



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

NEWSLETTER

# Bytes



January 2023 | Vol. 2 | Issue No. 1

## ***INNOVATING THE FUTURE***

How Technology is Transforming Industries



JNTUGV CEV (A)

[www.bytesthenewsletter.com](http://www.bytesthenewsletter.com)

## Editorial

*Dear Readers,*

*"In the information age, those who wield data and wield it with wisdom shall shape the world's destiny."*

– Anonymous

In this age of technological marvels, artificial intelligence (AI) has emerged as a transformative force, revolutionizing industries and streamlining decision-making processes. However, as we witness the growing prominence of AI algorithms, a disquieting concern looms large – the specter of algorithmic bias and its potential impact on fairness. As society stands at the precipice of a tech-driven future, the need for vigilance in addressing this pressing issue has never been more critical.

The rapid adoption of AI algorithms in various domains promises improved efficiency and objectivity. Yet, behind the allure of these automated decision-makers lies a disconcerting truth - the algorithms meant to optimize our lives could inadvertently perpetuate societal biases. Algorithmic bias, the propensity for AI systems to favor or discriminate against certain groups based on attributes such as race, gender, or socioeconomic status, threatens to deepen existing inequalities and compromise the principles of fairness we hold dear.

Consider hiring and recruitment, where AI-powered platforms are increasingly relied upon to identify the best candidates. On the surface, these systems claim to eradicate human biases, but lurking beneath lies the possibility of ingrained prejudices sneaking into the algorithms' learning process. As a result, candidates from underrepresented backgrounds might find themselves unfairly excluded, widening the workforce diversity gap.

Equally concerning is facial recognition technology, lauded for its potential in security and identification. Yet, studies have shown that specific facial recognition algorithms exhibit racial biases, leading to misidentifications and reinforcing racial profiling. The ramifications of such errors are profound, eroding trust in technology and amplifying distrust among marginalized communities.

AI algorithms have found applications in predicting recidivism and determining sentences in the criminal justice system. While the intentions behind such implementations are noble, the outcome is disquieting. Biases in these algorithms have resulted in harsher treatment for specific demographics, raising ethical concerns about justice and human rights.

As AI algorithms seep into our daily lives, even credit

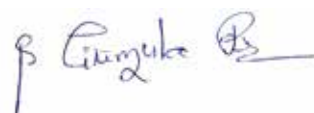
scoring has become subject to their influence. Struggling to balance risk assessment and fairness, credit scoring algorithms might inadvertently favor certain socioeconomic groups, restricting access to credit for others.

However, it is essential to remember that technology is not inherently biased; the biases originate from the data on which AI algorithms are trained. Addressing algorithmic bias requires a multi-faceted approach involving meticulous curation of diverse and representative datasets. By taking deliberate steps to ensure that the data reflects the diversity of our society, we can mitigate the risk of perpetuating biases in AI decision-making.

Moreover, the quest for fairness in AI demands transparency and accountability. AI models must be designed with fairness constraints, and their decision-making process should be transparent and explainable. This will empower individuals to understand and question the outcomes, fostering a culture of accountability and continuous improvement.

As we stand at the crossroads of a technological revolution, we must embark on a collective journey to strike a balance between AI's promise and its potential pitfalls. The pursuit of fair AI decision-making will require collaboration among technologists, policymakers, and society at large. Regulatory bodies must lay down guidelines that hold AI developers accountable for addressing algorithmic bias and promoting ethical AI development.

The road ahead is undoubtedly challenging, but we must not shy away from embracing the power of AI responsibly. By confronting algorithmic bias head-on, we can forge a future where technology is a catalyst for positive change, where fairness and inclusivity are not mere ideals but living realities. Let us tread forth, hand in hand, ensuring that the power of AI is harnessed for the greater good of all as we build a world that thrives on the principles of equity and justice.



