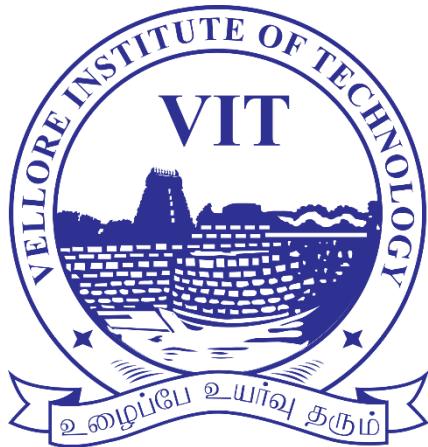


# Vellore Institute of Technology



## An Internship Report

*Submitted in fulfilment of the requirements of Credit Transfer under*

**BACHELOR OF ENGINEERING**

in

**ELECTRONICS AND COMMUNICATION ENGINEERING**

by

**YOGESHWAR.JB**

**REGNO: 21BEC0521**

**Internship Carried out at**



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## **Vellore Institute of Technology**

VELLORE INSTITUTE OF TECHNOLOGY

(An ISO 9001:2008 Certified Institution)

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### **CERTIFICATE**

Certified that the Internship report submitted by **Mr. YOGESHWAR.JB, REGNO : 21BEC0521**, a bonafide student of **Vellore Institute of Technology** in fulfilment of the requirements of Credit Transfer under award of **Bachelor of Engineering in Electronics and Communication Engineering** of the VELLORE INSTITUTE OF TECHNOLOGY, during the year 2022-2023. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report. The Internship report has been approved as it satisfies the academic requirements in respect of Internship prescribed for the said degree.

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## **ACKNOWLEDGEMENT**

To begin, I express my profound gratitude to my parents, whose tireless efforts and sacrifices have shaped my present and future. Without their dedication, I would not be where I am today.

Hearty thanks to **Mr. Ragavandir**, for providing all the facilities that helped me in timely completion of Internship work.

I am grateful to **Dr. NOOR MOHAMMED V**, Head of the Department, Electronics and Communication Engineering for his support and encouragement.

I am indebted to respected and beloved Chancellor **Mr. G. Viswanathan** and the management of Vellore Institute of Technology, for providing all the facilities that helped me in timely completion of this seminar report.

Finally, I would like to thank all the teaching and non-teaching staff of Department of Electronics and Communication Engineering for their valuable help and support.

**YOGESHWAR.JB**

**21BEC0521**

## ABSTRACT

My internship at **BGENT** unfolded as a captivating journey through the realms of modern technology. Over the course of 5 weeks, I embarked on an exhilarating quest that took me deep into the heart of cutting-edge electronics, prototype development, and the dynamic landscape of innovation. This comprehensive report serves as a testament to my enthralling expedition, chronicling the wealth of knowledge and experiences I garnered during this remarkable odyssey.

Throughout this report, I will walk you through the significant chapters of my journey, from unleashing my tech-driven potential to mastering the art of crafting PCBs and breathing life into prototypes. I will delve into the intricacies of IoT protocols, navigating the vast web of connectivity with MQTT, CoAP, and Websockets. In the realm of machine learning and deep learning, I will unveil the AI oracle known as SSD (Single Shot Detector) and explore its inner workings.

## **Methodology:**

At BGENT, our methodology is rooted in excellence and innovation. We follow a structured approach:

**Research and Exploration:** We conduct in-depth research, identify trends, and explore technologies.

**Innovative Product Ideation:** We brainstorm and refine ideas focused on societal welfare.

**Prototyping and Testing:** Our engineers design and test prototypes for performance and efficiency.

**Manufacturing Excellence:** We maintain high-quality standards in large-scale production.

**Continuous Improvement:** We value customer feedback and continuously refine our products.

## **Programmes and Opportunities:**

The Institute combines pioneering research with top class education. An innovative curriculum allows the student flexibility in selecting courses and projects. Students, even at the undergraduate level, get to participate in ongoing research and technology development - an opportunity unprecedented in India. As a result, a vibrant undergraduate programme co-exists with a strong postgraduate programme.

## **Organization Information:**

BGENT , a pioneering leader in electrical and electronics manufacturing, boasts over three years of cutting-edge R&D experience. Our mission revolves around developing innovative products, with a special focus on conserving vital resources like water and electricity. Our portfolio spans household appliances, electrical devices, and electronics manufacturing, all driven by a commitment to improving lives and uplifting communities. Collaboration with academic institutions and rigorous quality standards define our approach, ensuring the reliability, efficiency, and sustainability of our solutions. At BGENT , we're on a continuous journey to shape a brighter, greener future through relentless innovation and technology's transformative power.

## **Benefits to the company / institution through your report:**

The report I've prepared offers numerous benefits to the company/institution. It provides a detailed analysis of my internship experience, showcasing the practical application of skills and knowledge acquired during the program. By highlighting my involvement in cutting-edge technology projects, it underscores the company's commitment to innovation and staying at the forefront of the industry. Additionally, the report demonstrates the organization's role in nurturing and shaping young professionals, making it an attractive destination for future talents. Furthermore, the focus on product development aligned with societal welfare reflects the company's commitment to sustainability and social responsibility, enhancing its reputation and potential for partnerships and collaborations.

## **Learning Objectives/Internship Objectives:**

- Internships are generally thought of to be reserved for college students looking to gain experience in a particular field. However, a wide array of people can benefit from Training Internships in order to receive real world experience and develop their skills.
- An objective for this position should emphasize the skills you already possess in the area and your interest in learning more.
- Internships are utilized in a number of different career fields, including architecture, engineering, healthcare, economics, advertising and many more.
- Some internships are used to allow individuals to perform scientific research while others are specifically designed to allow people to gain first-hand experience working.
- Utilizing internships is a great way to build your resume and develop skills that can be emphasized in your resume for future jobs. When you are applying for a Training Internship, make sure to highlight any special skills or talents that can make you stand apart from the rest of the applicants so that you have an improved chance of landing the position.

