



GREEN UNIVERSITY OF BANGLADESH

Industrial Training
On
A Working Understanding of Machine Learning & Deep Learning

Submitted by
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An industrial training report submitted to the Department of Computer Science & Engineering for the partial fulfillment of the degree of Bachelor of Science in Computer Science & Engineering

TRAINING PLACE :	Unicorn Software and Solutions Sonargaon Janapath Road, Uttara Dhaka- 1230
TRAINING DURATION :	18 September 2023 to 26 October 2023
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REPORT DATE :	07 March 2024

Declaration

I sincerely thank everyone who gave me the chance to finish this **internship report on Machine Learning, Development, and Hosting**, which I have turned into the Green University of Bangladesh (GUB). It is an account of the original work we completed with **Ms. Abida Sultana's** assistance, and it was not completed in order to receive credit toward any degree or similar project.

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Certificate

This is to certify that the industrial training report entitled A Working Understanding of Machine Learning & Deep Learning has been prepared and submitted by **Estiak Hasan Emon** in partial fulfillment of the requirement for the degree of Bachelor of Science in Computer Science and Engineering on 07 March 2024.

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I would like to thank from the core of my heart several people who had helped me and guided me throughout the whole training period from 18th September 2023 until 26th October 2023. With guidance and support from them, the training is completed successfully especially when I faced any problems. First of all, I would like to thank my faculty supervisor, **Ms. Abida Sultana (Lecturer)** who was always there whenever I need help. She always supports me in my internship. Then, I would like to thank my industrial supervisor, **Kamrul Hasan (Software Engineer) (Dohatec New Media)** guidance and advice to solve my queries and doubts during my internship period who had been guiding me since my first day of training. He was very friendly to share the experience that he gathered, ML fields, IT knowledge, and skills about the latest technology and corporate culture. During my training period, I faced many problems and he lost his valuable time to help me and help my problems. Finally, I would like to thank Allah, my parents, and my family members who always give me mental support, financial support, and so on. To easily complete the training period they encouraged me and also motivated me when I'm facing any problems.

Abstract

During this industrial training at Unicorn Software and Solutions, I worked as an Machine Learning intern. During this training period, I was engaged in many of the services here. My objective for my machine learning internship was to investigate and utilize diverse algorithms and methodologies to tackle practical issues related to data analysis and forecasting. I worked on a variety of projects including classification, regression, clustering, and natural language processing problems by interacting with knowledgeable mentors and academics. By utilizing Python libraries like scikit-learn and TensorFlow, I was able to obtain practical expertise in model creation, optimization, and assessment. To guarantee reliable and understandable findings, I also actively took part in feature engineering, data preprocessing, and model interpretation. I gained a deeper understanding of machine learning ideas, improved my problem-solving abilities, and participated in significant projects with applications in a variety of fields thanks to this internship.

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Chapter 1

Introduction

1.1 Introduction

Well-known for its distinctive solutions and top-notch services, Unicorn Software Company is a ML & software development firm. Organizations seeking Machine learning, and mobile application development services, as well as bespoke software development, have come to rely on Unicorn as a reliable and trustworthy partner. The company is proud of its highly skilled workforce, which consists of people with a strong drive to deliver excellent results and a solid understanding of technology. To accurately and effectively satisfy clients' needs, Unicorn's skilled engineers, designers, and project managers work together. Businesses in the financial, healthcare, e-commerce, and educational sectors are part of Unicorn's portfolio. The company uses the newest technology and follows industry best practices to continuously provide innovative and cutting-edge solutions tailored to specific business needs. With its client-centric approach, Unicorn prioritizes the objectives, challenges, and vision of its clients. Because of this, they are able to provide complete and customized software solutions that foster development, increase productivity, and improve user experiences. Unicorn is committed to quality even after the project is finished. The company is dedicated to providing outstanding customer service and fostering enduring relationships with its clients. Unicorn provides ongoing maintenance, upgrades, and enhancements to ensure that its solutions are robust, secure, and compliant with evolving business requirements. Leading the software

development industry, Unicorn Software Company offers a wide range of services and products to help companies succeed in the digital era. With its experience, passion, and dedication to customer satisfaction, Unicorn continues to have a significant impact on the industry and propel innovation forward.

I was working as an intern in the machine learning industry here. All things considered, internships offer a unique chance for individuals to get practical experience, depend their understanding of their field of interest, and establish the foundation for future success in the workplace.

1.2 Motivation of Training

Although the motivations behind each person's desire to seek an internship will vary, the following are some common ones:

- **Professional Development:** Internships provide an opportunity to refine professional skills relevant to a particular industry or business.
- **Career Exploration:** Internships offer a great chance to learn about other industries and career paths.
- **Networking:** Through internships, we are able to meet people in the business or employment industry and build professional networks.
- **Resume Enhancement:** Relevant internship experience can make a big difference on a resume.
- **Skill Development:** We can learn new skills and cultivate talents that employers are looking for through internships.
- **Potential Job Offers:** A lot of internships serve as a launching pad for future job opportunities. Businesses often select exceptional interns who have exceptional talents, dedication, and cultural fit.

1.3 Objective of training

Already I said that I am doing an internship in the Machine Learning sector. Depending on a person's individual goals and aspirations, the goal of a ML internship can change.

- To explore my knowledge at the industry level.
- To understand industry-level working.
- To understand and try to solve real-world problems.
- To acquire different types of skills and knowledge.
- To adapt industry-level technologies and also adopt new technologies.
- To know about industry-level ethics and engineering role.
- To create career opportunities.

1.4 Identifying the gap between academia and industry

The discrepancies or differences between the knowledge, skills, and behaviors that are valued in academic settings and those that are necessary in real-world industry settings are known as the gap between industry and academia. This discrepancy has several causes, including:

- **Practical Application:** Academic education typically lays a larger focus on theoretical understanding and fundamental ideas, even if industry demands practical application and hands-on skills. Academic programs may not fully equip students with the practical experience necessary to handle problems in the industry, even while they provide a solid theoretical foundation.
- **Pace of Change:** Industries are always evolving due to consumer demands, evolving trends, and technological advancements. However, it may take more time to update academic curricula to reflect the most recent developments in the field.

- **Industry-Specific Tools and Technologies :** The industry may use particular techniques, processes, and technologies that aren't often included in academic degrees. In order to bridge the knowledge gap, graduates may need additional training or independent study because they may not be familiar with the tools and technologies that are frequently used in the industry.
- **Collaboration and Teamwork :** In professional settings, where people work together to achieve common goals, strong cooperation and collaboration abilities are usually required. Conversely, academic environments could place more emphasis on each student's performance and assessment.

1.5 Layout of Report

Chapter 2: Company Profile

This chapter provides an overview of the organization where I am interning.

1.6 Conclusion

Overall, I benefit greatly from an internship. I can use it to investigate what they know. From it, I can select their career.

Chapter 2

Organization Overview

2.1 Introduction

Many companies provide BPO (business process outsourcing), machine learning, and IT services. Unicorn Software Limited is an example of this kind of business. Unicorn Software Limited is a multinational provider of information technology, business process, and consulting services, with its headquarters located in Khulna, Bangladesh. Since its establishment in 2005, the company has grown to become one of the biggest and most respected global suppliers of IT services. Numerous IT services are offered by Unicorn, such as cloud computing, analytics, cyber security, application development and maintenance, and infrastructure management. The company also provides BPO services, including outsourcing for human resources, finance and accounting, and procurement. A wide range of industries, including manufacturing, financial services, healthcare, and retail, make up Unicorn's customers. The company has operations in over three countries and employs over 200 diverse people, demonstrating its global reach. Offering innovative solutions that advance its business goals and foster growth, Unicorn aims to be a dependable partner for its clients. Among the fundamental principles that guide the organization's choices and activities are integrity, client focus, excellence, and teamwork. A reputable and well-known organization, Unicorn offers a comprehensive variety of IT and BPO services to companies worldwide.

2.2 Office Address's

Corporate Office:

12 (6th Floor), Sonargaon Janapath Road

Sector- 11, Uttara Dhaka- 1230

Dhaka Division, Bangladesh

Phone : +8801712771878

Fax : +8802 8878906

Email : info@unicornsoftwarebd.com

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Phone: +8801700701145

Email: unicorn.hr@gmail.com

Sales Office:

Road- 24, House- 474, Nirala R/A

Khulna Sadar, Khulna- 9207

Phone : +8801367890975

Fax : +8802 8878204

Email : sales@unicornsoftwarebd.com

2.3 Location

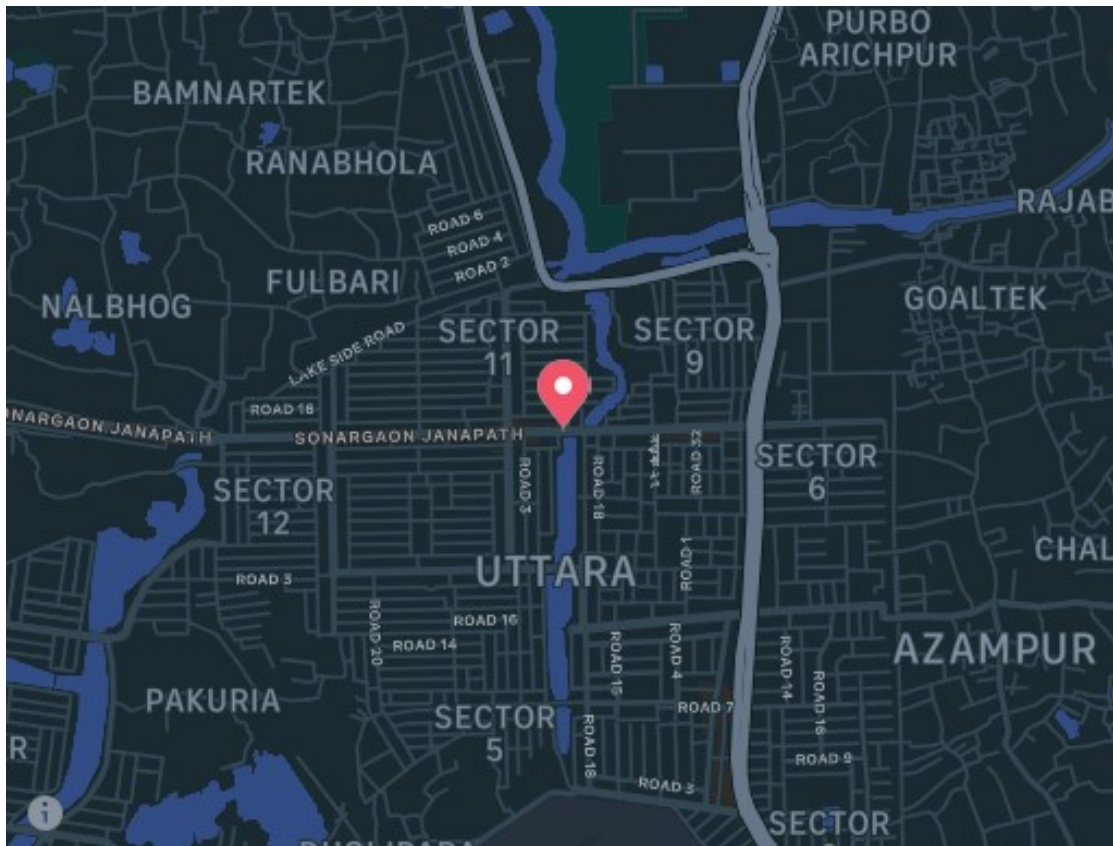


Figure 2.1: Unicorn Software and Solutions

2.4 Company Profile

Founded in 2005, Unicorn Software and Solutions has emerged as a dominant force in the dynamic Machine learning and tech sector. Thanks to its talented staff of specialists who always aim for excellence, the company has built a solid reputation for producing superior software products and bespoke solutions, as well as for offering outstanding support that goes above and beyond for customers. Our extensive portfolio highlights our adaptability and experience in managing various business needs and shows our ability to meet a wide range of client requirements across multiple industries. The dynamic and creative Unicorn Software Company specializes in developing software solutions that are state-of-the-art to meet the evolving needs of enterprises. With a focus on client