**Dr. Tirimula Rao Benala**

Editor-In-Chief, Bytes - The newsletter





# Editorial Board

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## Office of the Honorable Vice Chancellor



**Prof. Dr. Venkatasubbaiah**  
Hon'ble Vice-Chancellor

Jawaharlal Nehru Technological  
University Gurajada Vizianagaram  
(JNTGV)

Dear members of the academic community,

I am delighted to address you on the occasion of the latest edition of "Bytes - The Newsletter," centered around the captivating theme, **"Innovating the Future: How Technology is Transforming Industries."** As we embark on this intellectual journey, I am filled with immense pride and gratitude for the remarkable contributions of our students, faculty, and researchers in shaping the future through cutting-edge technological advancements.

At JNTUGV, we have always strived for excellence and innovation. Our commitment is to foster an environment that nurtures creativity, curiosity, and the pursuit of knowledge. This edition of "Bytes" encapsulates the essence of our academic community's relentless pursuit of excellence and its passion for driving transformative change.

The theme "Innovating the Future" resonates deeply with the core values of our institution. As we explore the fascinating intersection of technology and industries, we witness our collective efforts' profound impact on society. It is truly inspiring to witness how our researchers and innovators are leveraging technology, such as the Internet of Things (IoT), Machine Learning (ML), Artificial Intelligence (AI), and No-code AI, to revolutionize traditional practices across various sectors.

Our academic community has been at the forefront of innovation, and this edition of "Bytes" reflects the dynamic and forward-thinking spirit that defines JNTUGV. From autonomous vehicles and digital farming to AI-driven methodologies and software architecture, the articles featured here exemplify the transformative potential of technology and its ability to shape a better tomorrow.

Celebrating these remarkable achievements, we must reflect on our responsibility as scholars and educators. It is incumbent upon us to prepare our students for a future that is heavily reliant on technology. Incorporating the latest advancements into our curriculum and research empowers our students to become pioneers and leaders in their respective fields, driving positive change in the world.

I want to thank the editorial team for their unwavering dedication in curating this remarkable edition of "Bytes." Their commitment to promoting knowledge dissemination and showcasing the best of our academic community is truly commendable.

To the contributors, I offer my sincere gratitude for sharing your research, insights, and expertise. Your work is inspiring and sets a benchmark for academic excellence at JNTUGV.

As we continue our journey of innovation, let us remember that our collective impact goes beyond the walls of our institution. By pushing the boundaries of knowledge and exploring new frontiers of technology, we contribute to the progress and prosperity of society at large.

I encourage all academic community members to immerse yourselves in the wealth of knowledge presented within "Bytes - The Newsletter." Let us draw inspiration from the stories of innovation and harness our potential to transform industries and create a brighter future for future generations.

Thank you, and I wish you all a rewarding and enlightening experience with this edition of "Bytes."

Sincerely,

**Prof. Dr. Venkatasubbaiah**  
Hon'ble Vice-Chancellor

# Office of the Registrar



**Prof. G. Jaya Suma**

Registrar

Jawaharlal Nehru Technological  
University Gurajada Vizianagaram  
(JNTGV)

Dear Readers,

It is with great pleasure that I address you on the occasion of the 3<sup>rd</sup> edition of "Bytes- The Newsletter," where we explore the fascinating theme of **"Innovating the Future: How Technology is Transforming Industries."** As the Registrar of JNTUGV, I take immense pride in witnessing the academic community unite to celebrate the intersection of technology and innovation.

"Bytes" has consistently been a platform to showcase the brilliance of our students, faculty, and researchers. This newsletter highlights their achievements and fosters a culture of knowledge dissemination and continuous learning. In this edition, we delve into the profound impact of technology on various industries, and I am confident that the content presented will be both insightful and thought-provoking.

As the world evolves at an unprecedented pace, technology continues to be the driving force of change. Industries across the globe are witnessing transformative advancements, and it is our collective responsibility to embrace and understand these changes to remain relevant in the ever-competitive academic landscape.

The articles featured in this edition exemplify the spirit of innovation and perseverance that defines our academic community. From exploring the realms of autonomous vehicles and digital farming to understanding AI-driven methodologies and software architecture, we witness firsthand how our institution's expertise contributes to advancing technology and its application in diverse sectors.