## **WEEKLY OVERVIEW OF INTERNSHIP ACTIVITIES:**

1 <sup>st</sup> WEEK	DATE	DAY	NAME OF THE TOPIC/MODULE COMPLETED
	1/8/23	Tuesday	Overview to Company Profile & Total Internship Schedule
	2/8/23	Wednesday	Brief Introduction on Electronics such as UPS/Inverter etc..
	3/8/23	Thursday	Types of Rectifiers and Control Systems
	4/8/23	Friday	Brief overview of Electric Vehicles and its Electronics
	5/8/23	Saturday	Types of Communication Interfaces involved in EV and Digital Electronics
	6/8/23	Sunday	Holiday

WEEK 2	DATE	DAY	NAME OF THE TOPIC/MODULE COMPLETED
	7/8/23	Monday	Brief overview on Different types of Motors and Batteries
	8/8/23	Tuesday	IOT and Microcontrollers
	9/8/23	Wednesday	Implementation of IOT and Microelectronics in Real situation
	10/8/23	Thursday	Brief overview on Different types of Display's used in Industries (LCD , TFT etc..)
	11/8/23	Friday	Theoretical Calculation and Estimation on various Electronics Equipment i.e., Power Consumption, Efficiency , Stability etc..
	12/8/23	Saturday	Sample Projects Automated PC Power-On Circuit

WEEK 3	DATE	DAY	NAME OF THE TOPIC/MODULE COMPLETED
	14/8/23	Monday	Brief overview of Various Protocols Involved in IOT
	15/8/23	Tuesday	Halfday / Overview and Discussion on Progress
	16/8/23	Wednesday	Theoretical Calculation on Battery i.e., Charging and Discharging Rate, SOC,SOH etc..
	17/8/23	Thursday	Web socket and Virtual Network
	18/8/23	Friday	Creation of Datasets for AI
	19/8/23	Saturday	General Overview on Machine learning and Deep Learning

WEEK 4 <sup>th</sup>	DATE	DAY	NAME OF THE TOPIC/MODULE COMPLETED
	21/8/23	Monday	Creation of Datasets for AI
	22/8/23	Tuesday	Connecting Various Manufacturers for Different Electronics
	23/8/23	Wednesday	Assigning Projects
	24/8/23	Thursday	Creation of Datasets for AI
	25/8/23	Friday	Exploring various Electronic Prototypes / Site Visit
	26/8/23	Saturday	Research On project and its Various aspects

WEEK 5 <sup>th</sup>	DATE	DAY	NAME OF THE TOPIC/MODULE COMPLETED
	28/8/23	Monday	Implementation of Project
	29/8/23	Tuesday	Implementation of Project
	30/8/23	Wednesday	Creation of Datasets for AI
	31/8/23	Thursday	Finalization of Project and its Specification
	1/9/23	Friday	Last day of the Internship / throughout this Journey I learnt about Electronics and Product Development from Prototype
	2/9/23	Saturday	Holiday

Throughout this intensive 5-week period, I had the opportunity to dive deep into various aspects of the project, gaining valuable insights and acquiring new knowledge along the way. I encountered challenges, made discoveries, and expanded my skill set significantly. This experience has been instrumental in broadening my understanding of the subject matter and strengthening my abilities in the field.

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# **Internship Odyssey:**

**by Yogeshwar. Jb**

**Internship Duration: 1/8/23 – 1/9/23**

**Company: BG Enterprises**

## **Abstract:**

My journey through the world of technology at BGENT was a remarkable adventure. Over 5 weeks, I embarked on a thrilling quest, uncovering the secrets of cutting-edge electronics, prototype development, and embracing the challenges of innovation. This report encapsulates my exhilarating journey and the treasure trove of knowledge and experiences I acquired along the way.

## **Unleashing the Tech Within:**

My internship at BGENT was an exciting exploration of the world of technology. With curiosity and determination, I set out on this journey, eager to unlock its hidden wonders.

## **Crafting PCBs and exploring into Prototypes:**

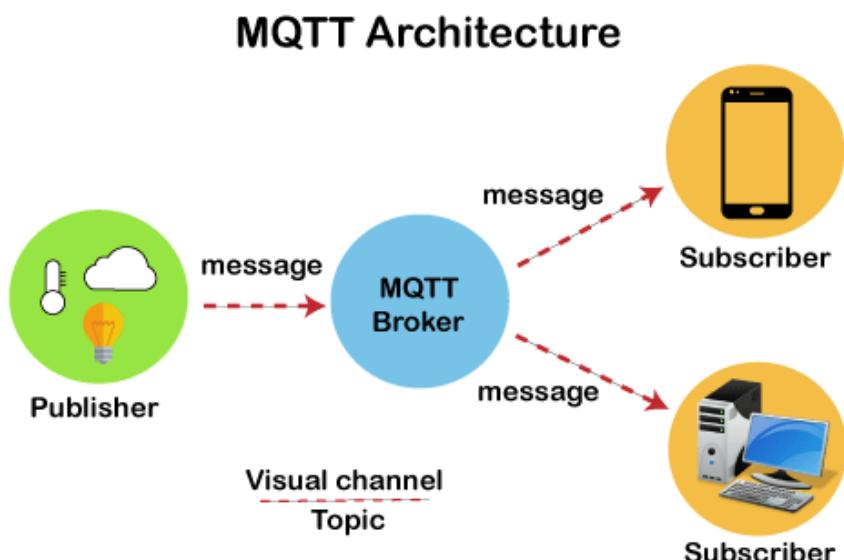
**Electronics Alchemy:** My initiation into electronics was akin to practicing alchemy. I delved into the intricate process of designing Printed Circuit Boards (PCBs), where seemingly random lines on a board transformed into circuits that came to life. I marvelled at how these PCBs became the main stream of our projects, carrying electrical impulses and turning ideas into tangible prototypes.

**Troubleshooting Odyssey:** Troubleshooting was a significant aspect of my journey. When encountering electronic challenges, I approached them with determination, using tools like the soldering iron to address issues head-on. It often felt like a battle against elusive bugs and problems that tested the integrity of our creations. However, with each successful resolution, I gained a deeper understanding of electronics and a sense of accomplishment.

