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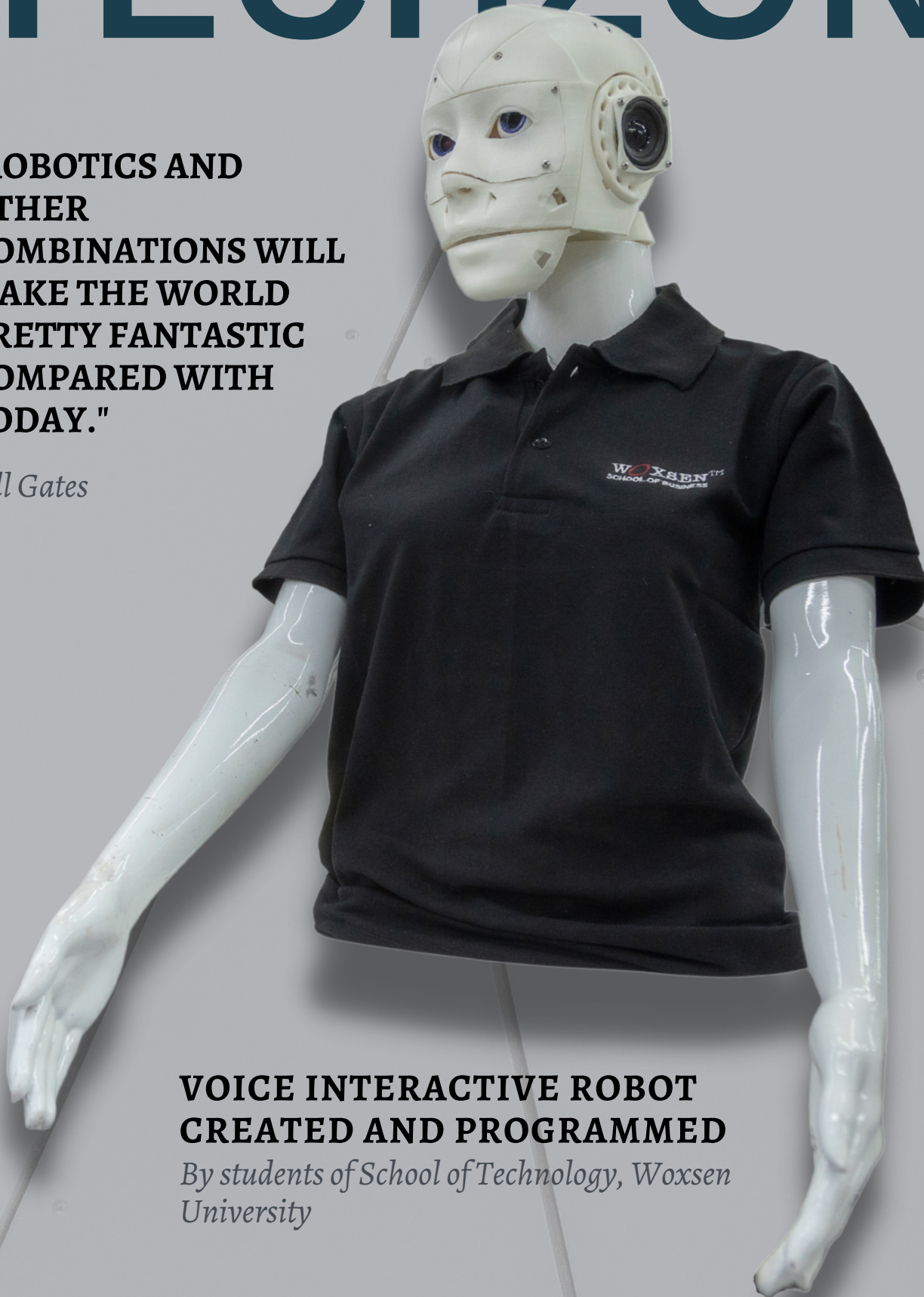
TECHZONE

"ROBOTICS AND OTHER COMBINATIONS WILL MAKE THE WORLD PRETTY FANTASTIC COMPARED WITH TODAY."