As we prepare our students for the challenges of tomorrow, it is essential to equip them with theoretical knowledge and practical insights into the latest technological trends. "Bytes" bridges theory and practice, allowing our students to grasp the real-world implications of their academic pursuits.

I extend my heartfelt appreciation to the editorial team for their tireless efforts in compiling this exceptional edition. Their dedication to showcasing the best of our academic community is truly commendable. I would also like to extend my gratitude to the contributors for their invaluable contributions, which undoubtedly enrich the content of this newsletter.

To the readers, I encourage you to immerse yourselves in the knowledge shared within these pages. Embrace the spirit of innovation and utilize this knowledge to transform your academic journey and contribute to the betterment of society.

As the Registrar, I remain committed to supporting and nurturing a conducive academic excellence and growth environment. Let us forge ahead, united in our pursuit of knowledge and driven by the passion to make a meaningful impact on the world.

Thank you, and I wish you all an enriching experience with the 3<sup>rd</sup> edition of "Bytes."

Sincerely,

**Prof. G. Jaya Suma**

Registrar

Jawaharlal Nehru Technological University Gurajada Vizianagaram (JNTGV)

## Message from Principal



**Prof. K. Srikumar**

B.Tech., M.Tech., Ph.D.  
Professor & i/c Principal  
JNTU-GV University College of  
Engineering

Dear Students, Faculty and Staff,

I am delighted to extend my warmest greetings to all of you on the occasion of the latest edition of **"Bytes - The Newsletter"**. It gives me immense pleasure to witness the continuous growth and accomplishments of our academic community, which are now immortalized in the pages of this newsletter.

"Bytes" has been a platform for us to showcase the brilliance and ingenuity of our students, faculty, and researchers. It is a testament to the academic excellence and innovation culture that thrives within JNTUGV College of Engineering. I express my heartfelt appreciation to the editorial team for their dedicated efforts in bringing together this inspiring collection of articles.

This edition's theme, **"Innovating the Future: How Technology is Transforming Industries,"** aligns perfectly with our institution's vision to be at the forefront of technological advancements. The fast-paced world demands that we remain agile and proactive in adapting to the dynamic changes in the technological landscape. Through this newsletter, we can explore how our institution is contributing to shaping a better tomorrow through technological innovation.

As a leading institution, we take pride in our research initiatives, academic programs, and projects contributing to society's progress. The articles featured in this edition present a compelling glimpse into how technology, such as the Internet of Things (IoT), Machine Learning (ML), Artificial Intelligence (AI), and No-code AI, is revolutionizing various industries.

Our students, as the torchbearers of tomorrow, play a crucial role in this transformation. Please immerse yourselves in the knowledge shared within these pages. Learn from the achievements and insights of your peers and mentors, and let this serve as inspiration for your pursuits in the world of technology.

To our esteemed faculty members, your dedication to research and teaching continues to drive our institution's success. Your commitment to fostering a culture of innovation and excellence is evident in the ground-breaking research and projects featured in this edition of "Bytes."

Lastly, I thank all the contributors for sharing their expertise and experiences. Your contributions are invaluable, enriching our academic community in more ways than one.

As we celebrate our institution's and its members' achievements, let us also remember our responsibility to society. As future engineers and technologists, our actions have the power to impact millions of lives. Let us use technology responsibly and ethically, focusing on creating solutions that address real-world challenges and contribute to the greater good.

Once again, I extend my best wishes to all of you. May this edition of "Bytes - The Newsletter" inspire us to reach greater heights and strengthen our resolve to impact the world through technology and innovation positively.

