# D-KOSMOS

*FACULTY OF COMPUTER APPLICATIONS & INFORMATION TECHNOLOGY*

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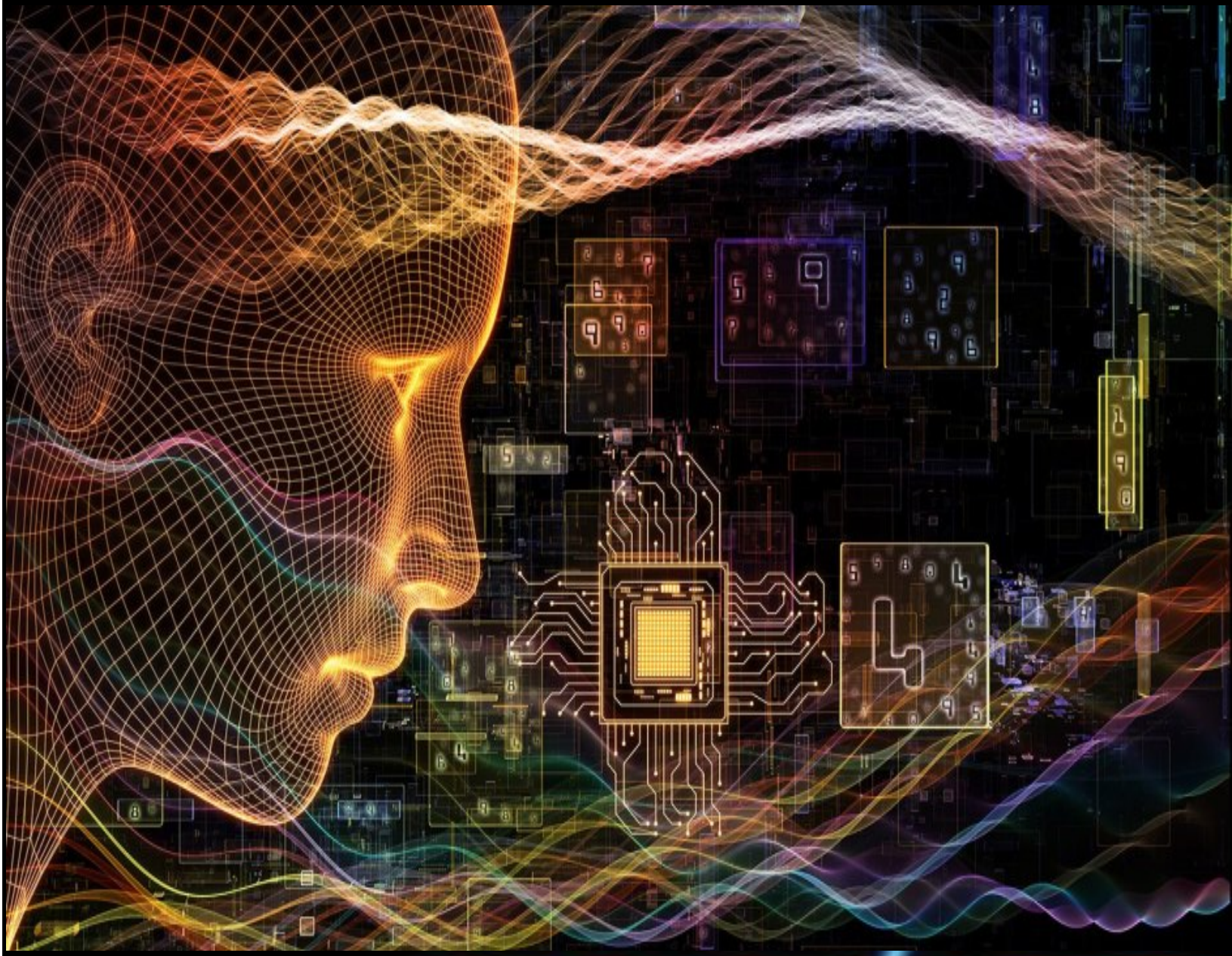

# Quantum Computing

Message From

Dean, FCAIT

Prof. R. P. Soni

## Message From Dean, FCAIT

Quantum computing is not a replacement for the binary classical computing that has become a standard of modern life. Quantum computers use quantum physics to emulate the physical world, they can solve problems that today's computers will never have the power to tackle. The use of quantum computers has immediate applications in industries such as pharmaceuticals, chemicals, and energy. Algorithms using quantum math can unlock value by vastly speeding up data-intensive applications in such fields as search, cryptography, and machine learning.