Bill Gates

VOICE INTERACTIVE ROBOT CREATED AND PROGRAMMED

By students of School of Technology, Woxsen University

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EDITORS' NOTE

Technology plays an important role in our lives especially during times of difficulties where it becomes difficult to survive without innovations. TECHZONE hopes to inform you about some of the excellent developments different industries are undergoing, and also about the people behind them. We wish these stories inspire and motivate you to achieve your aspirations and provide an insight into the changing world around us .

We sincerely thank all our editorial board members for designing this magazine and making it look so attractive and meaningful and I also thank all the authors for contributing their articles to this magazine.

This magazine gives a brief presentation about the activities and Tech talks and much more about technology . This magazine is a platform where students exhibit their skills.

MIXED REALITY GOGGLES FOR SOLDIERS

By Amogh Deshmukh, Assistant Professor

The invention of Mixed Reality (MR), which combines both VR and AR for a more immersive experience with the digital elements in the real world.

A human eye cannot perceive things beyond a certain point. It needs the help of gadgets to see invisible things. With the invention of Virtual Reality (VR), a human eye could interact with the virtual world.

Then came Augmented Reality (AR), where a person could see virtual elements floating around in the real world. Now that the virtual elements were added to the real world, humans wanted to interact with the virtual elements in real time. Hence, came the invention of Mixed Reality (MR), which combines both VR and AR for a more immersive experience with the digital elements in the real world.

Microsoft has won a contract from the US Army requiring 120,000 mixed reality headsets which are worth $22 billion over the next 10 years. In military use, this headset is known as Integrated Visual Augmentation System (IVAS). It consists of many sensors, a wide lens and a computer. It also has an internal display to share, produce and enhance the information for the soldier who is wearing it.

The IVAS provides tactical edge on the ground during the war. It has a digital night vision which gives a better field of view of the enemy at night. IVAS can be used for fighting adversaries and acquiring the targets during the day and night. It has a digital thermal low-light night vision capability. It consists of Artificial Intelligence features, such as facial recognition and textual translations in real time.
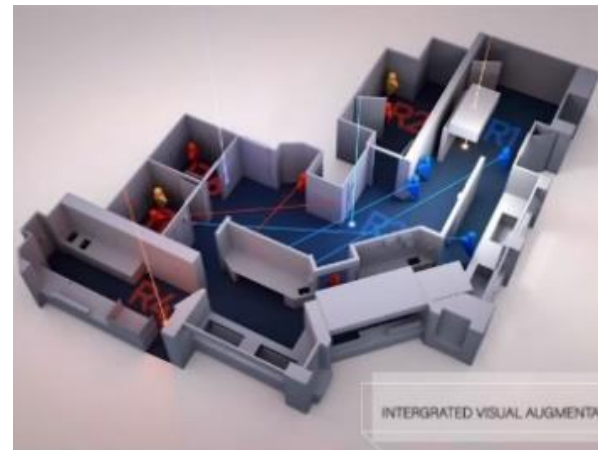
IVAS provides land navigation during the war to identify various check points. There is no need to move your eyes away from the battle field. IVAS provides synthetic training environments, which can be used to build training scenarios with 3D holographic enemy to train the soldiers who can talk with each other, hide from the enemy, and fight in a virtual scenario. Soldiers and leaders can conduct after-action reviews using 3D holographic images, terrain and playback for rehearsing and training for the real battle. IVAS provides inter soldier wireless connectivity, ability to pass real time data among squads, platoons and company formations. Soldiers can share images of all the objectives of the mission on the battle field in real time and categorize them as finished or pending. IVAS uses soldier borne sensors for planning and rehearsing the objectives of the mission using 3D holographic images in real time.

One of important features of IVAS is the ability to see "through" the closed vehicles. This is done by external cameras used for recording and are shared with the soldier's headsets. When traveling and dismounting from the vehicle, troops riding inside the armored vehicles will be more aware and have a better sense of their surroundings. As the soldiers patrol the borders on foot and are in enemy zones, they can see recorded video from cameras on the other side of an armored vehicle. The signal needs to remain strong to receive the footage.

