JNTU-GV COLLEGE OF ENGINEERING (A)
Jawaharlal Nehru Technological University Gurajada Vizianagaram
DEPARTMENT OF INFORMATION TECHNOLOGY

NEWSLETTER

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DATA SCIENCE & ADVANCED ANALYTICS

ACM STUDENT CHAPTER SPECIAL EDITION

STB NO. 186519

Editorial

Dear Readers,

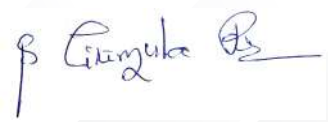
"Information is the oil of the 21st century and analytics is the combustion engine."

– Peter Sondergaard, Senior Vice President and Global Head of Research at Gartner, Inc.

The Department of Information Technology is releasing the second edition of the newsletter, "**Bytes**," which encompasses state-of-the-art development in IT industries, competitive programming nuggets, Cutting edge problem-solving techniques, and student and faculty achievements. This issue theme focuses on "Data Science & Advanced Analytics." The multidisciplinary field of data science integrates statistics, computer science, machine learning, and domain expertise to extract knowledge and insights from data. Frequently, a data product is what data science creates. Creating a data product involves translating an organization's data into a service or product that meets a demand.

Organizing worldwide programming competitions, the **JNTU-GV, CEV (A) ACM Student Chapter** deserves special praise for its tireless efforts to improve its international visibility. **Therefore, this edition is dedicated specifically to them**. This unique newsletter creates a platform for Alma matter to contribute articles on best industry practices. This approach helps current students to get acquainted with the latest technology. It serves the department and institution's growth twofold. Firstly, the industry's best practices can be reflected in our student community through their alums. It makes more sense to the students. Secondly, it helps to bridge the gap between industry and academia. It's the dream of any computer science/ Information Technology graduate to join companies like Meta, Apple, Google, etc. The newsletter devotes a particular column to algorithm design techniques and their importance in MAANG companies. "Bytes" will act as a platform to nourish coding techniques to crack such companies. We invite our research collaborators to share a glimpse of fundamental research to enable our faculty and students to solidify their research quotient.

We are grateful to all of our contributors and readers. So many high-quality articles have been received. We are indebted to the members of the Bytes publication committee, the editorial board, the authors, and the reviewers for their remarkable contribution and support in the production of this issue. Finally, I've traced and acknowledged ownership and copyright and obtained permission for items in this Newsletter. I will gladly contact any unreachable copyright proprietors to obtain rights. We would like to express our gratitude to our Hon'ble Vice Chancellor, Registrar and Principal for their unwavering support, guidance, and encouragement throughout the publication of this issue. We respect the assistance and cooperation of our Information Technology department's personnel at the JNTU-GV University College of Engineering in Vizianagaram. We eagerly anticipate receiving constructive comments and recommendations from our respected members and readers at bytes.newsletter@gmail.com. I wish you the best year yet. May you always be happy as you accomplish your goals! I hope you luck achieving your goals and to-do lists this year! Think big and have confidence in yourself this year since a new year means new prospects! May 2023 bring you happiness, prosperity, love, and blessings!



Dr. Tirimula Rao Benala
Editor-In-Chief, Bytes - The newsletter

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Message from Hon'ble Vice Chancellor

Dr. G.V.R. Prasada Raju

Hon'ble Vice-Chancellor *FAC*

The second issue of the technical journal "BYTES" will be published by the department of INFORMATION TECHNOLOGY, JNTU-GV, College of Engineering Vizianagaram (A), with the theme "DATA SCIENCE & ADVANCED ANALYTICS" this academic year (2022-2023). "Bytes" provides pupils different methods for developing their technical knowledge and proficiency. The second edition is mainly dedicated to the JNTU-GV ACM Student Branch (STB-186519) for their outstanding and ongoing efforts through international coding competitions to promote the university on the global stage. Best wishes for all of "The ACM Student Branch" initiatives. I also appreciate the team's cooperation and efforts in raising awareness of this issue. Success to them, please.

Message from Registrar

Dr. Swami Naidu Gurugubelli

Registrar, $_{i/c}$
M.Tech (IITM); Ph.D
Professor in Metallurgical Engineering

It is a commendable effort on the part of the Department of Information Technology, JNTU-GV, College of Engineering Vizianagaram (A), to produce "BYTES" with the theme DATA SCIENCE & ADVANCED ANALYSIS regularly, with the current edition being notably dedicated to the ACM Student Branch (STB-186519). The JNTU-GV ACM Student Branch deserves special recognition for its tireless efforts to raise its profile abroad by participating in international programming contests. This edition is dedicated to them in particular. I hope that Bytes establishes itself as a spark that ignites the zeal and excites their brains for numerous intrusive inventions among students and invigorates the members of "The ACM Student Branch." My best wishes to the Editor-in-Chief and editorial board for continued success.

Message from Principal

Prof. K. Srikumar
B.Tech., M.Tech., Ph.D.
PROFESSOR & i/c PRINCIPAL
JNTU-GV University College of Engineering

I am delighted to extend my congratulations to the Department of Information Technology, JNTU-GV College of Engineering Vizianagaram(A), on the publication of the second issue of the technical magazine "BYTES (Data Science & Advanced Analytics)," which provides a forum for students, teachers, and alumni of various disciplines to share their ideas and creative abilities. Furthermore, this edition acknowledges the ACM Student Branch (STB-186519), which has worked tirelessly to promote our college internationally through its students' participation in international programming competitions. I wish all the students and members of the ACM Student Branch (STB-186519) who contributed to the journal's publication success in their future endeavors.

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Deep Learning Inference

Dr. Ravi Panchumarthy

Sr. Machine Learning Engineer, Intel Corporation, Portland, Oregon, USA. Email: ravi9@outlook.com
https://www.linkedin.com/in/ravipanchumarthy

Introduction

Deep learning has become an increasingly popular and powerful tool for building intelligent systems. Deep learning is a subfield of machine learning that is concerned with the development of algorithms and models that can learn from data and make predictions or take actions based on that data. Deep learning is based on the idea of building complex, hierarchical models that can learn a wide range of features and patterns in data by building on top of each other, in a process known as "deep" learning. This approach has proven to be incredibly powerful and has been applied to a wide range of real-world problems, from image and speech recognition, to natural language processing, and even to solving complex, multi-dimensional problems in fields like healthcare and finance.

Deep learning involves training a model on a large dataset to enable it to make predictions or take actions based on new data. This training process involves feeding the model a large amount of data, along with the correct answers or labels for that data, and then adjusting the model's internal parameters to minimize the error between the model's predictions and the correct answers. This process can be computationally intensive and time-consuming, but it is essential for creating a deep learning model that is able to make predictions accurately and reliably or take actions.

Once a deep learning model has been trained, it can be used for inference, which is the process of applying the trained model to new data to make predictions or take actions. This process is typically much faster and more efficient than the training process and allows the model to be applied to real-world problems in a wide range of industries. Inference is a crucial part of the deep learning process, as it allows these trained models to be used in real-world applications. It allows the models to make predictions on new data and provide valuable insights and information that can be used to improve a wide range of systems and technologies.

In this article, we will explore the basics of deep learning inference, the steps involved in the inference process, and some of the challenges and considerations that arise when performing deep learning inference. We will also look at optimization techniques and some examples of deep learning inference in action.

Deep Learning Inference Steps

The steps involved in deep learning inference typically include the following:

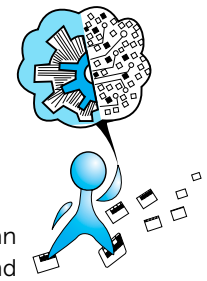
1. **Loading the trained model:** The first step in deep learning inference is to load the trained model that will be used to make predictions. This typically involves loading the model weights and architecture into memory so that it can be used for inference.

2. **Preprocessing the data:** The next step is to preprocess the data that will be used for inference. This typically involves cleaning and formatting the data to ensure that it is suitable for input into the model. This may involve tasks such as normalizing the data, removing outliers, and selecting specific features or input dimensions.

3. **Feeding the data into the model:** Once the data has been preprocessed, it can be fed into the model for inference. This involves passing the data through the model and using the trained model to make predictions based on the input data.

4. **Using the model to make predictions:** After the data has been fed into the model, the model will use its trained weights and architecture to make predictions based on the input data. The model will output a prediction for each input data point, which can then be used for further analysis or decision-making.

5. **Evaluating the model performance:** Finally, the performance of the model can be evaluated to assess its accuracy and reliability. This typically involves comparing the model's predictions to ground truth labels or known outcomes, and calculating metrics such as precision, recall, and accuracy. This can help to identify areas where the model may be performing



poorly and suggest ways to improve its performance.

Types Of Deep Learning Models Used for Inference

There are many different types of deep learning models that can be used for inference, each with its own strengths and weaknesses. Some of the most common types of models used for inference include the following:

1. **Convolutional neural networks (CNNs):** CNNs are a type of deep learning model that is commonly used for image recognition and other computer vision tasks. They are designed to process and analyze visual data, and they can extract features and patterns from images to make predictions.

2. **Recurrent neural networks (RNNs):** RNNs are a type of deep learning model that is commonly used for natural language processing and other sequential data tasks. They are designed to handle data with temporal or sequential dependencies, and they can process and analyze text, audio, and other time-series data.

3. **Generative adversarial networks (GANs):** GANs are a type of deep learning model that is commonly used for generating synthetic data. They are composed of two neural networks – a generator and a discriminator– that compete to produce more realistic data.

4. **Autoencoders:** Autoencoders are a type of deep learning model that is commonly used for dimensionality reduction and feature extraction. They are designed to learn a compact representation of the input data, and they can be used to reduce the number of input dimensions or extract relevant features for inference.

Each of these types of models has its own strengths and weaknesses, and they are used in different applications depending on the specific needs and requirements of the task at hand. It is important to carefully select the appropriate model type for a given inference task to achieve the best possible performance.

Deep Learning Inference Challenges

There are several challenges and considerations that can arise when performing deep learning inference. Some of the most common challenges and considerations include the following:

1. **Model performance:** One of the key challenges in deep learning inference is achieving good model performance. This involves achieving a high level of accuracy and reliability when making predictions based on the trained model. This can be difficult, especially with large and complex datasets, and it requires careful tuning and optimization of the model to achieve the best possible performance.

2. **Data quality:** Another important challenge in deep learning inference is ensuring the quality of the data used for inference. This involves ensuring that the data is clean, accurate, and representative of the real-world situations in which the model will be used. Poor-quality data can lead to inaccurate or unreliable predictions, so it is important to carefully assess and preprocess the data before using it for inference.

3. **Computational resources:** Deep learning inference can require significant computational resources, including high-performance GPUs and large amounts of memory. This can be a challenge, especially when working with large datasets or complex models. It is important to ensure that the necessary resources are available and properly configured to support the inference process.

To address these challenges and considerations, it is important to carefully plan and prepare for deep learning inference. This may involve developing strategies for optimizing the model, preprocessing the data, and managing computational resources. It may also involve working with domain experts and other stakeholders to ensure that the inference process is well-suited to the specific needs and requirements of the task at hand.

Optimizing Deep Learning Models for Inference

When using deep learning models for inference, it is important to ensure that the models are optimized for the specific task and data at hand. This can involve a variety of techniques and strategies for improving the performance of the model and making it more efficient and scalable. Some common techniques for optimizing deep learning models for inference include the following:

1. **Pruning:** Pruning involves removing unnecessary connections and parameters from the model to reduce its size and complexity. By removing these redundant or unnecessary elements, the model can be made more efficient and easier to deploy in real-world applications.

2. **Quantization:** Quantization involves reducing the precision of the model's weights and activations to reduce the amount of memory required to store the model. By reducing the precision, the model can be made more efficient and easier to deploy on devices with limited computational resources.

3. **Model compression:** Model compression involves using techniques such as compression algorithms and distillation to reduce the size and complexity of the model without sacrificing accuracy. By compressing the model, it can be made more efficient and easier to deploy in real-world applications.

4. **Ensemble models:** Ensemble models involve using multiple trained models to make predictions, and then combining the predictions to produce a more accurate and reliable result. By using ensemble models, the performance of the model can be improved without increasing the size or complexity of the model.

By using these and other techniques for optimizing deep learning models for inference, it is possible to improve the performance and efficiency of the model, making it more suitable for real-world applications.

Deep Learning Inference Examples

1. **Image recognition:** One of the most common applications of deep learning inference is image recognition. This involves using a trained deep learning model to identify objects, scenes, and other visual features in images. For example, a deep learning model might be trained to recognize specific types of animals, plants, or landscapes in images, and then used to make predictions on new images.

2. **Speech recognition:** Another common application of deep learning inference is speech recognition. This involves using a trained deep learning model to transcribe spoken words into text. For example, a deep learning model might be trained to recognize specific words or phrases, and then used to transcribe audio recordings into written text.

3. **Natural language processing:** Deep learning models are also commonly used for natural language processing tasks, such as language translation, text classification, and sentiment analysis. In these applications, the model is trained on large datasets of text, and then used to make predictions on new text inputs. For example, a deep learning model might be trained to identify positive and negative sentiments in text, and then used to classify the sentiment of new text inputs.

These are just a few examples of the many applications of deep learning inference. Other examples include recommender systems, fraud detection, and medical diagnosis, among others. In each case, the trained deep learning model is used to make predictions on new data, providing valuable insights and information that can be used to improve the performance of the system or technology in question.

Conclusion

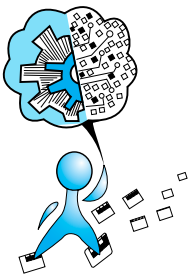
In conclusion, deep learning inference is a crucial part of the deep learning process, and it has revolutionized many different fields and applications. By using trained deep learning models to make predictions on new data, we can gain valuable insights and information that can be used to improve a wide range of systems and technologies.

In the future, we can expect to see further advances in deep learning and inference, as researchers continue to develop new models and techniques for improving the accuracy and efficiency of the inference process. This will spur new opportunities for deep learning and inference in a variety of applications, from image and speech recognition to natural language processing and more.

