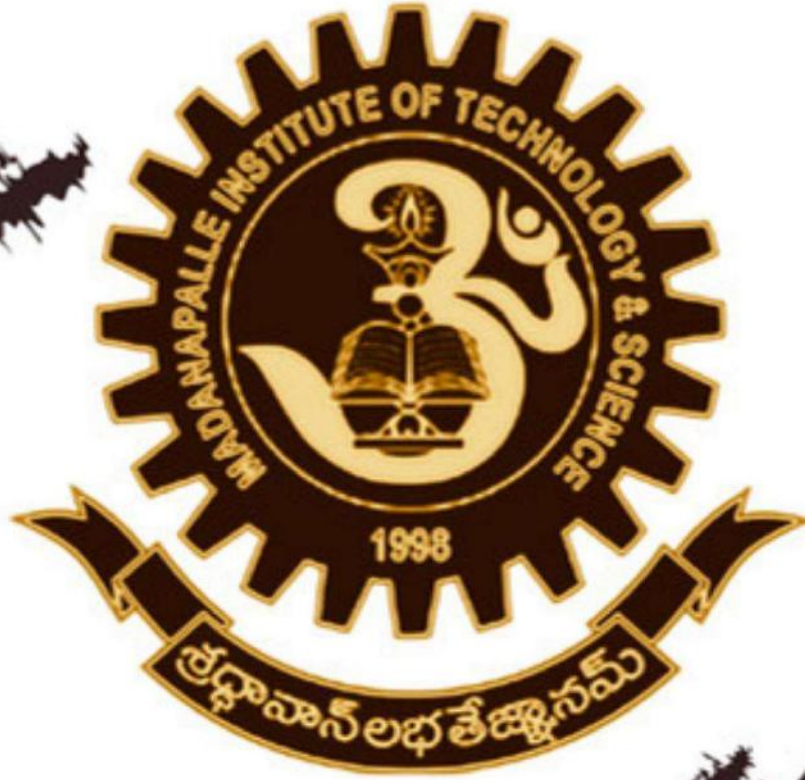# DEPARTMENT OF COMPUTER SCIENCE & TECHNOLOGY

SPARK
MAGAZINE
2021

Life of Science & Technology

About MITS

Madanapalle Institute of Technology & Science is established in 1998 in the picturesque and pleasant environs of Madanapalle and is ideally located on a sprawling 26.17 acre campus on Madanapalle - Anantapur Highway (NH-205) near Angallu, about 10km away from Madanapalle.

MITS, originated under the auspices of Ratakonda Ranga Reddy Educational Academy under the proactive leadership of Late Sri. N. Krishna Kumar M.S. (U.S.A), the then President and Dr. N. Vijaya Bhaskar Choudary, Ph.D., Secretary & Correspondent of the Academy.

MITS is governed by a progressive management that never rests on laurels and has been striving conscientiously to develop it as one of the best centers of Academic Excellence in India. The Institution's profile is firmly based on strategies and action plans that match changing demands of the nation and the students fraternity. MITS enjoys constant support and patronage of NRI's with distinguished academic traditions and vast experience in Engineering & Technology.

Institute Vision

To become a globally recognized research and academic institution and thereby contribute to technological and socio-economic development of the nation.

Institute Mission

To foster a culture of excellence in research, innovation, entrepreneurship, rational thinking, and civility by providing necessary resources for generation, dissemination and utilization of knowledge and in the process create an ambience for practice-based learning to the youth for success in their careers.

About us

The Department of Computer Science & Technology (CST) was established in the year 2018 and plays a vital role in producing value-based professionals to cater to the ever-challenging needs of technical excellence in the emerging areas of CST. The department offers one UG program with an intake of 60 students and the intake was enhanced to 180 seats in the year 2019. Department has adequate infrastructural facilities required for imparting high-quality education and the department is fully structured to meet the contemporary needs of the industry. Imparting high quality education is supported by well qualified and experienced faculty members with rich academic and industry exposure, who have pursued Masters/Ph.D degree from prestigious institutions like NITs, IITs, and Central Universities within India and abroad. Seminars, Workshops, and Technical Symposia are conducted in the department to keep faculty and students updated with latest developments in various technologies.

Department Vision

To bring forth globally competent engineers with societal consciousness, who thrive in academics and research in Computer Science and Technology.

Department Mission

M1:   To deliver technical education of the highest quality by improving the curriculum and using effective pedagogical techniques by qualified faculty.

