VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"Jnana Sangama", Belagavi-590018, Karnataka



An Internship Report on

REGULATORY REPORTING INTERN

Submitted in partial fulfillment for the award of the degree of Bachelor of Engineering

in

Artificial Intelligence and Machine Learning

Submitted by

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Internship Carried Out at SOCIÉTÉ GÉNÉRALE GLOBAL SOLUTION CENTRE ITPL, Patandur Agrahara, Bengaluru

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Certificate

This is to certify that the internship work entitled "REGULATORY REPORTING INTERN" carried out by

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A bonafide student of **Bangalore Institute of Technology** in partial fulfilment for the award of **Bachelor of Engineering** in **Artificial Intelligence and Machine Learning** under **Visvesvaraya Technological University**, **Belagavi**, during the academic year 2023-24 is true representation of Internship work completed satisfactorily.

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Name of the Examiners, Signature with Date

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Acknowledgement

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I extend my sincere thanks to my department faculty members of Artificial Intelligence and Machine Learning and also non-teaching staff for supporting me directly or indirectly for the completion of this Internship.

VISHAL S B 1BI20AI055 **Declaration**

I VISHAL S B, 1BI20AI055, student of 8th semester B.E in Artificial Intelligence and

Machine Learning, Bangalore Institute of Technology, Bengaluru, hereby declare that the

Internship work entitled "REGULATORY REPORTING INTERN" submitted to

Visvesvaraya Technological University during the academic year 2023-24, is a record of

an Internship work done by me under the guidance of Prof. Yamini Sahukar P, Assistant

Professor, Artificial Intelligence and Machine Learning, Bangalore Institute of

Technology, Bengaluru.

Date: VISHAL S B

Place: Bangalore 1BI20AI055

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CHAPTER 1 COMPANY PROFILE

Chapter 1

COMPANY PROFILE

1.1 About Company

Société Générale Global Solution Centre is part of Société Générale, a leading financial services group founded in 1864. The company operates using a diversified universal banking model, combining financial strength with sustainable growth strategies to support the economy and customer projects

Founded by a group of entrepreneurs in 1864 "to promote the development of trade and industry in France", Société Générale is today one of the leading European financial services groups. Based on a diversified and integrated banking model, the Group combines financial strength and proven expertise in innovation with a strategy of sustainable growth, aiming to be the trusted partner for its clients, committed to the positive transformations of society and the economy.

Active in the real economy for over 150 years, with a solid position in Europe and connected to the rest of the world, Société Générale has over 117,500* members of staff in 66 countries and supports on a daily basis 25* million individual clients, businesses and institutional investors around the world by offering a wide range of advisory services and tailored financial solutions.

The Group is built on three complementary core businesses:

- French Retail Banking, which encompasses the Société Générale, Crédit du Nord and Boursorama brands. Each offers a full range of financial services with omnichannel products at the cutting edge of digital innovation;
- International Retail Banking, Insurance and Financial Services to Corporates, with networks in Africa, Central and Eastern Europe and specialized businesses that are leaders in their markets;
- Global Banking and Investor Solutions, which offers recognized expertise, key international locations and integrated solutions

Team spirit, innovation, responsibility and commitment are the core values shared by all Société Générale employees. These values are central to our vision of a relationshipfocused bank committed to serving its customers.

As a responsible financial services group, the fairness and integrity of our practices are at the core of our relationship-building approach. Ensuring compliance with these principles is our responsibility towards our customers. It also helps us earn their trust and protects our Group's reputation

1.2 Vision Statement

Société Générale Group is committed to build together, with its clients, a better and sustainable future. This strategy is set of four pillars: the urgency of energy transition, having positive local impact, acting as a responsible employer, and maintaining a culture of responsibility

1.3 Key Industries

We accompany large corporate clients in their growth and development by offering them strategic advice and financing solutions. Our Corporate & Investment Bank provides expertise in strategic advisory, mergers & acquisitions, equity capital markets and strategic equity transactions.

