

Master Thesis Review

Charles University, Faculty of Mathematics and Physics

Thesis author	Karen Jia-Hui Li
Thesis title	A Diet-Coaching Chatbot with Neural Language Models
Submitted	2025
Program	Computer Science
Specialization	Computational Linguistics
Review author	Dr. Simone Balloccu
Role	Supervisor
Position	Lab Leader, TU Darmstadt

Review text:

The thesis explores the use of chatbots in the healthcare domain, particularly in nutrition, focusing on improving dietary habits through interactive digital interventions. Specifically, it evaluates three different chatbots built on a baseline template-based system, by implementing two neuro-symbolic variants to enhance user engagement and nutrition counselling capabilities.

Using a randomized controlled trial, the thesis conducts an extrinsic evaluation to assess whether the integration of neural models in chatbots benefit user engagement, dietary adherence, and emotional load. Three systems are evaluated: a template-based chatbot informing the user about their diet through a mix of text and visualisations; a second one, implementing a neural model that rephrases the templates output; a third one implementing both the rephrasing and a second neural model performing nutrition counselling, trying to understand users' struggles and providing help.

The thesis investigates if, compared to the baseline chatbots, the neuro-symbolic ones improve user engagement (by making the output more dynamic than fixed templates) and emotional load (by providing counselling). This is evaluated through three different user groups, which used the chatbot for seven weeks. The results of the study do not demonstrate significant improvements in diet quality, engagement levels, or emotional well-being with the neuro-symbolic chatbots over the baseline system. Despite these outcomes, the thesis provides valuable insights into the practical application of Large Language Models in real-world scenarios, thereby contributing to the evolving field of natural language processing (NLP).

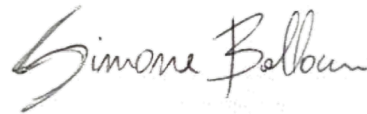
The thesis is well structured and presents a clear progression of ideas and methodologies across its chapters. Chapter 2 presents the background literature on Large Language Models and Natural Language Generation (NLG), with a comprehensive overview of current research trends. Chapter 3 continues literature review, by focusing on healthcare and digital health interventions. Both chapters do offer a thorough overview of the state-of-the-art, especially considering how fast-paced Natural Language

Processing and its application to healthcare are. Chapter 4 presents a detailed descriptions of the baseline chatbot and its neural-enhanced variants, motivating the implementation choices. Chapter 5 covers the finetuning of the neural models, preliminary intrinsic evaluation through metrics and provides a solid motivation for the final implementation choices. Chapter 6 showcases the clinical trial itself, detailing participants recruitment, overall demographics and more generally the extrinsic evaluation protocol. Finally, Chapter 7 analysis the results from the trial. While the findings show no statistically significant improvements over the baseline chatbot, this outcome underscores the thesis's commitment to transparency and empirical rigor in its research approach.

In conclusion, despite the absence of clear positive outcomes in favour of neuro-symbolic chatbots, the thesis significantly advances our understanding of LLM applications in practical healthcare settings. The approach is technically sound, implementation and evaluation choices are clearly motivated and the results are insightful regarding the limitations of LLMs in real-world scenarios. Overall, the thesis contributes meaningfully to the ongoing discourse in both NLP research and digital health interventions.

I recommend the thesis for defense.

I suggest to not consider the thesis for the annual award.

A handwritten signature in black ink that reads "Simone Bollum". The signature is written in a cursive, flowing style.

In Darmstadt, Germany, 30.01.2025 Signature: