Five Day Online National Level workshop on "Fundamentals of Quantum Computing and Applications"
1st to 5th March 2021
In Association with IEEE – Computer Society
Technically supported by IBM

R. V. College of Engineering, Bengaluru

RVCE is an autonomous institution affiliated to Visvesvaraya Technological University (VTU), Belagavi and is rated amongst the top ten self-financing Engineering colleges in the country. RVCE offers 12 Under Graduate Engineering programs, 16 Master Degree programs and Doctoral Studies. Utilizes its expertise in various disciplines to conduct Research and Development for Industry and Defense establishments in the country. The institution has established Incubation Centre, Centre of Excellence in Macroelectronics, Computational Genomics, Smart Antenna Systems, LDRA; Centre of Excellence in Internet of Things sponsored by CISCO, RVCE-Mercedes Benz Centre for Automotive Mechatronics, Toyota Kirloskar Motors sponsored automotive workshop, RV-Bosch Rexroth Centre for Automation. The students have won awards and accolades in national and international competitions.

About the CIRQuIT (Centre for Interdisciplinary Research in Quantum Information and Technology)
Vision:
To inspire young minds to take up research in Quantum Computing field and develop viable solutions to real-world problems.

Mission:
1. To increase awareness and spread knowledge about quantum computing and related concepts.
2. To conduct research in areas specific to:
    a. Quantum Algorithms
    b. Quantum Machine Learning
    c. Quantum Annealing Optimization
    d. Quantum Cryptography
    e. Quantum Hardware
3. Utilizing open-source quantum computing tools like IBM Qiskit, Cirq, Tensorflow Quantum, DWave Ocean SDK, Pennylane, and other related software.

The CIRQuIT has successfully conducted internship programs to build a team of 15 active researchers including faculty and students from various engineering disciplines. The group has collaborations with IBM for training and utilizing their open-source quantum computing toolkit QisKit. The members in the group takes active part in QC challenges and workshops.
Some of our areas of work includes:
1. Open-source Quantum Algorithms bank
2. Hamiltonian optimization of a graph theoretical problem using Quantum Annealing
3.Solving a classification problem using Quantum Machine Learning algorithms

About the workshop
Quantum computing is an application of superposition and entanglement quantum-mechanical phenomena to perform computation, as proposed by Richard Feynman in 1982. As said and done quantum computing is a revolutionary technology which leverages the bizarre characteristics of quantum mechanics to solve certain problems extremely faster than classical computing technologies. In future the quantum principles are used to create ultra-powerful computers which will play crucial role in cybersecurity, drug discovery, traffic optimization, forecasting and predictions, etc.

Objectives of the workshop:
- To give essential basics in quantum information theory and quantum computing
- To appraise with the working of quantum mechanics and related concepts.
- To build quantum circuits using quantum bits, and executing over quantum computers/simulators.
- To discuss working of some of the popular Quantum computing algorithms and their practical implementations and applications.
- To provide first-hand information on Quantum key distribution for Quantum-safe cryptography.

Rashtreeya Sikshana Samithi Trust
RV COLLEGE OF ENGINEERING®
(Autonomous Institution Affiliated to VTU, Belagavi)
Bengaluru- 560059, Karnataka.

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"FUNDAMENTALS OF QUANTUM COMPUTING AND APPLICATIONS
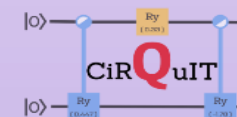### 1st to 5th March 2021
under
IEEE – RVCE Student Chapter
Computer Society

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Centre for Interdisciplinary Research in Quantum Information and Technology
R V College of Engineering

Workshop Content

Basics of Quantum Computing

- *From Bits to Qubits*: Dirac Notation, Quantum measurement, Bloch Sphere
- *Building Basic Quantum Circuits & Quantum Entanglement*: Basic Single Qubit and Two-Qubit Gates, Multipartite Quantum States, Quantum Operations, Bell States

Quantum Algorithms

- Quantum Teleportation
- Deutsch-Josza Algorithm
- Bernstein-Vazirani Algorithm
- Grover Search Algorithm

Quantum Cryptography

- From classical to quantum cryptography
- BB84 and B92 protocols

(Most of the sessions includes hands-on training on Quantum Computers/Simulators)
Pre-requisites: Python basics and basic Linear Algebra

Resource Persons: Researchers from **CIRQuIT** and industries.

Advisory Committee:
Dr. K.N. Subramanya, Principal, RVCE
Dr. Ramakanth kumar P., Prof. & HoD, CSE
Dr. Nagaraja G. S., Professor, Dept. of CSE
Dr. Sagar B. M., Prof. & HoD, ISE
Dr. A.R.Ashok Kumar, Dept. of CSE

Conveners and Chief-coordinators:
Dr. B. Sathish Babu, Professor, Dept. of CSE
Dr. Tribikram Gupta, Asst. Prof., Dept. of Physics

Coordinators:
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REGISTRATION DETAILS (Fees including GST)

- INR 1000 – Industry
- INR 750 – Faculty/ Research
- INR 500 –Student

Note: Active IEEE members will have 25% discount on registration fees

Registration should be done through NEFT
Name: RVCE-IEEE STUDENTS BRANCH
Account Number-2213404972
Bank- Kotak Mahindra
IFSC code- KKBK0008053
OR
UPI N0- 80880 65605 (Chiraj Bapat)

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