Student Experiential Learning

Report submitted to

VIT Bhopal University

Bachelor of Technology

in

Electronics and Communication Engineering
(Specialization in Artificial Intelligence and Cybernetics)

Submitted by

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Declaration of Originality

I, Varun Ram S, bearing the Registration Number 20BAC10038 hereby declare that this report of "*Student Experiential Learning*" represents my original work carried out as a undergraduate student at VIT Bhopal University. To the best of my knowledge, it contains no material previously published or written by another person, nor any material presented for the award of any other degree of VIT Bhopal University or any other institution. Any contribution made to this report by others, with whom I have worked at VIT Bhopal University or elsewhere, is explicitly acknowledged in the report.

Date : 15 October 2022 *Varun Ram S*

VIT Bhopal University

Acknowledgment

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I would like to express my special thanks to Dr Debashis Adhikari (Professor & Dean) of the School of Electrical & Electronics Engineering (SEEE), for the time, efforts and advice he provided throughout the trip. My Program Chair, Dr Soumitra K Nayak also helped me a lot with the advice he provided.

The opportunity given to me by the University helped me in doing a lot of Research and gaining awareness on various interdisciplinary domains and in addition to this, I also gained some Miscellanous learning experiences like Travelling within a new city, experiencing a new culture, etc.

Varun Ram S

Summary of Experiential Learning

The Experiential learning was one of the best opportunities given to us by our University where we got an opportunity to have an exposure to a practical based learning which is essesntial for an Engineering student. Talking about my personal experience, I had enjoyed every bit of the 2 week journey, right from landing in the buzzing IT hub of the nation, Bengaluru (formely known as Bangalore) to performing multiple hands on training across the week and then travelling to the Cultural capital of India, Chennai where again the theme of Industries was different compared to the previous week.

During my stay in Bengaluru, I got an opportunity to attend interesting workshops and perform hands on Sessions at Cranes Varsity - hosted by Indian School of Business and Computing (ISBC) across all the 5 working days of the week. The themes of workshops at Cranes Varsity included MATLAB, IOT and Embedded ARM. There were interesting demonstrations and quizzes with rewards, keeping up a healthy learning environment and spirit of competitiveness. In addition to this, I also got an opportunity to visit Aeronautical Society of India (AeSI) on Day 1 afternoon, SLN Technlogies on Day 3 afternoon and Albatross Aviation Pvt. Ltd. On Day 5 afternoon. AeSI provided an interesting workshop on aircraft structure study and aviation career opportunity awareness. SLN Technologies had a workshop on the usage of core electronics in Defence and Space Organizations. Albatross Aviation Pvt. Ltd. hosted a worshop on ultra light prop aircraft and importance of amateur aviation.

After reaching Chennai, on the first day I got a chance to visit Indian Space Research Organization (ISRO) at Sriharikota, Andhra Pradesh which is a 3 hour drive from the main city. We had a rare opportunity to see the actual control room at Satish Dhawan Space Centre and both the rocket launch pads used by PSLVs. The following day, I got a chance to visit Combat Vehicle Resouce and Development Establishment (CVRDE) where I got a chance to see the maintanence and research involved in tanks used by the army. The third day had an interesting awareness workshop on Robotics, Artificial Intelligence and Cloud Computing at VIT Chennai Auditorium. The entire of fourth day was spent in the same venue where we had motivational talks by different personalities from Multiple Organizations. The concluding day of the Experiential Learning was filled with fun and joy at the tech fest of VIT Chennai (Electro VIT ’22).

Keywords: ARM, AeSI, MATLAB, IOT,CVRDE, ISRO, PSLV

Contents

City Choice – 1

Bengaluru

Day – 1 report

1.1.1 **Industry 1 Name** – Cranes Varsity

1.1.2 **Objectives of learning at Indsutry 1:** MATLAB: Basics to Intermediate, Usage of MATLAB in various domains such as Digital Image Processing, Computer Vision, Multimedia Signal Processing, etc.

1.1.3 **Learning outcomes of Industry 1:**

- Introduction to the MATLAB software and basic terminologies such as workspace window and workspace variables.
- Basic operations in MATLAB such as addition, multiplication, etc
- Usage of the keyword(s) clc & clr and the difference between them
- Matrix multiplication using MATLAB
- Intermediate cocnepts such as Data Visualization, function plotting and algorithm implementation.
- Introduction to basics of toolboxes such as the Image Processing tool box
- Tutorial on creating images from signals received from a digital sensor.
- Awareness through demonstration of other features such as pre trained models, stereo vision and compression of images for Network Communication