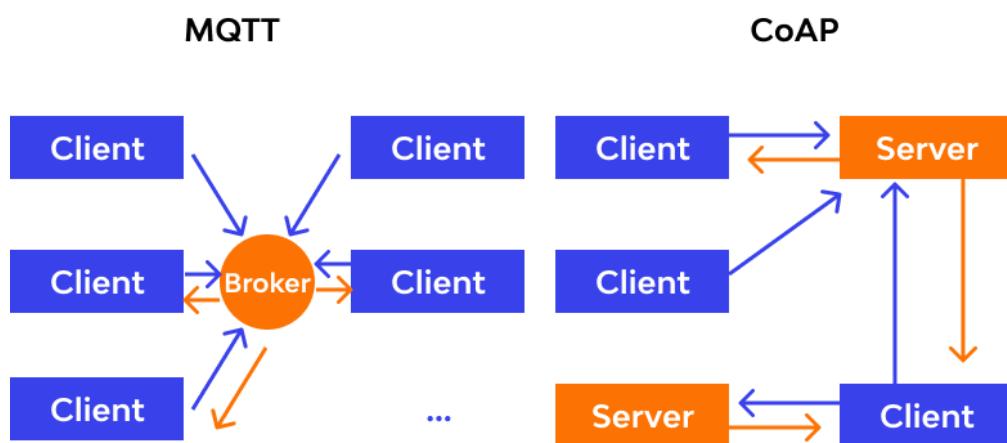
**Innovating for the Modern Age:** Understanding customer needs became my compass. I embarked on a quest to unearth what customers truly desired. Armed with this knowledge, I innovative solutions that addressed their needs with precision. This iterative process of innovation revealed the dynamic nature of technology, where customer feedback is the key towards excellence.

## IoT Protocols: Navigating the Web of Connectivity:

**MQTT: Message Queuing Telemetry Transport** MQTT emerged as the messenger of the Internet of Things (IoT). It was the invisible thread that connected our devices, enabling seamless communication in the digital realm. Whether it was transmitting sensor data from a remote weather station or issuing commands to smart home devices, MQTT's lightweight and efficient protocol formed the backbone of our IoT projects. It was the messenger that whispered commands to smart devices, orchestrating their actions with elegance.



**CoAP: Constrained Application Protocol** CoAP, the Constrained Application Protocol, was our passport to creating web-friendly IoT applications. It was the bridge that allowed IoT devices to communicate effortlessly with web servers. It transformed raw sensor data into digestible web content, opening up new possibilities for remote monitoring and control. CoAP was the language our devices used to converse with the web, making them fluent in the digital world.

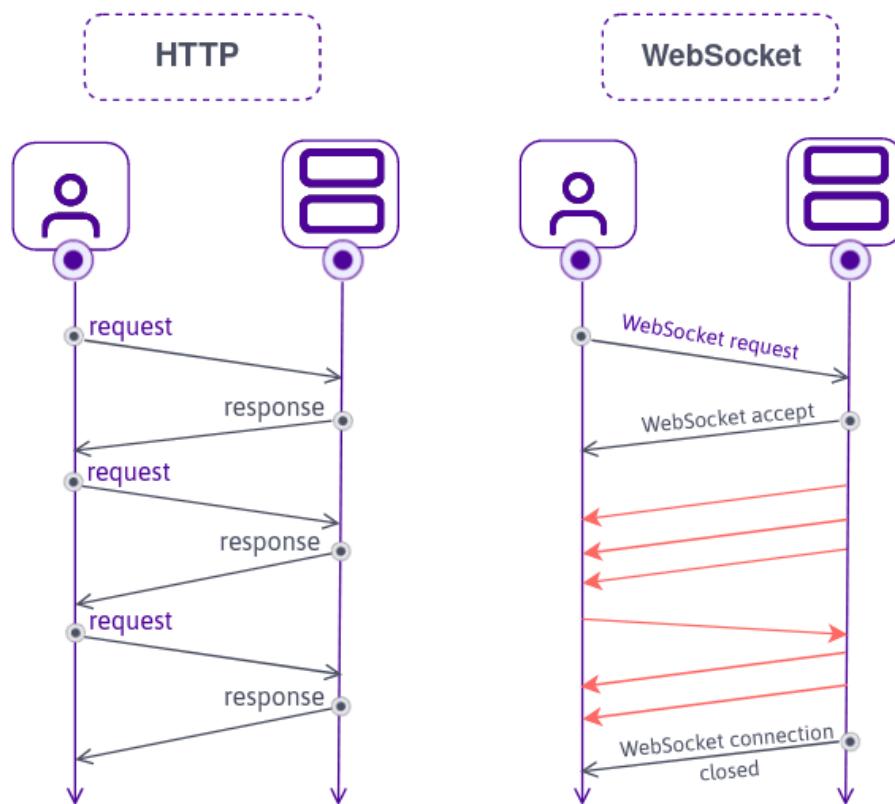


**Websocket: Real-Time Web Interactions:** Websockets, a fundamental element of modern web development, facilitate real-time, bidirectional communication between web clients and servers. Unlike traditional HTTP requests that follow a request-response model, websockets establish a persistent connection, allowing both clients and servers to send and receive data independently. This dynamic interaction empowers web applications with instant updates, interactive features, and low-latency data streaming, leading to a more engaging user experience.

For example, consider a live chat application. Without websockets, users would have to manually refresh the chat window to see new messages, resulting in a clunky and inconvenient experience. With websockets, messages can be sent and received in real time, creating a fluid and interactive chat environment. As soon as a user sends a message, it's instantly delivered to the chatroom, and all connected clients receive the message without the need for page reloads or manual updates.

In online gaming, websockets enable multiplayer games to function smoothly. Players can interact with each other in real time, whether they're cooperating in a team or competing against each other. Game state updates, such as player positions and scores, are continuously transmitted to all connected clients, ensuring that everyone experiences the game's current status simultaneously.