M2:   To foster interaction between Industry and academia, to improve students' abilities in research, innovation, and entrepreneurship.

M3:   To prepare the students to become professionally competent and intellectually adept by imparting required Skills to mitigate the societal problems.

Program Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives (PEOs)

PEO1: Graduates will have successful career by contributing for innovation of new technologies and systems in the key domains of Computer Science & Technology.

PEO2: Graduates will be able to perform technical/ administrative roles in information technology industry / R&D sectors and pursue higher education in reputed institutions.

PEO3: Graduates will be ethically and socially responsible towards the societal development and opting a career as an entrepreneur with moral values in various domains of Computer Science & Technology.

MESSAGE FROM THE CORRESPONDENT

Dear Readers,

I feel exhilarated that the Department of Computer Science & Technology of MITS is bringing out a magazine called SPARK from the year 2021. This Magazine brings out the intellectual brilliance in various new techniques introduced in Information Technology industry.

``HARD WORK, SINCERITY, DEDICATION AND ENTHUSIASTIC DEVOTION TO WORK WILL FETCH YOU UNBOUND SUCCESS, MAY THE LORD SHOWER HIS BLESSINGS ON YOU``

I heartily congratulate the students and the staffs of CST Department and Wish them a grand success.

Dr. N. VijayaBhaskarChoudary
Correspondent

PRINCIPAL'S DESK

"Be Interested, Committed and Repeated"

Dear Readers,

It brings me great joy to witness the vibrant interactions among the faculty and students of the Computer Engineering Department as they elevate SPARK_21 to new heights. This technical magazine will serve as a catalyst for both faculty and students, inspiring them to stay engaged and dedicated to the advancement of the department and the institute. My heartfelt congratulations to the editorial team for their hard work in making this possible. I extend my best wishes to the entire team for the journey ahead.

Principal
Dr. C. Yuvaraj

MESSAGE FROM THE HEAD OF THE DEPARTMENT

Dear Readers,

I am thrilled by the vibrant interactions among the faculty and students of the Computer Science & Technology Department, which have elevated SPARK_21 to new heights. This technical magazine promises to inspire both faculty and students to stay engaged and dedicated to the advancement of the department and the institute. My heartfelt congratulations to the editorial team for their outstanding contribution.

I wish all the best to the entire team for future. endeavors.

Prof. Dr. M.Sreedevi HoD,
Dept of CST
MITS

AI Unleashes the Power to Predict Protein 3D Structures

It's fascinating to see that the 2021 Breakthrough of the Year, as recognized by Science, is the realization of Christian Anfinsen's vision from his 1972 Nobel Prize acceptance speech. The use of artificial intelligence (AI) to accurately predict protein structures represents a significant milestone in the field of biochemistry and has broad implications for various scientific and medical applications. The achievement highlights the power of AI, particularly machine learning techniques, in handling the complexity of protein folding prediction. As mentioned earlier, DeepMind's AlphaFold is one notable example of an AI-driven software that has demonstrated remarkable success in predicting protein structures.

The use of artificial intelligence (AI) in predicting the three-dimensional structures of proteins. This is a significant and exciting area of research known as protein folding prediction. Understanding the three-dimensional structure of proteins is crucial for deciphering their functions and roles in various biological processes. Traditionally, determining the structure of proteins has been a complex and time-consuming task, often requiring experimental methods like X-ray crystallography or nuclear magnetic resonance (NMR) spectroscopy. However, these methods are resource-intensive and may not be applicable to all proteins.

AI, particularly deep learning algorithms, has shown promise in predicting protein structures more efficiently. One notable example is the use of deep neural networks in the CASP (Critical Assessment of Structure Prediction) competition, where teams develop algorithms to predict protein structures. DeepMind's AlphaFold, for instance, gained attention for its success in accurately predicting protein structures, demonstrating the potential of AI in this field. By leveraging vast datasets of known protein structures, AI models can learn complex patterns and relationships, enabling them to make accurate predictions for proteins with unknown structures.
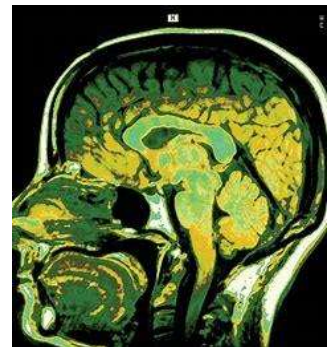
These advancements in AI-powered protein structure prediction hold great potential for accelerating drug discovery, understanding diseases, and advancing our overall knowledge of biology.