Best regards,

**Prof. K. SriKumar**

Principal

JNTUGV College of Engineering, Vizianagaram



# ACM Student Branch STB-186519



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Tenure: 06-Oct-2022 to 28-Oct-2023



**Chitturi Pavani Satya Sai**  
Deputy Event Head

Tenure: 06-Oct-2022 to 28-Oct-2023

## Editorial Column

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### Striking a Balance: The Pursuit of Fair AI Decision-Making

In this age of technological marvels, artificial intelligence (AI) has emerged as a transformative force, revolutionizing industries and streamlining decision-making processes. However, as we witness the growing prominence of AI algorithms, a disquieting concern looms large – the specter of algorithmic bias and its potential impact on fairness. As society stands at the precipice of a tech-driven future, the need for vigilance in addressing this pressing issue has never been more critical. In our fast-paced world, technology has become the driving force behind progress, enabling us to overcome challenges, streamline processes, and reimagine possibilities. As Chief Editor, it brings me great pleasure to present this compilation that delves into the fascinating intersection of technology and industries.

The rapid adoption of AI algorithms in various domains promises improved efficiency and objectivity. Yet, behind the allure of these automated decision-makers lies a disconcerting truth – the algorithms meant to optimize our lives could inadvertently perpetuate societal biases. Algorithmic bias, the propensity for AI systems to favor or discriminate against certain groups based on attributes such as race, gender, or socioeconomic status, threatens to deepen existing inequalities and compromise the principles of fairness we hold dear.

Consider hiring and recruitment, where AI-powered platforms are increasingly relied upon to identify the best candidates. On the surface, these systems claim to eradicate human biases, but lurking beneath lies the possibility of ingrained prejudices sneaking into the algorithms' learning process. As a result, candidates from underrepresented backgrounds might find themselves unfairly excluded, widening the workforce diversity gap.

Equally concerning is facial recognition technology, lauded for its potential in security and identification. Yet, studies have shown that specific facial recognition algorithms exhibit racial biases, leading to misidentifications and reinforcing racial profiling. The ramifications of such errors are profound, eroding trust in technology and amplifying distrust among marginalized communities.

AI algorithms have found applications in predicting recidivism and determining sentences in the criminal justice system. While

the intentions behind such implementations are noble, the outcome is disquieting. Biases in these algorithms have resulted in harsher treatment for specific demographics, raising ethical concerns about justice and human rights.

As AI algorithms seep into our daily lives, even credit scoring has become subject to their influence. Struggling to balance risk assessment and fairness, credit scoring algorithms might inadvertently favor certain socioeconomic groups, restricting access to credit for others.

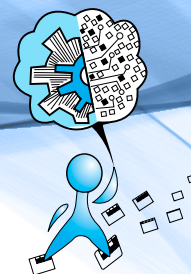
However, it is essential to remember that technology is not inherently biased; the biases originate from the data on which AI algorithms are trained. Addressing algorithmic bias requires a multi-faceted approach involving meticulous curation of diverse and representative datasets. By taking deliberate steps to ensure that the data reflects the diversity of our society, we can mitigate the risk of perpetuating biases in AI decision-making.

Moreover, the quest for fairness in AI demands transparency and accountability. AI models must be designed with fairness constraints, and their decision-making process should be transparent and explainable. This will empower individuals to understand and question the outcomes, fostering a culture of accountability and continuous improvement.

As we stand at the crossroads of a technological revolution, we must embark on a collective journey to strike a balance between AI's promise and its potential pitfalls. The pursuit of fair AI decision-making will require collaboration among technologists, policymakers, and society at large. Regulatory bodies must lay down guidelines that hold AI developers accountable for addressing algorithmic bias and promoting ethical AI development.

The road ahead is undoubtedly challenging, but we must not shy away from embracing the power of AI responsibly. By confronting algorithmic bias head-on, we can forge a future where technology is a catalyst for positive change, where fairness and inclusivity are not mere ideals but living realities. Let us tread forth, hand in hand, ensuring that the power of AI is harnessed for the greater good of all as we build a world that thrives on the principles of equity and justice.





# A Practical Approach to Handling a Project Using Agile Principles

**Ramya Peri**

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Managing any project efficiently requires careful planning, thoughtful architecture, and effective implementation. This article will explore a practical approach to building a student management system, utilizing agile principles for a more iterative and adaptable development process. The project's example will serve as a reference throughout the article.