Through a lot of soldier's feedbacks and building more than 28 prototypes over the past couple of years, the IVAS has been improved over time. Waveguide technology has been used to enhance the capability of the soldier on the battle field.

Soldiers can see through the armoured vehicle

3D holographic sign

In this digital world, IVAS provides advanced capabilities to soldiers for future war threats or any adversaries. IVAS provides soldiers the ability to move quickly and safely, improves situational awareness of every soldier on the battle field, provides virtual training battles and improves survivability. It makes a soldier smarter, better informed, more agile and lethal. It will save lives on the battle field. It is a really exciting invention which has turned into a reality and makes the battlefield safer and more immersive

Prototypes of the HoloLens and soldiers in action using HoloLens goggles

AWS ROBOMAKER- THE CLOUD SOFTWARE FOR ROBOT SIMULATION

By Sai Supriya

B. Tech 2020-24, Woxsen University

Amazon Web Services (AWS)

Storage, applications, networking analytics, computation, robotics machine learning and artificial intelligence (AI), virtual and augmented reality (VR and AR), communications, application creation, and management are some of the resources offered by Amazon Web Services. These programs are available in 24 different regional areas around the world

AWS ROBOMAKER FEATURES

- Cloud extension for ROS.
- Development Environment.
- Simulation.
- Fleet Management.

AWS ROBOMAKER

Amazon Web Services (AWS) is a cloud computing service Robo creator is a service that makes it simple to build large-scale robotics applications. AWS Robo Builder adds cloud services to the robot operating system (ROS) platform. AWS machine learning services, reporting services, and analytics services are also included. These factors combine to enable a robot to perform a variety of tasks on its own, including data streaming and data analysis.

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AWS ROBOMAKER SIMULATION

- **The AWS Robo** Maker simulation service is a fully managed service that allows you to build simulation environments and run/manage any infrastructure.
- **Few use cases** for Robomaker simulation are doing automated tests on robotic application in turns speeds up the iterative development To design algorithms and train machines, you can also create synthetic image or lidar data
- **World Forge and simulation** run are two main features of the Robo Maker simulation.
- **World Forge** enables to create various predefined and No engineering spending in randomised simulation worlds that mimic real-world conditions.
- Simulation approach enables to run simulations at any scale through fully managed compute infrastructure
- **Simulation world** forge World forge mimics real world conditions and facilitates simulation at any scale and variance of simulation in a fast manner, this improve quality of production code and speeds up time to market. Currently it provides worlds for indoor home environments, complete with configurable floor plans and furnishings.
- **Simulation run** Run large-scale, parallel simulations: The Robo Maker batch API allows programmers to start a large batch of simulations with only one API call. This enables developers to maximise difficulty, size, and test repetitions, resulting in a shorter development period and more reliable testing.

Managed ROS/ Gazebo environment:

Robot Operating System (ROS) is RoboMaker will use an open-source programme library to run it. Even, using the open-source Gazebo robot simulation engine, ROS 2 applications can be simulated. Without any extra work, Robo Maker allows you to run Gazebo⨯based simulations in the cloud. The service works with the Gazebo graphical client and communicates with running simulation jobs to visualise sensor data for GUI software, as well as interacting with the robot application via command line.

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INTERNET OF THINGS (IOT)

By Sabahat Shaik
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The Internet of Things (IoT) is a network of physical objects— "things" —that use sensors, software, and other technologies to connect and exchange data with other devices and systems over the internet. These gadgets range from relatively common household items to sophisticated industrial tools

A complete IoT Ecosystem consists of four different components: Sensors/Devices, Connectivity, Data Processing, and user interface. To begin with, sensors or devices collect data from their surroundings. This could be something as simple as a temperature reading or something as complex as a full video feed. Sensors/devices can be connected to the cloud via Wi-Fi, cellular, Bluetooth, satellite, or by connecting directly to the internet via ethernet. The software analyses the information once it reaches the cloud

Components of IoT Ecosystem

Sensors/ Devices

Connectivity

Data Processing

User Interface

This might be very simple, as checking if the temperature reading is acceptable or not. Next, the information will be used in some way by the end-user. This may happen through a notification (email, text, notification, etc). For instance, if the temperature of the company is too high, a text warning will be displayed.