In summary, websockets have transformed the web by enabling dynamic, real-time communication between clients and servers. They've paved the way for interactive features, live updates, and immersive user experiences across a wide range of applications, from chat and gaming to financial and collaborative tools.



## Machine Learning and Deep Learning: Unveiling the AI Oracle:

### Machine Learning:

Machine learning introduced me to the art of teaching machines to recognize patterns and make data-driven predictions. I explored various machine learning algorithms, from linear regression to decision trees and random forests. It was enlightening to witness how algorithms could ingest data, extract insights, and provide valuable predictions, which could be applied in fields such as predictive maintenance, recommendation systems, and natural language processing.

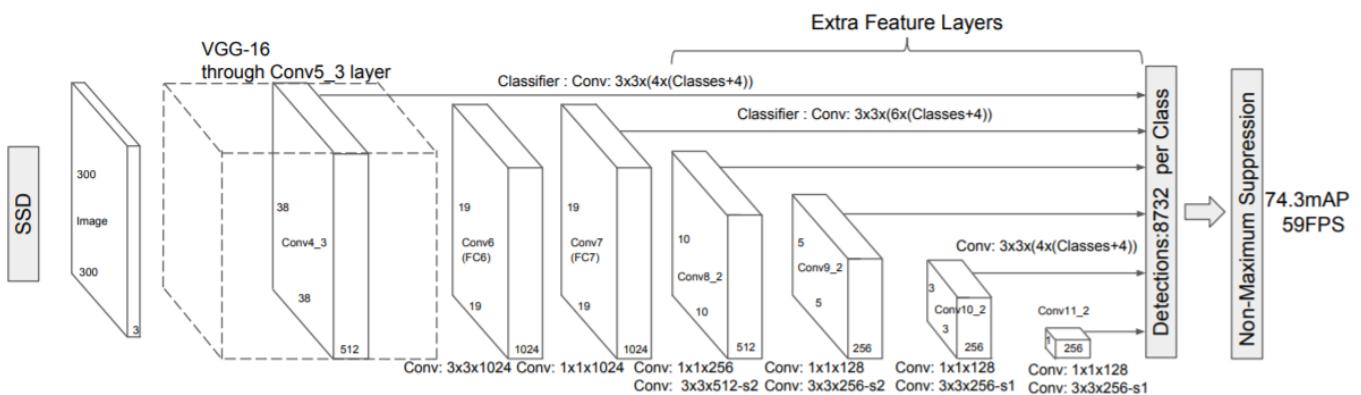
### Deep Learning:

Deep learning, a subset of machine learning, led me into the captivating universe of neural networks. I discovered how deep neural networks, with their multiple layers of interconnected neurons, could mimic human brain functions and perform complex tasks. The neural network architecture, backpropagation, and activation functions became familiar tools in my toolkit.

## Understanding SSD (Single Shot Detector)

### Introduction to SSD:

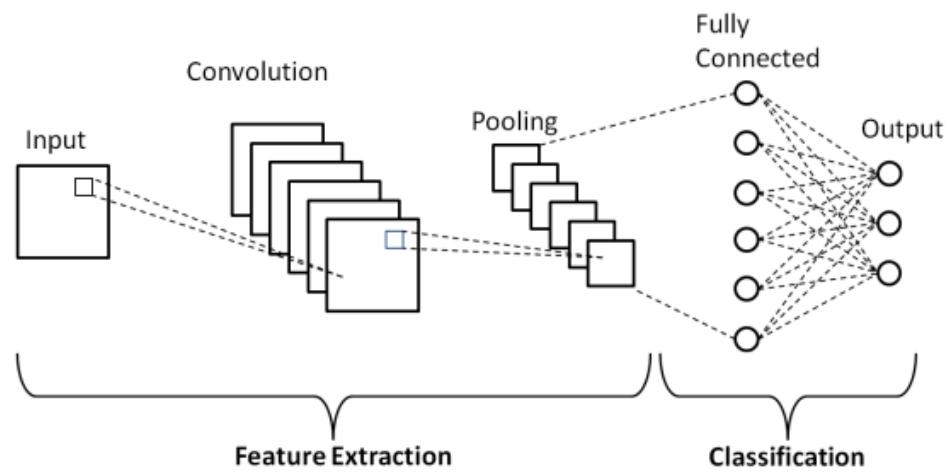
SSD, short for Single Shot Detector, was the sentinel guarding the gates of **computer vision**. It was a **deep learning-based algorithm**, a digital guardian capable of identifying and locating objects within images or video frames. **SSD's reputation for speed and accuracy** made it a revered choice **for real-time applications** such as autonomous driving, surveillance, and image recognition.