1.1.4 **Photographs of Industry 1:**

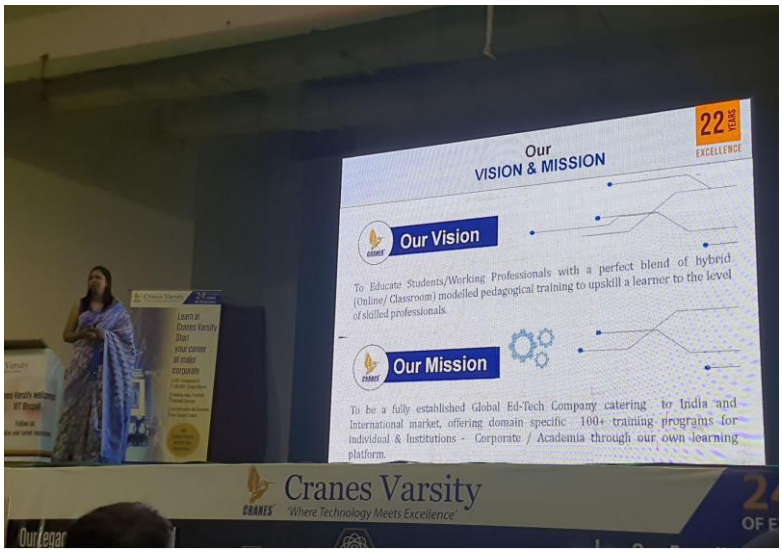

Fig 1.1.1: Briefing of the Workshop Objectives by the staff of Cranes Varsity

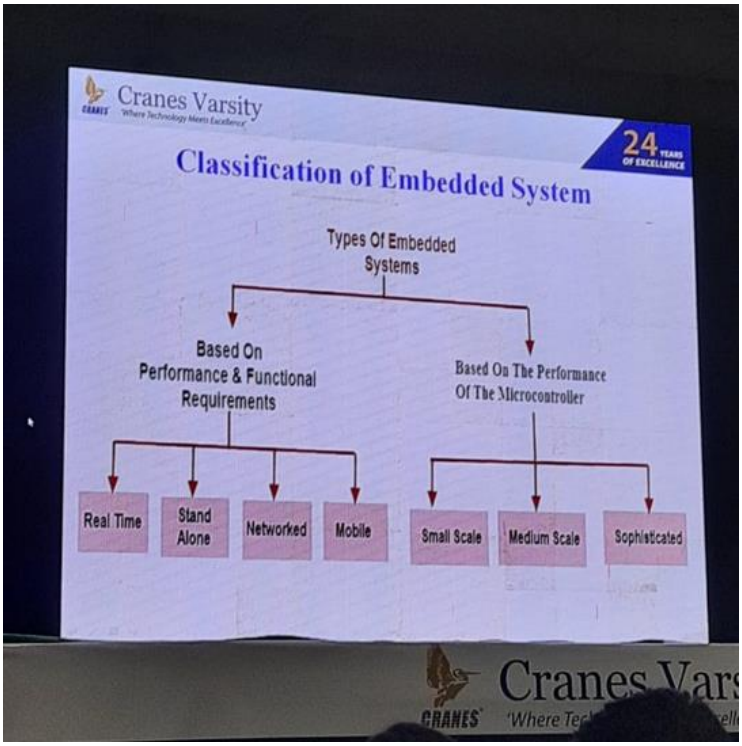

Fig 1.1.2: An Overview of Embedded systems before proceeding to the MATLAB session

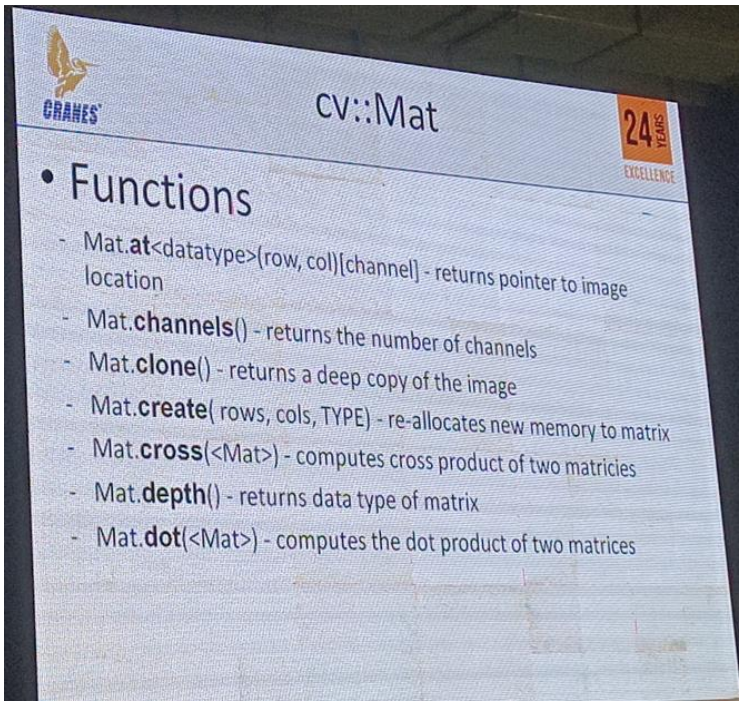

Fig 1.1.3: Slide showng some of the popular functions of MATLAB covered on Day 1

1.1.5 **Industry 2 Name –** Aeronautical Society of India (AeSI)

1.1.6 **Objectives of learning at Industry 2:** Basic terminologies of an aircraft such as wings, spoilers, flaps, etc., Concept of stress and aspect ratio in wings, Fly by line and Fly by wire system comparison, Awareness of career Opportunities in the Aviation market.

1.1.7 **Learning outcome(s) of Industry 2:**

- Mathematics of wings and concept of aspect ratio
- Aircraft Design Principles
- Concept of load on wings
- Basic Cockpit functions
- Understanding of Terminolgies such as yaw, roll, stall, etc.
- Understanding the actual working of streamlining and flaps.
- Awareness of career opportunities such as Aircraft Design Engineer, Aircraft Maintenance Engineer, Avionics engineer, etc.

1.1.8 **Photographs of Industry 2**:

Fig 1.1.4: Main Entrance of AeSI (Bangalore branch)

Fig 1.1.5: Logo of AeSI inside the main building

Fig 1.1.6: The conference hall where we had a 4 hour workshop

1.1.9 **Feedback of day – 1**:

Day 1 began with visiting ISBC(Indian School of Business and Computing) which hosted Cranes Varsity, early in the morning and getting briefed about the objectives and main goals of Cranes Varsity. The initial session by the team ended soon and it was followed by the workshop on MATLAB which was extremely amazing. We did have tea breaks in between and then the second phase of session took us deeper into different toolboxes available in MATLAB. The session at Cranes Varisity concluded before lunch.