Overall, deep learning inference is a fascinating and rapidly evolving field, and it will continue to play a crucial role in the development of new technologies and applications in the coming years. In the future, we can expect to see further advances in deep learning and inference, as researchers continue to develop new models and techniques for improving the accuracy and efficiency of the inference process.

About the Author

Dr. Ravi Panchumarthy is a Sr. machine learning engineer at Intel Corporation. He collaborates with Intel's customers and partners to build and optimize AI solutions. He also works with cloud service providers to enable Intel's AI optimizations in cloud instances and services. He has a PhD in computer science and engineering from University of South Florida with a dissertation focused on developing novel non-boolean computing techniques for computer vision applications using nanomagnetic field-based computing. He holds two patents and several peer-reviewed publications in journals and conferences.



Technology in Social Impact

Jaya Srinivasan

Jaya Srinivasan (Senior Manager – Projects, Ennovent)
Email: jaya.srinivasan06@gmail.com

I have been working in social impact since 2013, my interactions primarily being with social enterprises, not-for-profit organizations, and foundations whose areas of interest are sectors aligned with the Sustainable Development Goals (SDGs). Many meetings with new or prospective partners begin with participants mentioning their academic and professional backgrounds. It is always interesting to hear from people about their different paths; it is not unusual for those who have studied STEM and social sciences to work alongside one another on a single project.

My academic and career path has often invited several questions – after completing an engineering degree in Computer Science, I worked in IT for three years before earning a Master of Arts degree in International Relations to build a career in development/social impact. I felt that my strengths lay in this direction and that working in application support in an IT company was not doing either of us justice.

As a technology degree and an arts degree seem to have no connection with each other, to most people (including myself as I made the transition), there did not seem to be much overlap between the two. However, there is much more awareness of the use of technology in development now, especially with the rise of initiatives such as ICT4Dev and AI for Good. The need for appropriate technology in development/social impact programs is being increasingly put at the center of conversations, more so since the COVID-19 pandemic. India is also home to many social enterprises that employ technology as a critical part of their offerings – examples of solutions include improving access to primary healthcare through digital services, strengthening agriculture value chains, climate change management, better disaster resilience, and so on.

Background

I had previously heard the word 'systems' only in the context of computing. We studied Operating Systems and Database Management Systems or thought of the devices we worked on as intricate systems that worked magic with their components, visible and invisible. Likewise, a 'program' was for computing, and 'development' was related to IT projects.

However, I use these terms in entirely different settings now. In social impact, the focus is on sectors closely aligned with creating better lives for people, especially those who are marginalized. There are several definitions for social impact, but the key idea is about addressing social and development challenges[1]. Working towards positive social impact requires coordinated action across many stakeholders in complex systems. This involves the application of a wide variety of skill sets – business, technology, human resources, arts, and architecture – beyond the usual suspects.

In the following few pages, I will share a few examples of technology's critical role in social impact. While it is not the obvious career choice for technology professionals, it holds much promise for those looking to apply their skills in development programs for social change, be it engineering, coding, or data science.

Technology for impact

In the past four years, I have been working in programs that aim to make cities better places to live in, mainly to improve young people's well-being. Cities being complex systems, improving well-being requires the collaboration

1. https://careerhub.students.duke.edu/blog/2021/09/03/social-impact-definition-and-why-is-social-impact-important/

of several stakeholders with the target population: government, non-profit organizations, community-based organizations, and private sector companies. Each group brings its strengths and knowledge into the mix, applying them to address specific social challenges.

Let us pause for a moment and think about well-being. What do we think of when we imagine a better city? Improved infrastructure (lighting, roads, water, sanitation, and transport), education systems (schools and colleges), healthcare facilities (clinics and hospitals), public spaces (parks and libraries), and so on. Building, maintaining, and improving these complex systems calls for proven methods to work well and constant innovation to find the most sustainable ways for better access and longevity. In this respect, the use of technology is rapidly gaining traction in several sectors. Here, I share a few examples that deal with the application of technology in development.

Decision-making

The increasing focus on Smart Cities[2] has highlighted the need for data-driven decision-making and its various applications. At a systems level, data can help address some critical challenges related to safety and infrastructure. Machine learning can be applied to analyze safety parameters from city data and allows combinations with other data to produce recommendations for city governments to make cities safer[3]. Another example is the use of GIS tools that can contribute to planning and implementing interventions to manage climate change effects, even at the city level[4].

Program monitoring and evaluation

Development programs can be spread out over a long term, given the nature of the work and the inherent complexities of the processes involved. However, it is vital to keep evaluating programs at every level for fidelity to the objectives and to ensure that data gathered from different stakeholders, including the target population, contribute to program design and iterations. To this end, program funders seek to employ technology in various forms to improve the participation of the target population in cases where they are otherwise restricted to being 'beneficiaries.' The means to achieve this can range from encouraging simple video documentation through smartphones to capturing data sets that can be analyzed using AI algorithms for sensemaking, yielding results that can be fed meaningfully back into the programs.

Last-mile access

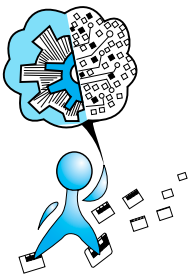
The negative impact of the physical distancing restrictions of COVID-19 lockdowns is well known – access to healthcare, employment, education, etc., was severely affected, particularly for those with limited access to the internet for remote solutions. However, the rise in digital tools has meant that some efforts could be made to reach low-income communities through customized methods. Home-learning programs using feature phones[5] and content delivered through IVRS messages helped engage students to a certain extent, as did access to healthcare, including mental health specialists, through online services and chatbots.

The examples above serve as a reminder of the potential for integrating technology into development programs and engaging technology professionals in career paths beyond those they may be accustomed to exploring. Naturally, responsible and safe use of technology is critical, and people who have specialized in different areas must share learning to improve the application of technology for positive social impact. Multidisciplinary specialization adds value to such programs, and it would be highly encouraging to see institutions and development practitioners actively explore how such cross-learning can be made possible.

2. https://www.mckinsey.com/capabilities/operations/our-insights/smart-cities-digital-solutions-for-a-more-livable-future
3. https://safetipin.com/methodology/
4. https://wri-india.org/blog/how-kochi-can-use-geospatial-data-build-resilience-and-beat-heat
5. https://uplink.weforum.org/uplink/s/uplink-contribution/a012o00001pTYE1AAO/aibased-voice-text-based-solutions-to-support-personalized-athome-learning

About the Author

Jaya Srinivasan has 12 years of experience in business development and program implementation. At Ennovent, she leads the design and implementation of programs across different sectors. She also contributes to research, network building, and partnerships. Previously, Jaya worked in business development and communications for a drip irrigation startup, and as Senior Systems Engineer with Infosys. She holds a Master of Arts degree in International Relations from the University of Sussex, UK, and a Bachelor of Technology degree in Computer Science and Engineering from ANITS, Andhra University, India.



Agile Project Management and its implementation in Data Science and Machine Learning Teams

Sandeep Dasari

Working as an Agile Delivery Manager at William Hill, London. Email: sandeep.dasari@williamhill.co.uk
LinkedIn: https://www.linkedin.com/in/dasari-sandeep/

Introduction

Applications for machine learning (ML) and data science (DS) that have been successfully implemented have enabled businesses to use creative business models and opened new prospects. On the other hand, companies using ML and DS solutions are at significant risk of failure and can quickly fail to meet their goals, according to research reports (Dabrowski, 2021). Therefore, adopting or adapting a project management approach to ML and DS applications' unique requirements is crucial. Agile Project Management (APM) could be suggested as a remedy result. However, a dearth of research takes an agile approach to ML and DS project management.

The complicated projects that are often completed by ML and DS teams include a variety of tasks from the knowledge areas of system engineering, software engineering (SE), and data engineering. System engineering, software engineering, and data engineering positions are among the most prevalent in projects. However, they can vary and largely depend on the project management techniques the teams use. It is significant to highlight that both ML and DS projects have project stakeholders, users, business analysts, system analysts, data scientists, and data engineers (Ransbotham et al., 2017).

Understanding Agile Project Management (APM)

Transparency, client focus, flexibility, ownership, effective leadership, and continuous development are the key characteristics of agile processes in the project management knowledge domain. Therefore, project management activities must follow this collection of agile principles to be agile. APM is an iterative method of developing software that emphasizes the creation of usable software with achievable tasks in short iterations. In addition, it highly values constant customer feedback and communication, enthusiastic cooperation, and rapid responses to modifications or new requirements. The values listed in the Agile Manifesto (2001) are as follows:

- "Individuals and interactions over processes and tools,"
- "Working software over comprehensive documentation,"
- "Customer collaboration over contract negotiation,"
- "Responding to change over following a plan,"

Based on their team structure, release dates, daily Business as Usual (BAU) duties, and organizational architecture, companies employ Scrum, Kanban, Data-Driven Scrum (DDS), and Team Data Science Process (TDSP) to execute this agile technique in a project. Saltz et al. (2017) conducted a controlled experiment to compare the ML & DS teams' use of Scrum, Kanban, and standard project management techniques. The obstacles faced by the Scrum teams were task estimates, data comprehension, and customer needs.

Scrum

The three primary roles in Scrum are Product Owner, Scrum Master, and Development Team. One of the most well-liked agile software development techniques is Scrum. It uses an incremental and iterative development strategy and cycles to arrange the total effort (Sutherland and Schwaber, 2017). Sprint cycles are time-boxed, have fixed objectives, and run between two and six weeks. All the software development activities are included in each Sprint. The product features are chosen from the product backlog and added to the sprint backlog during the first activity, the sprint planning meeting. During the execution phase of a sprint, a goal is attained. Short Stand-up Meetings are held to check on the daily status of the project. The inspect-and-adapt activities include the Sprint Review and Sprint Retrospective Meetings, which are held toward the conclusion of the Sprint. In the Sprint Review, the recently developed product increment is evaluated and presented to the project stakeholders.

The Sprint Retrospective examines the Scrum methods utilized to produce the product, whereas the Sprint Review concentrates on the product deliverables and the product itself.

Kanban

Lean thinking and just-in-time scheduling are closely related to the straightforward project management technique known as Kanban. Roles and process structure are not precisely specified; however, meetings can be scheduled as needed (Brechner, 2015). If their process models adhere to the Kanban principles, teams can adopt them. The fundamentals include using a task board, visualizing the workflow, limiting the amount of work in progress, monitoring, and controlling the flow by putting rapid feedback loops into place. To prevent bottlenecks, Kanban balances the workload needs with the team's capability to maximize value and decrease waste.

Application of Agile Methodology

It is feasible to adapt APM following corporate demands or the needs of DS and ML projects while embracing agile principles. The setting of DS and ML initiatives, company culture, and team members' individual experiences all play a role in this. Brasjo and Lindovsky (2019) state that ML projects have employed various adaptations of CRIS-DM, Scrum, Kanban, and TDSP. Lean Kanban and Scrum-like iterations are combined in Saltz, and Sutherland's (2019) proposed process model to make it more organized and repeatable. Agile is an approach that encourages ongoing learning and development. The future of business is driven by DS and ML initiatives, with Agile as the backbone to support successful delivery and ongoing improvement in ML/DS project lifecycles (see Figure 1). The key areas for implementing agile in ML/DS are to show progress and value and pursue improvement with clarity.

For ML and DS projects employing sprint-based Scrum, estimating what can be accomplished in a sprint may be a severe problem. Included in a fixed-length sprint may include unrelated and irrational backlog items. For instance, more or fewer items from the backlog may be needed for exploratory data analysis or model evaluation. As a result, spring lengths must be adjustable following the demands of ML or DS testing techniques. However, Kanban does not discuss project responsibilities, standards unique to a particular process, tools, or strategies. This arrangement could provide the teams with the freedom and allow them to utilize their customized process models. However, it might also lead to misunderstanding and ambiguity, leading to more implementation issues (Brechner, 2015).

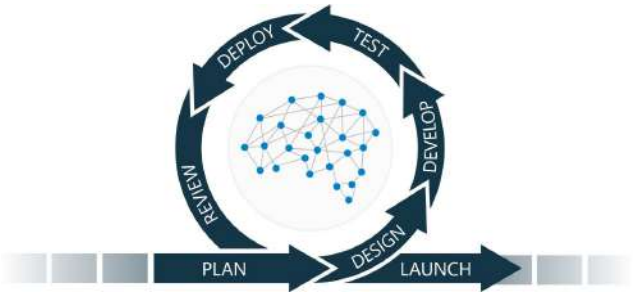


Fig. 1: Application of Agile Methodology to ML/DS Projects

Plan-driven approaches may be selected for projects with predictable activities and procedures and well-understood and attainable project objectives. In contrast, utilizing solely agile methods may not be appropriate for large systems with interdependent components, such as Scrum/Kanban as depicted in Figure 2. Simply adopting a plan-driven methodology may be rigid or inflexible. Hybrid approaches still have several shortcomings, notwithstanding the possibility of contributions. First, no formal standards, theoretical foundation, or practical context exist for developing hybrid approaches to meet the specific needs of DS and ML projects. The difficulties and problems that affect the success of agile and hybrid projects, for instance, are presented by Sithambaram et al. (2021), who classify them into four categories: organization, people, process, and technology.

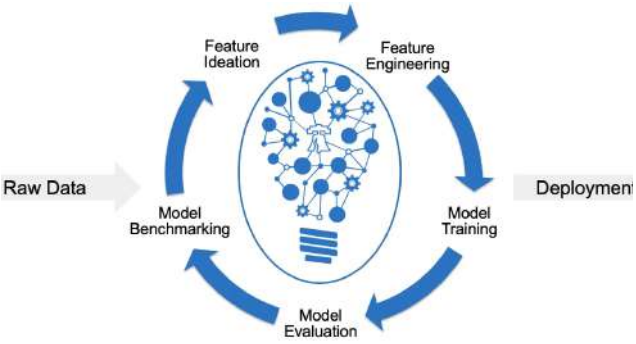


Figure 2: Sprint Cycle in ML/DS Projects

The findings of a case study on SE difficulties for ML and AI projects are presented in a research study done by a Microsoft team. Considering this, data finding and management may be considerably more challenging and complex than other SE processes. Reusing and customizing models calls for abilities beyond those of SE teams. ML modules could be trickier than conventional software modules since SE, ML, and AI modules might be intertwined in various sophisticated ways. Teams frequently worry about automating procedures like data aggregation, synthesizing, feature extraction, and pipeline. Additionally,

combining ML development with software development infrastructure would speed up the experiments.