20691A2820
G.CHANDANA
II YEAR_CST

MUSIC AND ARTIFICIAL INTELLIGENCE

**20691A2832
SK.SHAIK FAIZA
II YEAR_CST**

As an ardent music lover, my day begins with two simple things... early morning blues and a dope playlist to combat such symptoms. So many of us like to hit the gym, go for an early morning jog, or just chill out to our favorite Spotify recommended. Music undoubtedly plays a pivotal role in our lives. When we think of AI... it's glistening silver bots, self driven cars and complicated automations that immediately come to mind. Your Spotify recommended? A series of advanced algorithms that adapt to your taste in music, evolving at each step with the data you provide it, to create the perfect personalized tailor made song suggestions at your disposal. It's a uniquely powerful combination of 3 data analysis models.

(1) Collaborative filtering-analyze both yours and others behavior.

(2) Natural language processing-analyze text.

(3) Audio analysis-analyze the raw tracks themselves combined together you get your weekly recommended from an app that knows you like your best mate.

AI has been employed not just in marketing and recommendations. It has also been integrated into music production, creation, mixing and sampling, lyric generation and so on. Some softwares have been programmed to perform the songs as live performances. Some of the popular platforms are Google's magenta, amper, AIVA.

All of them have the basic concept: feed the system tunes of data-from disco classics to indie rock to EDM. It picks up chords, tempo, length, patterns and how notes relate to each other and from that data creates unique self produced melodies. pretty neat if you think about how it transforms an artists one month work into a 120 second process. Some deliver midi while some deliver audio. This feature can be exploited extensively to create more personalized content for the user.

Sony CSL laboratory distributed the first ever pop song written and produced entirely by AI called daddy's car based on the theme of Beatles. Over 13000 were entered into the program from which a 3.00 minute song was created entirely by AI. Back then popular musician David bowie worked alongside engineers to create an app called Verbalizer in the 90's. It took literary source material as input and randomly reordered them to form lyrics. This shone a new light in the creative writing process. In recent times pop artist Taryn southern, incorporated AI into her album to create "I AM AI" the first ever pop album composed and produced entirely with AI Use of AI in music is seen as unoriginal or threatening to musicians by many. However, AI is merely a tool that can work hand in hand with artists to create revolutionized music. It is only a threat if we deem it to be. By mingling AI into music, we can take music to the next level.

Demystifying Quantum Computing

20691A28E0
Rohitha. G
II YEAR_CST
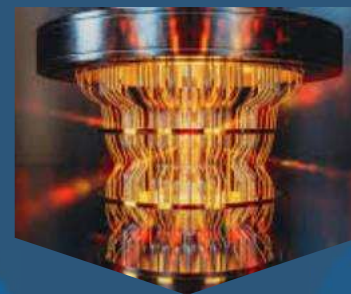
Quantum Computing, a relatively booming field of computer science and a field that is proven to be significantly faster in solving np-complete problems. Even big name corporations like Microsoft, Google, IBM are investing millions into this technology gold rush, also in the recent budget session our financial minister Mrs.NirmalaSitharaman announced $1.12 Billion towards the area of quantum technologies in India. The emergence of the Technology in 2010's has quite a lot of importance, Moore's Law is plateauing andthis is seen very evidently as the size of transistors has already reduced to 7nm. Any further reduction in size would cause the electron to experience a phenomenon of Quantum Tunneling, i.e. the transistor fails to work normally because the known laws of physics don't apply for an electron of size 4nm to 6nm, and quantum physics starts to take over.

Thus, we can say that nature is inevitably forcing us to shift towards quantum. Coming to the mathematical/computational aspect of the technology, it needs to be viewed as an entirely unique paradigm of computing, unlike traditional turing machines this one is not a deterministic computation, rather a probabilistic one. In simple terms, when an operation is performed on a bit of a normal computer it changes from one state to another, and the output is very much predictable using truth tables, but when dealing with a quantum computer and Quantum bits(qubits) the output is in probabilities of zero and one, this is also known as superposition of a qubit.