In the future, hybrid systems consisting of classical computers that call on their quantum cousins will solve problems that are unmanageable today.

Quantum computing may reach maturity over three generations spanning the next 25 years. Companies could be using early-generation machines to address practical business and R&D needs much sooner. In fact, there will be a potential quantum computing market of more than $50 billion developing by 2030. Realizing the potential, however, will be possible only when the technology can produce the number of "logical" qubits—the basis for quantum calculations—that critical applications require.

IBM recently announced a 20-qubit quantum processor and a simulator that can emulate up to 49 qubits, only to be outdone by Google a few months later with its Bristlecone chip, a 72-qubit processor. Other big tech companies and research institutions, including Intel, Microsoft, MIT, Yale, and Oxford, are active in the field.

Read more about the quantum computers in the articles contributed by students in this issue.

---R. P. Soni

"Primary aim of quantum computing intelligence is to improve human freedom, dignity, equality, security, and total well-being."

With this thought, we would like to present our next edition of D-Kosmos which will show how quantum computing allows the computer technology to be smaller and faster in our day to day life. With superposition, we can encode an exponential amount of information that can scale a solution better than classical computing.

We would also like to make a special mention of "Cyber Shadez-2019" based on "Robotic Process Automation" theme to learn beyond the textbooks. The current issue is presenting glimpses of culture festival- "SHADEZ". It is a platform for students to showcase their talents, creativity, imagination, leadership qualities, team spirit and fellowship. The issue holds descriptions of CSI, NSS, CWDC, ISR, Educational tours and other extra curricular activities organised by the institute.

We believe in forming a strong bond with our students. For that we had organised farewell for third year students of BCA where they have enjoyed a lot, they recall there old college memory, watch video and played some fun interaction games as well.

We hope you like this edition of D-Kosmos. We would also request our readers to send in their suggestions and feedback, if any, on dkosmos@glsica.org.

Wish you a happy reading!!!!

Editorial Desk.


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# Quantum Computing

We experience the benefits of classical computing every day. However, there are challenges that today's systems will never be able to solve. For problems above a certain size and complexity, we don't have enough computational power on Earth to tackle them. To stand a chance at solving some of these problems, we need a new kind of computing which is Quantum Computing.

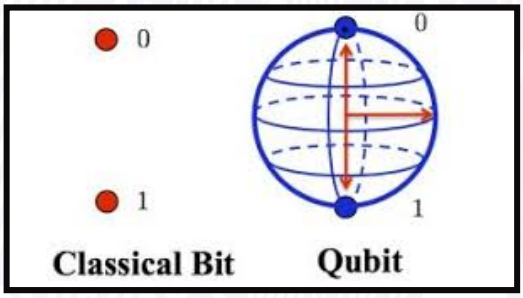
It is the key technology for future artificial intelligence. Universal quantum computers leverage the quantum mechanical phenomena of superposition and entanglement to create states that scale exponentially with number of qubits, or quantum bits.

All computing systems rely on a fundamental ability to store and manipulate information. Current computers manipulate individual bits, which store information as binary 0 and 1 states. Quantum computers leverage quantum mechanical phenomena to manipulate information. To do this, they rely on quantum bits, or qubits.

## Qubit

A qubit is a quantum bit, the counterpart in quantum computing to the binary digit or bit of classical computing. Just as a bit is the basic unit of information in a classical computer, a qubit is the basic unit of information in a quantum computer.

In a quantum computer, a number of elemental particles such as electrons or photons can be used with either their charge or polarization acting as a representation of 0 and / or 1. Each of these particles is known as a qubit, the nature and behavior of these particles form the basis of quantum computing.




## What can quantum computers do that normal ones can't?

Quantum computers operate on completely different principles to existing computers, which makes them really well suited to solving particular mathematical problems, like finding very large prime numbers. Since prime numbers are so important in cryptography, it's likely that quantum computers would quickly be able to crack many of the systems that keep online information secure. Because of these risks, researchers are already trying to develop technology that is resistant to quantum hacking, and on the flipside of that, it's possible that quantum-based cryptographic systems would be much more secure than their conventional analogues.

