

Professor T.D. Dwivedi Memorial Lecture



Generative AI Beyond the Black Box: A Bayesian Model for LLM Reasoning, Inference and Applications

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Abstract

Generative AI, based on Large Language Models (LLMs), has become very popular. In this talk, based on joint work with Professor Vishal Misra, I will explore the foundational aspects of LLMs and specifically show by examples of In Context Learning (ICL) that it is consistent with Bayesian reasoning. The approach involves constructing an ideal generative text model represented by a multinomial transition probability matrix with a prior and approximation of this matrix. As a part of it I will present results on continuity of the mapping between embeddings and multinomial distributions, and Dirichlet approximations for the corresponding prior. I also provide empirical evidence supporting our model through visualizations of next token probabilities using an instrumented version of the Llama model. Finally, I will discuss an application of Generative AI, AI Tutor, involving translations from Prakrit to modern Indic and non-Indic languages that allows non-experts to have a question answer dialogue with the system to understand the content.

Bio

Siddhartha Dalal is a Professor of Professional Practice at Columbia University where he teaches, researches and mentors startups on AI and Crypto Currencies. Prior to Columbia he was Chief Data Scientist and Sr. VP at AIG in charge of R&D, CTO at RAND Corporation, VP of worldwide research at Xerox, and Chief Scientist at Bell Labs/Bellcore. He has an MBA and a Ph.D. with over 100 peer reviewed publications, patents and monographs. He is recipient of several awards including from IEEE, ASA, ASQ and Bellcore. He is also a recipient of Meritorious Civilian Service Medal from US Army, Dean's Excellence award from Columbia and Rochester Distinguished Scholar Medal from University of Rochester.

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