AUTOPSYCHO

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This PhD position is opened to strongly motivated and excellent Master students who like both computer science and linguistics. Knowledges in cognitive-behavioral psychology and philosophy will be a plus. Ideally, the candidate holds a Master degree in Computer Science (or Applied Mathematics) equivalently is graduated from a Computer Science (or Applied Mathematics) Engineering School. Ideally, the candidate has strong knowledge both in computer science (formal methods, IA, ML, neural nets, LLM...) or applied mathematics (probability, statistics, ML,...) and in computational linguistics ; knowledges in cognitive psychology and philosophy will also be appreciated. The PhD thesis could be made in collaboration with University of Montréal.

Keywords: Cognitive Behavioral Therapy, emotions, LLM, linguistics, NLP, IA

Research project:

The role of automatic negative thought patterns, cognitive distortions and interpretation systems that arise in response to specific situations has been highlighted since the 1960s, notably by Beck (1976) in the context of cognitive-behavioral therapy (CBT).

Beck suggested that underlying cognitive schemas, or deeply held beliefs, shape the way individuals interpret experiences. Hence, it is crucial to identify negative thoughts and cognitive distortions, which are often the root cause of emotional distress.

It is also important to understand the underlying schemas and belief systems that contribute to these thought patterns, in order to effectively address and modify them. Cognitive restructuring involves using techniques to encourage patients to test the validity of their thoughts and develop more balanced, realistic perspectives.

There are many reasons to consider automating certain therapist tasks without seeking to fully automate therapy: the identification of automatic negative thought expressions across different behavioral variables, the therapist's lack of availability, the cost of therapy, improving therapist training and the need to improve therapy quality.

Certain tasks, such as detecting cognitive distortions, identifying mental operations used and maladaptive cognitive schemas, detecting inconsistencies (verbal or multimodal) during oral interviews and/or in written texts by the patient, for example, in their thought journal, are suitable for automatic processing.

Recent articles (Chen et al., 2023 ; Lim et al., 2024) propose using the power of large language models (LLMs) to detect cognitive distortions.

Our research program aims to use LLMs to produce “good” automatic analyses tools, in order to optimize follow-up of patients treated in this context, by creating decision-support tools to complement and facilitate the activities of CBT professionals.

This analysis work can also be applied to non-therapeutic contents like text, in order to improve writing, detect distortions, etc.

References :

Aaron T. Beck. Cognitive Therapy and the Emotional Disorders. International Universities Press, New York, NY, 1976.

Zhiyu Chen, Yujie Lu, and William Yang Wang. Empowering psychotherapy with large language models: Cognitive distortion detection through diagnosis of thought prompting, 2023.

Sehee Lim, Yejin Kim, Chi-Hyun Choi, Jy-yong Sohn, Byung-Hoon Kim. (2024). ERD: A Framework for Improving LLM Reasoning for Cognitive Distortion Classification.
https://doi.org/10.48550/arXiv.2403.14255

List of documents to be provided:

1. Cover letter
2. Thesis project proposal (2 pages)
3. Academic transcripts for the last three years
4. Copies of awarded diplomas
5. Detailed CV
6. Letters of recommendation