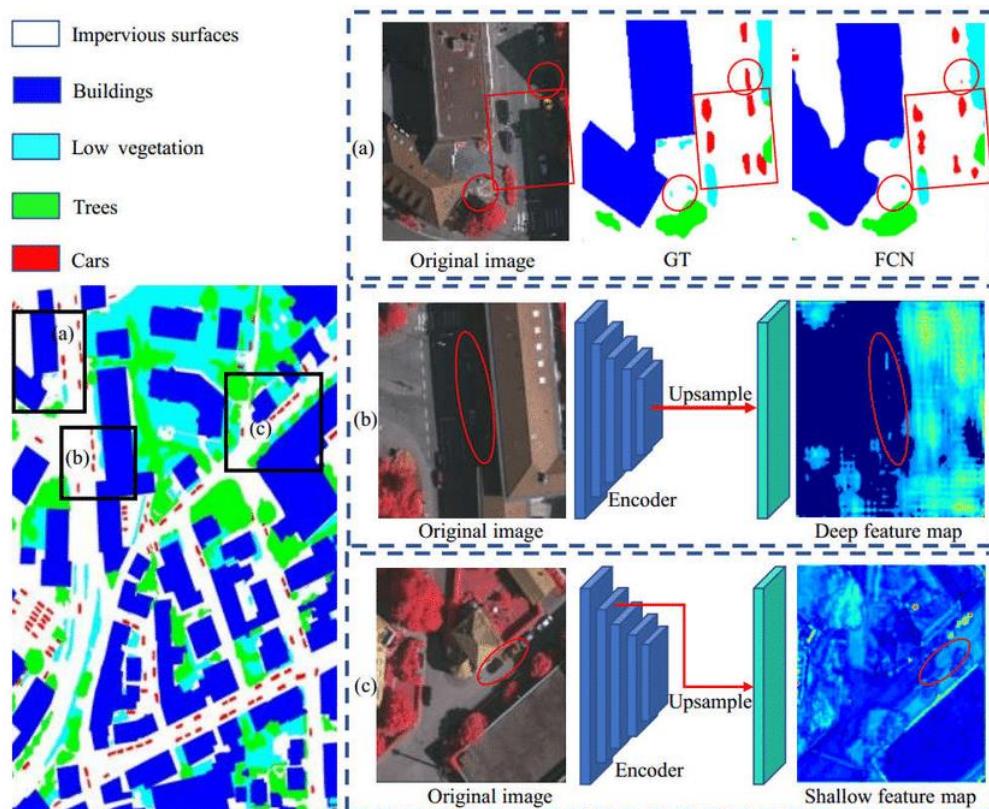
Architecture of SSD Algorithm

## How SSD Works:

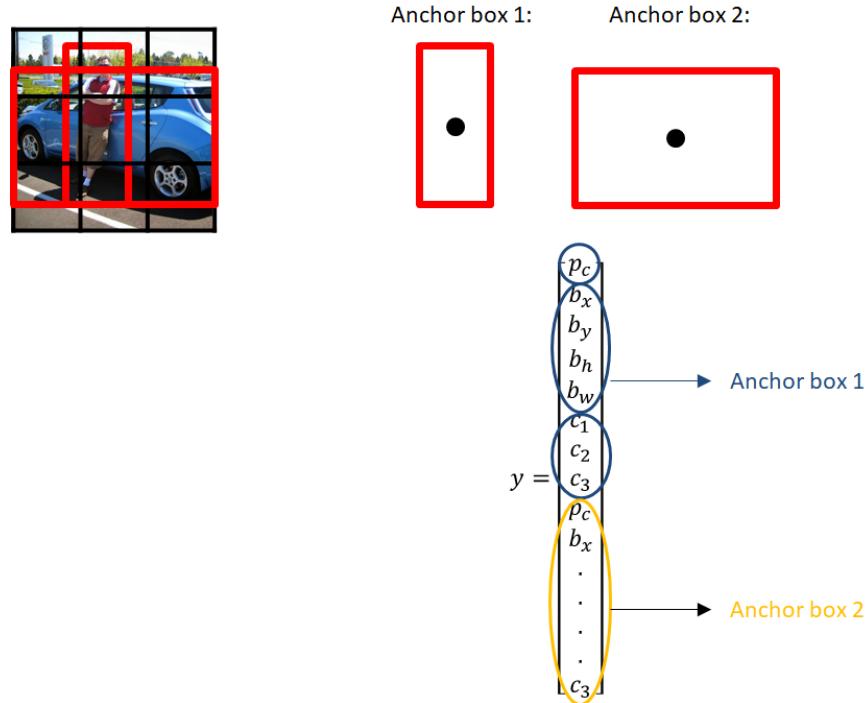
**Base Convolutional Network:** SSD's journey began with a base convolutional network, a seasoned traveler that had traversed vast datasets like ImageNet. This network was the feature extractor, capturing intricate details from the input image. It was the first step towards understanding the visual world.



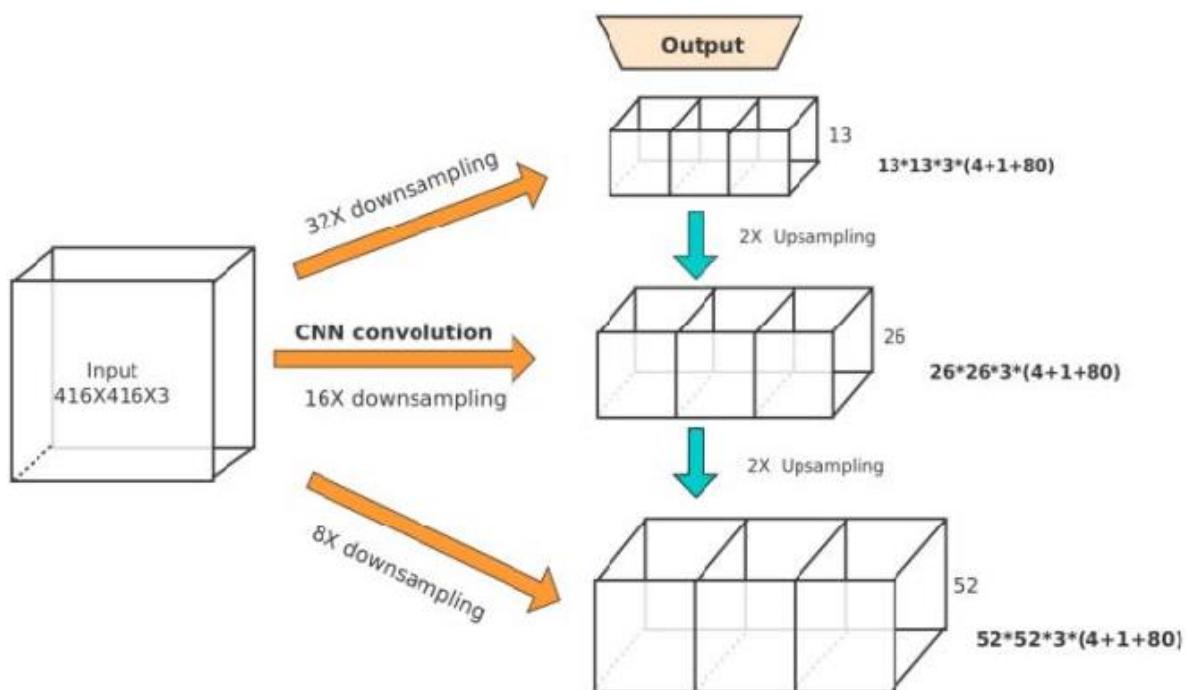
**Multi-scale Feature Maps:** SSD's quest for knowledge led to the creation of multi-scale feature maps. These maps, akin to treasure maps, were derived from the base network but offered insights at different scales. They were vital in detecting objects of varying sizes within the image, like deciphering different clues on a treasure hunt.