Riya Soni, iMSc-IT, Sem-4

# Q System One

IBM Q, industry-first initiative to build commercial universal quantum systems for business and science applications. The company is leading the way in the quantum space and is racing to be the first to develop a fully functional and commercially viable quantum computer. The company announced that its first "commercial" quantum computer - Q System One.

"The IBM Q System One is a major step forward in the commercialization of quantum computing," said Arvind Krishna, senior vice president of Hybrid Cloud and director of IBM Research. "This new system is critical in expanding quantum computing beyond the walls of the research lab as we work to develop practical quantum applications for business and science."

IBM Q systems are designed so that they can tackle problems that are currently seen as too complex and exponential in nature for classical systems to handle. Future applications of quantum computing may include finding new ways to model financial data and isolating key global risk factors to make better investments, or finding the optimal path across global systems for ultra-efficient logistics and optimizing fleet operations for deliveries.

Designed by IBM scientists, systems engineers and industrial designers, IBM Q System One has a sophisticated, modular and compact design optimized for stability, reliability and continuous commercial use. For the first time ever, IBM Q System One enables universal approximate superconducting quantum computers to operate beyond the confines of the research lab.

Much as classical computers combine multiple components into an integrated architecture optimized to work together, IBM is applying the same approach to quantum computing with the first integrated universal quantum computing system.
IBM Q System One is comprised of a number of custom components that work together to serve as the most advanced cloud-based quantum computing program available, including:

- Quantum hardware designed stable and auto-calibrated to give repeatable and predictable high-quality qubits.
- Cryogenic engineering that delivers a continuous cold and isolated quantum environment.
- High precision electronics in compact form factors to tightly control large numbers of qubits.
- Quantum firmware to manage the system health and enable system upgrades without downtime for users.
- Classical computation to provide secure cloud access and hybrid execution of quantum algorithms.

## Quantum annealing

D-Wave systems use a process called quantum annealing to search for solutions to a problem.In nature, physical systems tend to evolve toward their lowest energy state: objects slide down hills, hot things cool down, and so on. This behavior also applies to quantum systems. To imagine this, think of a traveler looking for the best solution by finding the lowest valley in the energy landscape that represents the problem.

Classical algorithms seek the lowest valley by placing the traveler at some point in the landscape and allowing that traveler to move based on local variations. While it is generally most efficient to move downhill and avoid climbing hills that are too high, such classical algorithms are prone to leading the traveler into nearby valleys that may not be the global minimum. Numerous trials are typically required, with many travelers beginning their journeys from different points.

In contrast, quantum annealing begins with the traveler simultaneously occupying many coordinates thanks to the quantum phenomenon of superposition. The probability of being at any given coordinate smoothly evolves as annealing progresses, with the probability increasing around the coordinates of deep valleys. Quantum tunneling allows the traveller to pass through hills—rather than be forced to climb them—reducing the chance of becoming trapped in valleys that are not the global minimum. Quantum entanglement further improves the outcome by allowing the traveler to discover correlations between the coordinates that lead to deep valleys.

## Programming a D-Wave System

To program the system, a user maps a problem into a search for the "lowest point in a vast landscape," corresponding to the best possible outcome. The quantum processing unit considers all the possibilities simultaneously to determine the lowest energy required to form those relationships. The solutions are values that correspond to the optimal configurations of qubits found, or the lowest points in the energy landscape. These values are returned to the user program over the network.

Because a quantum computer is probabilistic rather than deterministic, the computer returns many very good answers in a short amount of time—thousands of samples in one second. This provides not only the best solution found but also other very good alternatives from which to choose.

Application development is facilitated by D-Wave's open-source Ocean software development kit (SDK), available on GitHub and in Leap, which has built-in templates for algorithms, as well as the ability to develop new code with the familiar programming language Python.

Vishnu Pillai, iMSc-IT, Sem-4

# Companies Working On Quantum

Rigetti is a name that often crops up in relation to quantum computing and has been praised for keeping pace with much larger tech giants in the world of quantum.The firm has developed a hybrid quantum computing platform that is currently in private beta and it combine the power of a quantum processor and a classical processor.