pleasure, Unicorn offers a wide range of services, such as Machine learning Mobile application development and bespoke software development. Our highly skilled staff members are dedicated to being at the forefront of technology advancements and applying industry best practices to create reliable, scalable solutions. We take pride in our ability to identify the unique demands of each of our clients and transform them into software solutions that are both functional and easy to use. having a varied portfolio that includes investments in industries including banking, healthcare, e-commerce, and education. We have a strong track record of meeting deadlines and budgets while producing excellent work. At Unicorn, we value building enduring connections with our clients and ensuring that their software solutions remain safe, reliable, and adaptable through ongoing support and maintenance. We stand out in the crowded field of software development because of our dedication to quality and innovation.

2.5 The Services of Unicorn

Offering a broad range of services that are specifically designed to meet the changing needs of the digital age, Unicorn Software and Solutions excels in this area. We provide a broad range of crucial services to firms hoping to thrive in the cutthroat business world of today. I'm going to go over each service now. To satisfy the various needs of organizations, Unicorn offers a broad range of services. The services offered by Unicorn encompass several aspects of software development and design, with an emphasis on producing solutions of superior quality. The following are Unicorn's primary offerings:

- **Development of Personalized Software:** Unicorn specializes in creating unique software solutions that are tailored to meet each client's unique requirements. The development team at Unicorn offers robust, scalable, and user-friendly software solutions, ranging from enterprise level apps to web and mobile apps, by fusing the newest technology with industry best practices.
- **Web Development:** Websites that are feature-rich, aesthetically pleasing, and responsive are Unicorn's specialty. The web development team at Unicorn com-

bines design and functionality to provide smooth online experiences, whether the project is a content management system, e-commerce platform, or business website.

- **Mobile Application Development:** For iOS and Android mobile platforms, Unicorn develops native and cross-platform apps. The aim of these mobile applications is to enhance user engagement, increase accessibility, and provide user-friendly experiences across multiple industries.
- **Machine Learning:** Unicorn offers machine learning services that include computer vision, natural language processing, recommender systems, predictive analytics, and other complete solutions suited to a variety of sectors. Unicorn offers machine learning solutions that are scalable and customized, with an emphasis on innovation and cutting-edge technology, to enhance corporate growth, drive insights, and optimize processes.
- **UI/UX Design:** The goal of Unicorn's design team is to create compelling user experiences and excellent user interfaces. Using state-of-the-art design tools and techniques, extensive user research, and user-centered design concepts, they build visually beautiful and user-friendly interfaces that optimize user satisfaction.
- **Testing and Quality Assurance:** Unicorn stresses the value of testing and quality assurance in ensuring that software solutions fulfill the highest requirements. The QA team uses thorough testing and quality control methods to identify and resolve any potential problems, guaranteeing that the finished product is dependable, effective, and free of errors.
- **Administration and Assistance:** Administration and Assistance In order to ensure the uninterrupted functionality of the software solutions, Unicorn offers ongoing maintenance and support services. This covers routine updates, security enhancements, bug fixes, and technical assistance for any problems that could occur.
- **IT solutions and Consulting:** In order to help businesses evaluate their technological needs, create winning strategies, and enhance their IT infrastructure, Unicorn

provides consultancy services. This includes the deployment of IT solutions, technological recommendations, and analysis of IT systems.

In the software development industry, Unicorn stands out for their commitment to quality, client satisfaction, and innovative solutions. Unicorn provides services to businesses of all kinds, helping them to use technology to further their growth and success.

2.5.1 Educational Institute Management System

UEIMS offers cutting-edge features that are aesthetically pleasing and optimized to optimize the functioning of your educational establishment.

The management of an educational institution is made much easier and more flexible by the Unicorn educational institution management system, which is a well-organized and efficient system that includes features like student attendance, student information, teacher information, education delivery, registration, human resource management, consulting, management, and reporting services. This method is an excellent way for parents, kids, instructors, and administrative officers to collaborate and communicate with one another.

2.5.2 Custom Software Development

Unicorn Software and Solutions specializes in creating custom software solutions that are matched to each business's particular requirements and obstacles. Our strategy entails gaining a deep comprehension of the objectives, challenges, and daily operations of our clients. Our specialized software development team guarantees the development of applications that are scalable, effective, and easy to use by utilizing state-of-the-art technology and industry best practices. We work together with our clients to produce solutions that not only meet but beyond their expectations, from conception to deployment.

2.5.3 Machine Learning Field

Leading machine learning startup Unicorn Software and Solutions recently revealed their most current advancement in natural language processing, using sophisticated deep learning methods to reach sentiment analysis accuracy never before seen. Major IT companies have taken notice of their novel approach and have formed strategic alliances with them in order to incorporate their technology into a variety of applications, from social media monitoring tools to chatbots for customer care. Furthermore, Unicorn Software has increased the scope of its computer vision research, developing novel picture recognition algorithms with uses in self-driving cars and medical diagnostics. The company continues to be at the forefront of AI innovation, with an expanding staff of elite researchers and engineers, ready to transform industries with their state-of-the-art solutions. Because of its dedication to pushing the limits of machine learning, Unicorn Software and Solutions has been able to draw in investors and raise a sizable sum of money to support its ongoing development and growth into new markets.

2.5.4 Web Development

Leading the way in web creation, Unicorn Software and Solutions creates dynamic, flexible websites that support clients' business goals. Our talented group of architects, designers, and developers works together to produce online platforms that are both aesthetically pleasing and well-built. Whether it's a sophisticated web application, corporate portal, or e-commerce site, we use the newest technology to guarantee optimum scalability, security, and speed.

2.5.5 Cloud Solutions

Businesses are moving more and more to the cloud, and Unicorn Software and Solutions offers strategic cloud solutions that are suited to certain organizational requirements. Our skills include building strong data security, optimizing infrastructure for performance and economy, and launching apps on well-known cloud platforms. Whether customers need platform as a service (PaaS), infrastructure as a service (IaaS), or cloud

migration, our cloud solutions enable companies to grow, innovate, and streamline their processes.

2.5.6 User Experience (UX) Design

Prioritizing the user experience is key to our design philosophy. In order to increase user engagement, Unicorn Software and Solutions places a high priority on developing user-friendly and aesthetically pleasing interfaces. In-depth research, user testing, and iterative prototyping are all carried out by our UX design team to make sure that the final product not only satisfies functional needs but also offers end users a smooth and enjoyable experience. We think that great user experiences have the transforming potential to increase client happiness and loyalty.

2.5.7 BPO Solution

- **Customer Analytic:** With the use of customer analytic services, businesses can gain a deeper understanding of their customers' feedback and behavioral patterns. Users can create reports and visualizations using this data to present their findings.
- **Customer Interaction Services:** Customer service, incoming and outgoing calls, collections and retention, product support, and quality assessment are all included in this service area.
- **Back Office Services:** They provide back office services, including as transaction processing, document management, HR outsourcing, and finance and accounting.
- **Solution/ Application:** Call Center Solution, Complaint Management System (CMS), and Customer Relationship Management (CRM) are some of the application services and solutions offered.
- **Non-Voice/Digital Engagement Platform:** The Non-voice/Digital Engagement platform includes Complaint Management Services, Digital Marketing E-Commerce, Social Media Management, and Transaction Processing.

2.5.8 Training

Unicorn is a private training company that specializes in providing exceptional career-oriented training programs and support services for knowledgeable professionals working in corporate settings. Thus far, we have trained twenty youth in various IT sectors.

- **ICT Training:** Unicorn Software Limited is one of the biggest and most respected ICT training providers in Bangladesh. They provide training in various IT, ICT, and machine learning courses. They use a sizable number of vendor-certified instructors, including CCNA, CCNW, MCSA, MCITP, RHCE, and others, to teach their courses. A selection of Unicorn's IT/ICT and ML training courses are as follows:
 - Microsoft Office Specialists' Program.
 - Basic Programming Language Course (C/C++).
 - Specialized programming course in Python Language.
 - Microsoft Visual Studio 2010 Specialists' Program.
 - Basic Deep Learning Algorithm.
 - Basic HTML, CSS, PHP.
 - Data Aggregation and Validation.
 - Data Quality Assurance.
 - Digital Image Processing and OCR.
- **Corporate Training** Their business training programs are dedicated to an excellence concept and offer comprehensive solutions. Among their corporate training techniques are:
 - Image Recognition and Computer Vision.
 - Natural Language Processing (NLP).
 - Tailored Education for Particular Uses.

2.5.9 Tech Solution

Any type of IT/ITES and ML program can be planned, designed, implemented, and carried out by Unicorn's highly qualified and knowledgeable team of tech wizards.

- **Data Analytics and AI:** Our data analytics and AI services help businesses use data and analytics to create new revenue streams and business models while preserving the security, quality, and regulatory compliance of the data. With the help of our data, analytics, and AI services, users can access processes that are more adaptable and clear, allowing businesses to provide value throughout the customer experience. Our technologies facilitate process automation and augmented intelligence in addition to improved decision-making. Technologies like machine learning (ML), artificial intelligence (AI), and advanced analytics support these solutions.
- **Web and UI Development:** Unique user interfaces (UI) and bespoke web pages are created by Unicorn utilizing a range of platforms and technologies, including ASP.NET, HTML5/JavaScript, and Ruby on Rails.
- **Mobile App Development:** I develop highly customized mobile applications that are suited to certain requirements. For each of the three primary mobile operating systems-iOS, android, and Windows-it comprises developing a special mobile application.
- **SQL BI Solutions:** My goal is to assist their clients in overcoming the numerous challenges associated with creating and executing intricate SQL BI solutions, including the integration of such solutions with their present systems and tools.
- **Chat bots:** As organizations strive to deliver the best customer experience (CX), more and more are turning to automated chatbots for customer support across all channels. Chatbots are predicted to handle up to 85 percent of customer service interactions by 2020. As you offer self-service choices to your clients, make sure they receive the greatest possible customer experience.