The Internet of Things has many applications in various sectors such as consumer IoT, enterprise IoT & manufacturing, and industrial IoT. These applications include telecommunications, energy, and automobiles, among others. Computers and mobile devices can be used to control smart homes, smart appliances, connected heating, and lighting. Sensor-equipped devices collect and analyse user data before transmitting it to other technologies to make users' lives easier. Other examples include smart health, smart cities, smart farming, smart TV, wearables, smart cars, and so on. Smart buildings help to reduce energy costs by automatically adjusting the temperature. The smart farming system can assist in crop monitoring such as light, temperature, humidity, and soil moisture. It supports smart city features such as streetlights, smart meters, and sanitation, and many others.

IoT spans all industries, from agriculture to space, in an era of cost-effective computing resources, unlimited bandwidth, and always-connected devices. According to a recent IDC (International Data Corporation) estimation, global IoT spending in 2019 will be $745 billion, a 15.4 percent increase compared to the previous year. Global spending is expected to exceed $1 trillion by the end of 2020-2022. IoT, like every other innovation in history, has faced its own set of challenges.

Here are some major challenges faced by IoT:

- **Security**: Managing large amounts of data while maintaining privacy and proper security measures is a significant challenge when incorporating IoT solutions.
- Availability of bandwidth: Connectivity is a lot bigger challenge to the IoT than you might think. As the IoT market grows at an exponential rate, experts are concerned about the bandwidth-intensive IoT applications such as video streaming will soon run out of room on the IoT's current server-client model
- Scalability: Massive amounts of data must be processed when billions of internet-connected devices connect in a massive network. Scalability is required for the system that handles and analyses data from these IoT devices. Everyday objects are connected to one another via the Internet in this era of IoT evolution. For the interpretation of useful data, the raw data obtained from these devices necessitates big data analytics and cloud storage.
- IoT Product Integration with IoT Platforms: Enterprises must integrate various IoT-connected products with the appropriate IoT platforms in order to successfully implement IoT applications. Inadequate integration may result in irregularities in functions and efficiency in delivering value to customers.

- **Gap between expectations and reality: IoT is still in its early stages in many industries; there is a difference between what is expected from IoT and what is feasible. The main role here is played by organizational data maturity.**

It is critical in the future market because everything is now based on the internet and smart devices. The Internet connects devices to collect and send data across networks, so it will be very important in the near future. The Internet of Things has emerged as a world-leading technology. It has grown in popularity over a short period of time. Furthermore, advances in Artificial Intelligence and Machine Learning have simplified the automation of IoT devices. AI and ML programs are essentially combined with IoT devices to provide proper automation. As a result, the Internet of Things (IoT) has expanded its range of applications in a variety of industries

The Internet of Things is a technology that is widely used in several organizations. It aids in accomplishing tasks without the need for user intervention or human assistance. This incorporated technology allows the object to interact with internal states or with the surrounding factors, which assists in decision-making. This has both advantages and disadvantages, as do all technologies, but it is up to us to choose and invest wisely.
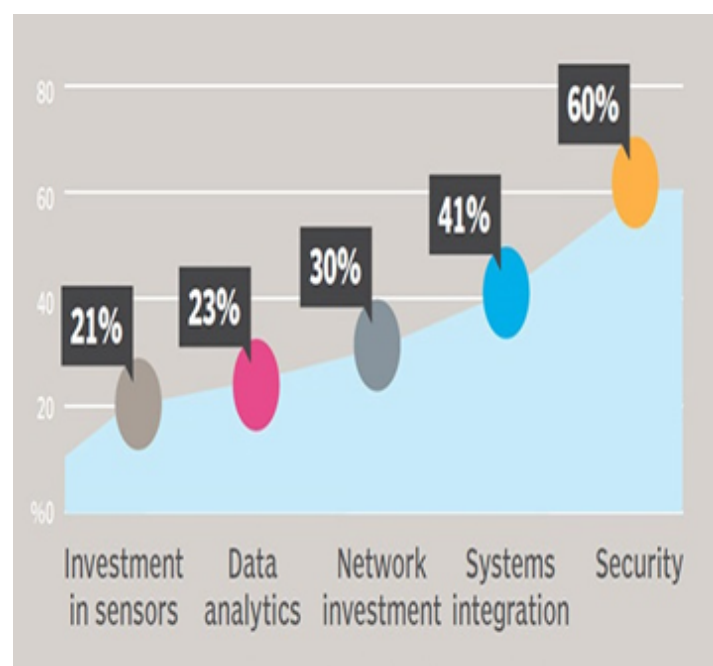
ROBOTIC FACE