**Example:** Building a Student Management System

## Requirements Gathering and Use Cases:

The first step in any project is to gather requirements and brainstorm use cases. For a student management system, it is essential to understand the existing processes within the university or college. This might involve interviewing key stakeholders, such as clerks, the Head of Department (HOD), and principals, to comprehend the workflow and approval processes.

To visualize and document these processes, a process mapping diagram with swimlanes can be used. This will help identify bottlenecks, improvement areas, and a clear

understanding of how the system should function.

Next, to capture the user needs effectively, create user stories. User stories should be concise, describing a single functionality from the user's perspective, regardless of their role. Keeping them small makes it easier to manage and prioritize tasks throughout the development process.

The most basic user stories indispensable to the system's functionality should be included in the first release. Prioritize them over other features to ensure a minimum viable product (MVP) is delivered early on. This approach aligns with the Agile development philosophy of incremental progress and continuous improvement.

## Architecture:

Having a well-defined architecture is crucial to ensure scalability, maintainability, and efficiency of the student management system. The architecture of the given case study is depicted in Fig. 1. In this example, we will consider the following components for the architecture:

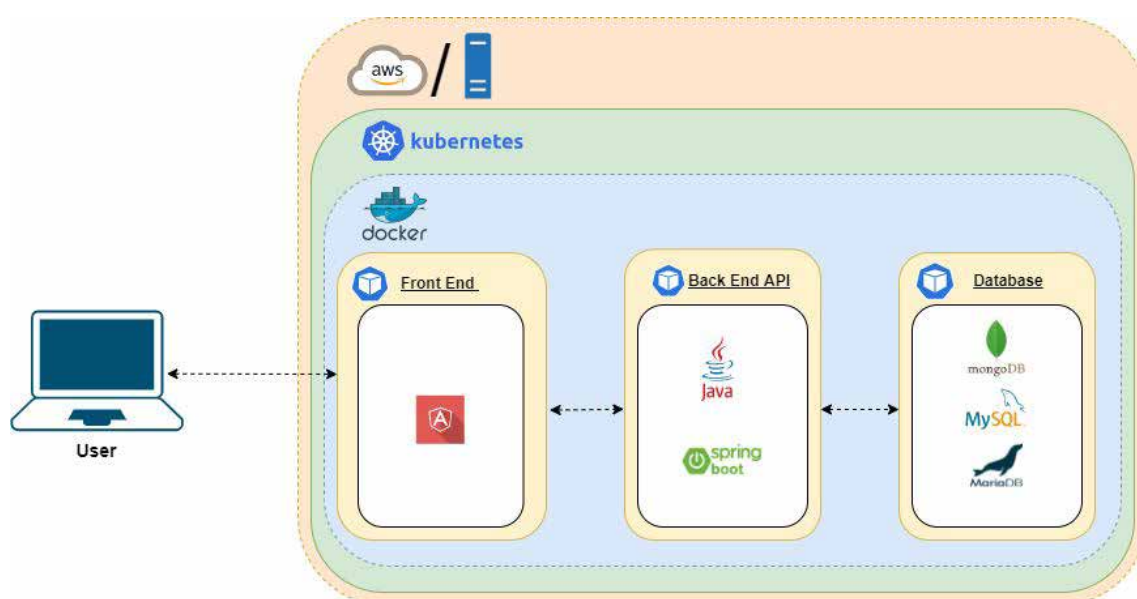


Fig. 1

**Frontend:** Angular - Angular is a popular frontend framework based on TypeScript and CSS, providing a robust and modular structure for building responsive user interfaces.

**Backend:** Java Microservices - Microservices architecture allows breaking down the application into smaller, independent services, enabling easier development, testing, and deployment.

**Database:** A relational database like MySQL can be used for record tracking. For actual storage of student data in JSON format, MongoDB, a NoSQL database, can be utilized for its flexibility and scalability.

**Deployment:** Docker - Docker containers provide an isolated and consistent environment for deploying applications, making it easier to manage and scale the system efficiently.

The choice between on-premise or cloud deployment should also be based on budget, scalability requirements, and the organization's policies.