2.6 The organizational structure of Unicorn Technologies Ltd.

Unicorn Software & Solutions is renowned for its painstakingly constructed organizational structure, which places a strong emphasis on fostering teamwork, stimulating creativity, and enhancing productivity at every turn. The organization comprises diverse specialist teams that focus on distinct phases of the software development life-cycle. These teams collaborate well to guarantee the seamless completion of projects. Establishing transparent channels of communication and fostering a proactive culture of continuous improvement are two areas of great importance inside our firm. With each project delivery, this targeted strategy enables us to consistently exceed the high standards set by our esteemed clients. The departmental organizational structure of Unicorn Software Ltd. is hierarchical in nature, comprising:

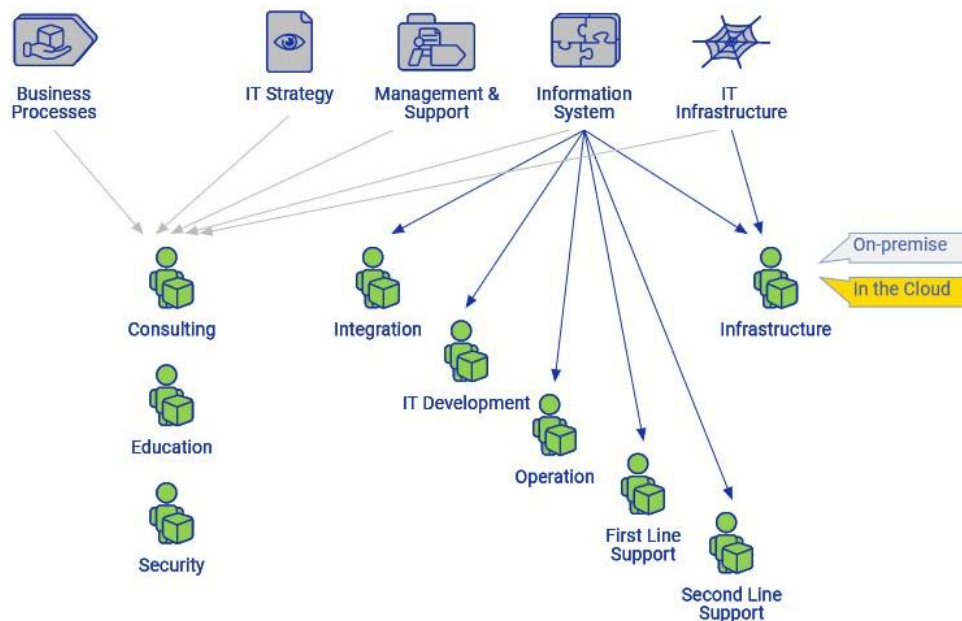


Figure 2.2: Unicorn Software and Solutions Organizational Structure

- **Executive Management:** The executive management team is made up of the CEO, CFO, CBO, and other senior executives. They are in charge of making all

business management decisions, including financial management, strategic planning, and decision-making.

- **Sales and Marketing:** The sales and marketing section is responsible for promoting and selling the company's products and services to clients. This department is in charge of developing new business opportunities, creating relationships with customers, and creating and implementing marketing strategies.
- **Operations:** The operations department oversees all aspects of the company's daily operations, including quality control, resource management, and project management.
- **Human Resources:** Managing the company's human resources, including hiring, training, performance reviews, and employee relations, falls within the purview of the HR department.
- **Finance and Accounting:** The Finance and Accounting department oversees all of the company's financial operations, including budgeting, financial planning, accounting, and reporting.
- **Information Technology:** The information technology division is in charge of overseeing the organization's hardware, software, and networking infrastructure. This section additionally provides IT help to the company's clients.
- **Research and Development:** The task of developing new products and services and improving those that are already on the market falls to the Department of Research and Development. This division is also responsible for research and keeping up with emerging technologies and market trends.

Unicorn Software and Solutions' hierarchical organizational structure consists of the executive management, sales and marketing, operations, human resources, finance and accounting, information technology, and research and development divisions. The company can efficiently manage its operations and offer its clients top-notch IT services and solutions thanks to its organizational structure.

2.7 Solution Provider

We use our skills, knowledge, and resources to foresee challenges and dangers. In addition, we generate concepts, recognize issues, create solutions, and create the inconceivable by providing risk management, security, and IT solutions, among other things. Many businesses who want to enhance their experiences work with us.

- IT Solution
- Security Solution
- Fin-tech Solution
- Risk Management
- Quality Assurance

2.8 The Mission of Unicorn Software and Solutions

With its cutting-edge technologies and innovative approach, Unicorn Software and Solutions has become Bangladesh's leading provider of information technology. The company's goal is to provide clients with cutting-edge solutions so they may grow their businesses and accomplish their goals.

The goal of Unicorn is to enable companies by providing cutting-edge software solutions that promote expansion, effectiveness, and success. Unicorn is dedicated to providing clients with outstanding value by fusing state-of-the-art technology, industry knowledge, and a client-focused methodology.

- Client Success: The core of Unicorn's objective is its clients' success. They put a lot of effort into understanding the specific goals, challenges, and needs of each of their clients in order to offer tailored solutions that satisfy their particular objectives. Unicorn offers robust software solutions to its clients in an effort to facilitate their growth and achieve mutual success.

- **Customer Satisfaction:** Delivering the best IT products and services possible to ensure client happiness and steadfast devotion.
- **Innovation and Excellence:** Unicorn is dedicated to staying at the forefront of both industry standard operating practices and technological advancements. To develop innovative and effective software solutions, they continuously investigate novel methodologies, technological advancements, and emerging trends. Unicorn pushes team members to go beyond expectations in order to consistently exceed client expectations.
- **Collaboration and Partnerships:** Unicorn is dedicated to creating long-lasting partnerships with its customers. They put great importance on sincere communication, working as a team, and having in-depth knowledge of the sectors they serve. With its clients, Unicorn aims to establish alliances based on open communication, trust, and mutual advancement.
- **User-Centered Design:** Unicorn holds the principles of user-centered design in the highest regard. They understand how important it is to create user-friendly interfaces that improve experiences. Unicorn employs design thinking techniques, usability testing, and user research to ensure that their products are not only useful but also enjoyable to use.
- **Continuous Improvement:** Unicorn is committed to continuous learning and progress. They evaluate their business, appreciate feedback, and search for methods to make their products better. Unicorn continuously innovates and adapts to market shifts to ensure that they remain in the forefront of the software development industry.

In general, Unicorn's goals are to empower companies with cutting-edge software solutions, cultivate client success, encourage teamwork, deliver quality, give top priority to user-centered design, and enhance their offerings on a constant basis. Unicorn seeks to positively influence the companies it works with and support their long-term expansion and prosperity by living up to these values.

2.9 The Vision of Unicorn Software and Solutions

The vision of Unicorn is to be a preeminent worldwide supplier of revolutionary software solutions, distinguished by outstanding quality, creativity, and customer satisfaction. In the future, according to Unicorn, companies in all sectors will use technology to accomplish their objectives, increase productivity, and maintain their competitive edge in a digital environment that is changing quickly.

- **Technological Leadership:** Being at the forefront of technological innovation is Unicorn's goal. They see themselves as a client's go-to advisor, giving them advice on the newest advancements in technology, fresh fashions, and industry best practices. Unicorn continuously invests in research and development in an effort to drive technological advancement and shape the path of software solutions.
- **Impact Solutions:** Unicorn wants to provide software solutions that have a big impact on businesses. In addition to meeting their clients' immediate needs, they strive to create solutions that offer them a competitive edge and long-term success. Unicorn aspires to be a major help to businesses in conquering challenges, optimizing workflows, and accomplishing their strategic objectives.
- **Global Reach and Collaboration:** Unicorn aspires to be the trusted advisor and go-to partner for its clients. They wish to establish long-lasting relationships built on honesty, reliability, and excellence in service. When providing solutions that are specifically tailored to fit the needs of its clients, Unicorn goes out of its way to completely understand their objectives, problems, and enterprises. Unicorn aspires to be its customers' go-to source for software solutions as well as a knowledgeable and reliable partner.
- **Positive Impact on Society:** Unicorn's objectives extend beyond financial success. Their goal in working is to positively impact society. Unicorn aims to produce software solutions that improve people's lives, boost sustainable development, and encourage social change. They aim to employ technology for the

good of society, whether in the realms of healthcare, education, environmental sustainability, or other important social fields.

The vision of Unicorn is to lead the world in innovative software solutions that improve customer satisfaction, innovation, and societal impact. With an emphasis on social responsibility, worldwide collaboration, technological leadership, impactful solutions, and reliable relationships, Unicorn hopes to influence the direction of software development and significantly improve the companies and communities they work with.

2.10 The Value of Unicorn Software and Solutions

Unicorn's values delineate the fundamental concepts and beliefs that steer the organization's actions, choices, and interactions with customers, staff members, and the broader community. These principles are a reflection of Unicorn's dedication, professionalism, and ethical standards. These are Unicorn's core principles:

- **Client Satisfaction:** At Unicorn, client happiness is our first priority. They are committed to understanding client needs, exceeding client expectations, and offering them solutions that genuinely enhance their businesses. With its clients, Unicorn hopes to build enduring connections via excellent service, openness, and trust.
- **Innovation:** Unicorn regards innovation as a critical component of their success. They promote a culture of creativity, investigation, and ongoing improvement. By being abreast of emerging technologies and trends, Unicorn aims to deliver innovative solutions that address shifting company needs and yield game-changing outcomes.
- **Excellence:** Unicorn maintains an extremely high bar for quality in all facets of their business. They always seek to improve and never give up in order to deliver the best possible answers. The experts at Unicorn are committed to giving clients the best results possible, have a strong work ethic, and pay great attention to detail.

- **Integrity and Ethics:** Unicorn maintains moral principles and does business with the utmost integrity. Sincerity, transparency, and accountability in all interactions are valued. In addition to maintaining stringent secrecy, Unicorn takes the highest care and duty to safeguard client data and intellectual property.
- **Collaboration and Teamwork:** Unicorn fosters an inclusive and collaborative work environment. They firmly believe in the benefits of teamwork and the synergy it creates. Unicorn facilitates open communication, knowledge sharing, and teamwork among team members to enable exceptional outcomes.

All things considered, Unicorn's DNA is shaped by these values, which also influence how they deal with clients, partners, their staff, and the community at large. By following these principles, Unicorn hopes to make a long-lasting difference and keep its standing as a reputable and trustworthy leader in the software development sector.