By Er.Rounak B Sanghvi, Er.Sudarshan Mandal, Er.Vishal Kr Sharma

Construction of body:

The designing process is done using AutoCAD fusion 360 software and the file is saved in .stl format. The .stl file is then converted into G-code because the 3D printer needs the file in G-code for printing. The Robotic Face is printed in different parts by the 3D printer and then it is assembled. The material used for printing is PLA (Polylactic Acid) having a melting point in-between 170° C to 210° C. The has been completed in 4 days at 50% filament density with support.

Functioning of Chatbot:

One ReSpeaker 4 mic array kit has been used to take the voice command as input then the Raspberry pi converts the speech into text format and the Raspberry pi search the result from the Google database in text format. The Raspberry pi converts the text into speech. Two speakers are connected to the Pi which amplifies the speech signal and gives the answer.

Components Used:

1. Raspberry pi 3B+
2. ReSpeaker 4-mic array kit
3. Speaker
4. SanDisk class 10 SDHC card 32 GB variant
5. Connecting wires
6. Motors

Specifications of Components:

Raspberry Pi:

In this project Raspberry pi 3 B+ model is used as the main microprocessor to process the data.

- "Broadcom BCM2711, Quad core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz"
- "2GB, 4GB or 8GB LPDDR4-3200 SDRAM (depending on model)"
- "2.4 GHz and 5.0 GHz IEEE 802.11ac wireless, Bluetooth 5.0, BLE"
- "Gigabit Ethernet"
- "2 USB 3.0 ports; 2 USB 2.0 ports."
- "Raspberry Pi standard 40 pin GPIO header (fully backwards compatible with previous boards)"

- "2 × micro-HDMI ports (up to 4kp60 supported)"
- "2-lane MIPI DSI display port"
- "2-lane MIPI CSI camera port"
- "4-pole stereo audio and composite video port"
- "H.265 (4kp60 decode), H264 (1080p60 decode, 1080p30 encode)"
- "OpenGL ES 3.0 graphics"
- "Micro-SD card slot for loading operating system and data storage"
- "5V DC via USB-C connector (minimum 3A*)"
- "5V DC via GPIO header (minimum 3A*)"
- "Power over Ethernet (PoE) enabled (requires separate PoE HAT)"
- "Operating temperature: 0 – 50 degrees C ambient"
- "A good quality 2.5A power supply can be used if downstream USB peripherals consume less than 500mA in total."

ReSpeaker 4-mic array:

It has 4 Microphones having 3 meters radius voice capture. It has 2 Grove Interfaces, with 12 APA102 user LEDs having the Software Algorithms VAD(Voice-Activity-Detection), DOA(Direction-of-Arrival) and KWS(Keyword-Search)

SanDisk class 10 SDHC card 32 GB variant:

SanDisk class 10 32 Gb SDHC card is used for installing the operating system for the Raspberry pi. The Operating system used in this project is Raspberry pi OS 64-bit version. It has a reading speed of 120 megabytes/second.

Motors

Total 4 servo motors have been used in this robotic face for different purposes with different specifications as mentioned below:

Motor	Operating voltage	Quantity	Purpose
MG90S	4.8 - 6.6 Volts	1	Up-Down eye movement
MG90S	4.8 - 6.6 Volts	1	Left-Right eye movement
MG995	4.8 - 7 .2 Volts	1	Jaw movement
MG995	4.8 - 7 .2 Volts	1	Neck movement

Softwares Used:

AutoCAD fusion 360 software is used for designing the body of the robotic face.

Cura is used to convert the AutoCAD fusion 360 .stl file into G-code for 3D printing.