D-Wave is a smaller company that is making, ahem, waves in the realm of quantum.In late 2018, D-Wave launched "Leap", the first real-time quantum application environment, providing remote access to a live quantum computer. They've also directly partnered with Volkswagen on developing a traffic management system for taxis.

IonQ has created the most powerful quantum computer to date. It's slightly different from other quantum computers as it uses trapped ions for qubits. IonQ describes it as 'storing information on individual atoms'.

Google has partnered with NASA on the testing of a quantum computer known as 'D-Wave Two', developed in partnership with D-Wave. Google and IBM, creates qubits on silicon chips which are chilled to zero. The Google AI faction of the tech conglomerate is working in the area of quantum, the main priorities are building quantum processors and developing new quantum algorithms with the aim of speeding up computational tasks for machine learning. Some of the areas the unit is currently looking at include superconducting qubit processors, qubit metrology, quantum simulation, quantum assisted optimisation and quantum neural networks.

Microsoft has been working on scalable quantum computing for nearly two decades, creating its first quantum computing group—known as Station Q—in 2006. Microsoft Quantum – Santa Barbara (Station Q) is a Microsoft Research lab focused on studies of topological quantum computing. Topological quantum computation is a unique field where the connection from theory – both mathematics and theoretical physics – to experiments is very close, and researchers from different backgrounds can work hand in hand towards a common goal. Station Q encompasses this whole range of research from the mathematical description and classification of these phases to guiding our experimental collaborators towards practical implementations of topological qubits.

Amazon Web Services offering quantum computing to customers. It launches "the first production-ready quantum computer" via the cloud, is called Quantum Compute Cloud, or QC2. Quantum computing will "increase the speed at which our customers can process complex scientific data in the cloud, which will enable unprecedented success in problem-solving We can use it to solve certain types of math and logic problems with breathtaking speed. The QC2 uses more sophisticated data representation known as a qubit or quantum bit. Each qubit exists in all of it's possible states simultaneously, but the probability that a qubit can be in any of the states can change. Quantum computers work by manipulating the probability distribution of each state.

Kaabir Kanjani, iMSc-IT, Sem-2

# NSS & ISR

01

"We make a living by what we get but we make a life by what we give". With an endeavor to encourage students for better education, the team of FCAIT visited Ekta High School on 23rd Sepetmber, 2018 to assist the poor and needy children with the distribution of notebooks and essential material resources. The Team imparted audio/video lectures on computer education and enhancing English spoken ability.

02

FCAIT organised a guidance program which gives the insight knowlwdge about thalassemia. The camp was followed after the seminar on 28th December, 2018 by Indian Red Cross Society.

# CWDC

01

A seminar was conducted by FCAIT on "Personality Development & Enhancing Soft Skills" by Mr. Shravan Nair on 25th February, 2019. The reseaon behind the seminar was to touch the bottom of Youth issues for developing and maintaining positive self-images.

02

A seminar was conducted by FCAIT on fitness for healthy life by Rajan Dalal, fitness trainer and owner of Prassanna Gym on 21st December, 2018. He discussed about necessary physical exercises and healthy food to maintain health and fitness.

# Farewell

"Saying Goodbye does not mean anything. It's the time we spent together that matters, not how we left it....". FCAIT oraganized a farewell function to bid abieu to final year students of 2016-2019 batch on 19th March, 2019. The function began with welcome speech. Dean FCAIT, Shri R. P. Soni enlightened the students with his inspirational speech and also wished them for the bright future. Students amused by video depicting their three years of college life journey. Many interesting and tricky games were played to pep up the environment, summing up, the evening was great, filled with nostalgia and fun and excitement!

# Industrial Tour

| Industrial Tour | Date |
|---|---|
| Gujarat Solar Park | 2nd January, 2019 |
| ISRO | 2nd January, 2019 |
| Akshay Patra | 30th January, 2019 |
| Gujarat Emergency Response Center 108 | 10th January, 2019 |

# Educational Tour

FCAIT students visited to Gandhi Kutir Ashram, Gandhinagar on 21st December, 2018. The name Dandi Kutir is to remember the rebellion against British Tax on salt that the Indians had to pay. Gandhi led Indians to Dandi coast to make salt in defiance of the tax. The visit was to create a source of inspiration from Gandhi's life to the young-generation through modern science and technology.