2.11 Methodology

Unicorn employs a methodical and planned approach to guarantee the effective completion of software development projects. This process covers a number of phases, from preliminary planning to ultimate deployment and upkeep. The process starts with a thorough examination of the project's scope, corporate goals, and customer needs. To fully comprehend the intended results, this step entails in-depth talks and consultations. Unicorn enters the design phase after requirements are established, at which time wireframes, prototypes, and user interfaces are produced. In order to guarantee clear and aesthetically pleasing solutions, this step places a strong emphasis on usability testing and user-centered design concepts. Following the acceptance of the design, Unicorn's skilled development team uses agile development approaches to start the development process. To ensure transparency and progress monitoring, they divide the project into digestible pieces, establish reasonable deadlines, and work closely with clients throughout. Unicorn adheres to stringent quality control procedures all through the development process. This entails thorough testing at different phases to find and fix

any problems or bugs. Unicorn moves forward with deployment and implementation after development is finished. They offer users training as needed and offer complete support during the changeover period. Following deployment, Unicorn is dedicated to providing continuous maintenance and support to keep the software solution current, safe, and effective. When necessary, they offer quick bug fixes, updates, and enhancements. Effective project management, honest communication, client collaboration, and meticulous attention to detail are all stressed in the Unicorn process. Through adherence to this methodical process, Unicorn guarantees the provision of customized software solutions that satisfy customers, propel company expansion, and provide enduring prosperity.

2.12 Conclusion

Unicorn Software and Solutions is to be a dependable and trustworthy partner for its clients. The company's goal is to give businesses the information and abilities they need to succeed in the digital age. The mission of Unicorn Software and Solutions is to establish itself as the go-to technology partner for customers looking to flourish in the quickly changing digital landscape by maintaining a dedication to quality, innovation, and moral business conduct. My internship experience served as the basis for writing this report. My internship in Machine learning support at Unicorn Software and Solutions Company is now complete. Being a support care Machine learning company, Unicorn Technologies Limited, distinct This place offers a variety of services. Help Care, the previously mentioned IT provider, is aware of every service. I wrote the report with this knowledge in mind.

Chapter 3

Specific Details on Training Activities and Report

3.1 Introduction

The teaching given throughout the five weeks of industrial training will be covered in more detail in this chapter. This will provide a brief summary of the steps involved in assembling the training.

An internship is a great way for a first-year graduate student to obtain experience handling real-world problems. Typically, an internship entails project work for a business. A child can learn academic stuff from school, but he also has to know how to deal with issues that come up in real life. A recent graduate student is likewise unfamiliar with the protocols of a respectable company's workplace. way colleagues communicate with one another at work. The concept of business ethics is also known to the students. An internship is a type of professional learning opportunity that gives students practical job experience related to their field of study or career interest. Through an internship, a student can carry out research, grow professionally, and pick up new skills. I began working as an intern in the machine learning section of Unicorn Software & Solutions on **September 18, 2023**. In charge of the department is **Kamrul Hasan**.

The department's departments include machine learning, networking, software, and the

web. Both networking assignments were given to me. This wing was further divided into two additional squads, one of which was assigned to handle system and network administration. On each new PC, the support staff must install the operating system and any necessary software. We respond quickly to any requests for help with computers. support can be of two types: remote support using Virtual Network Computing (VNC) or on-site help from a team member who is physically present at the user's location. This staff rarely has the ability to help by taking on the role of the user. Throughout my whole internship, I prioritized assistance and networking.

3.2 First Week

3.2.1 Completing HR formalities

My first day at Unicorn Software and Solutions was September 18, 2023. All companies have HR processes to complete before joining. Unicorn has certain HR requirements as well. Once HR formalities were finished, they introduced the member of my department.

3.2.2 Introducing

My senior presented me to every team member when I joined. I am also given an introduction to my AGM, Managers, and the machine learning team.

3.2.3 Visit all process

As I previously mentioned, Unicorn has a large number of departments and call centers. I visited each procedure and introduced myself on the second day. Healthcare, finance, retail, automotive, manufacturing, UML, MMBL, and other processes are among them.

3.2.4 Visiting Data Center

There are two enormous data centers owned by Unicorn. This type of data center was unfamiliar to me. Numerous switches, routers, servers, and different forms of connectivity are present. My seniors are assisting me in comprehending some of this data center's fundamental network connections.

3.2.5 Learning Some Basic Troubleshooting

In the context of machine learning, identifying and resolving technical problems that impact system performance is an essential first step in diagnosing computer problems. Typical issues include hardware issues, software defects, network connectivity, and security flaws. To fix these problems, one must have a thorough understanding of operating systems, networking protocols, and troubleshooting techniques. This can mean doing virus checks, updating programs, changing out faulty hardware parts, or keeping an eye on network configurations. It is essential to maintain a record of every troubleshooting activity in order to monitor development and prevent issues later on. In general, successful troubleshooting in a networking environment requires technical expertise, critical thinking, and attention to detail.

3.2.6 Solving PC Problem

Try to solve some basic PC problems:

- PC power problem.
- Internet connection problem.
- Keyboard-Mouse problem.
- Headphone connection problem.
- PC slow issue.
- RAM, Hard disk issue.

3.3 Second Week

3.3.1 Basic Python

Python requires a comprehension of basic ideas like variables, data types, and control structures like conditionals and loops. I also need to understand the fundamentals of input/output operations and how to define and call functions. Develop your program writing skills by starting with simpler tasks, working on more difficult ones, and utilizing Python's vast libraries for a range of applications.

3.3.2 Install Some Necessary Libraries

- a. **NumPy:** Install NumPy, type `pip install numpy` into a terminal or command line.
- b. **Pandas:** Utilize pip, the Python package installer, to install Pandas. Type `pip install pandas` into my terminal or command line. As an alternative, I can install Pandas by running `conda install pandas` if you're using Anaconda.
- c. **Matplotlib:** Install Matplotlib, do `pip install matplotlib` in the terminal or command line. Pip is a Python package installer. As an alternative, I can use `conda install matplotlib` to install Matplotlib if we're using Anaconda.
- d. **Seaborn:** Installing Seaborn using the Python package installer pip, I can install Seaborn by typing `pip install seaborn` into a terminal or command line.
- e. **TensorFlow:** Install TensorFlow, In my command line or terminal, I can type `pip install tensorflow` to utilize pip, the Python package installer.
- f. **PyTorch:** An open-source machine learning library with a focus on dynamic computation graphs and flexibility was created by Facebook's AI Research division.
- g. **XGBoost:** A popular library for supervised learning challenges in data science and machine learning contests that has been tuned for gradient boosting.

- h. **CatBoost:** A Yandex gradient boosting library that can handle big datasets with ease and is tailored for categorical features.
- i. **Natural Language Toolkit (NLTK):** A top platform for developing Python applications that interact with text in human languages; popular for jobs involving text analysis and natural language processing.
- j. **Scikit-learn:** A popular Python machine learning package that offers easy-to-use and effective capabilities for data mining and analysis.
- k. **OpenCV:** A popular open-source computer vision and machine learning software library for tasks like object detection and real-time image processing.

3.3.3 Classification- Identifying which category an object

Classification is the process of allocating an item or data point, according on its qualities or properties, to one of several predefined categories or classes. In order for a model to learn patterns and relationships between features and associated classes, it is usually trained on labeled data. Based on the properties of new, unseen data points, the model can reliably predict their class once it has been trained.

3.3.4 Project 01: Customer segmentation analysis product recommender system

It entails splitting up the client base into various groups according to shared characteristics like behavior, preferences, or demographics. This segmentation is used by a product recommender system to provide clients with tailored product or service recommendations depending on the features of their segment. Through customization of recommendations to particular consumer segments, companies can improve customer happiness and boost revenue.

3.3.5 Geo Location Exploration

- a. **Market Distribution:** We must process the geo dataset before we can examine the market location distribution.
- b. **E-commerce Platforms:** Personalized product recommendations based on customer segmentation information improve the user experience on e-commerce websites, increasing user happiness and conversion rates.
- c. **Retail Chains:** Use the system in physical retail chains to examine consumer behavior, inclinations, and demographics in order to facilitate more focused marketing campaigns and enhance in-store product placements for maximum sales.
- d. **Online Marketplaces:** By customizing product recommendations for each seller and buyer, you may increase the effectiveness of online marketplaces and build a more responsive, dynamic platform that meets a wide range of user needs.
- e. **Digital Marketing:** By using customer segmentation analytics to improve digital marketing strategies, companies can target particular consumer categories with ads and promotional activities, increasing the effectiveness of their marketing operations.
- f. **Healthcare Platforms:** Make health and well-being advice on healthcare platforms more tailored to each user's needs, interests, and lifestyle by using customer segmentation.

3.3.6 Promotion Timing

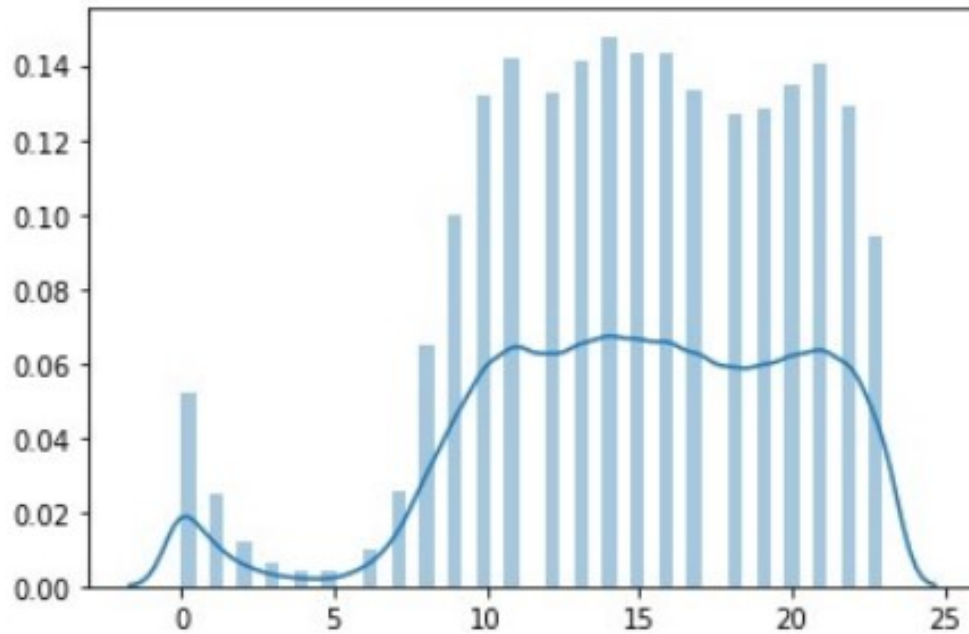


Figure 3.1: Best hour

As can be seen above, the majority of consumers buy goods from 10 a.m. till 22 p.m.