Conclusion

Popular AI subfields include machine learning (ML) and data science (DS), which have created new business models and provided creative solutions to various practice area difficulties. There are several facts concerning ML and DS initiatives failing and producing disappointing outcomes, even though they might significantly influence businesses. Adopting or adapting APM strategies to ML and DS applications' unique needs has been a significant contributing element. The project management techniques that are recognizable to or appealing to organizations are those used in the SE field. Despite sharing many key characteristics, none of the APM approaches is widely used in ML and DS. Scrum-inspired techniques are still used for ML and DS projects.

However, the biggest disadvantages are the difficulty with job estimates and the set length of sprints. Setting up manual or automated data or machine learning pipelines is a significant barrier for fixed-length iterative development cycles like Scrum. For ML and DS projects, process-specific rules, tools, and strategies are not provided by Kanban, even though it may be seen as more adaptable and more straightforward than the other APM methodologies. With its high-level task estimations, decoupled meetings from iterations, and capability-based executions, DDS, a relatively new methodology, may address Scrum's shortcomings. Another frequent problem for ML, DS, and SE teams is automating the software engineering, data collection, synthesizing, feature extraction, and pipeline operations.

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About the Author

Sandeep Dasari is an Agile Delivery Manager Agile Delivery Manager at William Hill, London. He is a Certified Scrum Master CSM® and registered Prince 2 Practitioner with over 7 years of hands-on experience in Software Engineering & Product Development in the FinTech, Aviation and Gaming industries. At William Hill, Sandeep is line-managing Six project managers directly and 21 analysts indirectly. He also oversees and mentors 6 agile and cross-functional teams from the UK, Gibraltar, Poland, Malta, Bulgaria, and Manila. Sandeep has successfully delivered 45+ top-line scaled agile projects and has global working experience in the United Kingdom, Saudi Arabia, United Arab Emirates and India.

Enhancing the efficiency of software defect prediction models built on imbalanced data using oversampling methods

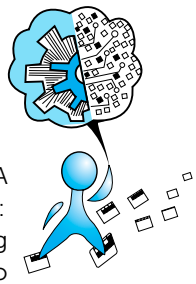
Tantati Karunya

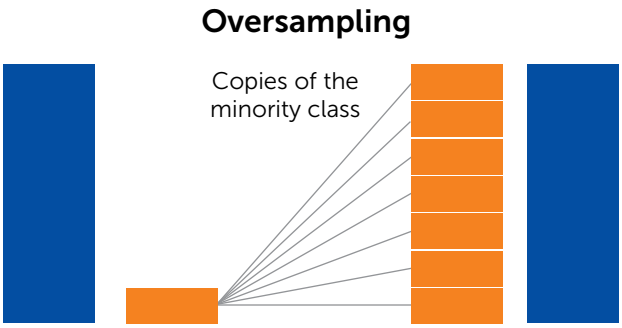
Front-end developer at SAILS software solutions. Email: thetantati@gmail.com

Software defect prediction (SDP) is essential to analyze and identify defects present in a software model in the early stages of software development. The identification of these defects and their early removal provides cost-efficient software. Machine learning (ML) techniques have been successfully used for developing defect prediction models. However, these techniques deliver off-target results when implemented on imbalanced datasets. For example, a dataset with unequal class distribution is technically imbalanced. Thus, ML techniques on such imbalanced data lead to a biased prediction of minority class instances, which are more important than majority class instances. Therefore, the imbalanced data problem must be resolved to successfully develop an efficient SDP model. A study on "Efficiency of oversampling methods for enhancing software defect prediction by using imbalanced data" evaluated the prediction capability of ML classifiers for software defect prediction on nine imbalanced NASA datasets by applying oversampling methods. A set of five oversampling methods were considered to synthesize minority class instances and make the datasets balanced. These oversampling techniques replicated or synthesized the instances of minority classes to balance the datasets. When the datasets were balanced, ML classifiers were used to develop a defect prediction model. The experimental results acquired by applying ML classifiers on the imbalanced and balanced data showed an enhancement in the learning capability of ML techniques with the implementation of sampling techniques. Oversampling methods considerably improved the prediction performance of the ML classifiers.

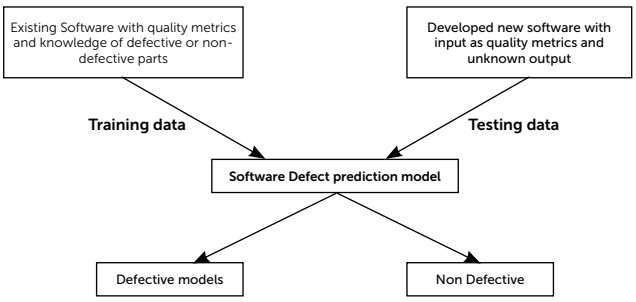
Introduction

The development of software systems is the driving force of the modern world. Nowadays, software is being used in all fields. High-quality software with excellent performance is required to achieve a competitive edge in the market. With major digital transformations of organizations, software-based innovation and development expand rapidly, which results in balancing value delivery at a high speed without sacrificing quality. However, this balance cannot be easily attained. In most organizations, software quality lags behind other objectives. Quality negligence leads to a drawback, which is reported in this NIST report. Although organizations can monetize the business value of speed, they rarely measure the offsetting cost of poor quality. In 2020, the total cost of poor software quality (CPSQ) in the U.S. was $2.08 trillion (T). Moreover, a NIST report indicated the U.S. figure for 2020 for the technical software debt of severe defects that require correction to be $1.31 T (without interest); however, this report did not include technical debt for total CPSQ because it represents an increasing future cost (14% increase since 2018). Software defect prediction assists software practitioners in efficiently allocating test resources, to predict potentially defective modules in a software product. Several machine learning (ML) techniques have been proposed for software defect prediction; however, no common consensus regarding dominant classifiers is available. Thus, designing a reliable defect prediction model remains challenging. Software defect prediction (SDP) models are used to analyze and identify defective modules present in the software. These models predict whether a software module is prone to defects. In software products, defects may lead to failure or undesirable outcomes in software. Therefore, developers should use a model that can provide accurate predictions of software defects to identify the defective models in the early development stages and rectify them to acquire high-quality software. ML classifiers were initially used to design software defect prediction models. However,





datasets used for software defect prediction comprise more nondefective instances than defective instances; this result is termed the class imbalance problem. Furthermore, various studies on defect prediction models have confirmed that approximately 80% of defects are observed in limited modules (approximately 20%), which indicates that minority classes host more instances of defects than non-defective majority classes. Thus, applying ML techniques to such imbalanced data leads to biased results of minority class instances. Therefore, to effectively handle an imbalance in datasets, oversampling methods have been employed. A paper on "Efficiency of oversampling methods for enhancing software defect prediction by using imbalanced data" implemented five oversampling techniques to balance the imbalanced data and five ML classifiers to develop a defect prediction model. The oversampling techniques used are random over sampler, synthetic minority oversampling technique (SMOTE), adaptive synthetic sampling (ADASYN), SL-SM, and SVM-SOMTE. The ML classifiers implemented are decision tree classifiers-j48- classifier, random forest (RF) classifier, NaïveBayes (NB) classifier, and ensemble



learning classifiers, that is, Adaboost (AB) and Bagging (BG) classifiers. To obtain the effect of oversampling methods on the development of defect prediction models, it analyzed nine defect prediction public NASA datasets. The study answered the following:

- Q1: What is the impact of using oversampling techniques to generate defect prediction models by using ML classifiers?
- Q2: Do balanced datasets improve the prediction capability of ML classifiers? If yes, what is the extent of improvement?
- Q3: Which oversampling technique used provides the optimum results to develop a defect prediction model?

Outcome

The study has investigated whether the performance of defect prediction models improved when the datasets were balanced. It used five oversampling methods, ROS, SMOTE, ADASYN, SL-SMOTE, and SVM-SMOTE, to overcome the class imbalance problem. Five ML classifiers were used to develop the defect prediction models: J48, random forest, Naïve Bayes, AB, and BG. When the datasets were balanced, the ML classifiers were used to develop defect prediction models. The results were analyzed by evaluating the accuracy of defect prediction models for the ML classifiers and oversampling methods. The performance of oversampling methods was compared to identify the optimum oversampling technique.

The following are the main findings of our study. First, balancing the data by using oversampling methods enhanced the prediction capability of defect prediction models: A considerable increase in the performance of the ML classifiers was observed when oversampling techniques were used to overcome the data imbalance problem. When various oversampling methods were used to balance the datasets, the capability of the ML classifiers to predict the defectiveness in software increased to as high as 80%. SVM-SMOTE was the optimal oversampling method because of the capability of SVM-SMOTE to synthesize minority class instances in a safe region bounded by support vectors. Furthermore, SMOTE and ADASYN oversampling performed well. Hence, the analysis of this study can be used by researchers working in the defect prediction domain.

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About the Author

Tantati Karunya is currently working as a Front-end developer at SAILS software solutions. She has done her bachelors in Information Technology from JNTUK-UCEV Vizianagaram. Her fascination is with software applications and design systems. she has published her journal in

Innovations in Systems and Software Engineering, 2022.

How to start career in Big Data?

A Comprehensive Solution For New Generation folks

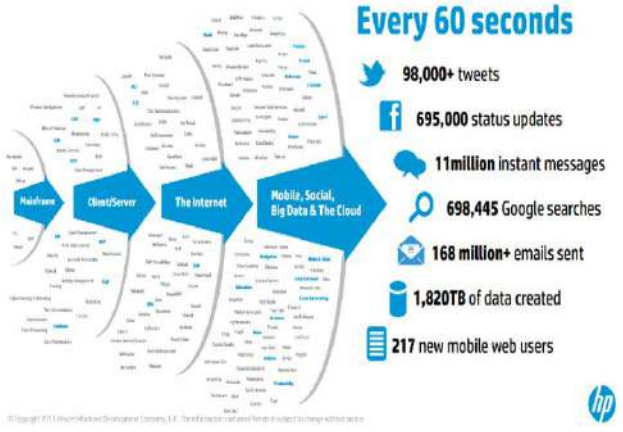
Surya N. Kompella

Senior Software Developer at Hewlett Packard Enterprise. Email: sn.kompella@gmail.com

Introduction:

Let me ask a simple question to readers... "Do you know how much data you are creating on daily?" You may answer "Hey!! I don't know. But I am using one mobile, one laptop, one smart watch, etc.....". You are right. Many of us don't know how much data each we are creating individually or socially. In one research demonstrating that each individual is handling nearly 8 devices. Many of social networks are collecting our information through their web sites and apps etc... This is amazing to see our historical data.

We cannot separate ourselves from gadgets where gadgets are serving human needs. What about the data? Which we are collecting on each second. I found that https://www.ancestry.com/, the genealogy site, stores around 2.5 petabytes of data. The Internet Archive stores around 2 petabytes of data and is growing at a rate of 20 terabytes per month. Ecommerce companies are collecting click data is unpredictable quantity. All above statistics are tentative my analysis 3yeare back!!!!



Now you may understand we need some one to handle all this data effectively and provide you as and when you need this data. There BIGDATA come in to light. Bigdata is having 5V's of characteristics are Volume, Velocity, Variety, Veracity, Value.

Pre-qualified knowledge required:

- A person should have vision to make his carrier in Bigdata
- He should have minimum knowledge on any one language on SQL, Java, Scala, Python, R.
- Minimum knowledge on data types.

Minimum timeline to trigger your carrier:

- This is something depending on level of competency.
- Under my training with above minimum knowledge person triggered his carrier in a 6 months by spending his 4Hr/day.

Basics of big data:

Bigdata can be stored in Hadoop Distributed File System(HDFS), cloud based storage system etc... . Let us discuss in this article on HDFS. HDFS stored data can be operated multiple ways through various frameworks. More familiar industrial usage are Hadoop and Spark.

Hadoop:

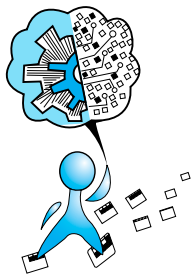
Hadoop is a framework which is written in Java that can handle with large cluster of commodity hardware to store large size data with expandable hardware facilities. Hadoop will work on "MapReduce Programming Algorithm" which was introduced by Google.

Hadoop can work with various languages most familiar are Hive Query Language(hql), pig scripting language, impala, hBase, java

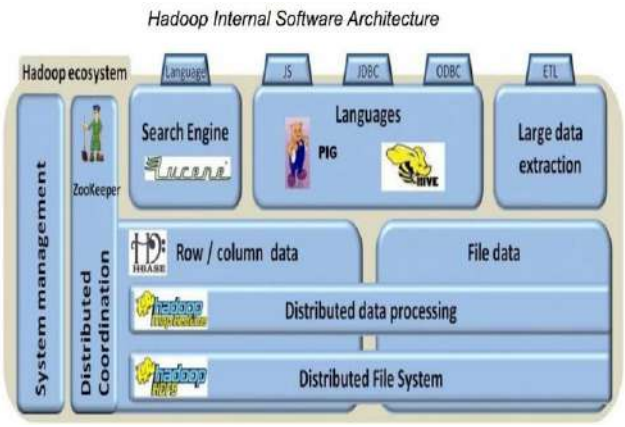
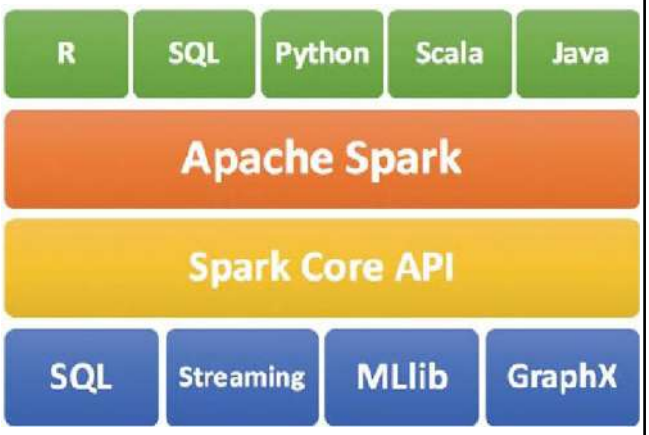
Spark:

Spark is a framework which a free source from Apache.

