

Keynote speech

Quantum Image Processing

Shashidhar Ram Joshi

*Former Dean, Institute of Engineering, Tribhuvan University
Nepal
srjoshi@ioe.edu.np*

ABSTRACT

The basics of quantum computing along with different types of computing environments will be done. The concept of qubits will be introduced and compared with bits. The concepts of superposition and quantum entanglement will be discussed. The application of Shor's and Grover's algorithm will be discussed briefly and how these algorithms contribute for the enormous power of quantum computing will be elaborated. The brief description of quantum gates will be introduced. The applications of digital image processing is an on-demand technique and plays a crucial role in this present and future era. It is a process that involves analyzing and manipulating images digitally via computer. This makes them more informative for human interpretation and picture information for different tasks such as maintaining storage, fast transmission, and extraction of pictorial data. Basically, image processing involves enhancement and restoration of images for the beautification and reality. In such processes, the role of quantum computer in the present context and its future will be matter of discussion.

Algorithms like Quantum Hadamard Edge Detection, which can identify outlines and features significantly faster than classical methods, will be explained. Topics on protection of visual data through quantum encryption and quantum key distribution will also be discussed. The process of image augmentation using quantum computer in the present scenario and future scopes are the interest for the researchers. The pattern recognition using hybrid quantum machine learning models for image classification and segmentation will be elaborated.

Index terms— *Qubit, Quantum gates, Quantum Hadamard Edge Detection, Quantum Key Distribution, Quantum Machine Learning*

Speaker's short biography:



Prof. Dr. Shashidhar Ram Joshi is the former Dean of the Institute of Engineering (IOE), Tribhuvan University (TU) from 2020 to 2024. His international academic background includes a Bachelor's in Electrical Engineering from REC Surat (India) with a Gold Medal in 1984, a Master's from the University of Calgary (Canada) in 1992, and a Ph.D. in Electronics and Computer Engineering from the IoE, TU (Nepal) in 2007.

He has served as a Research Fellow at Osaka Sangyo University and a Visiting Professor at the South Asian University (SAU). He has supervised over 100 Master's theses and multiple Ph.D. scholars. His research spans AI/ML, Image Processing, Pattern Recognition, Particle Tracking Velocimetry, Quantum Computing etc.