Post lunch, I had the privilege to visit the Aeronautical Society of India (Bangalore branch) where I had the opportunity to even meet the Vice President of the Society. The workshop was for 4 hours and took us into an amazing journwy through basics of airfoil structures and then before concluding, the speaker gave us awareness on various career opportunites from multiple domains of Engineering in Aviation.

Overall Day 1 went fantastic with a brain full of knowledge to carry home.

Day – 2 report

1.2.1 **Industry Name** – Cranes Varsity

1.2.2 **Objectives:** MATLAB: Intermediate to Advanced, Usage of Simulink, Usage of MATLAB and Simulink in the Theory of Compiler Design systems and Digital Logic circuits, Usage of features such as design template and drag & drop option bars for web page design

1.2.3 **Learning outcome(s):**

- Basics of Simulink and different libraries of blocks available.
- Understood the concept of matrix dimensions and significance of dimension matching and concatening matrices in MATLAB.
- Understood the difference between 0 and null values in dimension matching.
- Learnt how to design an app using drag & drop feature and other sliding tool bars.
- Learnt algorithms for hiding an image in another image which can serve as project combining the domains of Computer vision and Cyber Security.

1.2.4 **Photographs:**

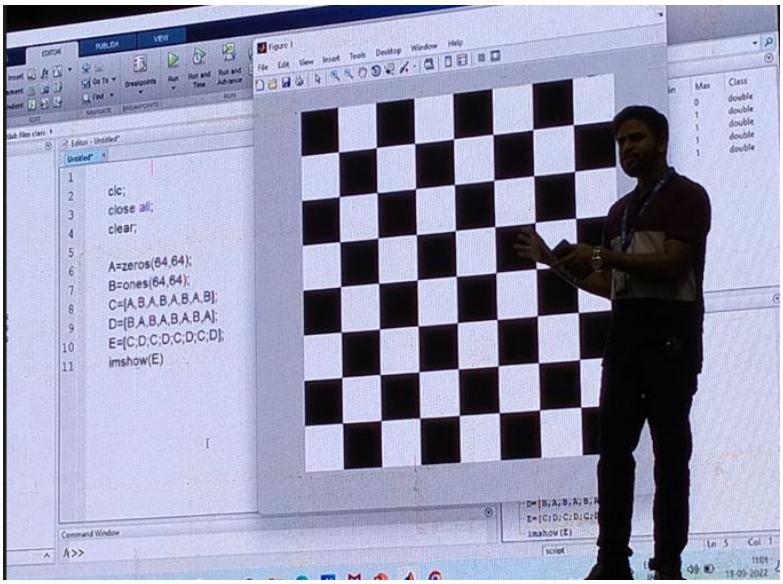

Fig 1.2.1: Chess board created using Matrix concatenation in MATLAB

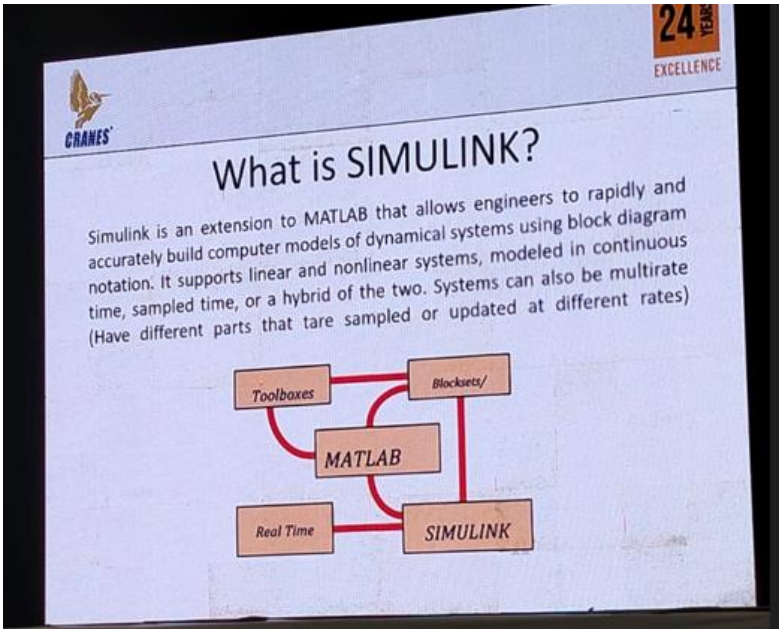

Fig 1.2.2: Slide showing the basics of Simulink that was explained in The workshop

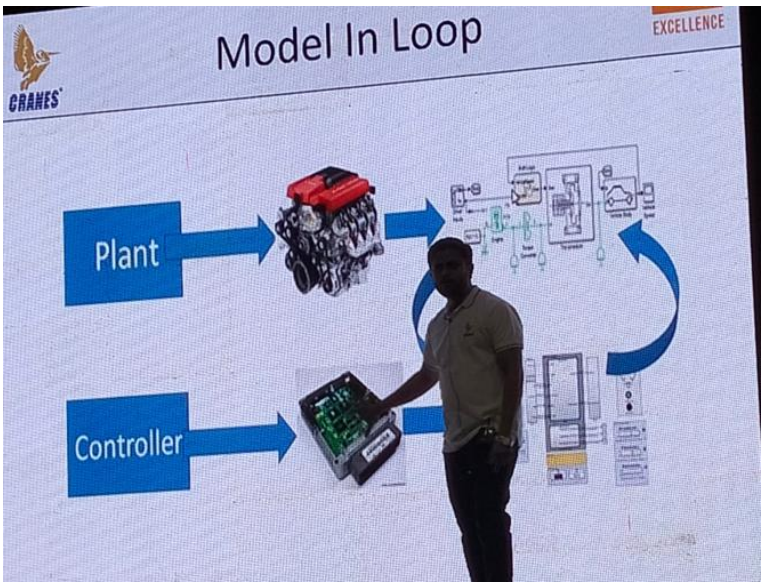

Fig 1.2.3: Slide showing Model in a loop concept that was being explained by the instructor