1. You can read Bigdata Characteristics in detail on https://www.geeksforgeeks.org/5-vs-of-big-data/
2. You can learn more on HDFS at https://www.geeksforgeeks.org/hadoop-architecture/



Architectural Comparison:

Hadoop	Spark
	

Spark can handle Historical data like Hadoop and near real time data which will help data scientist to make quick business decisions. Spark will work with in process memory leads 10 times faster than Hadoop.

Spark framework supports variety of languages like python, java, scala, sql, R, et...

Required hardware:

For practice, you can use your pc as single node cluster and interact with components. Processor should be superior that i5, RAM-16GB & above, SDD/HDD 500gb or greater will make effective.

Required software:

All Apache software are free source. You can preliminary install cloudera quick start, VM Work station, 7zip. You can install other software on SOS basis.

Sequence of learning:

After once install all software, you can start learning with various data sets. Components learning sequence suggested are MapReduce -> MapReduce with Java -> hive -> pig -> sqoop -> impala -> flume -> solr -> hue -> oozie -> spark & its components.

About the Author

Mr. Surya N Kompella, is a multi-disciplinary qualified person who believe "Education never ends as long as people wants to grow". To make his believe truth and motivate for new generations, he pursuing his Masters in Computer Applications at the age of 45 . He is a having more than two decade experience in various engineering fields with his qualifications as Metallurgical engineer and obtained his masters in various domains such as MIIM, MBA(PM), MCA. He serviced in India and abroad for various reputed companies like TATA, Thermax, TOSHIBA and presently in Hewlett Packard Enterprise as a Senior Software Developer.

Trader- The Road Less Taken

P. Sravya
B. Tech IT, 2020. Email: parasanasravya@gmail.com

Warren Buffet, the legend, once said: "Today people who hold cash equivalents feel comfortable. They shouldn't. They have opted for a terrible long-term asset, one that pays virtually nothing and is certain to depreciate". Exactly what he said was brilliant, but sadly, just 3% of Indians invest in the stock market, which is a very small percentage of the country's population. In contrast, in the USA, 55% of the population invests in the stock market. These statistics provide us with a good sense of how the people of India lack financial literacy, which is the most important skill to learn to become wealthy in this modern world.

1. Background

Let's dig into my background to see how I chose trading as my career. I have always wished to enroll in and continue my post-graduate studies with an MBA in 2020, following the completion of my graduation from the information technology branch. I wanted to do business since I had always desired to, as I always wanted to make or build something on my own so that I could be independent; it will also be challenging for me rather than a routine task. By pursuing an MBA, I can advance my progress toward my objective of starting a business. So, I began looking for reputable universities where I could obtain an MBA. The Indian IIFT (Indian Institute of Foreign Trade) in Delhi and Kolkata and the SIBM (Symbiosis Institute of Business Management) in Pune and Bangalore all interviewed me after I took one of the top entrance exams.

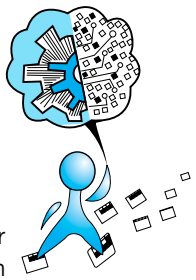
During my interview preparation, I learned more about finance, economics, and financial markets. Apart from preparing for my interview, in my leisure time, I have read books from different genres, out of which these two stood out for me, such as Rich Dad Poor Dad, Business of the 21st Century, etc. I learned a lot from these books, and I concluded that having a passive income would help me achieve financial independence. As a result, having some basic knowledge of the financial markets, I began learning more about the stock market to generate passive income. After learning further, I approached my parents with the idea of investing in the stock market. My parents were at first hesitant about the concept of trading and investing. However, I explained how trading and investing work and how eager I am to pursue them. They were accustomed to the concept of trading, and my father supported me by providing me with a significant amount of money to invest. In my early phases of trading and investing, I did a really good job; at this point, I've considered making it my full-time profession. At this point, I received a letter from SIBM (Symbiosis Institute of Business Management) stating that I had cleared my interview and that they had offered me admission into their institution. But I had a strong conviction that I could pursue trading as a full-time career. Then, I had a conversation with my family about the possibility of me trading as a full-time profession. We thoroughly researched the advantages and disadvantages of each option before deciding whether to pursue an MBA or make trading a career. We then concluded that, since the internet had made it feasible, I could learn about the MBA subjects online. I subsequently decided against continuing with my MBA and started trading. I made this decision, and my family and I were thrilled about it. But after people learned about it, they began criticizing me and my dad for considering trading, saying things like "trading is gambling" and "many people have lost their wealth." However, my entire family is encouraging me to pursue my goals, as I am pretty confident and good at them. I couldn't imagine doing anything else besides this job, which I thoroughly enjoyed.

Yeah, I know this is a profession where huge risk is involved, but **"The biggest risk is not taking a risk. In a world that's changing quickly, the only strategy that is guaranteed to fail is not taking risks."** as said by the great personality Mark Zuckerberg, which I vouch for.

Now let us begin by knowing about the investment and how it helps one, in the long run, to become financially independent.

2. What is Investment?

An asset that aids in wealth building is an investment. The



money we earn is partly spent, and the rest is saved for meeting future expenses or as an investment made to create income or capital growth, which is known as an investment.

3. Why should one invest?

One needs to invest to:

1. Earn a return on our idle resources.
2. Generate a specified sum of money for a specific goal in life.
3. Make provisions for an uncertain future.

The created corpus can be utilized for a variety of reasons, including accumulating money for retirement or a down payment; creating an emergency fund; or meeting particular commitments like paying off loans, covering school costs, or purchasing other assets.

One of the important reasons why one needs to invest wisely is to meet the cost of inflation.

4. Inflation:

Over time, the cost of necessities, including food, clothing, transportation, rent, and leisure activities, rises; this rise is known as inflation. As a result, we might be able to buy fewer products for the same amount of money.

Items	Price in 1985	Price in 2007	Price in 2021	Average inflation rates
Soap	₹ 3	₹ 12	₹ 35	9.1%
Petrol	₹ 8	₹ 49	₹ 100	7.3%
Toothpaste	₹ 8	₹ 50	₹ 124	8.7%

Here, is the table that represents how prices have increased over time due to inflation.

The above data gives a clear picture of how inflation affects the cost of necessities over time. So, investing part of our income in financial markets is advisable to meet inflation.

If one had invested!!

Let's consider a scenario where the average salary of the person living in India is Rs. 3,87,500 (Rs. 32840 per month) and he/she invests 10% of his/her monthly income through a SIP (systematic investment plan) where the investment grows at, say, 12% per annum for 30 years.

Monthly investment amount	3200
Current age	25
Retirement age	55
Rate of Interest (Annual)	12

The table below contains values for calculating a systematic investment plan (SIP).

Output:

Future value	1,12,95,724
Number of years invested	30
Amount invested	11,52,000
Total earnings	1,01,43,724

If one hadn't invested, he would be left with only 11,52,000, but if he had invested 10 percent of his income annually for 30 years, he would have earned a pile of that amount, which is 1,12,95,724 including the amount he had invested.

As we have learned why investing is important, let's dive into how we can start our investment journey by learning some stock market basics.

5. Basics of Stock Market:

a. What is the Stock Market?

The term "stock market" describes many marketplaces where shares of publicly traded firms can be purchased and sold. Such financial transactions happen on authorized exchanges and in over-the-counter (OTC) markets that follow a predetermined set of regulations. Traders in the stock market buy and sell shares on one or more of the stock exchanges that are part of the overall stock market.

b. Stock Exchange:

The stock exchange provides a platform for investors to buy and sell securities from each other.

There are three national-level stock exchanges in India:

The Bombay Stock Exchange (BSE) was established in 1875.

The National Stock Exchange (NSE) was established in 1992.

Multi-Commodity Exchange (MCX), established in 2003.

c. What is an Index?

The performance of the entire market is sampled using a limited number of stocks. The term "index" refers to this sample. The price of the stocks chosen for the sample is used to determine this index's value.

The market indices are generally representative figures, and thus stocks will be chosen from multiple

sectors.

d. Types of Indices:

1. Benchmark indices such as the BSE Sensex and NSE Nifty.
2. Broad indices such as the Nifty 50 and the BSE 100.
3. Indices are created based on the market capitalization of the companies, such as BSE Midcap and BSE Small Cap.
4. Sector-specific indices like Nifty FMCG, Nifty Bank, CNX IT, and S&P BSE oil and gas.

e. Securities:

Financial instruments that are tradable or that can be bought and sold are generally referred to as "securities".

For example, shares, bonds, etc.

The types of securities in which one can invest money include

1. Shares
2. Government Securities (Bonds)
3. Debentures
4. Units of mutual funds
5. Commodity derivatives

f. Securities Market:

A securities market is a place where buyers and sellers of securities can enter into transactions to purchase and sell shares, bonds, debentures, etc.

The securities market is divided into two distinct and interconnected segments: the primary market and the secondary market.

g. Types of Securities Market:

1. **Primary market:** In a primary market, securities are created for the first time for investors to purchase. New securities are issued in the market through a stock exchange, enabling the government as well as companies to raise capital.

   For a transaction to take place in the market, there are three entities involved: the company, investors, and an underwriter. A company issues securities in a primary market as an initial public offering (IPO), and the sale price of such a new issue is determined by an underwriter. A primary market transaction is directly between the issuer company and the investor.

2. **Secondary Market:** It is a platform where the shares of companies are traded among investors. Market timing is 9:15 a.m. to 3:30 p.m. for equity.

h. Differences between Primary and Secondary Markets:

Primary Market	Secondary Market
It is the market where issuers raise equity or debt capital by offering securities to investors.	It is the market where existing securities are traded. Here, no fresh capital is raised.
The purpose is to raise long-term funds through the issue of securities.	The purpose is to give existing securities marketability and liquidity.
The management of the company issuing the securities determines the prices of the securities in compliance with SEBI laws and regulations.	The factors of supply and demand in the market, which determine market prices for traded securities, cause these prices to change over time.
In this market, securities can only be sold to investors once.	Investors and traders are free to purchase and sell existing securities as often as they like.
Underwriters are the main intermediaries in the primary market.	Brokers are the main intermediaries in the secondary market.
There is no organization set up for the primary market, and hence the primary market does not have any physical presence.	The secondary market is set up geographically and has an organizational presence. It is known as the stock exchange.

6. About SEBI:

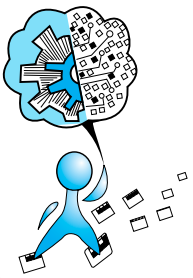
SEBI stands for Securities and Exchange Board of India; it is a statutory regulatory body established by the Government of India in 1992 to protect the interests of investors investing in securities and to regulate the securities market.

So far, we've covered a few basics of the stock market. Let's now move on to the next segment, which is fundamental analysis.

7. Fundamental analysis:

A technique for figuring out a stock's true or "fair market" value is fundamental analysis. Fundamental analysts search for stocks currently trading at prices higher or lower than their real value. If the fair market value is higher than the market price, the stock is deemed undervalued and a buy recommendation is given, and vice versa.

We approach fundamental analysis of the stock market in the following ways: we approach fundamental analysis of the stock market from the bottom-up or top-down.



A) **Economy analysis:** The economy is studied to determine if the overall conditions are good for the stock market. When the economy expands, most industries and companies benefit and therefore grow. Similarly, when the economy contracts, most industries, and companies tend to suffer.

Economic factors:

1. **Political stability:** Political stability and economic growth are deeply interconnected. For sustainable and balanced growth, a stable political environment is required.
2. **Gross domestic product (GDP) data:** It is a monetary measure of the market value of all the finished goods and services produced in a period.

   When there is an expansion in GDP and an increase in GDP growth rate that is above consensus or market expectations, corporate earnings tend to increase, which leads to overall bullishness in the stock market. The inverse happens when there is a contraction in GDP.
3. **Index of Industrial Production (IIP) data:** It is a composite indicator that measures the change in the volume of production of a basket of industrial products during a given period compared to the volume of production in a chosen base period.

   When the IIP growth rate is above consensus or market expectations, corporate earnings increase, which leads to overall bullishness in the stock market, and vice versa.
4. **Consumer spending:** It is the amount of money spent by households in an economy on durable and non-durable goods.

   The general population's income levels rise as the economy progresses, and with more money at their disposal, consumer spending rises. Hence, any significant increase in consumer spending is seen as a good indicator of a booming economy, and vice versa.
5. **Inflation:** It is the rate at which the general level of prices for goods and services is rising. This results in a fall in the purchasing power of the currency.

   Inflation causes a rise in the prices of energy, food, commodities, and all other goods and services. This, in turn, impacts the cost of living, the cost of doing business, borrowing money, mortgages, and corporate and government bond yields, and hence affects the entire economy. If inflation is controlled at reasonable levels, the economy may prosper, resulting in an increase in stock market indices, and vice versa.
6. **Interest rates:** It is also known as the "lending rate." The lending rate is the interest that will be charged for borrowing money, expressed as a percentage of the total amount of the loan. Interest rates are directly linked to the state of the economy and inflation.

   When the economy is booming, consumer confidence and spending increase, which leads to inflation. To control inflation, central banks often hike interest rates. Similarly, when the economy is contracting, consumer confidence in spending reduces, which often leads to deflation. Under such circumstances, central banks often reduce interest rates.