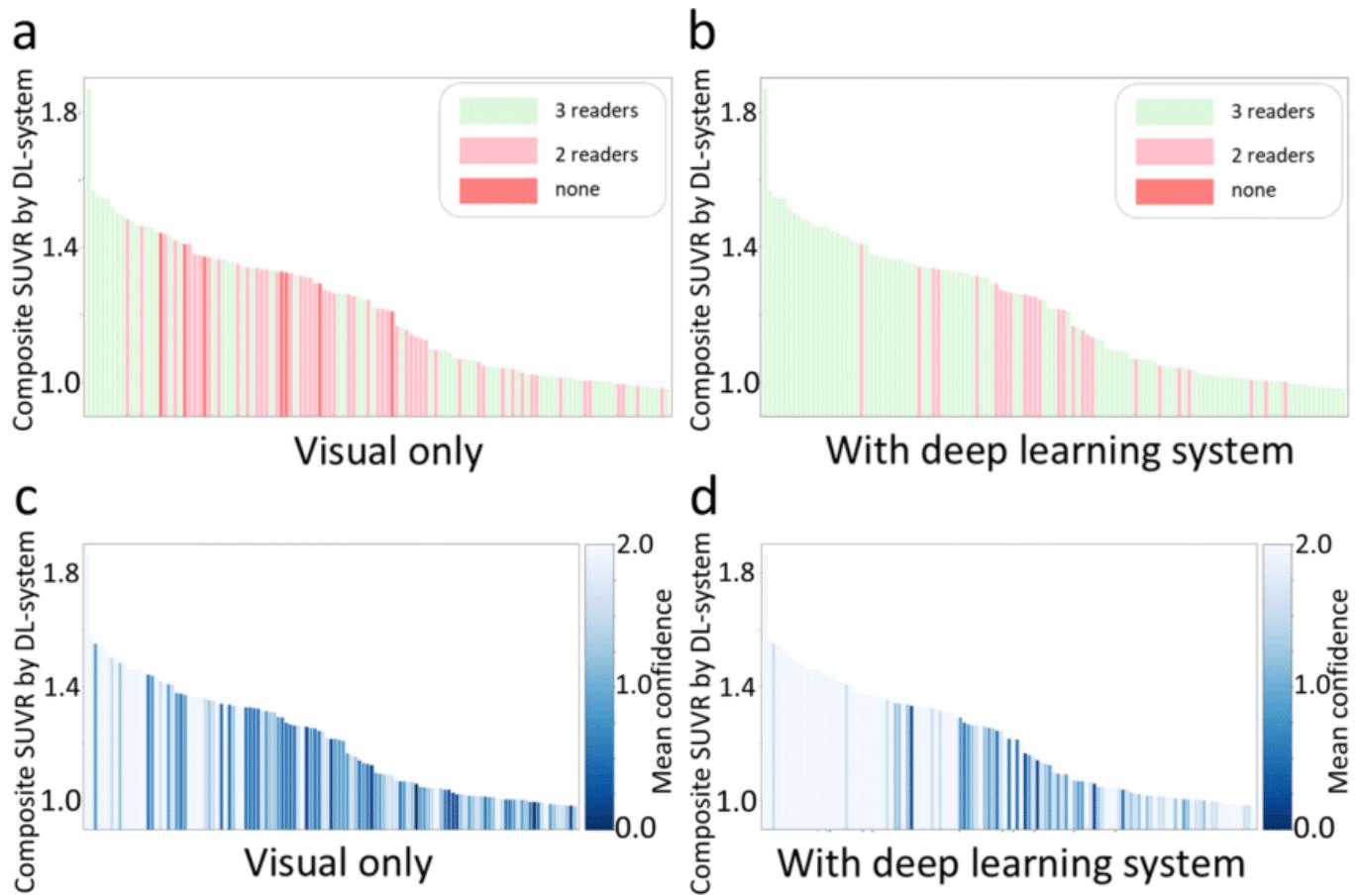
**Anchor Boxes:** Anchors were the predefined templates, carefully crafted rectangles with various aspect ratios and scales. They resembled the parchment with marked spots on a treasure map. At each location on the feature maps, SSD associated these anchor boxes, anticipating potential object discoveries.



**Predictions at Multiple Scales:** SSD's predictions were the revelations, akin to deciphering ancient scripts. For each anchor box, SSD made two types of predictions: class scores (e.g., car, pedestrian, bicycle) and bounding box adjustments. These predictions unveiled the identity and location of potential objects, much like unlocking the secrets of a hidden treasure.



**Confidence Scores:** Confidence scores were the marks of certainty. SSD calculated these scores for each predicted object, reflecting the likelihood that an anchor box contained a real object. It was the algorithm's intuition, discerning between true discoveries and false leads.



The inter-reader agreement and confidence score according to deep learning-based amyloid estimation results. The estimated results of the amyloid burden by deep learning were represented with the inter-reader agreement in 121 amyloid PET scans among 3 readers for the visual interpretation-only session (a) and visual interpretation with the deep learning-based estimation results (b). The estimated results were also represented with the confidence score for the visual interpretation-only session (c) and visual interpretation with the deep learning-based estimation results (d). The color indicates the agreement of the number of the same results among 3 readers (green: the same amyloid quantification among 3 readers, pink: the same amyloid quantification of 2 readers, and red: difference amyloid quantification among 3 readers (a, b). The colormap indicates the mean of confidence scores among 3 readers (c, d)

**Non-Maximum Suppression (NMS):** NMS was the final test, the crucible where predictions were refined. It was the process of eliminating duplicate or overlapping predictions, ensuring that only the most confident and relevant detections remained. NMS was the guardian of accuracy, separating genuine artifacts from mirages.