1.2.5 **Feedback of the day – 2:**

Day 2 began with again visiting Cranes Varsity early in the morning. The day started off with a positive note and it was really optimistic to see the enthusiasm to teach on the faces of the workshop instructors. Again a very interactive session with a concluding quiz and rewards towards the end. At the end of the day, we had added Simulink to our belt of skills.

Day – 3 report

1.3.1 **Industry Name –** SLN Technologies

1.3.2 **Objectives:** Concept of LRUs, Analog Electronics and role of Electronics in the Defence sector.

1.3.3 **Learning outcome(s):**

- Learnt the Basics of LRUs (Line Replaceable Units)
- Understood the Applications of LRUs in Defence applications
- Understood the working of a project that showed working of LRUs

1.3.4 **Photographs**:

Fig 1.3.1: The company's board just outside the entrance

Fig 1.3.2: Sample LRU shown to us for demonstration

Fig 1.3.3: A concluding group pic of us students with the workshop organizer

1.3.5 **Feedback of the day – 3:**

We arrived at SLN technologies in the mid hours of a lethargic afternoon, however when we arrived here we could find a lot of energy in the members of the company working here. Even though they had limited space within their office, they were large in terms of generosity and extremely cordial to us students. We were guided to a conference room where we had an amazing session on Line Replaceable Units for about an hour. We also got a chance to see some live working projects at their office. The best part of this day was the way the members of the company welcomed us students and we were equally exicted seeing their enthusiasm to give us some knowledge. The session concluded with a brain full of new ideas and a cheerful group pic.

Day – 4 report

1.4.1 **Industry Name –** Cranes Varsity

1.4.2 **Objectives:** Basics of Internet of Things (IoT), Introduction to Communication Protocols such as SPI, UART, etc.

1.4.3 **Learning outcome(s):**

- Understood the requirement of Internet of things for smart cities and smart projects
- Gained knowledge on various types of IoT projects through the demonstrations given in the sessions.
- Understood the advanced working of a number of Communication protocols
- Clarity on presenting a case studies between different types of Embedded technologies