Google API has been used to fetch google database with the Raspberry pi.

BalenEtcher is the software which is used to burn the operating system in the SDHC card.

The programming language used in this project is python:

- Python is an interpreted language which is object-oriented.
- It is a high-level programming language with dynamic semantics.
- Its high-level built-in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development.
- It is simple and easy to learn.
- Most of the syntax are in general English language which emphasizes readability and therefore reduces the cost of program maintenance.
- This language supports modules and packages
- It gives us program modularity and has the feature of code reusability.

# TECH TALK ON "CYBER SECURITY THREATS AND REMEDIATIONS"

By Aparna Vemuganti
B. Tech 2020-24, Woxsen University

Cyberattacks are now so common. Cybersecurity is the practice of securing computers and other digital infrastructure from malicious attacks. We were privileged to have with us Ms. Deepa Priya for Technical Talk on "Cyber Security Threats and Remediations" for the B.Tech students at Woxsen University. Ms. Deepa Priya is a Cyber Security expert and a certified Ethical Hacking professional, currently based in Australia. She has been working as a cyber security analyst in the insurance sector

TECH TALK

BY

MRS. DEEPA PRIYA

CYBER SECURITY PROFESSIONAL AT GREENSTONE FINANCIAL SERVICES, SYDNEY, AUSTRALIA

Major Threat Types

- Social Engineering
- Ransomware
- Phishing
- DDOS Attacks
- Third Party Software
- Cloud Computing Vulnerabilities
- Corporate Security Challenges
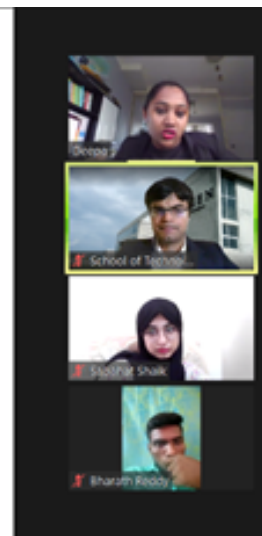
She talked about the major cyber threats currently in our society like DDOS(Distributed Denial of Service) attacks where, Hackers flood a network with requests to exhaust bandwidth. We learnt about Ransomware which is a form of malware that encrypts a victim's file. The attacker then demands a ransom from the victim to restore access to the data upon payment. She then explained about Social Engineering attacks where the victim is fooled into revealing sensitive data such as, passwords, pins etc. We also learnt about some of the cloud computing vulnerabilities. Mam explained to us about how to handle these tricky attacks, where the victim may fall into the trap unknowingly by updating our computers with antivirus software, updating our firewall definitions etc.

Common Cybersecurity Threats

Malware

Malware is software that does malicious tasks on a device or network such as corrupting data or taking control of a system.

DDoS

Distributed denial of service attacks aim to disrupt a computer network by flooding the network with superfluous requests to overload the system and prevent legitimate requests being fulfilled.

Zero-Day Exploits

A zero-day exploit is a flaw in software, hardware or firmware that is unknown to the party or parties responsible for patching the flaw.

Ransomware

Ransomware is a type of malware that denies access to a computer system or data until a ransom is paid.

She talked about various remediation to fight against the cyber security threats. She talked about Risk Assessment which is used to Identify hazards and risk factors that have the potential to cause harm to a computer. She talked about various monitoring processes to keep a check on various cyber threats. She talked about identification of various vulnerabilities in a network and remediation procedures by using different tools which can be used to stop a cyber attack. She said training about the cyber threats and educating the students in this 21st century is very critical as cyberattacks are now so common. Recent reports show that hackers attack a computer in the US every 39 seconds!
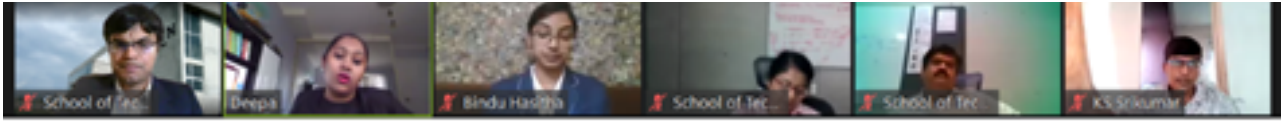
Cyber Security Threat Remediation

- Risk Assessment
- Monitoring Processes
- Identification of Vulnerability
- Remediation Procedure
- Awareness Training and Education

This tech talk has really created an awareness among the students about cyber attacks in the 21st century and how we need to protect ourselves from such attacks. We learnt about how organizations are dealing with such cyber attacks on a daily basis. Depending on the severity of the attack the organizations prioritize in finding a solution for such attacks. This was a real eye opener for all the students about cyber attacks.