# CSI Activities

| Date | Name of Activity | Name of Expert |
|---|---|---|
| 15th December, 2019 | Workshop on Cross Platform Mobile Application Development using IONIC | Mr. Pratik Maniar, Dynamic Elements |
| 10th January, 2019 | Seminar on AI, Animation, Virtual Reality | Mr. Ninad Shastri, Xplora |
| 16th January, 2019 | Workshop on iOS Mobile Application Development | Prof. Vishal Narvani |
| 31st January, 2019 | Seminar on CareerOptions | Dr. Harshal Arolkar |
| 5th February, 2019 | Workshop on Introduction to Embedded System using Arudino | Prof. Poonam Dang, Prof. Jyoti Dubey |
| 21st February, 2019 | Workshop on Wordpress | Prof. Nirav Suthar |
| 22nd February, 2019 | Workshop on MongoDB | Prof. Monica Gupta, Prof. Jainin Vakil |

# Cyber Shadez - 2019

FCAIT and FCT hosted the annual National Level Technical Festival **"Cyber Shadez-2019"** at the GLS University Campus on 9th February, 2019. The theme of the TechFest was **"ROBOTIC PROCESS AUTOMATION"**. The objective of the TechFest was to provide a platform for the students of BCA, Bsc(IT/CA/CS), iMSc(IT/CA/CS), PGDCA, Msc(IT), MCA and iMCA to showcase their technical skills. It also intended to give insight knowledge of upcoming robotic process automation technology to the students. Competitions like Marathon Programming, Relay Programming, Idea Presentation, Robo Race, RPA Projects, Logo Designing, IT Quiz and Database Treasure Hunt were organized under Cyber Shadez 2019 within UG and PG category. More than 300 students from across the state participated in the event with great enthusiasm.

# Shadez

College cultural events are important part of student college life beside studies. **"SHADEZ-2018"**, the annual cultural fest was celebrated on 31st December, 2018. Various events such as Poster Making, Master Chef, Debate, Elocution, On the Spot Photography, Painting, Best out of Waste, Collage Making, Mahendi, Rangoli, Face Painting, were held simultaneouly.

# Placement -2019

FCAIT always plan for students for their placement as one of the important carrier prospective. Student who aspire for jobs are taken care yet majority of students go for higher studies. Following are the list of students selected in various IT industries:

| S.No. | COMPANY NAME | STUDENT NAME |
|---|---|---|
| 1 | TCS | Garima Jani |
| 2 | Wipro | Kartikeya Madnani |
| 3 | | Chandani Thakkar |
| 4 | | Simran Harjani |
| 4 | | Hariprakash Chandak |
| 5 | | Shruti Tanna |
| 6 | | Priyanka Panchal |
| 7 | | Parin Patel |
| 8 | | Vatsal Mehta |
| 9 | | Aditya Bhatt |
| 10 | | Hardik Jani |
| 11 | | Pooja Mavadhiya |
| 12 | | Aashi Shah |
| 13 | | Aneri Deliwala |
| 14 | Infosys | Vanshika Agarwal |
| 15 | | Rushita Vacchani |
| 16 | | Mustafa Udegadhwala |
| 17 | | Aniruddh Chavda |
| 18 | | Meet Patel |
| 19 | | Devansh Bhavsar |
| 20 | | Garima Jani |
| 21 | | Deepanshu Agarwal |
| 22 | | Ravi Wadhwani |
| 23 | | Vishwa Bavishi |
| 24 | | Sakshi Singhvi |
| 25 | | Dhruv Rajput |
| 26 | | Dhyanvi Shah |
| 27 | | Abbas Chudiwala |
| 28 | DIGIMATION | Upasna Dhameliya |
| 29 | | Parin Patel |
| 30 | | Ravi Wadhwani |
| 31 | Way 2 Web | Dilip Jasrajani |
| 32 | | Devansh Bhavsar |
| 33 | | Parin Patel |
| 34 | | Dishan Bhardwaj |
| 35 | ORACLE | Parin Patel |
| 36 | | Garima Jani |
| 37 | | Simran Harjani |
| 38 | | Dilip Jasrajani |
| 39 | | Annirudh Chavda |