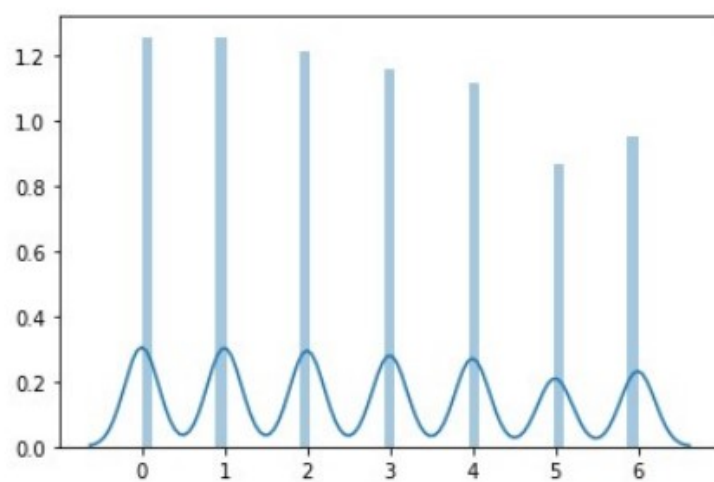


Figure 3.2: Best day

As we can see, Tuesday had the most purchases (1), followed by Monday with 0 purchases. Nevertheless, even on other days when sales are not very low, I advise against promoting things on Saturday (5) because it is the lowest.

3.3.7 Customer Behaviour Exploration

- a. **Best Customer:** In this case, offering rewards for any products purchased like points may entice customers to make additional purchases from your business and maintain their attention. This point can be exchanged for a discount or anything else that piques their interest.
- b. **Loyal Spender:** Similar to the preceding category, you can award points for specific purchases to keep customers spending money with you. By accumulating specific points, they might be classified in the top customer category.
- c. **Potential Loyal:** This type of consumer is one that makes frequent purchases and is new. I can award customers with points for each transaction to keep them spending money with you. They can move up to the loyal spender group with a specific point accumulation before becoming interested in a different business.
- d. **New Customer:** We don't truly comprehend the behavior of new customers. As a result, the business might advertise products that the client found interesting during a prior purchase.

3.3.8 Product Exploration

The project called Customer Segmentation Analysis and Product Recommender System entails a thorough evaluation of multiple important variables. client segmentation effectiveness is measured by factors like segment homogeneity and segment heterogeneity, which make sure that different client groups are clearly identified.

Total pool: 24,447 Products, 68,069 Customers, 31,931 Ratings given

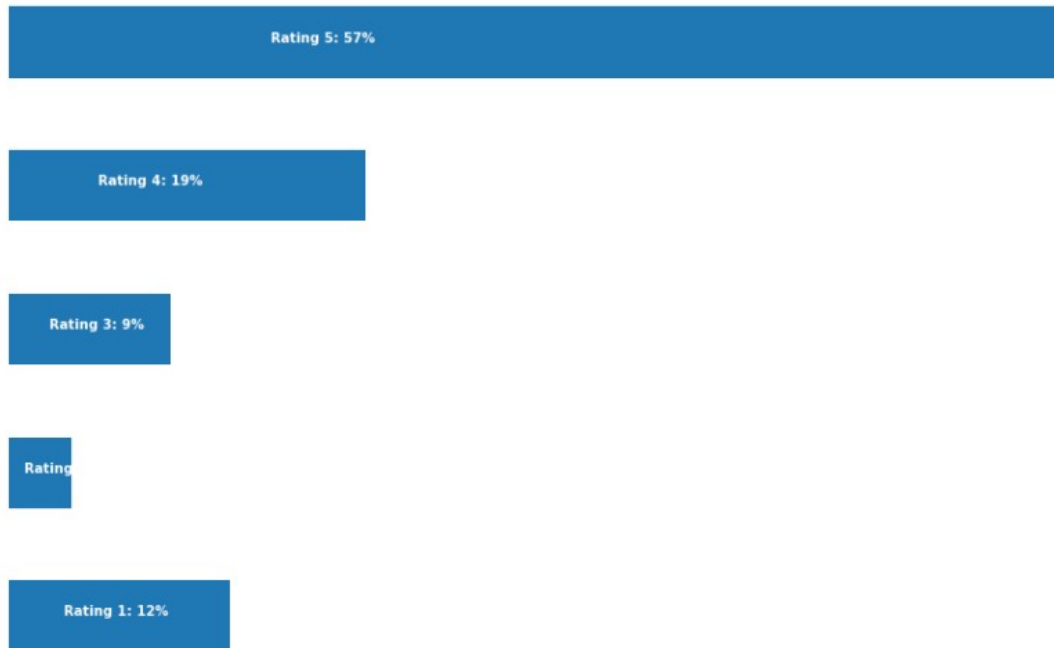


Figure 3.3: Popularity analysis review score

3.3.9 Delivery Exploration

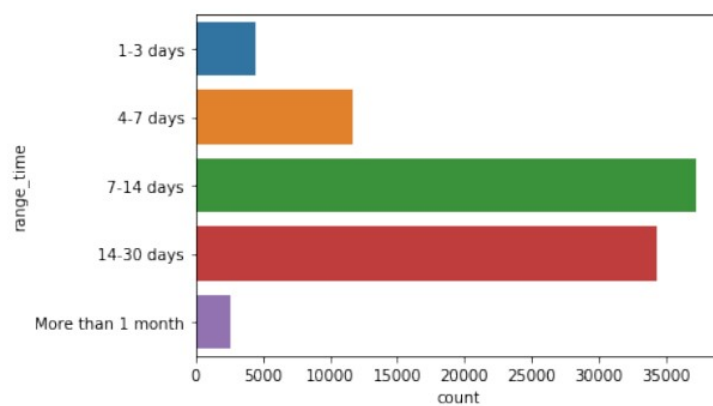


Figure 3.4: Early delivery exploration plotting

3.4 Third Week

3.4.1 Project 02: Handwritten Character Recognition With Neural Network

The process of transferring handwritten or printed text into digital format is called optical character recognition (OCR), or handwritten character recognition. It can be used for a wide range of tasks, including automatically processing forms, digitizing old records, and even helping those who are blind read printed materials.

3.4.2 Methodology

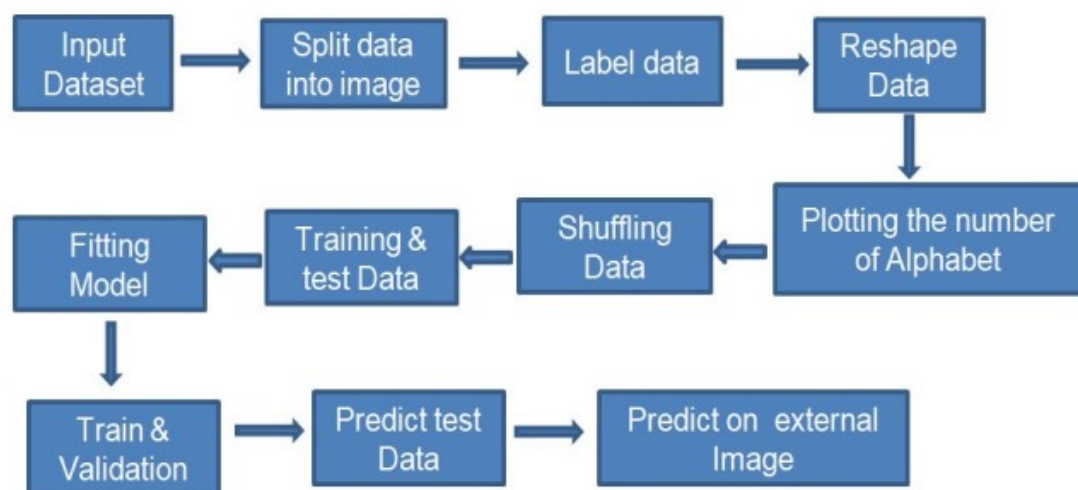


Figure 3.5: Methodology of handwritten character recognition

Enhancing the image's features through preprocessing, then extracting features to identify important patterns. These attributes are then used to train machine learning algorithms, including convolutional neural networks (CNNs), to effectively identify and recognize handwritten characters.

3.4.3 Predictions on Test Data

Using test data, a trained machine learning model is applied to unseen data to produce predictions or classifications based on identified patterns. By contrasting these predictions with the actual labels or results in the test dataset, the predictions' accuracy is assessed.