   These are some of the crucial factors that are to be taken into consideration for the economic analysis, which gives us a basic idea of how the stock market will perform.

B) **Industry analysis:** It is a method of market assessment used by businesses, analysts, and long-term investors to understand the profit potential of an industry and the amount of competition present in it.

Classification of Industry: Based on products and business cycles, industries can be classified.

1. **Growth Industries:** A growth industry is a sector of the economy experiencing a higher-than-average growth rate. Their growth is related to consumer demand for new products or services that companies within the industry are beginning to offer.

   Ex: Technology sector
2. **Cyclical industries:** This is a type of industry that is sensitive to the business cycle such that revenues are generally higher in periods of economic prosperity and expansion and are lower in periods of economic downturn and contraction.

   Ex: Construction, auto components, steel, etc.

3. **Defensive industries:** Defensive industries include those that make products or offer essential services. As result, sales and earnings in defensive industries remain relatively stable during economic ups and downs.

   Ex: Utility industry.

4. **Cyclical-growth industry:** This industry possesses characteristics of both a cyclical and a growth industry.

   Ex: Automobile industry.

   This analysis provides us with a good idea of which industry or sector will perform the best in the short term, allowing us to invest in that sector for the medium to long term.

C) **Company analysis:** It is the final stage of fundamental analysis, wherein the investor analyses both quantitative and qualitative aspects of various companies and selects a few that are good from a medium- to long-term investment point of view.

a. Qualitative analysis:

1. **Economic moat of the company:** "Economic moat" refers to the ability of a business to maintain competitive advantages over its competitors to protect its long-term profits and market share from its rivals.

   As a long-term investor, one should invest in companies that have a strong economic moat.

   To identify stocks with a wide economic moat, one needs to analyze:

   a. Consistent earnings even during bad economic times.
   b. High level of cash on hand.
   c. Better financial performance compared to competitors in the same industry.
   d. Product dominance in the market.
   e. Powerful intellectual property.
   f. High brand recognition.

2. **Promoters or management background:** It is important to check the background of a company before investing.

   We should check these pointers:

   a. Find out who the company's promoters are or who the company's top management is, what their experience is, and what their educational qualifications are.
   b. Has the promoter or management of the company been punished or penalized by SEBI or other regulatory bodies in the past?
   c. Are there any court cases, frauds, or disputes against the promoter or management of the company?

   If we don't find any such information about the promoters or management of the company, we should move ahead with further analysis.

3. **Corporate governance:** It is a system of rules, practices, and processes by which a company is directed and controlled.

   Some of the key characteristics of good corporate governance include:

   a. independent leadership
   b. Transparency
   c. Accountability
   d. Consensus building
   e. Stakeholder relations
   f. Proper framework and policies in place.

4. **Promoters' faith in the business:** Before investing in any company, try to determine the promoters' or management's level of confidence in the company's long-term prospects.

   A high promoter's shareholding in a company is a good indication and shows that the promoter or the management has faith in the company.

5. **Extent of pledging of shares by promoter:**

   A pledge of shares is the act of lending shares as collateral for a loan.

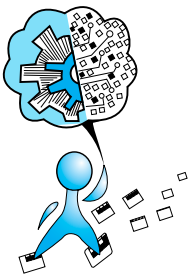
   As a thumb rule, to be on the safe side, it is better to avoid investing in companies where the promoters have pledged more than 20 to 30% of their shareholding.

   An increased percentage of pledging of shares by promoters over a while is seen as a bad sign, while a decreasing percentage of pledging of shares by promoters over a while is seen as a good sign.

b. Quantitative analysis:

Quantitative characteristics tell us two important things about a company:

1. How has the company currently performed



in comparison to earlier years?

2. How has the company performed as compared to its peers during the same period or in previous years?

Quantitative aspects include things like:

These are some of the parameters we should check before investing in a company; they give us an idea of how the company has performed in comparison to earlier years and compared to its peers.

S. No.	Parameter	Interpretation
1.	Liquidity (or) current Ratio = Current assets/ current liabilities	Ideally, it should be (2:1). It tells about the liquidity position of the company.
2.	Solvency (or) Debt to Equity Ratio= Total long-term debt/ Shareholder's funds	At Max (2:1). It gives an analysis of the capital structure of the company, i.e., own funds vs. loan funds.
3.	Profitability Ratio (or) Return on Capital Employed (ROCE)= EBIT/ Capital employed	The higher the percentage the better. It measures profitability or returns on money invested in the company.
4.	Activity Ratio (or) Inventory turnover ratio = Cost of goods sold (COGS)/ Average inventory	Higher, the better. It determines how many times the inventory was replenished; that is, it measures operational efficiency.
5.	Valuation Ratio (or) Price to Earnings ratio (PE) = Market price per share/ Earnings per share	If the ratio is higher, it is considered costly, and vice versa. We should compare it with the average industry PE.
6.	Share capital to reserves (or) 5years trend in reserves.	An increasing trend in reserves is considered good, and vice versa. If there is an increase in the trend, then there is a better chance of receiving a bonus or dividends from the company.
7.	Free Cashflow = cashflow from operations-purchase of fixed assets + sale of fixed assets.	The higher the number, the better, and vice versa. It measures the free cash available to the company for the operation of the business.
8.	Shareholding pattern (Any pledging of shares)	More than zero shares pledged is a bad sign, and ideally, the number of shares pledged should be zero.

The above ratios will let us know how the company is performing and whether we should invest in it or not.

Now, after finishing the above fundamental analysis, we will get to know which company is fundamentally strong. Now, let us see how many ways we can invest or trade in the stock market.

8. Investing:

Investing is the process of buying assets, such as stocks, that increase in value over time and provide returns in the form of income payments or capital gains.

9. Trading:

Trading is the buying and selling of securities, such as stocks, bonds, currencies, and commodities, for short-term profit.

10. Difference between investing and trading:

Trading and investing differ primarily in that traders frequently enter and exit the stock market to make short-term gains; investors, on the other hand, have a longer-term perspective. They often hold onto stocks despite market volatility because they think in terms of years.

11. Types of trading:

1. **Intraday trading:** It is also known as "day trading." Intraday trading occurs when an investor purchases and sells stocks on the same day. The investor should square off his or her trade within a day.
2. **Scalping trading:** Scalping trading is a short-term trading technique that involves buying and selling underlying assets multiple times during the day to earn profit from the price difference. The trader's position was held for a few seconds to a few minutes.
3. **Delivery trading:** It is a form of long-term investment in which the investor uses delivery trading to hold on to their purchased stocks for a longer period. The period can vary from two days to two decades or more.
4. **Swing Trading:** Swing trading capitalizes on the changes or swings in prices of stocks or any other financial commodity in the market over a few days. A position in this type of trading is usually held for a few weeks or a couple of months.
5. **Positional trading:** It is a form of trading that relies on a buy-and-hold strategy. The traders should hold the equities they trade for a long period. The usual time frame for positional trading ranges from several weeks to several months.
6. **Fundamental trading:** Traders involved in fundamental trading are well-known for their fundamental analysis of the company's data and further growth estimations. Special attention is

paid to company-related events.

7. **Technical trading:** It is done through efficient technical market analysis. Traders can make informed trading decisions by using this type of analysis to comprehend stock price changes.

Disclaimer: Trading and investing in stocks, options, or equities involves market risk and is not suitable for all investors. The information presented in this article is provided solely for informational and general educational purposes. Please consult an investment advisor for better advice, as I am not a SEBI-registered analyst.

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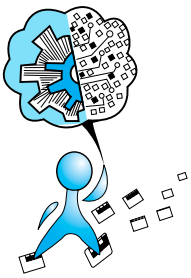
About the Author

Sravya Parasana, currently working as a full-time trader, investor, technical analyst, and fundamentalist who focuses on both long- and short-term investments in the equity market. Apart from the stock market, I invest and trade in crypto markets. My primary area of interest is the derivatives market, which includes futures and options and is regarded as the riskiest and most rewarded in the stock market. My areas of interest are macroeconomics, business, management, and finance. I graduated from JNTUK UCE Vizianagaram with a degree in the field of information technology in the year 2020.



Should We Move Data and Computation to the Cloud, and When?

Divi Utkala

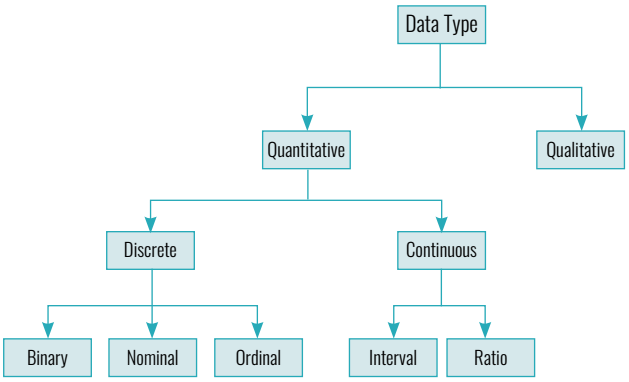
Data Engineering Associate at Accenture on business intelligence technologies Email: divi.utkala@gmail.com

DATA

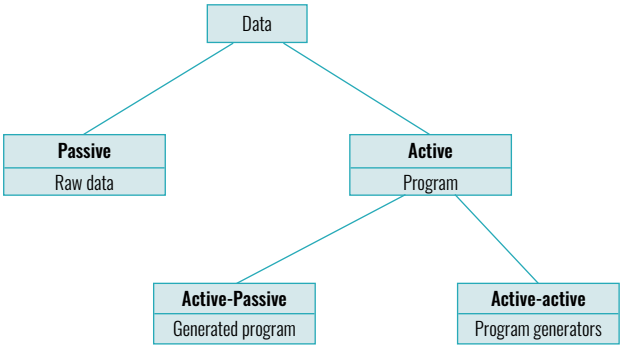
As per Jalan and Winterhalter, in today's world, data can be defined in terms of 5Vs, which refer to:

- Volume (size of data)
- Velocity (speed of data transferring)
- Variety (range of data)
- Value (extraction of valuable information from data)
- Veracity (data integrity and privacy policy)

However, if this parameter is taken into consideration to define data, it will be too narrow because data or data related to science is multidisciplinary given its varied forms and usage.

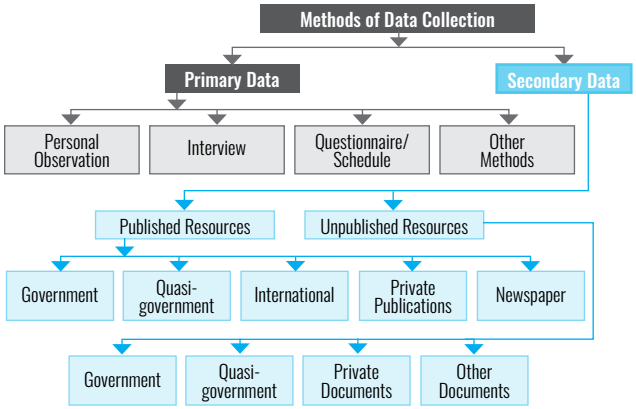


Various types of data (Jalan and Winterhalter)



Data utilization (Jalan and Winterhalter)

In addition to that, data is represented in various forms, which are:



(Ncert)

Overall, we do not just create data simply, we build it for a particular purpose of analysis and draw some results from it. (Olson)

Computation

Computation is a procedure of completing a job using computer technology involving both hardware and software. However, it uses a diff to process, manage and communicate data. (Jena, Satyabrata)

As per Jena Satyabrata, we have different types of computing environments, like:

- Personal computing
- Time-sharing event computer system computing
- Client-server computing
- Distributed computing
- Cloud computing
- Cluster computing CLOUD

Internet-connected servers along with the software and databases they run are referred to as "cloud servers" and within a network, it is referred to as 'cloud'. These are situated in data centers worldwide. As computing

and storage take place on servers in the data center, rather than on individual devices, the cloud allows users to access files and applications from almost any device. (Cloudflare)

Cloud Computing

An internet-hosted service, which takes place in the cloud, is classified as cloud computing. It is divided into 3 main types:

- Saas (Software as a service)
- Paas (Platform as a service)
- Iaas (Infrastructure as a service) (Wesley Chai)

The main aim of cloud computing is to come up with easy, ascendible access to computer resources and IT services.

Merits and Demerits

As per Fabrice, moving to the cloud has both pros and cons. The following are the merits and demerits associated with moving data to the cloud:

Merits

- Faster project start-up time
- No more application updates or lack of storage
- Access data and apps from everywhere
- Seamless on-demand sizing
- Reliable availability
- High levels of security DEMERITS
- The need for internet access
- On-demand billing models
- Security of data stored on providers' servers
- Provider lock-in
- Software versions can be different or non-existent in cloud versions
- Specific skills are required

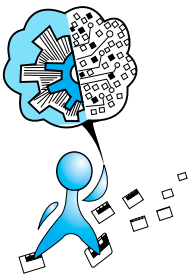
Move Data and Computation to the Cloud

Cloud migration has advantages and disadvantages. How, comparatively, migration is more advantageous. I posit how it can be beneficial:

1. **Fault Tolerance:** Fault tolerance involves a system's ability to continue running despite a component's failure. The system here can be a computer, network, or cloud cluster (Davis David)
2. **Cost Savings:** Costs and space can be minimized by moving to cloud technology. In the past, paying for on-site servers (and sometimes even off-site data centers) was necessary before the cloud. Rather than hosting servers in-house, the cloud provider handles the data centers and other resources. (Davis David)
3. **Connectivity & Accessibility:** With anytime, anyplace access, users can stay connected irrespective of where they work. Users can use any device to access files any time, anyplace. The risk of files being kept on any machine is thereby eliminated (ibistechnology).
4. **Increased Collaboration:** The cloud service enables easy collaboration between employees in different locations. By providing simultaneous synchronization, working, and sharing of documents and records in real-time, cloud computing helps increase employee collaboration and efficiency (ibistechnology).
5. **Resourceful Development and Testing Environments:** Cloud computing technology allows development and testing teams to provision server and storage resources with just a few mouse clicks. New environments can be quickly and easily created. Costs, however, can continue to climb if they are not managed well (loffler).
6. **Scalability:** Scalability is another reason businesses choose cloud. Cloud computing scalability is the capacity to scale up or down IT resources as required to satisfy shifting business demands. The ideal situation is for one's capacity to be as close to one's demands as possible, but forecasting needs is rather difficult (Davis David).

