A Report on One-day Guest lecture on
"Quantum Computing: A Journey into the future of Computing"
Organised by Department of Computer Science & Technology
30.01.2024

Organized by: Dr. K. Dinesh, Associate Professor, Department of CST; Mr. V. Naveen, Assistant Professor, Department of CST
Submitted by: Mr. V. Naveen, Assistant Professor, Department of CST
Resource Person Details: Dr. Aravinda S, Assistant Professor, Department of Physics, Indian Institute of Technology Tirupati
Participants: II Year CST Students
Attendance: 70 participants
Venue: CST Department
Mode: Offline

Report Received on 12.02.2024
Department of Computer Science & Technology has organized **"**One-Day Guest Lecture on Quantum Computing: A Journey into the future of Computing**"** on **30.01.2024** (Tuesday) from 10:00 AM to 12:00 PM.

Welcome Address:

The event commenced promptly at 10:00 AM with a warm and engaging welcome address to all by **Mr. V. Naveen**, **Assistant Professor, Department of CST,** Madanapalle Institute of Technology & Science **(**MITS), Madanapalle. The main objective of a guest Lecture on "Quantum Computing: A Journey into the future of Computing" is in a rapidly changing world, Quantum computing can improve research and development, supply-chain optimization and production. In addition, quantum computing can process large quantities of data, it can aid in making better decisions and predictions, such as in applications such as facial recognition, object recognition, and fraud detection.

Resource Person Lecture:

Dr. S. Aravinda, Assistant Professor, Department of Physics, Indian Institute of Technology Tirupati started to explain about Quantum computing, Quantum computing represents a paradigm shift in the realm of information processing, promising unprecedented computational power that could revolutionize various fields. As we embark on this journey into the future of computing, it becomes imperative to understand the fundamentals of quantum mechanics and how they enable the extraordinary capabilities of quantum computers.

Resource Person stated how to Understand Quantum Computing,

At its core, quantum computing harnesses the principles of quantum mechanics to perform computations in ways that classical computers cannot emulate. Unlike classical bits, which are binary and can only be in one state (0 or 1) at a time, quantum bits or qubits can exist in multiple states simultaneously, thanks to phenomena such as superposition and entanglement.
Superposition allows qubits to exist in a combination of both 0 and 1 states simultaneously, exponentially increasing the computational possibilities. Entanglement, on the other hand, enables qubits to be correlated in such a way that the state of one qubit instantaneously affects the state of another, regardless of the distance between them. These quantum phenomena form the foundation of quantum computing and enable it to solve certain problems much faster than classical computers.


Further, he explained about the applications and Challenges ahead in Quantum Computing, Potential Applications:

The potential applications of quantum computing span across various fields, including cryptography, optimization, drug discovery, material science, and artificial intelligence. For instance, quantum computers could break existing cryptographic protocols by efficiently factoring large numbers, thus rendering current encryption methods obsolete. In optimization problems, quantum algorithms could significantly speed up processes such as route optimization, portfolio management, and supply chain logistics. Furthermore, quantum simulations could revolutionize drug discovery by accurately modelling molecular interactions and predicting drug efficacy with unprecedented precision.

Challenges and Road Ahead:

Despite the promising potential, quantum-computing faces several challenges that must be addressed before it can realize its full capabilities. These challenges include decoherence, error correction, scalability, and the development of practical quantum algorithms. Decoherence, the loss of quantum coherence due to interactions with the environment, remains a significant hurdle in maintaining qubits' delicate quantum states. Error correction techniques are essential to mitigate errors caused by noise and imperfections in quantum hardware Furthermore, he discussed as achieving scalability to build large-scale quantum computers with hundreds or even thousands of qubits remain a formidable task. As we continue to overcome these challenges, collaborations between academia, industry, and government entities are crucial to advancing quantum computing research and development.

Vote of thanks:

The guest lecture formally concluded with a vote of thanks delivered by **Mr. V. Naveen, Assistant Professor**, **Department of CST**. In his address, he expressed sincere gratitude to resource person for taking the time to share his expertise and inspired our students towards quantum computing.

Outcomes: At the end of Program, Students can able to,

1. Understand the Breakthroughs in Cryptography.
2. Infer knowledge in Accelerated Optimization.
3. Interpret the potential applications of Quantum Computing.
4. Illustrate the Challenges & Advancements in Material Science.
5. Outline the advancements in Artificial Intelligence algorithms.