1.4.4 **Photographs:**

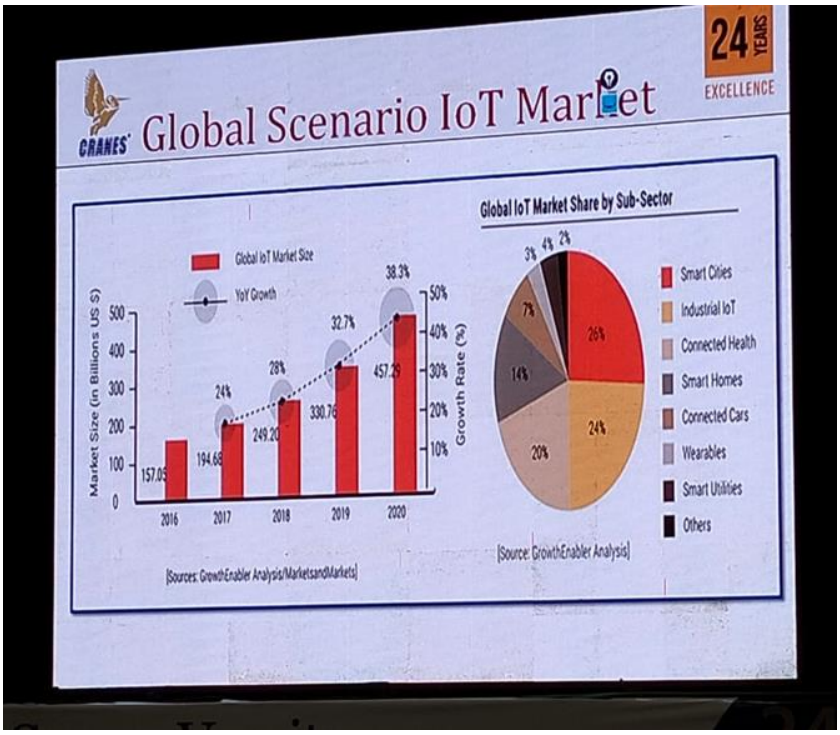

Fig 1.4.1: Slide showing the global scenario of IoT market

Fig 1.4.2: The T-shirt and Earbuds that I won in the Quiz Competition

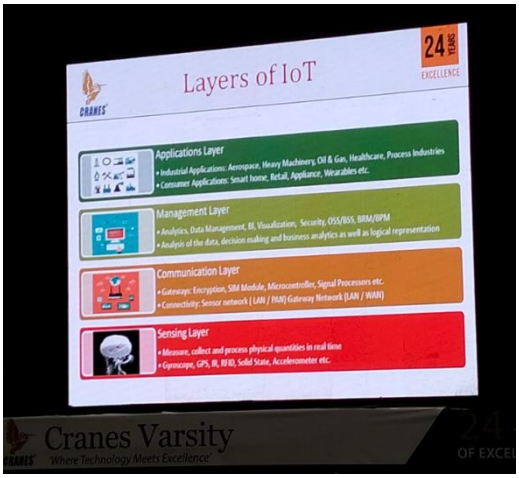

Fig 1.4.3: Slide showing the multiple layers of IoT Concept

1.4.5 **Feedback of the day – 4:**

The fourth day of the exciting Experiential learning began with once again visiting Cranes Varsity and the day's theme was Internet of Things which is a pretty popular area of interest for a large part of the Engineering population irrespective of the branch they come from. During the second half of the session, we gathered at the nearby ground for a cheerful group picture. We were again back in the auditorium and the session gave us interesting ideas of projects. Towards the ending, there was an interesting quiz competiton with multiple rounds and I managed to secure the 3rd place in the same. I was rewarded with a T shirt having their logo and a pair of Earbuds.

Day – 5 report

1.5.1 **Industry 1 Name** – Cranes Varsity

1.5.2 **Objectives of learning at Industry 1:** Basics of Computer Vision and Digital image Processing, Implementation of OpenCV functions in Python

1.5.3 **Learning outcome(s) of Industry 1:**

- Understood the basics of Computer Vision and its relation with Image processing
- Understood basic functions in OpenCv and implemented the same in an IDE
- Understood the concept of image size calculation and 3 channel images
- Well versed with the concept of Edge detection with operators such as canny and sobel
- Implementation of a full fledged CV Project – Object Detection

1.5.4 **Photographs of Industry 1:**

Fig 1.5.1: Introduction Session on Computer Vision on Day 5

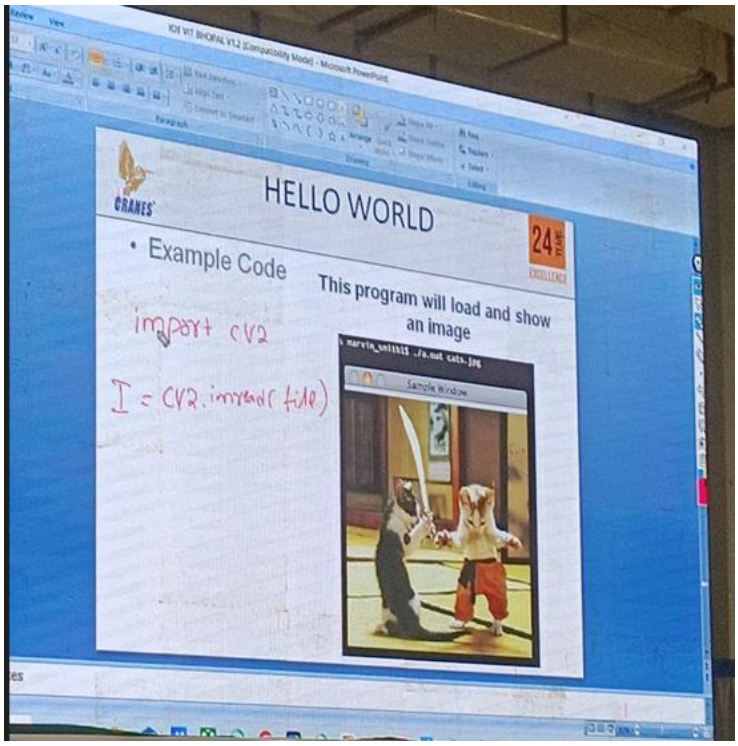

Fig 1.5.2: Introduction to the OpenCv library in Python

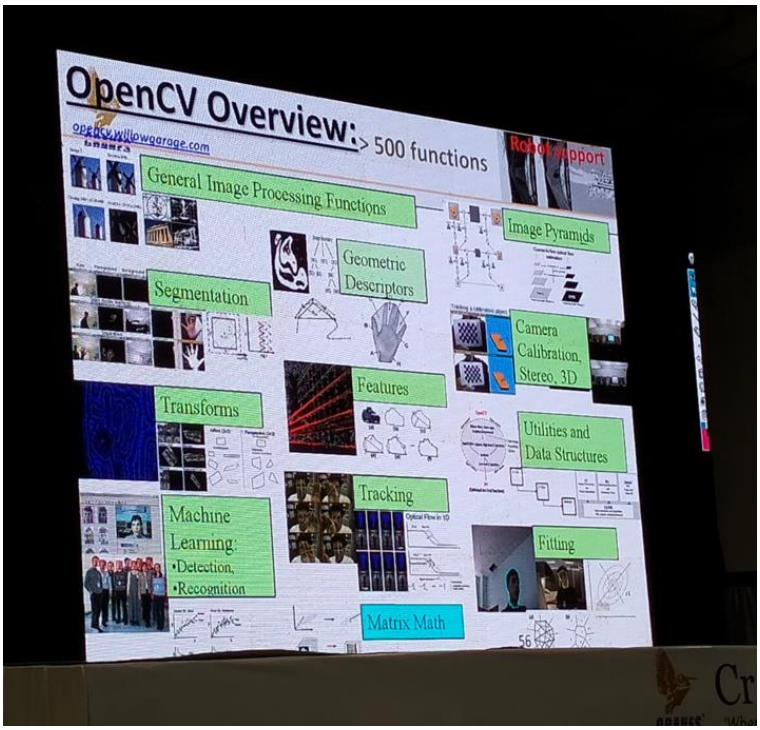

Fig 1.5.3: Diving Deeper into the functions of OpenCv library

1.5.5 **Industry 2 Name** – Albatross Aviation Pvt. Ltd.