In the Asia Pacific region, our Global Finance teams originate and distribute structured finance transactions. We combine sector and industry knowledge together with the technical know-how and structuring skills to bring the right solutions.

Natural Resources & Energy Finance

Harnessing our sectoral expertise, we provide a full range of finance and advisory services for producers, traders, processors and end-users of energy, metals and soft commodities through three key platforms:

Energy Group: financing and advisory services for energy projects worldwide as well as structured financings and reserve-based lending for energy players

Metals & Mining Finance: structured financing and advisory services for metals & minerals sector players as well as financing of large and diversified mining companies

Traders, Commodity Finance & Agribusiness: financing of traders and commodity players/processors as well as trade finance to cover traders and commodity players against non-payment risk.

Debt Capital Markets

We tailor capital raising strategies to your funding goals, matching your needs to the demands of investors across the world. Our debt capital markets teams aim to raise the finance you need, keeping your funding costs as low as possible. Our insight into capital market conditions and investors' requirements allows us to advise you on the best capital raising strategies. Through our integrated platform combining multi-product origination, structuring and syndication, we tailor solutions that match your specific goals. Our recognized engineering skills and strong syndication/placement capacities throughout Europe, the United States and Asia, help us to make our clients' ambitious, innovative financings possible.

Acquisition Finance and Rating Advisory

Société Générale's Advisory & Financing Group team accompanies the bank's large corporate clients in their strategic and acquisition-related financing needs. We offer financing advisory and funding solutions to support clients in completing their contemplated acquisitions. With a dedicated team located in Hong Kong, the Advisory & Financing Group team can provide acquisition financing solutions with a quick turnaround time for our clients going abroad. Financing can be arranged in various forms and tenors, from bridge loans to term loans, based upon clients' requirements and deals' characteristics. The Advisory & Financing Group team also provides rating advice to clients, assisting companies for first-time ratings, rating upgrade and defense and in strategic transaction situations.

Export Finance

We deliver financing solutions, risk coverage and advisory services related to import or export contracts whose underlying assets are capital goods, equipment and/or services to companies and financial institutions around the world.

Infrastructure & Asset Based Finance

We offer a broad range of products to our clients, whether corporate or public, including capital-raising, risk management and advisory services in, among other areas: Project Finance, Public Private Partnerships (PPPs), Shipping Finance and Aviation Finance.

Market Services

We provide hedging, investment and risk advisory solutions for corporate clients globally. Based on an advisory approach, we are able to deliver expert response to risk management, in particular in the realm of foreign exchange and interest rates. Our market services to corporate clients include Market Risk Advisory solutions, Cash & Derivatives services and Investor solutions. Based on a cross-asset approach with customized services, we deliver a comprehensive range of products and solutions across all asset classes, while taking market risk and the evolving regulatory environment into consideration.

Global Transaction Banking

For corporates, we provide domestic and international solutions to improve their payment methods, monitor their accounts, manage their transactions remotely and pool their cash. They can benefit from international trade and risk mitigation experts so they can improve their cross-border operations. We offer means to maintain their competitive edge through financing or optimization solutions for their accounts receivables and payables. With its network in more than 50 countries, Global Transaction Banking's local and international teams possess the skills, expertise and in-depth market knowledge allowing corporates to seize all opportunities and make the most of them.

CHAPTER 2 ABOUT THE DEPARTMENT

Chapter 2

ABOUT THE DEPARTMENT

2.1 Overview

The Federal Reserve System relies on the timely and accurate filing of report data by domestic and foreign financial institutions. The data collected from these regulatory reports facilitates early identification of problems that can threaten the safety and soundness of reporting institutions and ensures timely implementation of legal corrective actions. CFOs are required to attest to the accuracy of their reports for capital assessments and stress testing.

Regulatory reporting is a critical activity for financial institutions and requires a concerted effort from risk, finance, and IT. Many financial organizations have expressed frustration with the high level of redundancy, dependence on manual processes, and opacity of their regulatory reporting processes. We believe that automation and technology-enabled data management are critical elements of an agile, robust reporting function that will allow financial services companies to be more proactive as new requirements arise.

