

# Cognitive AI: Impacting Healthy Living

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## Abstract:

Advances in big data analytics and AI, powered by modern computing hardware, have enabled deep neural networks to process vast streams of multimodal data—voice, text, video, and sensor signals—from the Internet of Things. A major leap in this trajectory is the emergence of large foundational models that generate human-like content from latent vector representations. However, these systems raise concerns about reliability, trust, and integrity. As these technologies are widely accessible via mobile devices and everyday platforms, their use and misuse introduce compounded effects. Consequently, ethics, security, privacy, and explainability are more vital than ever in the responsible advancement of AI.

Our research focuses on multimodal data analytics and cognitive AI models that support machine perception and human-machine interaction. We aim to enhance machine cognition through contextual visual perception, embodied situation modeling, and advanced language understanding, including voice-to-text transformation, to enable accessible and inclusive assistive services. This talk will highlight the promises and perils of enhancing machine cognition by presenting our work in AI-driven decision support and assistive technologies in healthcare. It will also explore future directions in developing collaborative, conversational, and embodied robotic systems.



## Biography:

Dr. Farhana Zulkernine is a Professor in the School of Computing at Queen's University, Canada, and the Director of the Big Data Analytics and Management (BAM) Laboratory. She holds a Ph.D. from Queen's University and is a licensed Professional Engineer in Ontario. She is renowned for her expertise in big data analytics, machine learning, cognitive computing, and artificial intelligence. Her interdisciplinary research focuses on designing intelligent, scalable systems that integrate AI with human behavior modeling and contextual awareness to support decision-making in critical domains such as healthcare, law, business, smart cities, and accessibility.

With over a decade of industry experience across three continents, Dr. Zulkernine is committed to innovating technologies and services that address real-life challenges and enhance quality of life and well-being. Her work has significantly advanced the application of AI in health informatics, particularly in the analysis of multimodal medical data - including electronic medical records, radiology images, and conversational audio to deliver accessible assistive and decision-support services.

Over the past decade, Dr. Zulkernine's research has been supported by more than \$4 million CAD in funding from various government agencies and industry partners, including the Natural Sciences and Engineering Research Council (NSERC), Mitacs, IBM, Thales, Huawei, Pfizer, and Roche. She has supervised over 130 graduate and undergraduate students and postdoctoral fellows and has been recognized with numerous awards for her excellence in teaching, mentorship, and research.

With more than 150 published research articles, Dr. Zulkernine continues to play a pivotal role in developing inclusive, ethical, and socially impactful AI solutions. She has organized multiple conferences focused on AI and digital health, is a frequent speaker at international events, contributes to policy and advisory committees, and remains deeply committed to equity, diversity, and inclusion in research, education, and community engagement.