1.5.6 **Objectives of Industry 2**: Ultra light prop aircraft behaviour and characterstics study, Scope of Aviation at an Amateur level or as a hobby, Reasons why certain Businesses invest in hobby flying

1.5.7 **Learning outcome of Industry 2**:

- Investments in Aviation for non revenue flying
- Importance of non revenue flying
- Weight and drag characteristics of light aircraft
- Fuel management during in-flight
- Case study of the size and structure of the wings in ultra light crafts
- Statistical figures of Businesses in India owning ultra light props.

1.5.8 **Photographs of Industry 2**:

Fig 1.5.4: Ultra light prop aircraft at Albatross Aviation

Fig 1.5.5: High horsepower engine for ultra light props imported from Finland

Fig 1.5.6: Brochures given to us as souvenirs

Fig 1.5.7: Group picture of us students with the instructor Mr. Ahmed before the conclusion

1.5.9 **Feedback of the day – 5:**

The concluding day of Experiential learning in the city of Bengaluru was filled with another enriching learning experience, again with the day beginning at Cranes Varsity where we dived into depth on Computer Vision and usage of the OpenCv library for various projects and image processing applications. The session at Cranes Varsity concluded with a real time demonstration of the face detection project by the instructor. It was hard saying good bye to the Cranes Varsity team after all the bonding we had with them during the entire week, however we were taking with us a lot of knowledge in multiple domains.

The visit in the Afternoon was to Albatross Aviation Pvt. Ltd. which is located in the outskirts of the city in the calmness of a rural atmosphere surrounded with farms and agricultural businesses. The company mainly focused on assembling parts of Ultra light prop aircraft and these parts come from all across the globe. They also look after the maintenance of engines and related components. The instructor Mr. Ahmed was extremely enthusiastic to tell us about everything that was there at the place and his journey of how he came into this business was also very inspiring.

Overall the final day of the Experiential learning at Bengaluru was filled with a lot of new baskets of knowledge to be carried ahead in our career paths.

City Choice – 2

Chennai

Day – 1 report

2.1.1 **Industry Name** – Indian Space Research Organization (ISRO) – Sathish Dhawan Space Centre, Sriharikota Range (SDSC-SHAR)

2.1.2 **Objectives:**

- To learn about the working of a space command control room
- To get better insights on building a rocket at an industry from scratch to launching it at the final stage
- Knowledge on different types of launch vehicles
- Awareness on different career opportunities in space sector for Electronics and CSE graudates

2.1.3 **Learning outcome**:

- Understood the different types of Launch Vehicless
- Performed a case study on PSLVs using the video streamed at the space centre
- Understood the working of different communication control rooms operating for ISRO at differet parts of India and abroad
- Differences between PSLVs and GSLVs
- Importance of water, hydraulics and other fluids used in the launch pads
- Advancements in Indian Space Market since 2004

2.1.4 **Photographs**:

Fig 2.1.1: Rocket models for display outside Satish Dhawan Space Centre (SDSC)

Fig 2.1.2: Model of GSLV for display outside the library at SDAC

Fig 2.1.3: Group photo of us students taken before leaving the premises

2.1.5 **Feedback of day:**

The first day of visits at Chennai was definitely one of the best in the entire of 2 weeks. Visiting ISRO is still a dream for many Indians and people aborad, but we were lucky to have got this option from VIT Bhopal and I am thankful to all the organizers for the same. We visited the main control room of SDAC and also both the launch pads. Photography was restricted at some areas for security reasons, however it is the learning experience here that we all recall and that can never be proven by mere photos.

Day – 2 report

2.2.1 **Industry Name** – Combat Vehicle Research and Development Establishment (CVRDE)

2.2.2 **Objectives:**

- To understand role of Electronics and Mechanics in Tank industry
- To get better insights on various engines used in the tank
- To understand the electrical wiring systems used within the tank
- To learn better about the diesel engine
- To gain awareness on research and career opportunities in this domain

2.2.3 **Learning outcome:**

Being a student of Electronics and Communication with minors in AI and Cybernetics, this visit was extremely useful for because I learnt how Combat vehicles work and what is the role of electronics in them. AI also has its own applications, but at the current juncture, it is only in the testing phase and the security of the nation is prioritized over random implementation without adequate testing. I visited multiple laboratories in the campus and every laboratory had a different work line of its own. Total learning takeaways include: knowledge on payload factor on combat vehicles, different geographical/climatical conditions that might affect the performance of a combat vehicle and finally a case study on fuel efficiency vs speed of a combat vehicle.

2.2.4 **Photographs:**

Fig 2.2.1: The main entrance of CVRDE, Avadi, Chennai

Fig 2.2.2: Logo of CVRDE (at the outer entrance)

2.2.5 **Feedback of the day – 2**:

The day started off with a lot of positive vibes and a lot of us waiting for the bus near VIT Chennai Auditorium. We then boarded a bus to CVRDE which is approximately an hour's drive from VIT Chennai. As soon as we arrived there, we had to deposit our bags and electronic gadgets owning to a lot of security restrictions. Photography was also limited to only outside the gate. The best part of the day was when we got to meet a lot of Scientists from Multiple Divisons. My personal favourite was the Multi weather and climate testing lab where the combat vehicle would be exposed to different conditions in accordance to different cimatic conditions across different borders in India. Before the conclusion, we were guided to an Auditorium where a senior scientist of the organization interacted with us asking us about our areas of interest and he also explained how we can combine our personal areas of interest with the Combat Vehicle Industry. Overall the day was totally worth it and it was a close to once in a life time experience for us to visit CVRDE as the visitor passes are restricted.