As a part of the Regulatory Reporting Team, I was responsible for analytical and accurate generation of reports on a regular basis. Based on the location of the company, there are different regulators. Some of them include:

SEC (U.S. Securities and Exchange Commission): Responsible for regulating securities markets and protecting investors in the United States.

FINRA (Financial Industry Regulatory Authority): Oversees broker-dealers and ensures compliance with industry rules and regulations.

CFTC (Commodity Futures Trading Commission): Regulates futures and options markets in the United States.

ESMA (European Securities and Markets Authority): Regulates securities markets and financial instruments within the European Union.

FCA (Financial Conduct Authority): Regulates financial services firms and markets in the United Kingdom.

ASIC (Australian Securities and Investments Commission): Regulates financial markets, companies, and financial services in Australia.

Each regulator has specific reporting requirements, and our team ensured that the reports were prepared accurately and submitted in compliance with their guidelines.

Regulatory reporting for Over-the-Counter (OTC) trades plays a crucial role in enhancing market transparency and stability, especially following the lessons learned from the Global Financial Crisis (GFC). To mitigate risks associated with OTC derivatives, key regulatory steps were implemented. These include mandating the clearing and settlement of such trades through Central Counterparties (CCPs), which help reduce counterparty risk, and requiring that these trades be reported to designated Trade Repositories (TRs). This reporting regime enables better transparency, allowing regulators, investors, and other stakeholders to monitor systemic risks and market integrity effectively, thereby boosting investor confidence.

Specific regulatory practices vary globally. For instance, in the United States, the Financial Industry Regulatory Authority (FINRA) requires that off-exchange trades in National Market System (NMS) stocks and OTC Equity Securities, including Rule 144A transactions, be reported to facilities like the Alternative Display Facility (ADF) or a Trade Reporting Facility (TRF). In Europe, under MiFID II, all investment firms are obligated to report trades in OTC derivatives, bonds, and structured finance products within a 15-minute window if technologically feasible. Meanwhile, in India, the Clearing Corporation of India Limited (CCIL) mandates that banks and primary dealers report their OTC derivatives trades within 30 minutes to ensure efficient monitoring and transparency.

2.2 Organization Structure

In Société Générale Global Solution Centre, the organizational structure is designed to facilitate efficient operations and effective management across various functional areas. Here's a breakdown of the key points for your report:

Top-Level Leadership: At the helm of the organization is the CEO or Managing Director, who provides overarching strategic direction and vision for the company.

Executive Leadership Team: This team comprises top-level executives responsible for different functional areas such as business operations, operations management, and human resources. They work closely with the CEO to execute strategic initiatives and ensure alignment with company goals.

Functional Departments: The organization is divided into several functional departments, each headed by a Department Head. These departments typically include business units such as finance, technology, operations, risk management, and client services.

Department Heads: Department Heads are responsible for overseeing the day-to-day operations, setting departmental goals, and ensuring that teams are equipped to deliver on objectives. They report directly to the Executive Leadership Team and play a crucial role in driving performance and innovation within their respective departments.

Cross-Functional Collaboration: While each department operates autonomously, there is often a need for collaboration and coordination across different functions. This collaboration ensures that projects and initiatives are executed seamlessly and that resources are optimized to achieve business objectives.

Team Structure: Within each department, there are multiple teams, each focused on specific tasks or projects. Team members work together to leverage their expertise and skills to deliver high-quality outcomes and contribute to the overall success of the organization.

Communication Channels: Effective communication channels are established to facilitate information flow between different levels of the organization. Regular meetings, reporting structures, and technology platforms are utilized to ensure that stakeholders are informed and aligned.