## Advantages of SSD:

**Efficiency:** SSD's single-pass design enables real-time object detection, making it suitable for time-sensitive tasks.

**Multi-scale Detection:** SSD's use of multiple feature maps allows it to detect objects of varying sizes effectively.

**Accuracy:** SSD excels in accurately identifying objects in complex scenes, enhancing its value in computer vision applications.

## Applications of SSD:

SSD's prowess was sought after in various domains. It found its place in **autonomous vehicles**, where it watched over the safety of passengers. In **surveillance systems**, it tirelessly scanned for threats. In facial recognition, it recognized friendly faces. Its versatility and accuracy made it an indispensable tool in the arsenal of computer vision.

In summary, SSD was an **efficient and accurate deep learning algorithm for object detection**. Its journey involved traversing multi-scale feature maps, deciphering anchor boxes, and revealing predictions with confidence. In the world of computer vision, SSD was a sentinel, guarding and uncovering the treasures hidden within images and video frames.

## **Electric Vehicles: Powering the Future:**

During my internship at BG Enterprises , I had the privilege of immersing myself in the captivating world of electric vehicles (EVs). This journey unveiled the remarkable potential of EVs to transform the future of transportation. I delved deep into the core components that underpin the EV revolution: batteries, motor controllers, and drivers.

As I explored these cutting-edge technologies, I gained insights into their critical roles in enhancing EV performance, efficiency, and sustainability. The knowledge I acquired extends beyond the theoretical; it encompasses hands-on experiences and a profound appreciation for the impact of EVs on reducing our carbon footprint and shaping a greener tomorrow.

My time at BG Enterprises allowed me to not only witness the evolution of the automotive industry but also to become an active participant in driving innovation towards a more sustainable and eco-friendly future through EV technology.

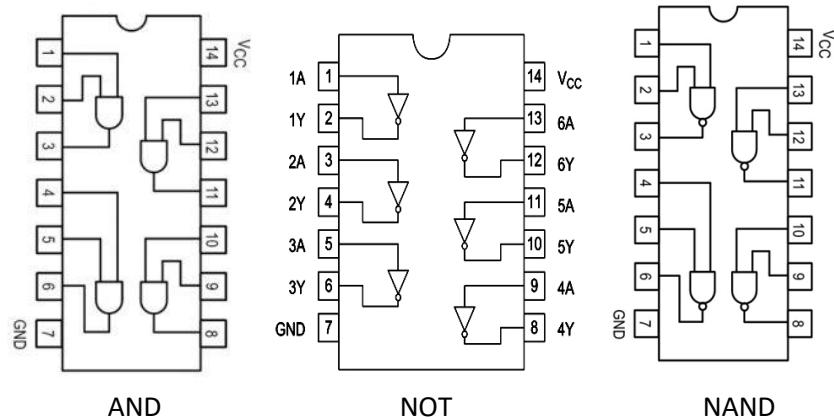
## **Projects:**

During my internship at BG Enterprises , I had the privilege of working on several projects that allowed me to apply my knowledge and gain hands-on experience in various technological domains. These projects showcased the practical applications of the concepts I learned and demonstrated the impact of technology on everyday life. Let's delve into the details of each project:

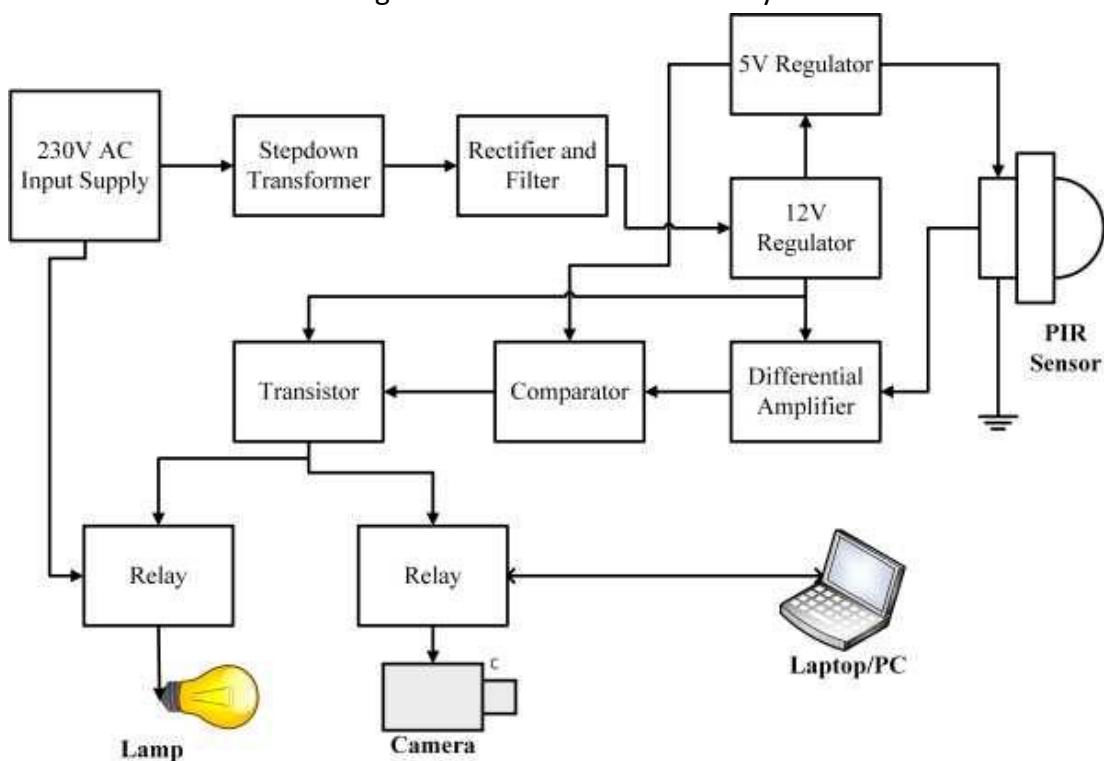
## Motion Detection Automation: Sensor-Powered Vigilance

**Overview:** The motion detection automation project was designed to enhance security and convenience. It featured a motion sensor system that detected environmental motion and triggered responses based on user-defined criteria.