When to Move

- It is when one's data center agreement is coming to an end and requires a better method of integrating acquisitions (backboneconnect).
- When one experiences capacity issues during peak periods and when it is time to upgrade essential software or hardware (Kelly Goolsby).
- When one needs to implement a disaster recovery (DR) solution, there is essentially never a better time to migrate to the cloud. DR serves as a second production environment. It provides a backup copy of one's programs and data to safeguard one's current On-Premises environment (Steve Prentice).
- It is crucial that it focuses on its differentiator, or on what is strategic and exclusive to the company. The time that IT resources can devote to strategic IT projects is frequently limited by ongoing IT responsibilities. A move to the cloud makes sense to relieve resource strain by reducing these responsibilities if a company's IT team spends



more time on helpdesk support than advancing the business (Resultant).

- When one wants to deploy cutting-edge applications quickly and to safeguard customers, it is indispensable to adhere to stricter regulations.

Conclusion

Overall, it is easy to understand why so many businesses are switching to cloud services. The cloud reduces costs and enables the outsourcing of talents not directly related to a company's core competencies. Cloud services' advantages for the environment appeal to businesses looking to reduce their carbon footprint. Nevertheless, there are implications for data security and privacy when employing a cloud computing service provider. Moving to the cloud implies a paradigm shift that necessitates careful thought about change management practices inside a business. Everything comes down to comparing how an organization currently does business with how they would do so once they move their on-premises infrastructure to the cloud. This adjustment will not take place immediately. However, organizations can decide whether cloud is appropriate for them or not by carefully evaluating their present procedures and long-term business goals.

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About the Author

Ms. Divi Utkala currently working as a Data Engineering Associate at Accenture on business intelligence technologies like Powerbi and Cognos. She is graduated from JNTUK-UCEV in Information Technology.

What is Robotic Process Automation?

Lalithambika Devi Korada

Associate Analyst in RPA, Emids Technologies Private Limited. Email: lallisaiguru@gmail.com

Robotic process automation (RPA) is a technology that mimics the way humans interact with software to perform high-volume, repeatable tasks. RPA technology creates software programs or **bots** that can log into applications, enter data, calculate and complete tasks, and copy data between applications or workflow as required.

When combined with **AI** and **Machine Learning**, RPA can capture more context from the content it is working with by reading text or handwriting with optical character recognition (OCR), extracting entities like names, invoice terms or addresses using natural language processing (NLP), and capturing more context from images, such as automatically estimating accident damage in an insurance claim picture.

RPA is growing in popularity because it can reduce costs, streamline processing and drive better customer experiences. Another attraction of RPA software is that business units can implement it without having to learn new tools or ask IT teams for support -- and without changing an organization's underlying IT infrastructure.

As RPA has grown in popularity, however, enterprises are seeing the need to integrate RPA process automations in their IT systems. While RPA automations can dramatically speed up a business process previously handled by humans, bots can break when application interfaces or process workflows change.

How does RPA work?

RPA mirrors the way people are accustomed to interacting with and thinking about software applications. RPA's ability to copy the way humans perform a computer-based process has contributed to its popularity compared with automation tools such as application programming interfaces (APIs) or **low-code development** that are more scalable but less intuitive or require expert knowledge to use.

What are the benefits of RPA?

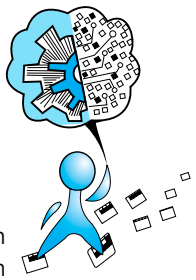
Robotic process automation technology can help organizations on their digital transformation journeys by doing the following:

- enabling better customer service;
- ensuring business operations and processes comply with regulations and compliance standards;
- dramatically speeding up processing time;
- improving efficiency by digitizing and auditing process data;
- reducing costs by reducing manual and repetitive tasks; and
- enabling employees to be more productive.

What are the challenges of RPA?

There are a **number of challenges related to RPA**, which have limited its use.

- **Scalability:** Enterprises have struggled to scale RPA automation initiatives because, although RPA's software bots are relatively easy to implement, they can be hard to govern and manage and therefore hard to scale.
- **Limited abilities:** While its name includes the words "process automation," many critics have pointed out that RPA software tools automate tasks. More work is often required to stitch multiple tasks together into a process. Craig Le Clair, an analyst at Forrester Research, has cautioned enterprises to observe the "**Rule of Five**" in building RPA applications because they tend to break when a bot must make more than five decisions, manipulate more than five apps or make more than 500 clicks.
- **Security:** RPA bots sometimes need to access sensitive information to complete their tasks. If **they are compromised**, they pose an additional security risk for firms.
- **Limited resiliency.** **RPA failures** can occur when applications change in ways that are not anticipated by developers.
- **New QA issues**. Bots require a variety of **new QA** practices to ensure they continue to work as intended.
- **Privacy:** Bots may be involved in working with



personally identifiable information governed by privacy requirements. Teams need to ensure this data is processed in conformance with local data protection laws such as GDPR. For example, if an RPA bot moved data outside of a given country without encryption that would be a violation of **Article 44 of GDPR**. RPA vendors are starting to **seek ISO 27701** certification as a foundation for managing sensitive information.

- **Efficiency:** RPA bots manually plod through an application in the same way a human does. This may not be as efficient as **automating applications** through APIs or workflow automations baked into the application itself.

Applications of RPA

Some of the top applications of RPA include the following:

- **Customer service.** RPA helps companies provide better customer service by automating contact center tasks, including verifying **e-signatures**, uploading scanned documents and verifying information for automatic approvals or rejections.
- **Accounting.** Organizations use **RPA** for general accounting, operational accounting, transactional reporting and budgeting.
- **Financial services.** Companies in the **financial services industry** use RPA for foreign exchange payments, automating account openings and closings, managing audit requests and processing insurance claims.
- **Healthcare.** Medical organizations use RPA for handling patient records, claims, customer support, account management, billing, reporting and analytics.
- **Human resources.** RPA can automate HR tasks, including **onboarding and offboarding**, updating employee information and time sheet submission processes.

Supply chain management

RPA can be used in **Supply Chain Management** for procurement, automating order processing and payments, monitoring inventory levels and tracking shipments.

Top RPA vendors

Listed in alphabetical order, the following are some top RPA vendors:

- ABBYY has long been a leader in developing OCR tools to streamline back-office applications. The company has recently expanded to help extend its automation capabilities across more use cases.
- Automation Anywhere provides an enterprise digital workforce platform geared toward procure-to-pay, quote-to-cash, HR, claims processing and other back-office processes.
- Blue Prism focuses on assisting organizations in regulated industries automate processes by offering desktop-aligned robots that are defined and managed centrally.
- Kyron provides full cycle automation capabilities including process mining, governance and AI modules that can extend RPA capabilities.
- NICE has traditionally focused on improving customer interactions with call centers and across multiple touchpoints. The company expanded its various automation capabilities to support RPA, with a strong focus on improving customer experience across multiple channels.
- Pegasystems has traditionally been a leader in business process management (BPM) tools but expanded into RPA with the acquisition of Open Span in 2016.
- UiPath offers an open platform to help organizations efficiently automate business processes.

The future of the RPA market is driven by hyper automation

A Global Market Insights Inc. report expects the RPA market to reach $5 billion by 2024. The increased adoption of RPA technologies by organizations to enhance their capabilities and performance and boost cost savings are prime reasons for the expected growth of RPA.

Although RPA has been popular because of its simplicity, enterprises have struggled with scaling implementations. Gartner predicts that in the long run, RPA's growth will be accelerated using **hyper automation**.

Hyper automation efforts combine RPA with other kinds of automation tooling, including low-code and no-code development tools, BPM tools and decision engines. IPA and cognitive automation modules will make it easier to weave AI capabilities into these automations.

Process and task mining will help to identify new automations. Other AI governance tools will help enterprises manage the overall process for streamlining processes in ways that **ensure trusted AI**.

As hyper automation takes hold, companies will need to develop a strategic approach to identifying and generating automation opportunities, and then managing the overall process across the enterprise. Some organizations have established an **automation Center of Excellence** to coordinate and scale automation projects.

Forrester research has predicted that the collective impact of these various types of automation technologies could help enterprises save $132 billion in labor value in the U.S. alone.

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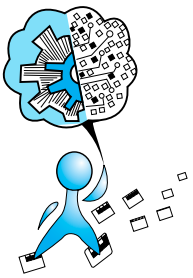
About the Author

Korada Lalithambika Devi currently working as a Associate Analyst in Emids Technologies Private Limited in Hyderabad. Strong experience with RPA Technology and RPA Tools like UiPath, Automation Anywhere. I'm graduate from JNTUK - UCEV in Information Technology.



PLM

Jasmin Mohammad

B.Tech graduate from Jawaharlal Nehru technological University University college of Engineering vizianagaram.
Email: 02281998mj@gmail.com

Introduction to PLM:

PLM stands for Product Life Cycle Management. PLM is the domain that manages the data or information related to the product right from the market needs to end-to-end life cycle of the product.

Understanding the nature of the product.

Types of Data:

- Product Data
- Process Data
- Product Data: What to do?
- Process Data: How to do it?

Example: Cooking. Before cooking, the chef should know what the correct ingredients are to prepare the dish.

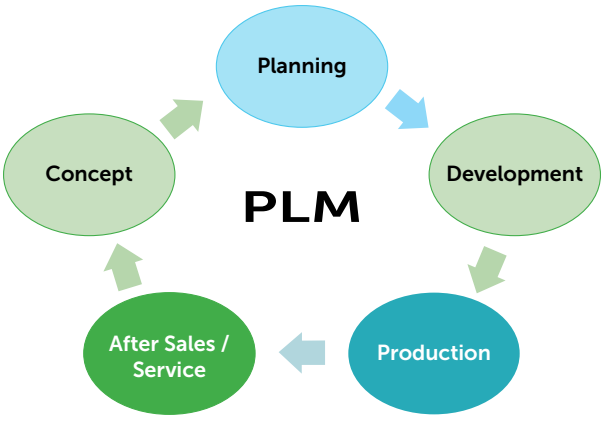
Without the knowledge of what product data and what is process data, if the chef prepares food, then definitely the outcome would be unfavorable.

Similarly, when a company XYZ is going to design car, they should deal with product and process data.

Let's say my company has launched a Car C1 and soon they decided to launch C2. The initially launched car should undergo lot of changes to launch C2 variant. This would take lot of efforts and time to launch C2 variant.

But with PLM we can achieve it through its efficient data management tools and software's very quickly with slight changes.

Note: Variant:(Another version of product or something)



Benefits of PLM:

- Re-work will be less and less scope for errors
- Development cycle will be reduced
- Increased Productivity
- Product quality will be enhanced
- Business Scalability
- Better Analytics
- Better Design and A better understanding of critical processes

Engineering branches must follow PLM

As I'm from IT [Information Technology] field I found PLM is the best domain for me. Mostly Mechanical Engineers and Computer science engineers have more chances to follow PLM approach.

It is not restricted but whoever interested and an enthusiastic person who tries to explore things and new learnings can also be a part of this PLM journey. Nowadays PLM is trending in almost all known industries like Aerospace, Automotive, Machinery, Defense and many more.

I just want to mention some of the tools which are necessary in PLM software:

Teamcenter, SAP, Agile PLM, CAD, CAM but currently my proficiency falls in Teamcenter which is a Software developed by Siemens.

SAP and Teamcenter connections will happen through T4s gateway which contains BGS and GS services.

T4s is huge, we can explore lot of things in that. It uses TCL [Transaction Control Language] for communication purpose.

We cannot store all the CAD(Computer-Aided-Design) data in our local system because the CAD data is huge as well as other users cannot access our local data and not only, they cannot access but also storage becomes one challenging factor

If we are using PLM tool, we can provide the workflow.

Using that workflow, we can give the best product to the end-user.

Here comes the topic Workflow. Most of us might heard about workflow. In simple words workflow is nothing but a flow of process or procedure. Coming to PLM workflow, the meaning slightly differs

A workflow is the process of automating business procedures by some rules or procedures. We can attach documents, tasks in our workflow and that we can pass from one participant to another.

Teamcenter workflows allow you to manage your product data processes. You can create any type of workflow to accommodate your business procedures.

Example for workflow: Let's say Employee A has filled his timesheet, but he need approval from the higher authorities. So, the time sheet will not be approved directly. There will be some procedure as part of the organization they follow, and the employee must follow the same procedure for his timesheet approval.

Firstly, the filled timesheet will be submitted to the HR department and the HR department will approve and forward it to the respective Team leads and finally the team lead will approve it and then goes to the higher officials.

Similarly, the workflow has different stages and modules for creating workflow in Teamcenter.

Workflow designer is used to design your workflow and end-users use the templates to initiate the workflow processes in Teamcenter using workflow viewer.

In PLM tool we can revise the parts and store it in the data base

why revise?

Let's see how:

Vehicle may consist of multiple parts and each part will be having sub areas. So, when we are dealing with bulk data obviously changes are required for making the product more efficient.

So, data may undergo continues changes for enhancing new designs. For Example, we have created one part in our Teamcenter tool, after some days the end user is having issue with that part, and he want a new change.

In that case, there is no need to create the part from scratch, we can use the revise solution provided by our PLM tool.

What is Revise? Revise is the process of creating the revisions of part. Once we create a part, it will be stored in the Teamcenter database, whenever the user feels there is a change required then he will convey to design team.

The design team finds the respective part in database, and they will revise that part for making changes and the revised part becomes the latest revision.

Not only revision, but we also have multiple features to explore. We can see the complete vehicle structure in our tool. We can download data, modify the data and upload the data as per our business needs.

About Teamcenter tool:

Teamcenter is tool or portal for your organizations product information by connecting all who needs to collaborate with product knowledge. Connecting with PLM, Teamcenter enables you to manage and control your product data digitally.

