Knowledge-infused Natural Language Understanding for Addiction and Mental Health Research

With the increasing legalization of medical and recreational use of substances, more research is needed to understand the association between mental health and user behavior related to drug consumption. Specifically, drug overdose and substance use-related mental health issues have become two major topics that have been widely discussed on social media platforms. Big social media data has the potential to provide deeper insights about these associations to public health analysts for making policy decisions. Multiple national population surveys have found that about half of those who experience a mental health illness during their lives will also experience a substance use disorder and vice versa. The communications related to addiction and mental health are complex to process and understand given their language and contextual characteristics. Surface-level data analysis alone is not sufficient to understand the complex nature of relationships among the addiction and mental health context. Moreover, dark web vendors have been using social media as a new marketplace for drugs. Social media users also discuss the novel drugs emerging in dark web marketplaces and associated side effects/health conditions. These communications get complex when researchers try to annotate them or link them to a specific mental health entity. Considering the significant sensitivity of such communications and to protect user privacy on social media, a potential solution requires reliable algorithms for modeling such communications. We demonstrate the value of incorporating domain-specific knowledge in natural language understanding to identify the relationship between mental health and drug addiction. We discuss end-to-end knowledge-infused deep learning frameworks that leverage the pre-trained language representation model and domain-specific declarative knowledge source to extract entities and their relationships jointly. Our model is further tailored to focus on the entities mentioned in the sentence where ontology is used to locate the target entity's position. We also demonstrate the capabilities of inclusion of the knowledge-aware representation in association with language models that can extract the Drug-Mental health condition associations.

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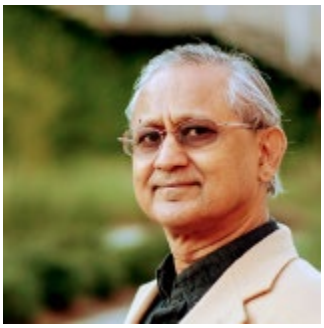

Prof. Amit Sheth (Home Page, LinkedIn) is an Educator, Researcher, and Entrepreneur. He is the founding director of the university-wide AI Institute at the University of South Carolina. He is a Fellow of IEEE, AAAI, AAAS and ACM, and is listed among top 50 computer scientists in the USA. He has (co-)founded five companies, including the first Semantic Search company in 1999 that pioneered technology similar to what is found today in Google Semantic Search and Knowledge Graph, ezDI which developed knowledge-infused clinical NLP/NLU, and Cognovi Labs at the intersection of emotion and AI. He is particularly proud of the success of his 45 Ph.D. advisees and postdocs in academia, industry research, and entrepreneurs.