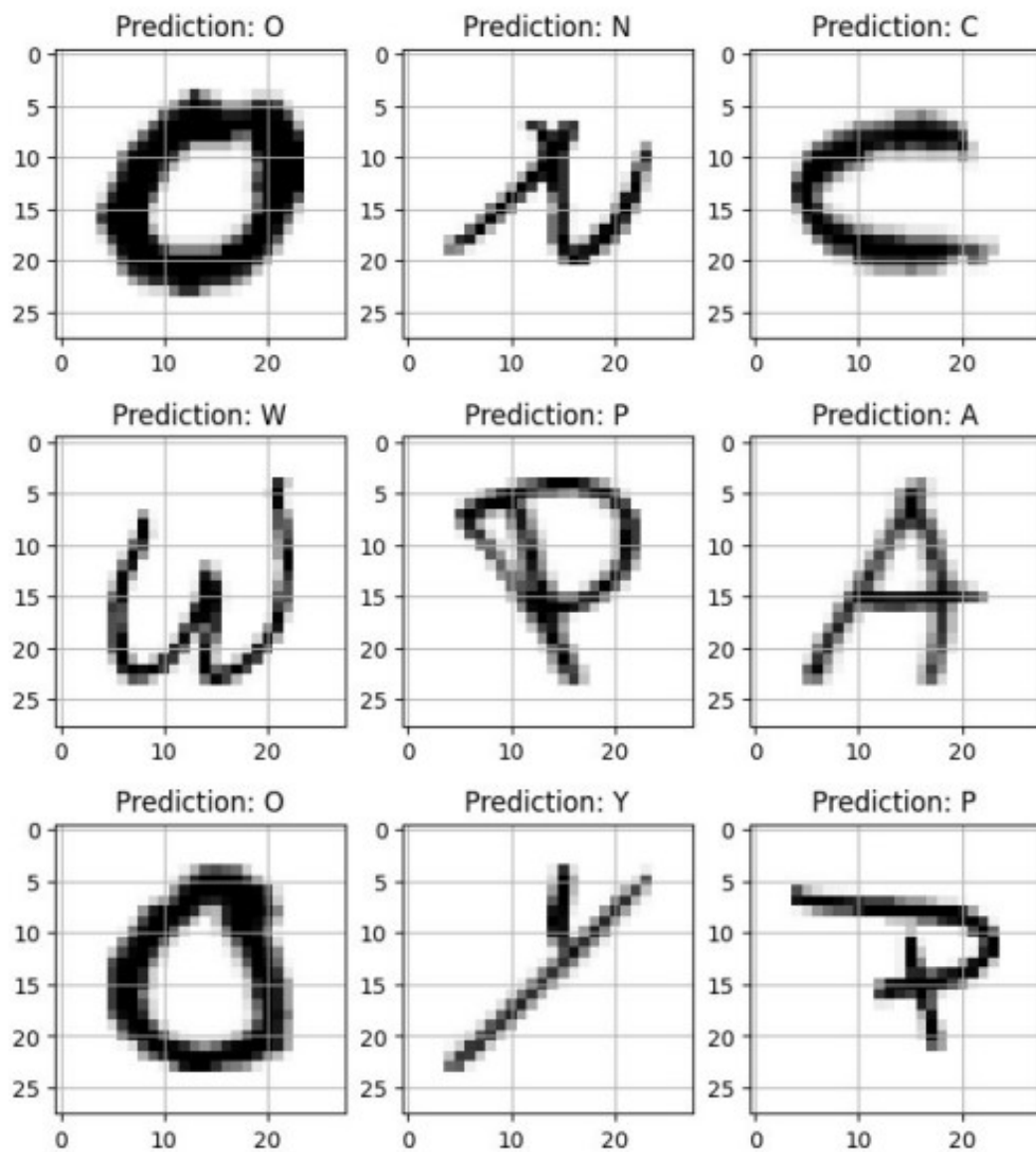


Figure 3.6: Testing

3.4.4 Predictions on External Data

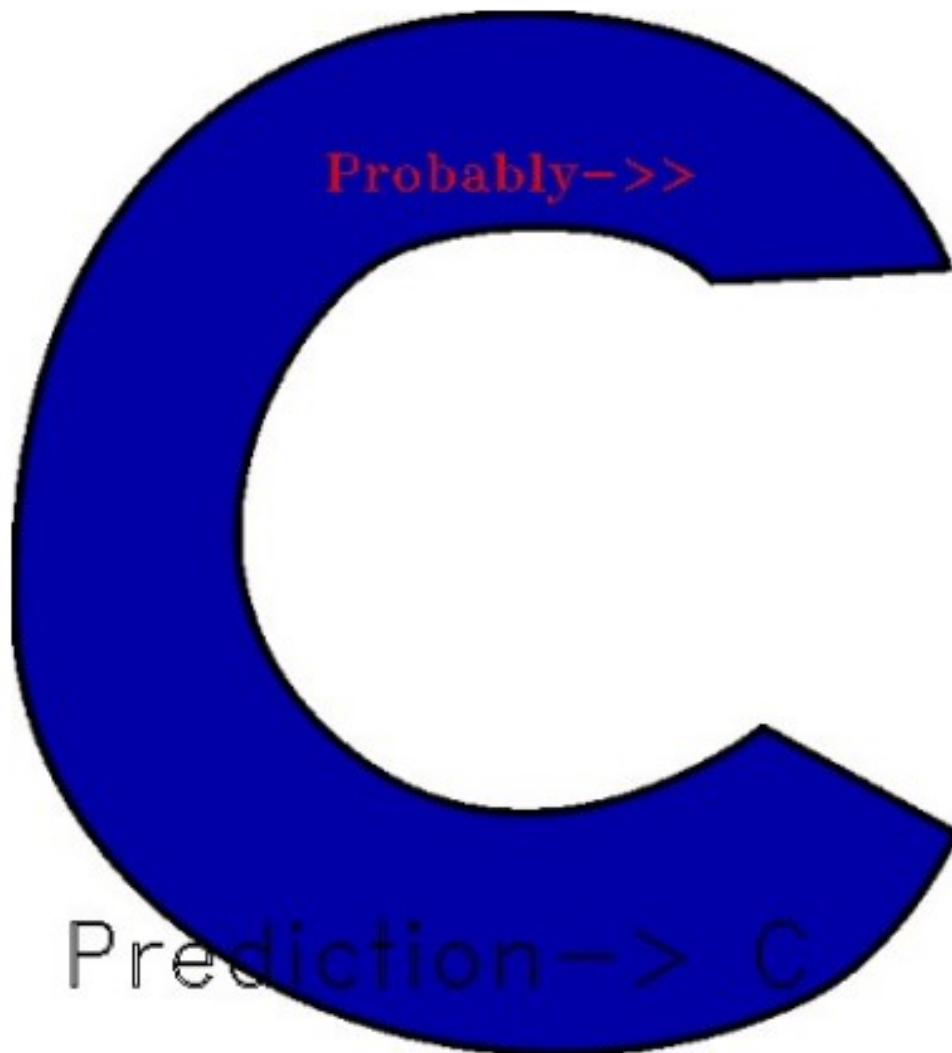


Figure 3.7: Prediction

When utilizing external data, a machine learning model that has been developed is used to forecast or classify data that was not used during the training or testing phase. The accuracy of these forecasts relies on the model's capacity to generalize to fresh, untested data, which may necessitate closely examining any discrepancies between the external dataset and the training set.

Neural network-based handwritten character recognition is a potent and adaptable technology that allows handwritten text to be accurately converted into digital format. It has many uses in many different domains, such as data entry and information extraction, accessibility for the blind, automation of form processing, handwriting-based authentication, education and language learning, and historical document digitization.

3.5 Fourth Weeks

3.5.1 Project 03: Human Face Detection System Configuring YOLOv8

A technology application known as face mask detection uses computer vision methodologies to determine whether or not a face mask is on a person portrayed in a picture or video. Using face masks to stop the virus from spreading became a crucial precaution during the COVID-19 pandemic, which attracted a lot of attention and led to the widespread adoption of this technology. The identification of face masks aids in the enforcement of mask-wearing regulations, which can considerably slow the spread of respiratory diseases, such as COVID-19.

3.5.2 Face Mask Identification with Deep Learning

When deep learning algorithms and techniques are used for face mask recognition, people are identified and categorized according to how consistently they wear face masks. Convolutional neural networks (CNNs), a subset of deep learning, have proven to be highly effective in the field of image recognition, which makes them a good fit for the problem of facial mask identification.

3.5.3 YOLOv8 Architecture

With the exception of the C3 module, which has been swapped out for the C2f module, the fundamental architecture of YOLOv8 is very similar to that of YOLOv5. The CSP concept is the source of this module. The C2f module of YOLOv8 was created by merging C3 with the ELAN idea from YOLOv7. This was done so that the module might be

developed. The goal of this integration was to enhance the gradient flow information of YOLOv8 without compromising its lightweight design in any way. Annotations in the form of bounding boxes are quite common in the field of deep learning; their frequency exceeds that of other annotation kinds.

$$dw = 1/w \quad (1)$$

$$x = \frac{x1 + x2}{2} \times dw \quad (2)$$

$$dh = 1/h \quad (3)$$

$$y = \frac{y1 + y2}{2} dh \quad (4)$$

$$w = (x2 - x1) \times dw \quad (5)$$

$$h = (y2 - y1) \times dh \quad (6)$$

The width (w) and height (h) of the image are represented in these equations, respectively. Next, we forecast the x, y, and anchor box's width (w) and height (h) (dw and dh). A software program called Label Img is used to visually mark and identify things in photographs.

3.6 Yolo Loss Function

$$\begin{aligned} &= \lambda_{\text{coord}} \sum_{i=0}^{s^2} \sum_{j=0}^B \mathbb{K}_{ij}^{\text{obj}} \left[(x_i - \hat{x}_i)^2 + (y - \hat{y}_i)^2 \right] \\ &+ \lambda_{\text{coord}} \sum_{i=0}^{s^2} \sum_{j=0}^B \mathbb{K}_{ij}^{\text{obj}} \left[\left(\sqrt{w_i} - \sqrt{\hat{w}_i} \right)^2 + \left(\sqrt{h_i} - \sqrt{\hat{h}_i} \right)^2 \right] + \sum_{i=0}^{s^2} \sum_{j=0}^B \mathbb{K}_{ij}^{\text{obj}} (C_i - \hat{C}_i)^2 \\ &+ \lambda_{\text{noobj}} \sum_{i=0}^{s^2} \sum_{j=0}^B \mathbb{K}_{ij}^{\text{noobj}} (C_i - \hat{C}_i)^2 + \sum_{i=0}^{s^2} \mathbb{K}_i^{\text{obj}} \sum_{c \in \text{classes}} (p_i(c) - \hat{p}_i(c))^2 \end{aligned} \quad (7)$$

There may be more than one class of object to detect in object detection. The mean of these AP values is then calculated by the mAP once the AP for each class has been determined. This gives an overall evaluation of the model's performance taking into consideration the variable degrees of difficulty in detecting different items across all classes.

