

Real Application of Machine Learning (REALM): Situation Knowledge on Demand (SKOD)

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Abstract: Extracting relevant patterns from heterogeneous data streams poses significant computational and analytical challenges. Identifying such patterns and pushing corresponding content to interested users according to mission needs in real-time is the challenge. This research utilizes the best in Database systems, Knowledge representation, Machine Learning to get the right data to the right user at the right time with completeness and low noise. If a user's need is unmet, queries evolve and get modified to come close to satisfy mission needs which may themselves be unclear. If need is partially met, when new streaming data streams in, our research connects relevant data to queries. The knowledge for further processing is kept in the form of queries (megabytes) vs database (giga bytes). The project deals with multimedia data at peta and zeta scale. The research leads to a scalable, real-time, fault-tolerant, privacy preserving architecture that consumes streams of multimodal data (e.g., video, text, sound) utilizing publish/subscribe stream engines and RDBMS microservices. We utilize neural networks to extract relevant objects from video and latent semantic indexing techniques to model topics for unstructured text. We present a unique Situational Knowledge Query Engine that continuously builds a multimodal relational knowledge base constructed using SQL queries and pushes dynamic content to relevant users through triggers based on modeling of users' interests. We analyze an extensive collection of Cambridge data (millions of Twitter tweets, 35+ structured datasets, and 100+ hours of video traffic, and needs for police, public works and citizens). At present data from West Lafayette police is being analyzed to provide identifying suspicious activity and deal with disasters such as school shootings. We will continue to learn from NG researchers to demonstrate the feasibility of the proof-of-concept. Research has resulted in Darpa proposals, collaborations with Sandia, JPL, and multiple NGC IRADS and many research papers and Ph.D thesis.

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2. Bio

Bharat Bhargava is a professor of the Department of Computer Science with a courtesy appointment in the School of Electrical & Computer Engineering at Purdue University. His recent research is on Intelligent Autonomous Systems and data analytics and machine learning.

It includes cognitive autonomy, reflexivity, deep learning and knowledge discovery. His earlier work on Waxed Prune with MIT and NGC built a prototype for privacy preserving data dissemination in cross-domains. Currently he is leading the NGC REALM consortium.

He has graduated the largest number of Ph.D students in the CS department at Purdue and is active in supporting/mentoring minority students. In 2003, he was inducted in the Purdue's Book of Great Teachers. In 2017, he received the Helen Schleman Gold Medallion Award for supporting women at Purdue and Focus award for advancing technology for differently abled students.

urls - <https://www.cs.purdue.edu/homes/bb/>
<https://www.cs.purdue.edu/news/articles/2019/bhargava-realm-ng.html>