# External Achievements

| Student Name | Competition Name | College Name | Position |
|---|---|---|---|
| Mustafa Udegadhwala | Codethan | INDUS | 1st |
| Rushita Vachhani | | | |
| Anshuka Gajjar | Codethan | | 2nd |
| Stuti Mehta | | | |
| Bhavika Tilhani | Buy Beg Borrow | | 2nd |
| Abhinav Goyal | | | |
| Hitesh Gohel | Multi Hand | | 2nd |
| Mod. Asim Mansuri | | | |
| Daksh Vatyani | Multi Hand | | 3rd |
| Abhinav Goyal | | | |
| Himanshu Joshi | Word of Mouth & Web Desiging | | 3rd |
| Darshan Jain | Mobile Gaming | CPICA | 1st |
| Arnav Desai | | | |
| Aman Pandya | | | |
| Shreyansh Jain | | | |
| Neha Aswani | Relay Programming & Debugger | | 1st |
| Ayush Ramrakhayani | | | & |
| Sagar Nagrani | | | 2nd |
| Sagar Ladla | Rotary Club IT-QUIZ | Rotary Club of India | 2nd |
| Mayur Solanki | | | |

# I.M. Nanavati Inter-College Sports Celebration 2018-19

Every year GLS University organizes a "Sports Celebrations" where students from GLS University institutes showcase there sports talent. This year GLS University Sports Celebration was held from 27th December, 2018 to 11th Jaunary, 2019.

FACIT Achievements in Sports Meet:

1. Man of the Match - Devansh Bhavsar (104 runs) Cricket(Boys)
2. Anjali Jain - Silver Medal, Chess
3. Garima Jani – Silver Medal, Long Jump(Girls)
4. Aman Chaurasiya- Bronze Medal, Long Jump(Boys)

# Media Bytes - Fresh Face

## TYBCA-Project Abstracts

**Rank–1** **The Musical App**

The Musical App is designed for music lovers who can learn music very easily at home on their finger tips without reaching to the academy. The registered user can learn Music, Instrumental, Vocal and many more.

**Prepared By: Pushti Pitaliya, Deep Shah, Aishwarya Thakkar**

**Guided by : Shaily Thaker**

**Rank–2** **Medscape**

The "MedScape" App is designed for the patients and doctors. App can manage appointment according to the schedule and speciality of doctors. The features of MedScape are medicine reminder, emergency button, blood donation, prescription and histroy of patients.

**Prepared By: Aesha Kayastha, Bhoomi Shah, Shruti Shah**

**Guided by : Ankita Kanojiya**

**Rank–3** **Project Planning Application**

This App looks after the entire project ( New, On-going) from start to end. This app also used to divide work in several phases like analysis, system design, coding, testing and maintenance work. Once project meet the the client requirements, their team upload the projects on live server for the demo/testing purpose.

**Prepared By: Chavda Dipali, Dalwadi Krupa, Patel Nirali**

**Guide By : Nirav Suthar**

## Faculty Corner

Dr. Ankit Bhavsar, Prof. Poonam Dang, Prof. Jyoti Dubey won the best paper award for a research paper titled "IoT and WSN Based Solid Waste Management for Ahmedabad City", presented at Two days National Conference on Emerging Technologies in IT 2019 - ISBN : 978-93-5346-668-8.

Dr. Ankit Bhavsar, Dr. Harshal Arolkar, presented research paper titled "ZigBee Frame Structure for WSN based Animal Health Monitoring in Rural Area of Gujarat" in International Conference on sustanaible Computing in Science, Technology & Management (SUSCOM-19) & SSRN-Elsevier Digital Library.

Prof. Jyoti Dubey, Dr. Ankit Bhavsar presented a paper titled "Long Term Evolution: A possible Solution For WSN Based Long Distance Data Communication" at Two days National Conference on Emerging Technologies in IT 2019 - ISBN : 978-93-5346-668-8.

Prof. Poonam Dang, Dr. Harshal Arolkar, published research paper titled "Electronic Design Automation Tool: A Comparative Study " in International Journal for Research in Applied Science & Engineering Technology Volume 7, Issue III, March 2019 ISSN No. : 2321-9653.