The best part of the day was from the part of the Scientists, who were highly enthusiastic in imparting their knowledge to us and they were kind enough to share their contacts with us.

We had one of the biggest learning takeaways of the entire Experiential Learning during this single visit.

Day – 3 report

2.3.1 **Event Name** – Hands on Session on @VIT Chennai Audtorium

2.3.2 **Objectives**: Hands-on Session 1: Kubernetes-based Machine Learning with Amazon Sagemaker and Hands-on session 2: The Role of Robotics in the Health Industr

2.3.3 **Learning outcome(s):**

- Amazon SageMaker Operators for Kubernetes and Components for Kubeflow Pipelines enable the use of fully managed SageMaker machine learning tools across the ML workflow natively from Kubernetes or Kubeflow. This eliminates the need to manually manage and optimise the Kubernetes-based ML infrastructure while still preserving control over orchestration and flexibility.
- Prepare data and build, train, and deploy models with SageMaker Studio - a hands-on session.
- Kubernetes is an open source system used to automate the deployment, scaling, and management of containerized applications. Kubeflow Pipelines is a workflow manager that offers an interface to manage and schedule machine learning (ML) workflows on a Kubernetes cluster.
- Benefits of Robotics in Healthcare
- High-quality patient care, effective clinical procedures, and a secure working environment for patients and healthcare professionals are all made possible by the use of robots in the medical area.
- Cleaning and sanitising AMRs make it possible for hospital rooms to be promptly cleaned and prepared for new patients, freeing up different staff members to concentrate on patient-centered, value-driven work.

2.3.4 **Photographs**:

Fig 2.3.1: The first view of VIT Chennai after entering the campus

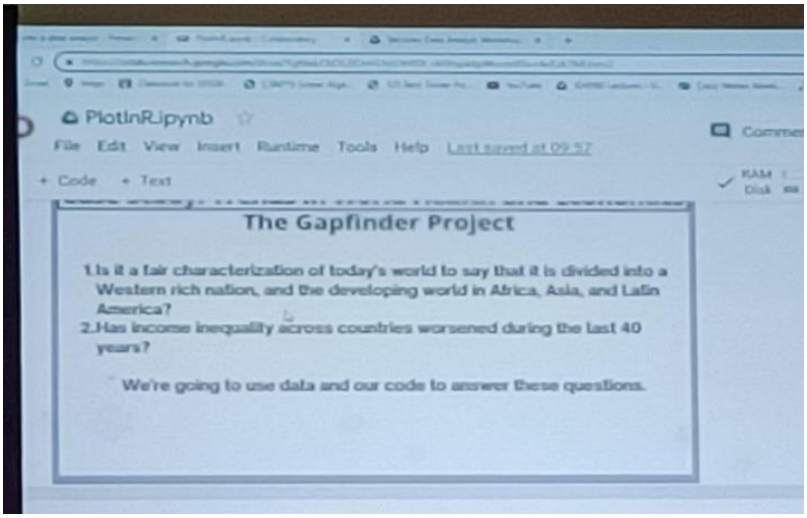

Fig 2.3.2: Slide demonstrating Gapfinder project using Amazon SageMaker

Fig 2.3.3: VIT Chennai auditorium just before the sessions began

2.3.5 **Feedback of the day – 3:**

Both the sessions of day 3 were beyond ambience. We were confused what to appreciate first, the ambience of the auditorium or the learning experience we were getting from the speakers. We even had a session by the CEO of a Robotics startup named ROBORAM. Overall, it was a day to remember.

Day – 4 report

2.4.1 **Event Name** – Motivate to Innovate

2.4.2 **Objectives**: Main objective was to create awarenss on multiple career pathways and also motivate the audience on working hard and other aspects

2.4.3 **Learning outcome(s):**

- Resource management
- Scope of AI/ML and Blockchain in the Banking and Finance sector
- Correlating technical knowledge with philosophy
- Plan B to career opportunities - opening multiple pathways and opportunities
- Time management
- Product and Research Development
- Career opportunities in multiple domains
- Learnt multiple paths to becoming an entrepreneur from scratch
- Debating on Innovation vs Invention
- Management, Strategy, Operational Research,Product and Services
- Technology advancements in Defence

2.4.4 **Photographs of Event:**

Fig 2.4.1: Pre inauguration scenes of "Motivate to Innovate" at VIT Chennai Auditorium