CHAPTER 3 TASKS PERFORMED

Chapter 3

TASKS PERFORMED

3.1 Technologies

Throughout my internship, I was exposed to a myriad of technologies critical to modern web and software development. Here's a deeper dive into each technology I used and how it contributed to my projects:

Python: My primary programming language throughout the internship, used for its versatility and the extensive libraries available for data science, web scraping, and web development.

Tkinter: This GUI toolkit for Python was essential for creating desktop applications like the web automation tool. It allowed me to build a user-friendly interface for users to interact with the application effectively.

yfinance: This Python library was vital for fetching real-time financial data, which underpinned the functionality of our stock prediction dashboard.

SARIMA and LSTM: These predictive models were central to forecasting stock prices. Understanding and implementing these helped deepen my knowledge of time series analysis and neural networks.

mplfinance: Used for its powerful financial charting capabilities, this library helped me visually represent stock data and predictive results, making them accessible to users who aren't experts in data science.

Django and Flask: These frameworks were used for web development. Django helped me manage database-driven websites with its robust structure, while Flask allowed me to build a lightweight, scalable backend service.

Azure Web Services: Learning to deploy applications on Azure introduced me to cloud computing's scalability, reliability, and security aspects.

This diverse technological toolkit not only enhanced my technical skills but also prepared me for a variety of challenges in the tech industry. Each technology played a critical role in the successful completion of my projects and provided me with invaluable practical experience.

3.2 Web Automation for Regulatory Reporting

During my internship at Société Générale, one of the projects I worked on involved developing a Python-based application for web automation to streamline regulatory reporting processes for our client. The task was challenging yet exciting, as it required me to integrate various technologies and develop a solution that could automate data collection, report generation, and submission to regulatory bodies such as ESMA, SEBI, and SEC.

My responsibilities in this project included understanding the client's requirements, designing the architecture of the application, and implementing the necessary functionalities. One of the primary challenges I encountered was extracting relevant data from the client's website in a structured format suitable for compliance reporting. To overcome this challenge, I leveraged Python libraries such as BeautifulSoup and Selenium for web scraping, allowing me to efficiently extract the required data.

Once the data was extracted, the next challenge was to reformat it into compliance reports that adhered to the specific requirements of each regulatory body. I utilized Python's powerful data manipulation libraries such as pandas to manipulate and transform the data into the desired format. Additionally, I implemented automated checks to ensure that the generated reports complied with the regulatory requirements of each regulatory body.

One of the key features of the application was its ability to run at regular intervals using task scheduling tools like cron jobs or Windows Task Scheduler. This ensured timely data collection and report submission, eliminating the risk of penalties for late submissions. I also incorporated robust error handling mechanisms to address issues such as network failures or data inconsistencies, ensuring the reliability and stability of the application.

The successful implementation of this web automation application had a significant impact on the client's regulatory reporting process. It not only improved efficiency and accuracy but also ensured compliance with regulatory requirements. By automating complex tasks, the application enabled the client to focus on their core business activities while reducing the risk of non-compliance issues.

Overall, this project provided me with valuable hands-on experience in web automation, data manipulation, and regulatory compliance. It challenged me to think critically and creatively to develop innovative solutions to complex problems, further enhancing my skills as a software developer.

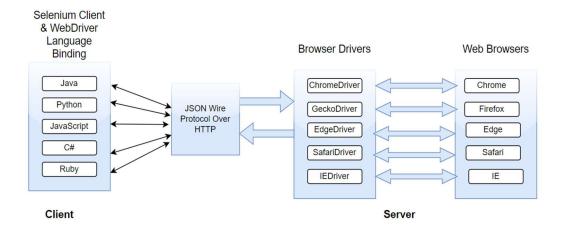


Fig 3.2.1 Selenium Web Deriver Api Architecture

3.3 Dashboard for Stock Prediction and Analysis

In another significant assignment during my internship, I was tasked with developing a dashboard for stock prediction and analysis. This project was particularly intriguing as it blended data science with software development to create a tool that could aid in financial decision-making. My role involved gathering financial data, implementing predictive models, and developing a user-friendly dashboard interface.