A very popular myth regarding quantum computers is that they will replace conventional computers that we use today. But the reality is far different, Quantum Processing units or qpu, when they come into existence they would work together with the conventional cpu just as the way the gpu works today. The gpu's have a particular job to perform, which the cpu fails to achieve when compared to the performance of gpu. Likely, the qpu will have a unique job that the cpu cannot perform. Hence, the cpu's will not be replaced totally. Another point of interest is that quantum computers can solve complicated problems like protein folding that can find a cure to cancer, and crack the RSA cryptosystems, etc. But in reality this would take around two to three decades to have a qpu that has such potential.

In terms of programming a quantum computer uses a completely different style of code, or it is safe to say that there would not be a code like the higher level programming languages of today, rather a circuit constructed using quantum(reversible) logic gates on a quantum wire would be employed. The circuit and the gates that it constitutes are not physical but rather abstract, technically speaking they would be vibrations on a quantum field. For starters, there are a few quantum programming languages like the q# (pronounced 'q sharp') from Microsoft and QISKIT (quantum information systems kit) from IBM, and google'scirq. In most of these quantum specific programming languages, we don't write code to be converted into binary or something like assembly language that will later be read by a computer bit by bit like the humans read a book word by word. But rather the circuit written in code for quantum computers would be like music where each gate acts as a musical note.

"Programming a Traditional Computer is like writing a book, the better your lines the better the performance, but programming a Quantum Computer is like composing Music the better the circuit the better the Rhythm."

TECHNOLOGY IN ANCIENT INDIAN HISTORY

20691A28E0
Rohitha. G
II YEAR_CST

"We owe a lot to the ancient Indians, teaching us how to count. Without which most modern scientific discoveries would have been impossible."

– Albert Einstein

Ancient India was a land of sages and seers as well as a land of scholars and scientists. Research has shown that from making the best steel in the world to teaching the world to count, India was actively contributing to the field of science and technology centuries long before modern laboratories were set up. Many theories and techniques discovered by the ancient Indians have created and strengthened the fundamentals of modern science and technology. While some of these groundbreaking contributions have been acknowledged, some are still unknown to most.

I am surprised that such kind of technology is used in our ancient Indian history. Physicist Fritjof Capra explained in The Tao of Physics -The Dance of Shiva symbolizes the basis of all existence. Meanwhile, Shiva also reminds us that the manifold forms, in the world, are not indispensable, but illusory and ever-changing.

SOME MODERN TECHNOLOGY USED IN THE EPIC MAHABHARATA:

1. LIVE TELECAST:

During Kurukshetra war, Sanjaya(charioteer) is given the power to view the happenings of the battleground as they happened and narrate them later to the blind king, Dritharashtra. With his boon,

he could also get to know the inner feelings of persons in battle ground. Sanjaya returned to Hastinapur after the fall of every commander to narrate the detailed events to Dritharashtra.

2.OPTICAL ILLUSIONS:

The Mahabharata describes the magical palace of the Pandavas famously called the "Palace of Illusions". Nothing in the Palace was really what met the eye. Walls could be walked through and seemingly empty spaces were really walls. A water-pool could actually be walked on and what looked like a safe plank was really water.

3.YOGA AND WATER RESISTANCE:

Duryodhana, the antagonist in the epic of Mahabharata, is an expert in the technique of water resistance or 'Jalastaambana'. Before his final battle with his rival Bhima, he meditates underwater, thereby gaining extra-ordinary strength,flexibility and agility.

3.CLONING AND TEST TUBE BABIES:

The science of cloning was well known and practised during the Mahabharatha times. As per Dr. B.G. Matapurkar, the Kauravas "were products of technology that modern science has not even developed yet". He said that according to the description in Mahabharatha, the Kauravas were created by splitting the single embryo into 100 parts and growing each part in a separate container. In other words, "they not only knew about test-tube babies and embryo splitting but also had the technology to grow humanfoetusesoutside human body.

4.ASTRAS (MISSILES):

The function of an Astra is more than that of a missile. It is said that Astras used in Mahabharata probably might have also used technologies of emitting most dangerous rays like Gamma and others, which have exceptional

powers to penetrate. Some Astras returns to the person who launches it, for instance, Krishna's Sudharsana Chakra. This may be similar to the reusable missiles which the Indian Space Research Organization (ISRO) is working on. Astras were also used for defensive purposes similar to a Tesla Shield which is used to destroy the enemy Astra coming towards it. The modern "Tesla shield" discharges electrical energy and any incoming physical object which hits the shell receives an enormous discharge of that energy and instantly vaporizes.