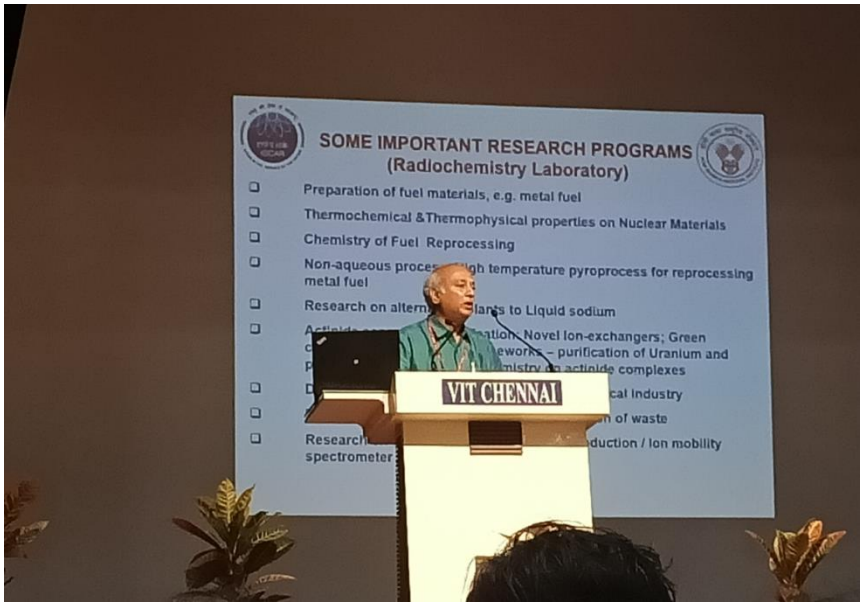

Fig 2.4.2: Speaker addressing us students on Radiochemistry

Fig 2.4.3: Speaker addressing us on technology advancements in Defence

2.4.5 **Feedback of the day – 4:**

At the end of day 4, all of us may not have learnt anything big in terms of technical stuff or academic points, but we sure did change our perspectives and approaches to how various things in life must be done. The entire day was definitely an eye opener for a lot of people like me and clearly the session did not fail the title they said "Motivate to Innovate".

Day – 5 report

2.5.1 **Event Name –** TechnoVIT 2022

2.5.2 **Objectives**: Participation in non-technical events in the VIT Chennai-organized TechnoVIT Fest. Objective was to interact with new personnels and other students from different universities in order to build connections and new learning experiences.

2.5.3 **Learning outcomes**:

- Churned our brains and enjoyed all the fun activities
- Met and interacted with many students of VIT Chennai and other colleges
- Explored individual interests and created broader perspectives.
- Spectated various shows and games like Astroworld, Valeo, Juice Pong, etc.
- Broaden our horizons

2.5.4 **Photographs of event:**

Fig 2.5.1: Inaugration of the Techno VIT'22

Fig 2.5.2: Buzzing campus of VIT Chennai during Techno VIT'22

Fig 2.5.3: Tickets for participating in multiple events at TechnoVIT'22

2.5.5 **Feedback of the day – 5:**

The concluding day of the Experiential Learning was filled with a lot of fun and joy. We had got opportunities to participate in multiple games (technical and non technical) hosted by the students of VIT Chennai. Best part was we even built a lot of connections and made new friends. Although the games were quite competitive, we took it as fun and enjoyed the procedures of the games—not desperate to win, intead curious to learn and complete the given task to the best of our potential.

Conclusions

The 2 week experiential learning was extremely fruitful and amazing for me. I was able to add a lot of skills to my belt that I gained from across different sessions, workshops and Industries.

As a conclusion to the Experiential Learning, I have formulated these problem statements from my end:

Project/Problem Statement 1:
Project Theme: Computer Vision, Digital Image Processing, Cyber Security and 2D Signal Transmission
Project Title: Hiding a secret image inside host image and transmitting it using relevant protocols
Mini Abstract: In this project, we aim to take a secret image and hide it inside the host image using many digital image processing and computer vision techniques. The image then shall be transmitted to the client or the receiver and we shall follow the block diagram of a Digital Communication system for the transmission system. The image pixel intensities shall also be changed to ensure difficulty in decryption by hackers. The receiver must be able to recover the original image safely.

Project/Problem Statement 2:
Project Theme: Computer Vision, Digital Image Processing, Deep Learning, Terrain Robotics, Kinematics of Objects
Project Title: Computer Vision based obstacle/enemy detection for Combat Vehicles
Mini Abstract: This project aims to design a model for Combat vehicles/any other defence vehicles that can detect enemies/obstacles during wars and cross firings at borders. We know the that the borders of our country are located in a Geography where colours of objects appear more or less same and identifying the enemy can be an ordeal by human vision. Our model will also use Attention Mechanism for Deep learning to solve the issue and subsequently, the detection should also be able to semi autonomously control the combat vehicle's speed and turret direction (Prototype can be implemented using Arduino UNO and DC motor to show working) along with issuing a target lock acknowledgment to the crew.

Project/Problem Statement 3:
Project Theme: Sensors and Mechatronics, Aviation, IoT, Aircraft wing structures, Aircraft turbines theory
Project Title: Automatic Altitude control mechanism for Ultra light glider aircrafts
Mini Abstract: Unlike large aircraft that includes the ones manufactured by Boeing and Airbus, ultra light gliders do not rely on Auto pilot and most of the control is done manually by the pilot. In this project, we aim to deploy sensors that can sense the wind speed, pressure and temperature conditions of the environment and send data to the controller depending on the which the ultra light glider would cruise to a safer altitude by just controlling the engine thrust and adjusting flaps appropriately and without pitching the flider up or down (again for safety issues). This can prevent untoward incidents/accidents involving glider aircrafts to a great extent and can make hobby flying relatively safe. (Note: This is not same as MCAS used in Boeing 737 MAX variants).

Project/Problem Statement 4:
Project Theme: Assistive Technology, Aritificial Intelligence, Natural Language Processing
Project Title: Indian Regional Language ChatBot
Mini Abstract: This project aims to build chatbots that would help the customer by providing assistance in regional languages such as Tamil, Kannada, Malayalam and Hindi. The chatbot will help a lot of people who are more comfortable in a language which is not English. The initial phase of the project would just have models trained with the data sets of the mentioned languages.

I hope to use all the knowledge I have gained during the 2 weeks to implement atleast one of these projects and even take them forward to my EPICS/Capstone project depending on the feasibility and real life requirements and also the approval and feedback I get from my Professors after the Phase 1 showcase.

(End of Report)

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