The first step was to fetch real-time stock data, for which I used the yfinance library. This library proved invaluable for accessing up-to-date financial information directly from Yahoo Finance. With the data in hand, the next challenge was to predict future stock movements. To tackle this, I applied a combination of statistical and machine learning techniques, specifically the SARIMA model for time series forecasting and LSTM neural networks for learning sequences in the data.

Implementing these models required a deep understanding of both the theoretical aspects of these algorithms and their practical application using Python libraries. After training the models, the results needed to be presented in an easily understandable format.

For this purpose, I integrated the mplfinance library to visualize the stock data and predictions effectively, creating interactive charts that were both informative and visually appealing.

The dashboard was designed using a combination of Flask for the backend, allowing us to handle requests and serve the data, and HTML/CSS with JavaScript for the frontend to create an interactive web interface. The end product was a robust tool that provided insightful analyses and predictions of stock movements, helping users make more informed investment decisions.

This project not only enhanced my skills in Python and data science but also taught me about the intricacies of financial markets. Moreover, it was a fantastic opportunity to see how technology can directly support business strategy and decision-making.

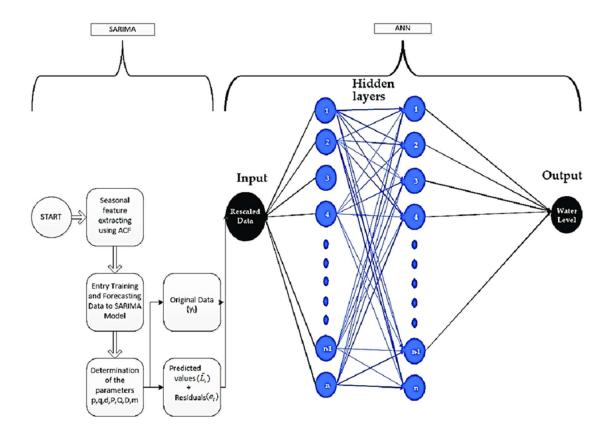


Fig 3.2.1: System Architecture

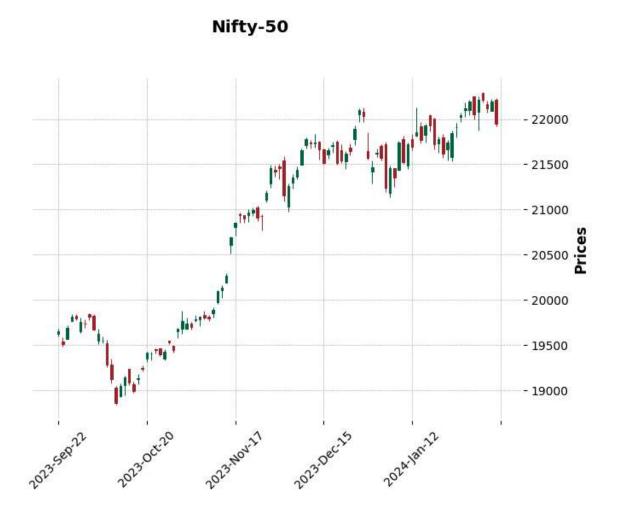


Fig 3.2.2: Nifty 50 Prediction Results

3.4 Django CRUD Operations & Flask Service Deployment

One of the more complex technical challenges during my internship involved working with Django and Flask to create web applications and deploy them to the cloud. My task was to demonstrate CRUD (Create, Read, Update, Delete) operations in a Django web application and to deploy a Flask service on Azure Web Services.

I started by setting up a Django project, which served as the foundation for implementing CRUD operations. This part of the project was crucial for understanding web application development's dynamic nature, as Django's architecture is highly

conducive to rapid development and clean, pragmatic design. I created models, views, and templates to handle the data management required for CRUD operations, focusing on delivering a seamless user experience and ensuring data integrity.

Concurrently, I developed a lightweight backend service using Flask. Flask's simplicity and flexibility made it an ideal choice for a service-oriented architecture. The service was designed to be stateless and interacted with the frontend via RESTful APIs.