**Components:** The core component was the motion sensor and logic gates (specifically the IC NOT, AND, NAND gates etc..) , which acted as the project's eyes and ears. Additionally, microcontrollers and relays were employed to execute actions in response to detected motion.



**Working:** The motion sensor continuously monitored its surroundings. When motion was detected, it sent a signal to the microcontroller, which, in turn, activated the relevant relay. This relay-controlled various actions, such as turning on lights, sounding alarms, or sending alerts to the user's smartphone. This project illustrated how sensor data integration could enhance security and automation.

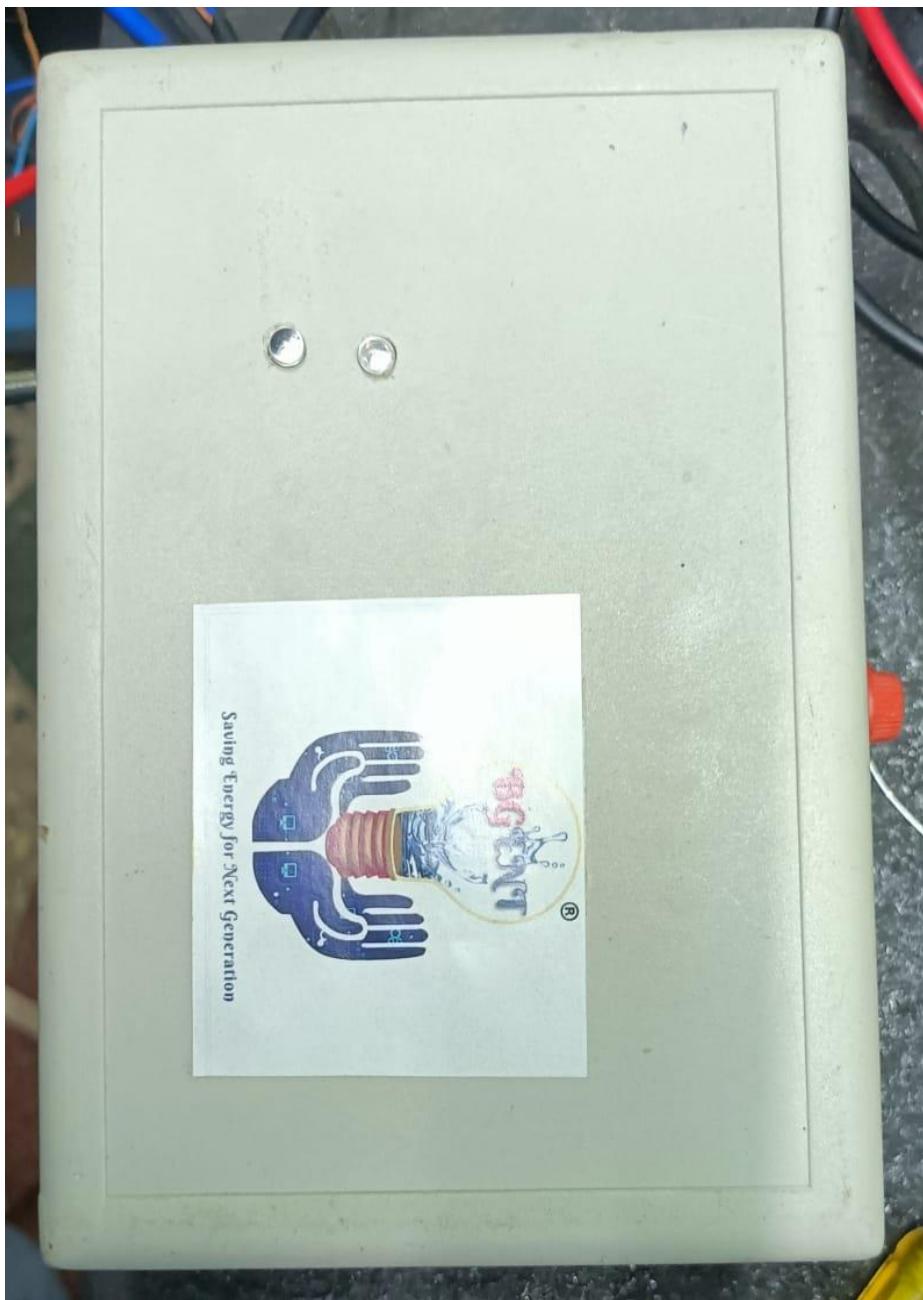


## Water Level Monitoring System: Efficient Resource Management

**Overview:** The water level monitoring system was designed to optimize water resource management by automating the detection and control of water levels in a reservoir or tank.

**Components:** The project relied on water level sensors such as Float Sensor, microcontrollers, and control mechanisms. These components collaborated to maintain water levels within predefined limits.

**Working:** Water level sensors were strategically placed within the reservoir to monitor water levels. When the water level approached a predefined threshold, the sensors sent data to the microcontroller. The microcontroller then activated control mechanisms, such as valves or pumps, to regulate the water level. This project showcased the practical application of technology in resource conservation.



These are the few projects exemplify how technology can be harnessed to **enhance security, automation, and resource management in various contexts**. They provided me with valuable insights into the practical implementation of electronics and IoT concepts, reinforcing the significance of these technologies in our modern world.

### **Conclusion:**

My internship at BG Enterprises was a valuable journey filled with exciting challenges and discoveries. Each day presented new opportunities to learn and grow, fostering my development into a tech-savvy individual. As I conclude this internship, I leave with not only experiences but also a renewed enthusiasm to continue exploring the limitless possibilities that the world of technology offers. I once again thankful for my Parents for supporting , and I am sincerely grateful to the BG Enterprises team for providing me this invaluable opportunity to work with them.