Xing, Hao Zhang, Joseph E. Gonzalez, and Ion Stoica. 2023. Judging LLM-as-a-Judge with MT-Bench and Chatbot Arena. doi:10.48550/arXiv.2306.05685 arXiv:2306.05685 [cs].