So, Companies digitalize their process for consistent adherence.

The data comes from CAD, CAM (Computer-Aided Manufacturing) tools is not much easy to view. But with Teamcenter lifecycle visualization there is the ability to view typical cad format design data in JT file.

Teamcenter does data control, document control etc.

Check-in and check-outs:

We can check-in and check-out the items by preventing it modified by other users.

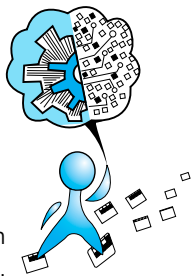
Check-out: The check-out functionality locks the item/part in Teamcenter so that only you can modify it, whereas other users are just able to view it

Check-in: Check-in functionality removes or releases the lock so that other users can also modify it.

Document control: In the before era, almost all manufacturing companies were doing their processes by their hand, which means the design data such as blueprints required for manufacturing will be created on paper.

There was no provision for doing it digitally or electronically. By doing man work there are lot of disadvantages for business. Let's say the paper has lost due to some reasons, then there is chance for ambiguity to occur.

So, because of that lot of design error will happen and



efficiency will be reduced

But our Teamcenter tool does Documentation control, In Teamcenter you can view any type of document whether it is word, excel, pdf, text file or anything. We can attach documents to workflows also.

We can apply check-in and check-outs also when we are working with documents if you are concerned about data mismatch.

Security:

PLM plays a very crucial role in maintaining the reliability and security.

In the Organization, with group user and roles- If a part is owned by one user, the same part cannot be accessed by another user.

Similarly, preferences are maintained as a part of security. Administrators can restrict some modules in Teamcenter by handling the preferences.

Preferences are editable and admins can import or export them into local drives when they are editing the preference values.

There are some access rights that stops the other user from accessing that part from the part owner. Those access rights will be maintained in the access manager module provided by Teamcenter tool

Once the part owner is left, the ownership of that part can be transferred to the other user.

These kinds of actions will be handled by the Administrators. Already in the above section I have explained about check-in and check-out concepts which will help us maintaining data in secure manner.

On top of Teamcenter, the developers can customize the tool as per business needs. For customizing the business processes there are some standards followed by every organization.

For e.g.: Let's say manual process is time consuming, then developer tries to automate it using the customizations. As experienced, I will try to add few points on customization side for basic idea.

As I have explained above about huge data like CAD data, BOM (Bill of Material) data, we can feel it will take time to load sometimes then we must deal with patience. At times we can customize using commands.

Teamcenter rich client provides us an easy way to do it through day-to-day use tools like eclipse.

Conclusion:

Here by I conclude that PLM is a business solution which ensures that the right information should be available to the right people with right context at right time.

In todays Global Manufacturing Environment proper utilization of assets is crucial.

PLM connects people, Information, Processes, data.

It helps in reusing the life cycle knowledge at development phase. PLM hence treated as the backbone of the company

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About the Author

Jasmin Mohammad B.Tech graduate from Jawaharlal Nehru technological University college of Engineering vizianagaram passed out in 2020.

PLM Consultant at Thinkinnov Solution Technologies private limited. Good knowledge in Teamcenter which is a tool provided by Siemens. Experience in customising the rich client with Java. Worked on multiple projects for MBOM customisations by meeting the client requirements with proper quality check and productive deployment. Experience in SAP tool and T4S which is a gateway between Teamcenter and SAP. Handling BGS and GS services by supporting the functional guys for transfer of data from Teamcenter to SAP.

She is interested in developing web applications and rest APIs, got hands on experience on springboot with Java.

She done Plugin project for Automotive divison by automating the complete MBOM creation flow. Data handling by generating pdf reports and extracting data into Excel sheet .

The Hidden effort!! !!!Behind the attractive website not as easy as it looks...

Ummadisetty Surya Teja

MCA IT, 2020 JNTU GV Vizianagaram. Email:suryasunny080@gmail.com

You want to make a web app or a commercial website. You can collaborate with a web development company. Brief your imagination website, after a few months of hard work and smart work they will back with attractive website with your imagination in front you.

However, developing a website takes time and is not as simple as it appears. The entire web development process takes a long time, and business analysts, designers, developers, and testers work tirelessly behind the scenes.

Before hiring a software development company to assist you, you should be aware of the entire process involved in developing a web application.

This is the way to our journey .....

1. Understanding client requirements
2. Documenting Business Requirements (BRD)
3. Planning
4. Designing
5. Development
6. Testing and Deployment
7. Maintenance

Understanding the client's requirement

Knowing the client's needs is the most important step in any web development process. This step is required before proceeding to the next. If you don't get this stage right, you're unlikely to get the software properly.

Gathering requirements should always be the first step in the development of a website. To fully understand the requirements,

Let us look at each of these in turn:

[a] When we step in to the developing the site need to be very clear of our goal as per client view.

[b] It is important to understand the client's goals for the requested website.

[c] It is beneficial understand the behaviour of the target audience. Depending on the culture, UI/UX will be rather effective.

Documenting Business Requirements BRD

BRD to be clear, precise, and understandable. When developing web application, developers will refer to this document which consider of development process, so it must contain all of the necessary data and breakdowns.

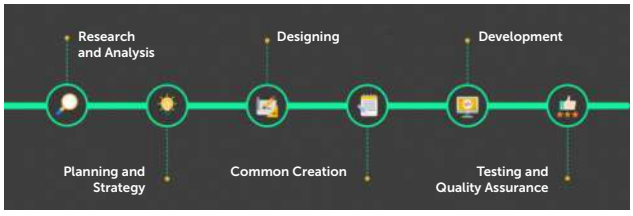
This Business Requirements Document will be the prize for both the customer and the software development company. Make a point of considering all prospective deliverables and constraints.

This stage of web development also helps to avoid expenses and time overrun. All construction must know to the guidelines outlined in this document, and any significant changes will necessitate more time and money.

Planning

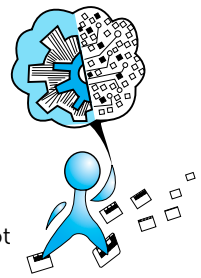
"A game without planning is just a wish."

The next stage is project planning, now that you know exactly what we need to built as per user need. Before writing the first line of code, it is a challenge to identify and gather the resources involved in the creation of the web application.



Framing phases....

- Wireframing
- Shaping



- Choosing
- Milestones
- Resource allocation

The development team can use a sitemap, which is a hierarchical catalogue of every page on a website, for future development. The designers and developers can see the site's structure as well as the overall layout of its pages. Without a sitemap, your website will be disorganized.

A wireframe is a tool for structurally visualizing website design, and identifying usability issues as early as possible is critical. It also assists in selecting the appropriate UI components and visualizing the entire user journey. This is the foundation of your website, and anything you try to build on top of it will fail if the foundation is weak.

An effective integrated planning strategy concentrates on all the elements needed to complete the project successfully. Planning the project ensures that the company's resources are used more effectively and that the time allowed for each phase is utilized to the fullest extent possible.

Design

A good design considers user interaction in addition to aesthetics. More than you would realize, your website's conversion rate depends on its design.

When the site architecture and wireframes are complete, the designers move on to the visual components.

The structure, screens, buttons, headers and footers, navigation, pictures, videos, and other provides a clear are all added during this stage of website development.

As previously stated, website designers must consider the app end users when creating their designs. The website layout with creative photos, colors and user customized logos etc.

Development

The code for converting your static website into usable software is now being written by the developers.

Without frond end no back end .. Vice versa...

Front-end development

This development is where client can see and can also access and can interact in the web browser. User participation is critical in this case.

Front-end developers are in charge of making the design a reality, despite the fact that they do not create the website.

Back-end development

The hidden framing which users can't access. The backend communicates with the front end and transfers data back to user interface website features.

Backend team monitor the implementation of all business logic and data storage. Backend development includes ,design and integration of databases, development, and integration of APIs, security, etc.

Testing and Deployment

Before putting any software into production, it always go through a thorough testing process to ensure that there are no flaws that could endanger your production environment.

A web application ensure daily health checks before going live. The initial wish is to not to find any errors or broken links exists. Then developer will happy to launch.

Software development firms use a variety of testing techniques to check their work and eliminate any bugs that could jeopardise the final product's quality. User acceptance testing is the most priority.

Code will pushed to production once the tester approve it and need to maintain the backup all level of servers in case anything wrong after deployment we can restore it.

At Binary, each milestone is followed by extensive testing. This is because fixing problems while the application is running is more difficult and time-consuming than fixing them when they are discovered early. Furthermore, this significantly reduces the cost of software development.

Maintenance

Upon deployed in production it means the task is no completed the actual task is started with maintenance.

The goal of software maintenance is to change and update software programs to fix problems, expand capacity, and add features to improve system performance.

All updates, errors, changes, patches and enhancements target to improve the functionalities of existing software.

Ensure that any issues that may arise are resolved as soon as possible by your software team.

Conclusion

Finally, never forget that web development involves more than just coding. Every stage of the web development process, which is broken down into smaller parts, is essential to a project's success.

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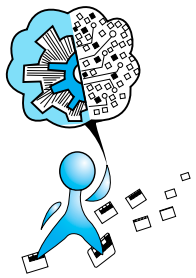
About the Author

Ummadisetty Surya Teja obtained a Master's degree from JNTU GV in 2020. He has been working as a software Engineer in TCS for the last two years. He has worked in web development projects and worked in educational institutions as teaching staff for cloud computing in Gayatri Degree College and certified in AZ-900 Microsoft Azure fundamentals and about to step in next level. He is very passionate about to step into start up .



Become a Pro at Programming

Ramyasri Mogali

Analyst at Tiger Analytics. Email: ramyasri.mogali7@gmail.com

In the era of continuous digitization in the software industry, it is important for students to learn coding and to focus on improving their programming skills. I remember the day when I started to do coding. I was at a loss as to where to begin and which language to use. I want to share a few things that can make you a good programmer.

The first thing to do to start coding is to choose a programming language. The C language helps you learn the basics of programming. It will provide you with a thorough understanding of how to code. After knowing about the basic concepts, you can easily switch to any other programming language. It will help if you learn multiple languages like procedural, object-oriented, etc., but the focus should be on developing logic and not the language.

Then start practising coding on any of the coding platforms like HackerRank, CodeChef, Leetcode, etc. I prefer Leetcode because it is more user-friendly and allows us to easily track our progress. The feature of streaking helps with consistency.

Learn the basics first, and after getting strong with the basics, move on to data structures and algorithms. Learn all the basic data structures like array, list, tree, graph, trie, etc. Try to understand where to use which data structure and the time complexity of those data structures. Learn all the basic and advanced algorithms for sorting, searching, dynamic programming, backtracking, etc., and their complexity computations. Learning STL libraries will aid in reducing the time required to code the entire logic as well as the code length.

Try to solve easy questions first and then move on to medium-level problems topic-wise. Solve similar problems that use the same logic. Try to write the code on your own. Even though it takes a lot of time, it increases problem-solving skills. You will gain confidence once the code has been accepted. Debugging the code will help you see where the code went wrong. Hence, debugging is always a good practice. After you've solved the problem, go to the discussion section. You will get a lot more approaches to solving the same problem. See the optimal solution for it. Always progress from brute force to better to optimal. Even if you have written the naive solution, it is important to understand the time and space complexities and the optimal solution. The reason for suggesting leetcode is that it tells you how fast your code beats other solutions so that you can decide which is the more optimal solution.

Another suggestion is to keep track of the codes you've solved, the algorithms you've learned, and everything else you've learned. It helps you review the things you have learned. One of the best practises is to write comments for the code you have written. so that when you come back, you can recollect the logic you have written, which might also help the people who want to understand your thought process.

Participate in as many contests as you can on various coding platforms. At first, you might be able to solve only one problem, but with continuous practice, you can definitely solve all the problems one day. Contests develop your competitive programming skills. They make you fast and increase your ability to think deeply about a problem. Join coding clubs if possible. Maintain coding profiles and do a minimum of 200 problems on any of those platforms and should also have good contest history. It will let recruiters know that you are good at programming and are consistent. The ratio of problems solved must be 1:2:1 for easy, medium, and hard.

Consistency is the key to success. It is important to solve problems every day in order to improve your problem-solving skills. If consistency is not present, you forget what you have learned, especially in coding. You might have to start from the beginning in order to keep the same pace. Set goals and deadlines to increase productivity.

Sharing solutions to problems accelerates the development of your thought process. Try teaching what you've learned to others to help you remember it longer and to generate new ideas. Do pair programming. It will improve your problem-solving skills as we code in front of others and observe other programmers.

Have faith in yourself and learn continuously.

Here are a few references that might be useful to start coding and excel at it.

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About the Author

Ramyasri Mogali recently completed her graduation in the stream of Information Technology from JNTU Gurajada Vizianagaram. Currently working as an Analyst in the Department of Business Intelligence at Tiger Analytics. She is fascinated by Programming and Problem-solving. She is good at Programming Languages like C++, Java, and Python and very interested in Android App Development. She created a few Android apps and released them on the Google Play Store, where they have received over 500 downloads.

Robotic Process Automation (RPA)

Husnara Mohammed

B.Tech graduate from Jawaharlal Nehru Technological University University College of Engineering, Vizianagaram.
Email: husnaraaa.786@gmail.com

Why RPA? What is the use of this new technology? What is the solution for implementing valuable business processes and repetitive tasks that need to be automated to reduce human work and avoid the mistakes humans make due to hectic schedules and multiple tasks they have been assigned to do? The Best and most low-cost solution for this is Robotic Process automation (RPA). This term was coined in 2012 by pat Geary, the chief evangelist for Blue prism. "RPA" this term stands for Robotic Process automation in. The term "Robotic" refers to a software-based bot or robot that may automate repetitive operations that require a great deal of time for humans to complete. The term "process" refers to tasks that can be automated through the use of bots. Therefore, according to its definition, Robotic Process automation is software or a tool that may interact with Graphic user interface (GUI) or user interface (UI) elements to automate repetitive business operations based on human-defined criteria.