Building a Smart Door using Alexa

Safiya. K	20691A28E4	II YEAR /CST

Home automation using voice control is one of the leading trends in the Internet of Things era. With more computing power easily available, the feasibility of devices getting connected to the internet is increasing at a rapid pace. With Amazon Alexa, home automation doesn't require multiple applications to control different devices. As many home devices can be integrated with Amazon Alexa, we can use it to operate most of the devices we use in our daily life which makes home automation more convenient. Traditionally, when a doorbell rings, the user needs to manually check who is at the front door. If the house has multiple entrances, the user has to keep a check on all of them. Especially if there are frequent visitors, this becomes tedious. Depending on the circumstances the user might need to remotely figure out who is at the door and decide whether to provide access or not. While there are smart door applications available in the market today, they are expensive and require additional setup.

This article describes the architecture and use-cases of a small project in which a simple and useful Alexa skill can be developed taking advantage of the Alexa Developer console. The motive of this project is to automate the process of checking the visitor at the door of a house and opening the door only if the visitor can be allowed inside the house using Amazon Alexa instead of manually going to the door and checking who the visitor is. The house owner will be able to remotely figure out the person who is at the door when a visitor presses the calling bell or by asking "Alexa, who is at the door?". In this project, we propose a solution that achieves smart door management using Amazon Alexa and a Raspberry Pi connected to the door. This approach involves training Amazon Alexa by adding custom skills to its capabilities. Amazon allows users to build custom Alexa skills using Alexa Skills Kit packages and these skills can be developed and deployed through Alexa Developer Console. The computational power of Raspberry Pi in conjunction with facial recognition algorithm would be used to efficiently recognize faces and provide updates to the house owner. If the system does not recognize a face, the house owner can ask Alexa to remember the visitor with a given name and Alexa can train the facial recognition model with the given inputs. House owners can also open or close the door remotely by giving instructions to Alexa.

The project architecture involves both hardware and software components and there is a continuous interaction between hardware and software modules. The hardware components include a Raspberry Pi connected with a small camera, a push-button acting as a doorbell, a piezo sensor to detect any vibrations or movements at the door, and a smart lock to close the door. The computational logic of these hardware components lies in the Raspberry Pi which performs all the actions and interacts with the Alexa skill through a middle tier. Due to the real-time synchronization feature available in the Firebase Realtime Database, it is used as the middle tier between the Raspberry Pi and the Alexa Skill by holding some flag values in the form of key-value pairs. Every Alexa skill requires a backend service endpoint which can be deployed using Amazon's serverless computing service AWS Lambda. This backend service is built using Alexa's ASK SDKs and contains functions that accept JSON requests based on the intent given by the user and returns the corresponding JSON responses to the Alexa skill which in turn gives out voice responses to the user.

When the house owner requests Alexa to check who is at the door, Alexa takes the voice input from the user and maps it to the corresponding skill's intent. The user's request is processed and sent to the corresponding backend function in the form of JSON. The function deployed on AWS Lambda receives the request and updates the flag values in the Firebase Realtime Database and waits for any other updates in the database. A daemon process running in Raspberry Pi continuously listens to the changes in Firebase. When it sees the flag values set in Firebase, it captures an image of the visitor at the door through the camera kit connected to it and uploads the image to the Amazon S3 bucket. This image is then run through a facial recognition model using any AWS Rekognition which recognizes the face and gives the name of the person. This name is updated in the Firebase

database. The Lambda function, which is still waiting for any update, notices this change, reads the value, and processes the output response. Alexa gives out the output as a voice response. This is the flow of control when the request is initiated by the user through Alexa.

When a visitor comes and presses the doorbell or if there is any vibration or movement sensed by the piezo sensor, the Raspberry Pi captures the image at the door and uploads it to the S3 bucket. The image is run through a facial recognition model and the result is notified to the user by calling Alexa's notification APIs by using the Proactive Events feature. This allows the house owners to get notifications on their Alexa devices. The intention of this project is to develop a solution that can take advantage of the higher computing power available today to build a custom product that can work both as a surveillance and personal assistant easing the job of door keeping. The entire solution being voice-controlled, it is easy for the users to operate and allows them to operate remotely using Alexa mobile app. Further research is being held to deploy this project on a large scale. This project is an implementation of a simple idea utilizing the Alexa developer console.

ART'S CORNER

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| Shaik Azmeed Basha | 18691A2805 | 4th YEAR /CST |

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