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TECH TALK ON "THE COMPUTER IN THE 21ST CENTURY"

By Gurrala Akash
B. Tech 2020-24, Woxsen University

MR. SACHIN DESAI

It was great to have Mr. Sachin Desai (Global Vice President & Head of Ericsson AI Accelerator) as our speaker for the tech talk conducted by Woxsen University on 22nd of April 2021. It was a very interactive session and an eye opener for all the students.

Mr. Sachin Desai delivered a very informative presentation on "The Computer in the 21st Century" in his meet with Woxsen University BTech Students. The virtual meet was highly unique, in that the speaker engaged the BTech Students audience with a wide ranging interaction on different topics.

He spoke about the latest developments in the area of Computer Science in the 21st century. The Competence and Essential Skills required of 21st Century Technology graduates. How the Start-Up Ecology is growing day by day in India and how it still needs to go miles before having a robust start-up eco system. The Need for Students to focus on a few important computer languages such as C++, Python and Java, rather than responding to the impulse of mastering every other language. Comparison between these languages and a myriad of computer languages that are being used in different fields such as Data Analytics. The Relevance of Open-Source Software and Full-Stack Development and how students can involve themselves in.

He talked about Up-keep i.e., students need to update themselves with the latest technologies which are changing rapidly. He talked about essential skills required for every student to succeed. How to collaborate with other people, how to take up the role of a leader, how to inspire others to be the best. He talked about how essential Data Science in today's world is to achieve Software 2.0. He talked about Life-Cycle Management i.e., from designing solutions and building them to operating them. He touched upon working with cloud-native software's such as GCP, AWS and Azure to build robust solutions that can be scaled
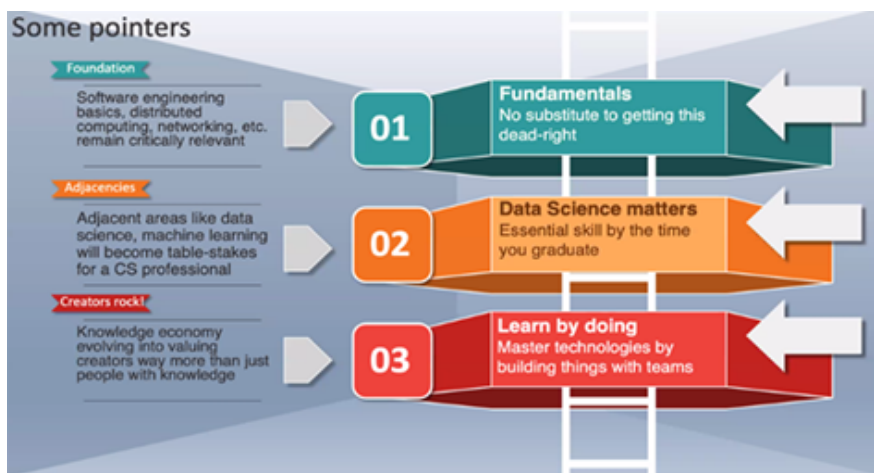
He summed up with three essential skillsets to focus on during their B.Tech: 1. Fundamentals - No substitute to getting fundamentals thorough, 2. Data Science - Essential skill by the time the student graduates and 3. Learn by doing - Master technologies by building things with teams. It was a very enriching session as we have learnt what all skill sets, we need to equip ourselves with to get into IT industry

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PYTHON OR JULIA!!