The final step was deploying the Flask service to Azure Web Services. This process involved configuring the Azure environment, setting up the necessary security measures, and ensuring the service's scalability and reliability. Deploying to Azure taught me a great deal about cloud services, including managing resources and monitoring the performance of live applications.

These projects were instrumental in strengthening my backend development skills and understanding of cloud infrastructure. They were also an excellent demonstration of integrating different technologies to create fully functional, scalable web applications.

I completed several significant projects that showcased my proficiency in software development and data analytics. I developed a web automation application using Python, integrated with a tkinter GUI, to automate regulatory compliance reporting processes. Additionally, I created a stock prediction and analysis dashboard employing techniques such as yfinance for data retrieval, SARIMA and LSTM models for prediction, and mplfinance for visualization, achieving a Mean Absolute Error (MAE) of 113.2. Furthermore, I implemented CRUD operations within a Django application, demonstrating my full-stack web development skills, and developed a backend service using Flask, which was deployed on Azure Web Services for enhanced scalability and reliability. These projects not only advanced my technical capabilities but also provided invaluable insights into practical applications in the financial sector, equipping me with the skills to tackle future challenges in software development.

CHAPTER 4 REFLECTION OUTCOMES

Chapter 4

REFLECTION OUTCOMES

My internship at Société Générale has been an enriching journey filled with valuable experiences and opportunities for growth. Throughout this period, I've not only contributed to the organization's projects but also developed essential skills and competencies that extend beyond technical expertise.

4.1 Technical Outcomes

During my internship, I was tasked with creating a Python-based application to automate the collection, reformatting, and submission of data for regulatory reporting to bodies like ESMA, SEBI, and SEC. This project significantly enhanced my skills in several key areas:

- **Python Programming:** I advanced my Python skills through the use of libraries for data manipulation and automation. This task helped me deepen my understanding of handling various data formats and interfacing with web APIs.
- **Web Automation:** Utilizing Selenium, I automated data collection from client sites, which involved navigating web pages programmatically and extracting relevant information. This experience taught me about the challenges and solutions in web scraping and automation, particularly in dealing with dynamic content.
- **GUI Development:** Implementing a tkinter-based GUI allowed me to explore user interface design in Python, making the automation tool more accessible and user-friendly for non-technical users.
- **Regulatory Compliance:** I gained valuable insights into the regulatory landscape of financial markets, learning about the specific data requirements and submission protocols of various regulatory bodies.
- Data Analysis and Visualization: Using libraries like yfinance for data collection and mplfinance for visualization, I improved my ability to handle financial data and present it in an insightful manner.
- **Predictive Modeling:** Implementing SARIMA and LSTM models for stock prediction enhanced my understanding of time series analysis and machine learning applications in finance. This experience has been fundamental in building my capabilities in statistical modeling and neural networks.

- Real-time Data Processing: Integrating real-time stock data into the predictive models and dashboard required efficient data processing skills to ensure timely and accurate predictions.
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 models and dashboard required efficient data processing skills to ensure timely and
 accurate predictions.
- Full-stack Web Development: By working with Django and Flask, I gained endto-end experience in developing and managing web applications. This included everything from database schema design to user interface implementation and API development.
- Cloud Deployment: Deploying the Flask service on Azure introduced me to cloudbased environments and the deployment workflows, which are crucial for modern web applications. This experience also taught me about scaling applications and managing cloud resources efficiently.
- Secure Application Development: Implementing secure CRUD operations and managing user data responsibly highlighted the importance of security in web development. I learned about authentication, authorization, and secure data handling practices.

Each of these projects not only enhanced my technical skills but also provided practical insights into how technology can solve real-world business problems, particularly in the context of regulatory compliance, financial analysis, and web application development. These experiences have laid a strong foundation for my future career in technology.

