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Channing Methods Seminar

May 7 (Tuesday), 2024, 11AM (ET)

MCP 5th-floor conference room & Zoom:

<https://us02web.zoom.us/j/579497999?pwd=cHNIWHMzWUJFUUVJTG1EeVJmY05aQT09>

Meeting ID: 579 497 999

Passcode: 844168



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Natural Language Processing and Large Language Models as Catalysts in Biomedical and Nutritional Research

Abstract: Natural Language Processing (NLP) has evolved dramatically, shifting from rule-based and statistical methods to the adoption of Large Language Models (LLMs). LLMs are becoming the new frontiers in research across various domains, including biology, medicine, healthcare, and nutrition, as they can be used not only on natural human language, but on any kind of data that can be represented as text. In biology, LLMs analyze genetic codes to predict gene function or mutations. They enhance drug discovery by optimizing molecular properties (GPT-MolBERTa, DrugAssist), and predicting chemical reactions. In medicine, LLMs leverage electronic health records to enhance clinical decisions and diagnoses. However, the application of LLMs in the food and nutrition domain faces challenges due to a lack of structured, domain-specific resources. Applications of LLMs in this domain include recipe development and nutritional analysis (ChatDiet, FoodGPT) and are still under development. This talk will provide a bird's eye view of LLMs and their applications biology, medicine, and nutrition. Furthermore, I will explore NLP pipelines in the food and nutrition domain, as well as process innovation in tasks such as nutrient prediction, prediction of the level of food processing, and food recommendations. I will point out specific examples of these applications, as well as ongoing research in the direction of using LLMs for deciphering the food matrix and assessing the level of food processing. The ongoing advancement in NLP not only highlights the versatility of LLMs but also underscores the continual need for domain-specific adaptations to fully exploit their potential.

Bio: Gordana Ispirova holds a Ph.D. in Information and Communication Technologies from the International Postgraduate School Jožef Stefan in Ljubljana. As of 2024 she is a postdoctoral research fellow at the Channing Division of Network Medicine. Her expertise lies in developing Natural Language Processing (NLP) and Machine Learning (ML) pipelines for predictive modeling, particularly harnessing the capabilities of Large Language Models (LLMs). Focusing her research mainly within the Food and Nutrition domain, currently she is exploring methods how to evaluate the level of food processing by leveraging a multidisciplinary approaches combining NLP, ML, Deep Learning (DL) and LLMs, with the goal of understanding the relationship between food processing and nutritional content, analyzing how processing impacts the food matrix, and ultimately assessing the impact of food processing on human health and its correlation with various diseases.