3.6.1 Sytem Architecture

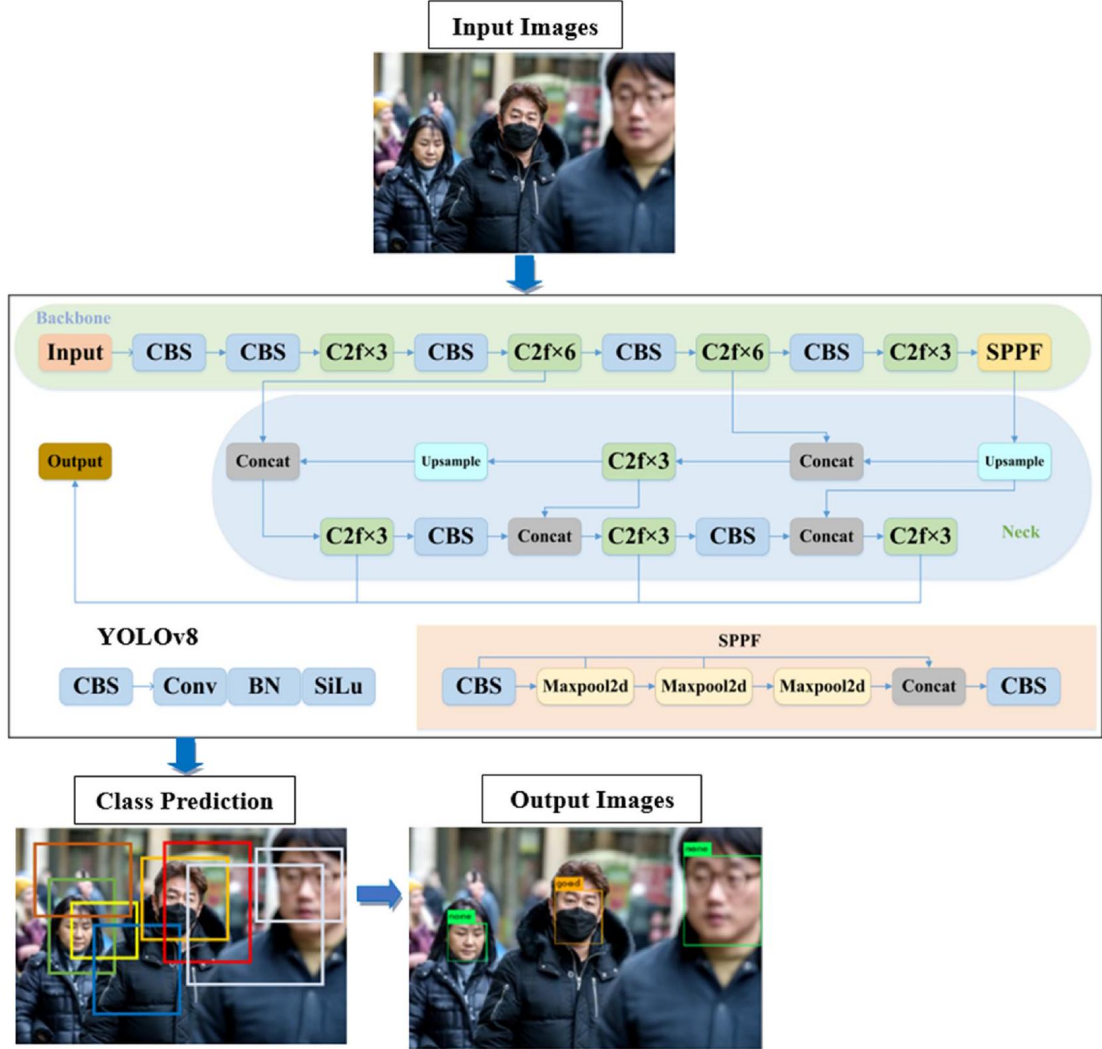


Figure 3.8: System architecture of YOLOv8

3.6.2 Face Mask Dataset (FMD) and Medical Mask Dataset (MMD)

This study made use of two separate datasets of medical face masks that were available to the general public for research purposes. First, a masked face dataset that is accessible to the public is called the Face Mask Dataset (FMD). The 976 images that make up the FMD dataset are kept in the PASCAL VOC format. Furthermore, the MMD collection consists of 698 photos, each including over 3100 medically masked disguised

faces. All participants in the study provided informed consent, and some MMD photo samples were given.

3.7 Fifth Weeks

3.7.1 Sample Images



Figure 3.9: Sample images in the experimental (FMD) and (MMD)

The MMD and FMD datasets were combined to form a unique, large dataset for the experimental setting. A dataset was used to collect 1515 photographs in total, and these images were carefully curated by removing duplicates and low-quality images from the original dataset.

The integration of the Medical Mask Dataset (MMD) and Face Mask Dataset (FMD) into our research is depicted in Figure 3.10. There are three distinct categories in the MMD: none, good, and awful. The FMD, on the other hand, is divided into three categories: incorrectly worn masks, masks with masks, and masks without masks. The

experiment provides an explanation for the three categories: "none" denotes instances in which masks were not worn at all, "good" denotes instances in which masks were worn correctly, and the category labeled as bad corresponds to instances in which masks were worn incorrectly.

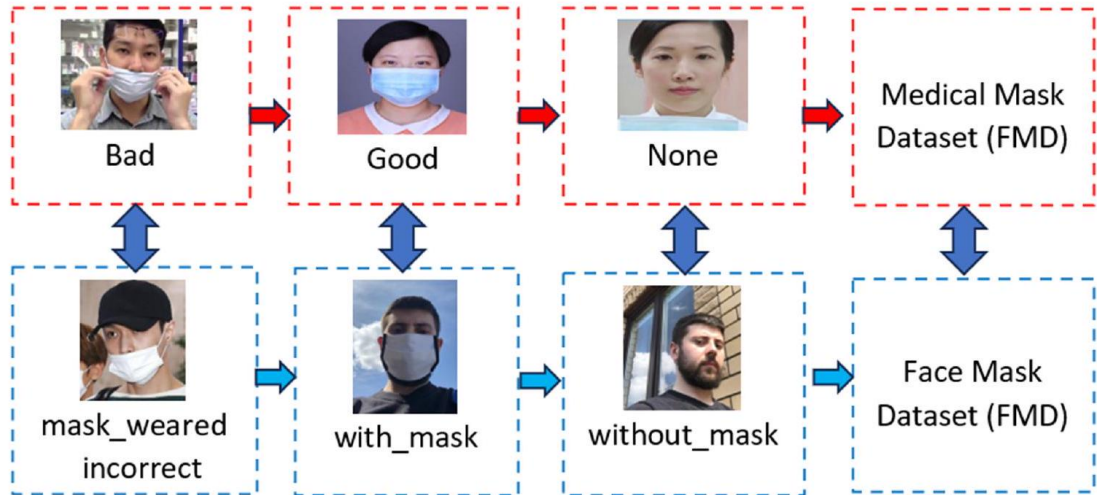


Figure 3.10: The combination of MMD and FMD datasets

3.7.2 Training Result

By making numerous modifications to the original data, a technique known as data augmentation is widely used in machine learning and deep learning to artificially increase the variety of a training dataset. Data augmentation can enhance a machine learning model's generalization and resilience by providing it with a greater range of training data.

We will employ a range of data-augmentation strategies throughout the training phase, including padding, cropping, and horizontal flipping, among others. Because of these techniques' benefits, huge neural networks are constructed using them extensively. Within each grid cell, the YOLO algorithm is intended to predict different bounding boxes. It is preferable to give only one predictor the task of predicting the bounding box for each item during the training phase. After determining which prediction has the highest current intersection over union (IOU) value for the ground truth, the YOLO

algorithm assigns a single predictor to be in charge of object prediction.

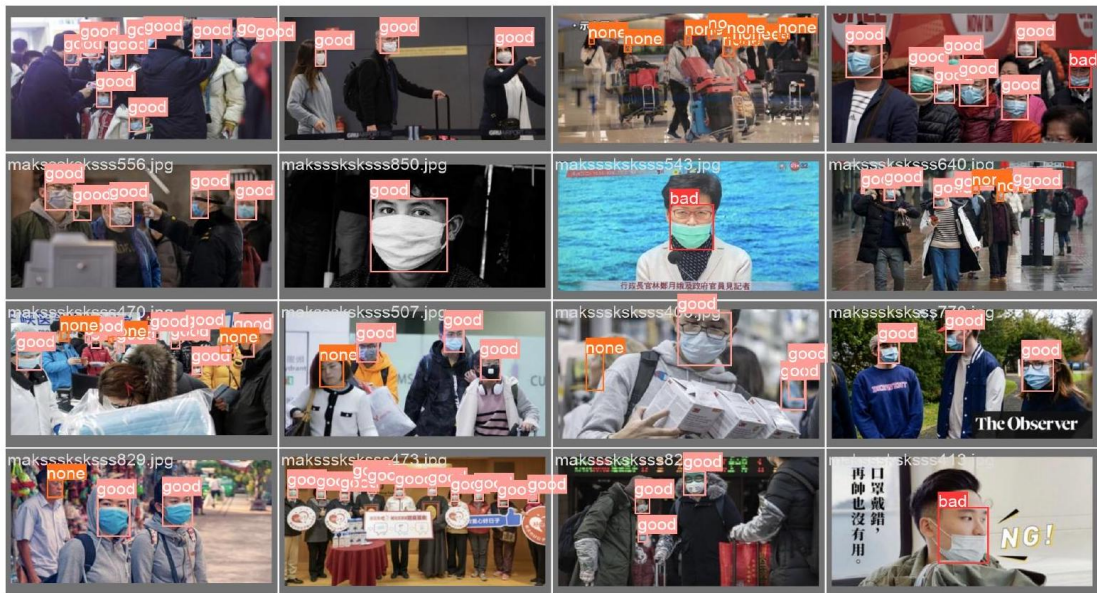


Figure 3.11: Training process for the test batch with 0 labels

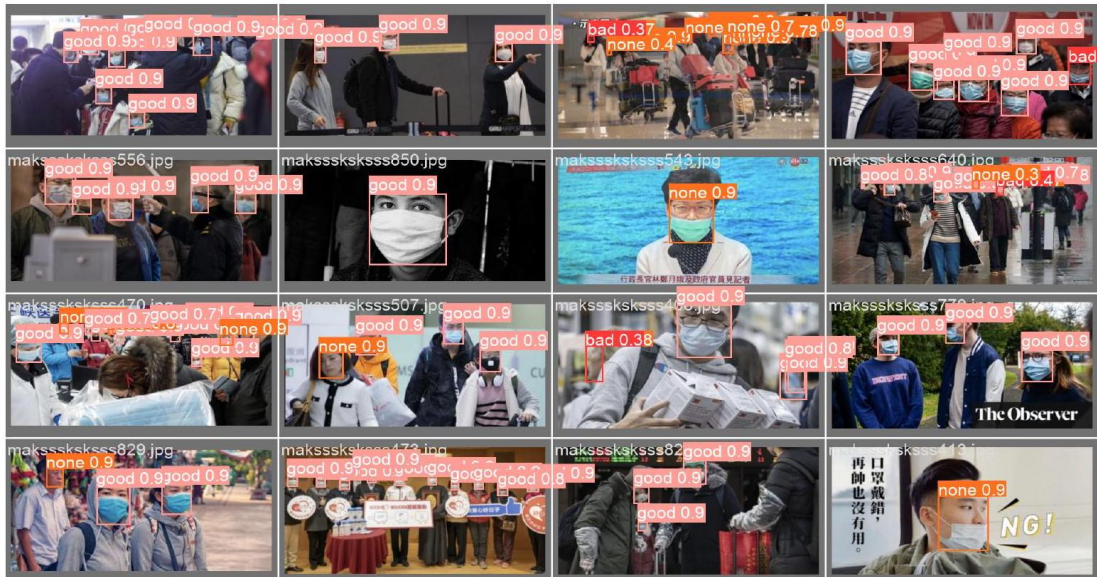


Figure 3.12: Training process for the test batch with 0 predictions

3.7.3 FMD and MMD Training Performance For All Models

Model	Class	Images	Labels	P	R	mAP@.5
YOLO7x	all	455	2153	0.624	0.931	0.634
	bad	455	71	0.611	0.943	0.162
	good	455	1732	0.941	0.964	0.976
YOLO7	none	455	348	0.771	0.884	0.493
	all	455	2153	0.608	0.930	0.631
	bad	455	71	0.165	0.940	0.167
	good	455	1732	0.938	0.977	0.985
YOLOv8n	none	455	348	0.721	0.873	0.741
	all	455	2153	0.578	0.833	0.618
	bad	455	71	0.141	0.686	0.151
	good	455	1732	0.890	0.968	0.981
YOLOv8s	none	455	348	0.701	0.844	0.722
	all	455	2153	0.650	0.773	0.703
	bad	455	71	0.216	0.680	0.366
	good	455	1732	0.967	0.974	0.98
	none	455	348	0.767	0.753	0.753
YOLOv8m	all	455	2153	0.715	0.828	0.783
	bad	455	71	0.354	0.680	0.4
	good	455	1732	0.982	0.971	0.990
	none	455	348	0.810	0.833	0.860

3.7.4 Recognition Results Using YOLOv8

When compared to the previous study, a PCA was suggested, and in an experiment using the Olivetti Research Laboratory (ORL) face dataset, the results showed only a 71% mAP. A different researcher used A Dataset of Masked Faces (MAFA) with LLE-CNN to get a 74.4% mAP. At an accuracy of 77.4%, our suggested YOLOv8n technique with 100 epochs surpasses previous models on the FMD and MMD in terms of the mAP. In this research, we were able to improve the overall performance of a recent study on face

mask recognition. Moreover, YOLOv5m was applied, and a 66.1% mAP was obtained. Next, YOLOv7 was offered, and its mAP was 62.2%. In the experiment using the FMD and MMD, our model, YOLOv8, achieved the best accuracy (98.1%) for the good class when compared to other models.