By Srikumar
B.Tech Student at Woxsen University

We all know that computers run through codes and algorithms and writing such codes is called coding. There are many programming languages through which one can do coding and in the world of programming python is one such language which has become popular and has grown exponentially since it was founded in 1991. Python is so popular because it is very straightforward to use and it allowed users to read and understand their code easily. As per a study there are over 7 million Python coders in the world which is not a surprise. However,   the world is evolving rapidly and so is technology, and programmers always want more. More flexibility, efficiency and more areas of application, etc. This is exactly what motivated the creators of Julia, another programming language that was introduced in 2012 Julia is supposedto address the shortcomings in Python and other languages used for data processing and scientific computing. According to the developers, their goal was to make a language that   might be as usable as Python, have an equivalent computational capability as MATLAB, and be as fast as C. As a result, Julia became a language of choice for many programmers, and yet many of us cannot decide whether or not they should learn Julia or Python.

What is Python?

Before knowing about Julia lets familiarize with python. Guido van Rossum founder of the language ABC in 1991 created a new language Python using all useful features and syntax of ABC. What made python special from other programming language of that time was that it was the easiest programming language and the fastest after C++ which has been made till now.

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If we were to see the major advantages of python, they would be.

- Less start-up time:- Though python is slower than Julia it takes very less time for its programmes to work as its runtime is less heavy although Julia's JIT compilation also decreases the start-up speed python works faster.
- Python is mature: - The Julia language is young and has only been around for 9 years and already has great features, but python has been around for 30 years now and has went through many new improvements and has a vast community in comparison to Julia as we know a language is nothing without people who use it. The community around
- Julia is growing rapidly but it is only a fraction when compared to that of python, so this serves python as a great advantage and a great future scope for improvement.
- iMore third packages - One of the main benefits of Python is the variety of third-party packages. Again, as we discussed there's not much software built around Julia. Libraries like Knet and Flux make Julia a good choice for machine learning, but vast majority of work is still done using PyTorch and TensorFlow.
- Python is still improving: - Being one of the most used programming languages python is constantly bringing in new improvements to its interpreter for its users and it has become easier to speed up for instance, the mypyc project translates Python into native C, which is much more convenient than Python. When dealing with pure math tasks this type of approach provides impressive results and up to four times better performance,

Julia

A team containing 4 members initially created Julia in 2009 and released it into the world in 2012 as an open-source, high-performance, and dynamically typed programming language.It was created in the name of greed said its four creators. While initially designed as a general- purpose programming language, Julia specializes at scientific and numerical computing.Multiple dispatches are used by the language as its central programming paradigm and supports parallelism in three primary levels.

The creator's main motive was to resolve the flaws of other languages as well as create something with unique and desirable features. So, is Julia better than Python or what makes Julia to compete on Parr with python?

- Speed: It's hard to talk about Julia without talking about speed. Julia prides itself on being very fast. When written well, Julia can be fast and sometimes even faster than C. Julia uses the Just in Time (JIT) compiler and compiles incredibly fast.
- Made for ML: Unlike Python, Julia was made with the intention of being used in statistics and machine-learning. One way I see this benefiting Julia over Python is in linear algebra. Vanilla Python can chug through linear algebra, but vanilla Julia can fly through linear algebra. This is because of course Python was never meant to support all the matrices and equations that go along with machine-learning. Julia feels a lot more catered towards these sorts of mathematics.
- Code conversion: It is very easy to convert code from Python and/or C to Julia. But the other way around is not an easy path. Converting code from Python to C or C to Python is very difficult. But Julia can interface with external libraries very easily written in C and Fortran. Using the PyCall library data can be shared easily with Python.

WHICH IS BETTER

So, to answer our question about which language is better, by now I think that you may have an idea about which language is better. Though Julia is having some exceptional features along with a great speed and is gaining programmers attention, Python is also not giving up in the race as they are constantly bringing in better improvements. In any language when you consider various factors you see that each has its own pros and cons. But in this case both Julia and Python have a great opportunity in the field of big data, data science, AI, and machine learning and we do not know what may happen. Only when Julia has a mass community following and full maturity it will be on par with Python in the above-mentioned fields but considering the Julia upsurge, Python will continue remain to be the big player in the industry but nevertheless both languages must share from the same plate and on an overall both of them are performing really well and I would say the competition between them will only get better from here

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