Table of contents:

- What is RPA?
- Why is RPA important?
- RPA Key features
- Types or flavors of RPA
- How does RPA work?
- Tools used for implementing robots
- Overview of UiPath studio
- Conclusion
- References

What is RPA?

Robotic Process automation is a tool or software that interacts with UI interface elements to implement business processes, repetitive tasks or application processes based on rules defined by a human.

Bots can learn and perform the task when they are taught the steps they need to perform. In some systems, RPA bots can also be trained using technologies like Artificial Intelligence to make the bots understand and record human actions for creating automation.

Why is RPA important?

In a simple explanation, we can say RPA is way more important nowadays because most non-technical organizations still rely on human power to perform automated tasks. RPA can help these organizations automate their business processes in most of the back office. The front office works with little monitoring by employees or even without it, which helps the employees invest their brains and valuable time in performing more important activities such as researching new technologies, completing projects on time, etc.

RPA can schedule the processes that run automatically with little human intervention or no intervention which help the firms or organizations reduce costs related to labor or operational costs.

RPA also can integrate with other tools and systems, which helps in data extraction without the use of API.

Unlike BPO companies, who assign their company's employees to ensure their operations are in-line with the company's standards, bots has the ability to perform the same operations with no error if they are trained correctly.

RPA Key features:

- **Uipath studio:** Bots can be implemented using this component.
- **Code free:** Bots can be programmed with minimal code.
- **Workflow center:** The platform where users can schedule their bots or trigger them.
- **Rules-based execution:** RPA bots can perform tasks based on rules defined by humans and when any error occurs, it can get handled, and a notification can be sent to humans monitoring them.
- **Cognitive capabilities:** RPA and AI can be integrated, which helps develop intelligent bots that can automate more creative tasks.

Types or flavors of RPA:

There are mainly three types of RPA, they are:

- Attended RPA
- Unattended RPA
- Intelligent process automation or IPA

Attended RPA:

This bot needs human to monitor or supervise them and observe the process that was automated using a bot. This process is also called Robotic desktop automation or (RDA). They should be triggered by humans and will have no preset time to run automatically. Humans can also be able to interact with the attended bots when they ask for some user input.

Example: An attended bot can update the addresses automatically with in less time rather than updating it manually when triggered by human

Unattended RPA:

This bot does not need humans to monitor or supervise them. They can be triggered based on the scheduled time or the programming logic. The input data can be passed through excel sheets, APIs, or some data sources when integrated with other systems. This type of bot can perform more complex and high-priority tasks.

Example: An unattended bot can be triggered if an email is received or an invoice is attached to an email and can store the file, process it, and make it ready for approval or cancellation based on rules defined by a human.

Intelligent process automation or IPA:

This is the latest generation of RPA technology, which integrates RPA and AI that can help RPA bots to learn about the tasks that need to be performed over time and process that automation with no human intervention

How does RPA work?

RPA works by using UI elements to interact with high-level applications. A workflow will be programmed using drag-and-drop activities that click, write, and extract data. No coding is needed, and multiple workflows can be called into one another to avoid confusion in the script. Each workflow will contain some tasks, which is the part of the process that needs to be automated, and for processes where coding is required C#, cvan be used as a programming language. RPA interacts with the UI-based elements embedded in different layers of applications or software to capture the data and perform the tasks specific to those elements. It works as a human interacting with computer applications to complete business processes.

Tools used for implementing robots:

Uipath studio, Automation Anywhere, and Blue Prism are the trending tools for RPA, and Uipath is the most popular among them.

Overview of UiPath studio

It is a tool developed by UiPath software company to implement RPA bots that automate business processes and interact with other software such as CRM or ERP software. It has several sophisticated features, including document understanding to process different types of documents and extract data from them and an action center feature to help stop the process when human approval is required. In addition, a test suite feature to evaluate the accuracy and effectiveness of the automated process before it is made public.

Conclusion:

The outcomes for RPA should improve as AI develops. Future implementation of intelligent bots, which feature a human-like interface for business users, will allow RPA to reach a wider audience. Guy Kirkwood, the chief evangelist of UiPath, asserts that RPA will serve as the central hub for automation.

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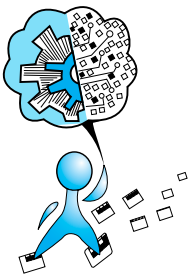
About the Author

Husnara Mohammed B.Tech graduate from Jawaharlal Nehru Technological University University college of Engineering vizianagaram passed in 2018.Did her Master's Course on AI which includes data science, Machine learning and deep learning technologies.Good practice of creating AI/ML models and analysing data, using data science for interpretation and normalisation of data before creating AI models using Python. Good knowledge regarding Agile delivery model and SDLC.



Choose your career properly

Deepika Imandi

Working as Advanced App Engineering Associative in Accenture .
Email: deepikaimandi2000@gmail.com

Hey peeps. I hope everything is well with you. Myself, Deepika: Some people choose this way because they think they can earn money quickly, and some people prefer it because of their passion.

Sugar is sweet. But, for some, it acts like poison. Salt may add flavor to your food. But, for some people, it may be forbidden. You may like something other than what I like. And I may not like what you want. Every person is different—Differ from a DNA profile is said to be unique for every human being. As a result, what is a better career option for one person may not be for another.

Every career has benefits and drawbacks. It depends entirely on one's thinking. For instance, I want to become a government servant, so I may serve the public, as that will provide me with greater satisfaction. I am aware that UPSC has numerous disadvantages and is still straightforward, but I am pleased that I am attempting to reach my objectives. Follow your heart and your passion, and selecting your route, is what I wish to convey.

A software engineer has to work hard, but there is a limit. I know an IAS would have to wake up at night if called upon due to some incident. In the case of software, there is always a backup team. Earning money has no boundaries. You can make more money from your salary, building a company, freelancing, outsourcing, etc., whereas in the IAS, there is no extra money unless you become corrupt, and then you can go to jail. IAS is a service where you must work for the country and its people, following the rules but not breaking them. Even though there are numerous disadvantages to choosing civil service as a career, someone who has passed on will choose it.

The youth are an asset for developing the country. If a kid like you chooses someone to serve the nation, it may bring about change in the country. It may take a long time, but a small impact can change many people's minds and lead to the development of our country. I am not encouraging everyone to enter civil service; some people who want to pursue this as a career are stepping back for various reasons. I want to encourage those people not to back down but instead to work hard and strive to achieve their goals.

UPSC posts for 24 different civil services are filled through the Civil Service Examination (CSE) conducted by Union Public Service Commission. Only a few thousand students can successfully clear this examination out of lakhs of aspirants. The most popular services are the Indian Administrative Services (IAS), Indian Police Services (IPS), Indian Revenue Services (IRS), and Indian Foreign Services (IFS). The allotment of services to successful candidates depends on the rankings obtained in the examination. After getting selected for service, a candidate is appointed to various posts. There are three types of civil services:

1. All Indian Civil Services
2. Group A Civil Services
3. Group B Civil Services.

And there are different posts under these services. I don't want to bore you by reading these articles and saying the other posts that come under these services because you can find them on the internet.

The journey of a civils aspirant is challenging because one who is preparing for civils may be demotivated and feel stressed because they have to face different people's opinions. We must be self-motivated daily, and consistency is the key to achieving what we want. An unknown quote says, "Push yourself because no one else is going to do it for you." The goal is yours, so you must make an effort.

Coming to myself I am just at the beginning of achieving my dream. I don't know whether I can achieve it, but I will give it a try, and I am happy that at least I am trying to achieve what I want.

So finally, choose what you want to become and achieve it. Many people around us will say this is not good for you and is not the correct path. Listen to them. Take the good in their words. Don't get demotivated. End of the day, you must be happy and satisfied with your work, whatever the field in which you like to work.

It is your personal choice. Every person thinks differently.

Every person has their expectations and beliefs. Every person has a different environment in which he has been brought up.

So, there is no absolute rule to say that the civil service is better than the private sector or that the private sector is better than the civil service. It all depends on your personal choice and your environmental influences. Both are good options. It would be best if you did what gives you more satisfaction – professionally, materialistically, or from whatever other angle you think applies to your personality. Finally, choose the career you want to become and try hard to achieve it.

About the Author

Deepika Imandi recently completed her graduation in the stream of Information Technology from JNTU Gurajada Vizianagaram. Currently she is working in Accenture as Advanced app Engineering Associative.

Kind Attention !

Prospective Contributors of Newsletter Bytes

Forthcoming Issues : **May 2023** : **Machine Learning, IoT, Blockchain**

Please note that Cover Theme for the April 2023 issue is **Machine Learning, IoT, Blockchain**. Please send your contributions by 15th April, 2023.

The articles should be authored as original text. Plagiarism is strictly prohibited.

Please note that Byte is a newsletter for members at large and not a research journal for publishing fullfledged research papers. Therefore, we expect articles written at the level of general audience of varied member categories. Equations and mathematical expressions within articles are not recommended and, if absolutely necessary, should be minimum. Number of pages of the articles should be at least 3 to 4 pages. Include a brief biography of four to six lines for each author with high resolution author photograph.

Please send your article in MS-Word format to Chief Editor, Dr. Tirimula Rao Benala in the email ids bytes.newsletter@gmail.com; Issued on the behalf of the Bytes Editorial Board.

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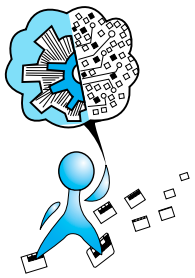

Deep Learning – Software Defect Prediction

Bonthu Sahita

ASE in TCS, Hyderabad. Email: bonthusahita@gmail.com

High-quality software is in high demand in today's developing technology. This is because people rely on software for every task. But the current software has become more complex and costly to develop. For this reason, there is still trouble with low quality at larger economic costs. To solve this problem we take an approach i.e Software Defect prediction that can improve the quality of software effectively.

Have you ever thought about how we can identify fault-prone areas in a large amount of data? This can be done through statement-wise detection of the error which involves methods like Data Pre-processing, Neural Networks, Random Forest, etc where the data undergoes training, testing, and cross-validation to remove any fault in the statement and using performance metrics we can calculate the accuracy of the model.

Introduction to SLDeep Model:

This model uses deep learning techniques to find a solution to problems faced by software developers. Initially, we use Data Pre-processing where one needs to compute metric data then extract the tokens, and later construct a matrix for the given program. By doing this we perform statement-wise observation of our data and clean data to prepare it for undergoing training and testing where the most important models i.e Neural Network and Random forest are used.

Neural Network:

We know that the Neural Network model is an effective Machine learning technique and mainly LSTM that belongs to the Recurrent Neural Network family. We use LSTM as it has self-loops with several layers and nodes that can flow for longer durations. This model memorizes the code structure as a sequence of statements thus helpful to observe data and make more informed decisions.

Random Forest:

However, we can also use the Random Forest technique which is a tree-based model that uses multiple decision trees to make decisions. While we train the data the model uses these decision trees and takes an average of all the values to improve the predictive accuracy of the data i.e greater the number of trees greater will be the accuracy and prevents over-fitting. Therefore the errors in the data are minimized substantially.

Finally perform K-fold cross-validation which is a strategy applied to the parameters, where the action reiterates k times for running the same algorithm on data. Each time it uses the fold as a test set and validates the model. Later averages the score at every stage.

The quality of the software after using this model can be identified using performance measures. They tend to evaluate the effectiveness of the SLDeep i.e accuracy, precision, recall, and f-measure. Using training and testing accuracy graphs we can approximately estimate the working efficiency of the model.

Conclusion:

It is every organization's basic necessity to have high-quality software to perform complex tasks and monitor errors at a faster rate, the Software Defect Prediction model gives the flexibility to pinpoint the errors in a huge amount of data with less time and less effort. This model can be used on programs in different application domains i.e Android Applications, defining metrics from C-based languages, etc.

References:

[1] https://www.sciencedirect.com/science/article/abs/pii/S0957417410011681

[2] https://arxiv.org/abs/1802.00921

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About the Author

Bonthu Sahita currently working as an ASE in TCS, Hyderabad. Completed Bachelors in Information Technology Department from JNTUGV, College of Engineering Vizianagaram and secured overall 8.62 CGPA. She is interested in Machine Learning and data analytics.

HOUR OF CODE

JNTU-GV College of Engineering Vizianagaram

DEPARTMENT OF INFORMATION TECHNOLOGY

Organised by: ACM JNTUGV CEV Student Branch STB No. 186519

About ACM JNTUGV CEV(A) ACM Student Chapter

ACM, the world's largest educational and scientific computing society, delivers resources that advance computing as a science and a profession. ACM provides the computing field's premier Digital Library and serves its members and the computing profession with leading-edge publications, conferences, and career resources.

ACM brings together computing educators, researchers, and professionals to inspire dialogue, share resources, and address the field's challenges. As the world's largest computing society, ACM strengthens the profession's collective voice through strong leadership, promotion of the highest standards, and recognition of technical excellence. ACM supports the professional growth of its members by providing opportunities for life-long learning, career development, and professional networking.

JNTUGV CEV(A) ACM Student Chapter was established at JNTU-GV College of Engineering Vizianagaram in September,2021 with the objective to promote the learning and computing activities on campus. Since then, department of Information Technology is leading the chapter activities on campus.

- Number of Information Technology Students: 300
- ACM Chapter Members: 70 members
- Majority of Members: Information Technology

Event Summary:

The Hour of Code is a global movement by Computer Science Education Week and Code.org reaching tens of millions of students in 180+ countries through a one-hour introduction to computer science and computer programming. This event was conducted across a span of three days for three different branches. They are:-**Information Technology, Civil & Metallurgy And Mechanical Engineering**. We explained them in detail about ACM, **HOUR OF CODE** event, Introduction to Python and explained about Rock ,Paper And Scissors game using python in Hour of Code website. We made this event very interactive with the students of respective branches. They enjoyed a lot in this event. They are even interested in joining ACM. They also summarized the event in their own words. We had a great experience while teaching them.