Figure 3.13: Recognition results using YOLOv8 good & none

3.8 Use of Engineering Tools, Techniques, and Resources

I learned about a variety of gadgets throughout my internship that have a significant impact on the computer engineering industry:

- Python
- Amazon Web Services (AWS)
- Deep Learning
- Natural Language Processing (NLP)
- Documentation and Guides
- Blogs and Forums

3.9 Related Works

This section aims to provide an overview of the state of knowledge regarding systems and a few action items. Many research publications have covered that.

In [1], character or principle: An Analysis of Psychographic Division Using an Online Review Enhanced Recommender System in Comparison, Big consumer data promises to be a game changer in applied and empirical marketing research.

In [2], amazon Lifestyles: Online reviews provide evidence for an improved recommender system, consumer preferences have been demonstrated to be reflected in and influenced by online lifestyles in a variety of online contexts.

In [3], k-Means Clustering-Based RFM Model to Enhance Product Recommendation and Customer Segmentation, the COVID-19 pandemic impacted offline retail stores and caused the liquidation of thousands of businesses.

In [4], deep Learning-Based Recognition of Handwritten Text, the LSTM deep model used in the model's construction yields very good accuracy.

In [5], assessment of pattern classifiers' performance for handwritten character recognition, this study examines some effective classifiers in handwritten digit recognition as part of a performance evaluation.

In [6], recognition of Handwritten Digits via Machine Learning Algorithms, the very significant problems in pattern recognition applications is handwritten character recognition.

In [7], the methods for Detecting Human Faces: An Extensive Review and Prospects for Further Research, face identification is a difficult problem for machines to accomplish, although it is a simple task for humans.

In [8], criminal Identification System Face Recognition and Detection, finding and identifying a criminal is a laborious and time-consuming task.

In [9], a quick and precise method for Facial Recognition, Authentication, and Validation, this study describes a deep learning pipeline that yields state-of-the-art performance on multiple benchmark datasets for unconstrained face detection and verification.

In [10], detection system for Multiple Faces in Video Sequence, this research proposes an enhanced method that goes beyond frontal view detection to recognize several faces in a video sequence.

3.10 Conclusion

We successfully completed a number of machine learning projects through our industrial training, including handwritten character recognition, human face identification systems, and customer segmentation research. These initiatives demonstrated machine learning's adaptability and usefulness in a range of contexts. Customer segmentation analysis made tailored recommendations and targeted marketing tactics possible, and handwritten character recognition made document digitization more automated and improved accessible for those with vision impairments possible. Our human face detection technology demonstrated the power of computer vision algorithms across a range of industries, including security access, surveillance, and photography. Together, these projects demonstrated the value of machine learning in optimizing workflows, boosting judgment, and upgrading user experiences across sectors, opening the door for more developments and breakthroughs in the area.

Chapter 4

Acquire Skills During Industrial Training

4.1 Introduction

Participants will have the chance to gain critical skills in data preprocessing, model development, and evaluation procedures during our industrial training in machine learning. Participants will obtain practical experience in developing machine learning algorithms, analyzing data, and interpreting findings through guided exercises and hands-on projects. Through the acquisition of these abilities, participants will have the know-how to address real-world issues and make valuable contributions to the quickly changing field of machine learning.

4.2 Learning of new technologies and applying them in solving an engineering problem

Keeping up with the most recent developments in tools, frameworks, and algorithms is essential for machine learning. Engineers can come up with creative solutions to challenging issues by regularly learning about and experimenting with cutting-edge technologies like deep learning architectures, reinforcement learning techniques, and

cloud computing platforms. For example, engineers can create more accurate and effective models for tasks like natural language processing or image production by utilizing advanced neural network architectures like Transformer models or GANs. Furthermore, integrating cloud-based solutions-like distributed training frameworks or serverless computing allows for the economical and scalable deployment of machine learning systems, overcoming resource- and scalability related technical issues.

4.3 Theoretical Knowledge

There are many different ideas and concepts included in machine learning. Here is a summary of the main theoretical ideas:

- **Statistical Learning:** Recognizing the ideas behind machine learning methods, such as the bias-variance tradeoff, generalization error, overfitting, and underfitting.
- **Deep Learning:** Covers the theoretical underpinnings of recurrent neural networks (RNNs), feedforward neural networks, convolutional neural networks (CNNs), and attention mechanisms in deep neural networks. Understanding ideas like weight initialization, optimization techniques, activation functions, and back-propagation is necessary for this.
- **Graphical Models:** Understanding of probabilistic graphical models and how to use them to model intricate variable dependencies, such as Bayesian networks and Markov random fields.
- **Reinforcement Learning:** Recognizing the deep reinforcement learning algorithms, such as Deep Q-Networks (DQN) and policy gradient approaches, as well as Markov decision processes, value functions, policy optimization, and the exploration-exploitation trade-off.
- **Kernel Methods:** Knowledge of the Mercer's theorem, the kernel trick, and the

theoretical underpinnings of kernel techniques as they relate to nonlinear regression and classification problems.

- **Model Evaluation and Selection:** Understanding of theoretical metrics and methods, such as bias-variance decomposition, cross-validation, and model selection criteria, for assessing and choosing machine learning models.
- **Optimization Theory:** Knowing optimization theory, including gradient descent techniques, convergence analysis, and convex and non-convex optimization, and how it relates to training machine learning models.

4.4 Practical Knowledge

An outline of the application domains for deep learning and machine learning is provided below:

- **Data Preprocessing:** Cleaning, transforming, and getting ready data for analysis, this includes scaling features to make sure ML algorithms work, managing missing values, and encoding categorical variables.
- **Feature Engineering:** Use statistical methods like feature selection, extraction, and transformation along with domain expertise to create new features or modify current ones in order to enhance model performance.
- **Model Selection and Evaluation:** Choosing the best model for a job by experimenting with different ML algorithms and DL architectures, and assessing model performance with measures like accuracy, precision, recall, F1-score, and ROC AUC.
- **Hyperparameter Tuning:** Use methods such as grid search, random search, Bayesian optimization, and automated hyperparameter tuning tools offered by libraries such as scikit-learn and TensorFlow to fine-tune model hyperparameters in order to maximize performance.

- **Deep Learning Architectures:** Applying DL frameworks like TensorFlow and PyTorch to implement DL architectures like transformer models, recurrent neural networks (RNNs), feedforward neural networks, and convolutional neural networks (CNNs).
- **Transfer Learning:** utilizing pre-trained deep learning models and refining them on domain-specific data to accelerate training and enhance performance through the application of strategies such as domain adaption, feature extraction, and fine-tuning.
- **Model Training and Validation:** Dividing data into test, validation, and training sets; using the training data to train machine learning models; using the validation set to fine-tune hyperparameters; and assessing generalization by testing the models' ultimate performance.

4.5 Ethical responsibilities and issues related to an engineering project

In order to preserve people's rights and dignity, machine learning and deep learning deal with biases in data and models, guarantee accountability and transparency in decision-making processes, and prioritize data security and privacy protection. It is imperative that engineers establish strong ethical frameworks and governance mechanisms early in the project lifecycle to minimize potential societal repercussions including discrimination, unjust treatment, and privacy violations. In the end, engineers have to give ethical issues top priority in order to advance justice, openness, and reliability in the creation and application of ML and DL technologies.

Chapter 5

Conclusion

5.1 Conclusion

My deep learning and machine learning industrial training has given participants invaluable knowledge and skills that are necessary for solving problems in the real world. Through practical projects and theoretical understanding, participants have developed their skills in data analysis, result interpretation, and the use of ML and DL algorithms. In addition to enabling people to flourish in their positions, this training has accelerated innovation and progress in the rapidly changing field of machine learning and deep learning. We are still dedicated to helping participants grow and develop going ahead as they use their newly acquired knowledge to tackle challenging issues and significantly advance the area.

Overall, the training has given me a strong foundation in ML field, and I am confident that the knowledge and abilities I have picked up will be extremely useful in my future job as an Machine Learning support engineer.

5.2 Challenges

The effectiveness of the ML team and Unicorn Software and Solutions' ability to manage a robust and secure ML infrastructure may be hampered by a number of challenges facing ML. I might run into the following issues as an ML engineer:

- a. **Complexity of Algorithms:** For individuals with no prior experience in programming or mathematics, ML and DL algorithms can be challenging due to their complexity and need for a comprehensive comprehension of these ideas.
- b. **Data Quality and Availability:** It can be difficult to find relevant and high-quality datasets for ML and DL model training, especially in sectors where data is noisy, sparse, or incomplete.
- c. **Computational Resources:** Large computing resources, such as high-performance GPUs or TPUs, are frequently needed for training DL models. However, not all participants or organizations may have access to or can afford these resources.
- d. **Algorithm Selection and Tuning:** Selecting the right ML or DL algorithm for a task and adjusting its hyperparameters to get peak performance calls for experience and trial and error, which can be resource- and time-intensive.

5.3 Scope of the study

The following subjects would normally be covered in the training and experience of an ML Engineer intern:

- **Foundational Concepts:** The course will cover the foundational ideas of machine learning and deep learning, such as neural networks, supervised and unsupervised learning, optimization algorithms, and model evaluation methods.
- **Algorithms and Techniques:** Many ML and DL methods and techniques, including decision trees, convolutional neural networks (CNNs), recurrent neural

networks (RNNs), reinforcement learning, and linear regression, will be covered throughout the program.

- **Tools and Frameworks:** Through practical experience with well-known ML and DL frameworks and tools including TensorFlow, PyTorch, scikit-learn, and Keras, participants will learn how to properly implement and train models.
- **Industry Trends and Emerging Technologies:** Exploring subjects such as explainable AI, federated learning, self-supervised learning, and AI ethics, participants will stay up to date with the latest industry trends and emerging technologies in ML and DL.
- **Collaboration and Networking:** Participants in the training program will have the chance to work together with mentors, industry professionals, and peers in a friendly learning atmosphere that will promote networking.

A typical course of study for an intern ML Engineer would cover a wide range of technical skills and knowledge related to computer hardware, software, and security. operating systems, documentation, cloud computing, virtualization, backup and recovery, server management, security, scripting, and automation, in addition to customer support. Additionally, the intern ought to be informed on the newest developments in machine learning, including YOLOv8 and YOLOv7 procedures.

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