Overall, these projects collectively enriched my technical skills in Python programming, web development, data analysis, and cloud deployment. They provided practical insights into solving real-world business problems and equipped me with valuable experiences that will be instrumental in my future career endeavors.

4.2 Non-Technical Outcomes

Throughout my internship at Société Générale, I've witnessed profound personal growth and development in various non-technical areas, each contributing significantly to my overall professional maturation and effectiveness.

Improved Verbal and Written Communication: The immersive nature of my internship has provided ample opportunities to refine my communication skills, both verbal and written, to a level of proficiency that exceeds my initial expectations. Through daily interactions with team members, stakeholders, and clients, I've honed the art of articulating complex technical concepts with clarity and coherence, ensuring that my messages resonate effectively across diverse audiences. Whether delivering concise project updates during team meetings, crafting comprehensive documentation to outline development processes, or providing constructive feedback to peers, I've cultivated a communication style characterized by precision, empathy, and adaptability. This newfound ability to convey ideas persuasively and concisely has not only enhanced my professional credibility but also fostered stronger relationships and collaboration within the team, laying the groundwork for sustained success in future endeavors.

Personality Development: My internship journey at Société Générale has been more than just a professional endeavor; it has been a transformative experience that has shaped me into a more resilient, adaptable, and self-assured individual. Working in a dynamic and fast-paced environment has tested my limits and pushed me to embrace challenges with confidence and determination. Through moments of triumph and setbacks alike, I've discovered the resilience to persevere in the face of adversity, the adaptability to thrive in ever-changing circumstances, and the self-assurance to trust in my abilities and instincts. Moreover, I've developed a growth mindset that fosters continuous learning and self-improvement, propelling me towards new horizons of personal and professional development with unwavering enthusiasm and optimism.

Time Management: Balancing multiple tasks and deadlines has been a central theme of my internship experience, challenging me to refine my time management skills and adopt

clarity and purpose.

strategies for optimal productivity and efficiency. By meticulously planning and prioritizing tasks, setting realistic goals, and maintaining a disciplined work ethic, I've been able to navigate the complexities of project management with poise and precision. Moreover, I've learned to leverage time-saving techniques and tools to streamline workflows and maximize productivity without sacrificing quality or attention to detail. This newfound proficiency in time management has not only enhanced my ability to meet project objectives and deadlines consistently but also instilled a sense of confidence and control over my professional responsibilities, empowering me to tackle challenges with

Resource Utilization Skills: In an industry characterized by rapid innovation and technological advancement, the ability to leverage resources effectively is paramount for success. Throughout my internship, I've cultivated a keen eye for identifying and capitalizing on available resources, whether it's tapping into the collective expertise of my peers and mentors, leveraging existing code libraries and frameworks, or conducting independent research to address technical challenges. By harnessing the power of collaboration, creativity, and resourcefulness, I've been able to overcome obstacles and drive project progress with ingenuity and efficiency. Moreover, I've developed a mindset of resource optimization that extends beyond technical contexts, enabling me to make informed decisions and allocate resources judiciously in all aspects of my professional endeavors.

CONCLUSION

Concluding my internship at Société Générale has been an enriching and transformative experience that has prepared me well for a career in software development. Throughout my time at Société Générale, I engaged in key projects like web automation for regulatory reporting, developing a stock prediction dashboard, and enhancing a Django application with CRUD operations. These projects deepened my technical proficiency in Python, Django, Flask, and front-end technologies, while also sharpening crucial soft skills such as project management and teamwork.

Each task I undertook offered unique challenges that improved my problem-solving skills and my ability to work under pressure. From automating data collection and report submission processes to creating predictive models for financial markets, my projects not only broadened my technical skills but also provided a practical understanding of how technology can be leveraged in finance.

Working closely with experienced professionals, I also learned the importance of clear communication, meticulous planning, and adaptive thinking in a corporate environment. As I move forward, I am thankful for the comprehensive learning opportunities provided by Société Générale and am excited to apply these skills in my future endeavors in software development, continually striving for growth and excellence.

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