## Implementation:

Before diving into coding, assessing if any existing solutions can be readily integrated to fulfill specific requirements is crucial. For example, integrating Google Sign-In or Azure Sign-In could be viable options for student authentication. These services offer secure and user-friendly authentication methods at minimal costs,

saving development time and resources.

Adopting an agile approach should divide the implementation phase into short iterations or sprints, where specific user stories are developed and tested within each sprint. This iterative process enables the team to receive feedback from stakeholders regularly and make necessary adjustments throughout the project's lifecycle.

## Conclusion:

Handling a student management system project requires a systematic and agile approach to ensure completion. The team gains clarity on the project's scope by gathering requirements, mapping processes, and creating user stories. The chosen architecture ensures a scalable and efficient system, including Angular for the front end, Java microservices for the backend, and MySQL and MongoDB for databases. Leveraging Docker for deployment enables consistency and easy management.

Moreover, exploring existing solutions for certain functionalities saves time and resources during implementation. Following an agile methodology, the team can adapt to changing requirements, receive timely feedback, and deliver an effective student management system that meets user needs and expectations. Building a student management system exemplifies how a practical approach combined with agile principles can lead to successful project outcomes.

## About the Authors



**Ramya Peri** is an accomplished product management leader with a solid academic foundation, having completed her undergraduate studies at Andhra University. With an impressive 15-year tenure in the IT industry in India and beyond, Ramya has honed her skills and expertise to become a recognized authority in her field. Throughout her career, Ramya has been instrumental in handling projects for multinational clients, garnering exceptional feedback for her technical acumen and seamless team integration. Her ability to cultivate positive working relationships with diverse team members has driven her success. Notably, Ramya demonstrates exceptional coordination and issue-resolution capabilities between various technical infrastructure and application teams, ensuring project timely and effective implementation. Additionally, her solution-driven leadership abilities shine through in her adeptness at organizing employee engagement activities in collaboration with Human Resources. As a testament to her contributions and accomplishments, Ramya Peri continues to leave a lasting impact in the IT industry and beyond, solidifying her reputation as a proficient and respected professional.





## 2. Continuous Learning:

Tesla's self automating cars are designed to continuously learn and upgrade its performance over time. The car is capable of collecting data about its own driving behaviour and make use of this data to enhance its driving algorithms through Machine Learning.



Fig. 3: Auto pilot mode in Tesla cars

## 3. Autopilot and Self Driving Mode:

Tesla has its own software that permits the self driving and autopilot modes in the car. The driver can reduce their manual tasks by the use of Advanced Driver Assistance System(ADAS) incorporated in the software. The driver can take the control of the car during any difficult and hard headed situations with aid of this special IoT features.

## 4. Updates:

One of the main implementation of IoT in Tesla vehicles is its update system. Usually the cars are updated in dealership or merchant stores. This may come out as a complex task wherein it is difficult for a driver to always to take the car to the merchant for any upgrades. In Tesla there is no need to take car to the dealer instead the car fixes itself and this is done through its self updating features. This feature was first implemented by Tesla S model.



Fig 4: Self updating feature

## 5. Mobile App:

Similar to the use of IoT in home appliances apps where we can turn on the lights, switch on or off the AC just by one click, the same functions can also be used in Tesla cars using a mobile app. We can access various features of the car like flashing lights, unlocking and locking the car etc with just a single click. There is also a special feature used in the app where we can move the car out of a tight space. We can also set the climate control, check the battery status and purchase upgrades through the app.



Fig. 5: Mobile app of Tesla

## 6. Application of Block Chain:

The application of Blockchain in Tesla self driving cars is to enhance the safeguard and secure the data. This technology can also be used to store and manage the huge amount of data collected.

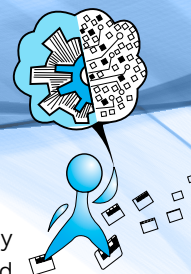
## Risks Associated with the Self Driving Cars

- Hackers can acquire access to the cars since these cars always connected to the internet .This may lead to some dangerous situations.
- The IoT features in self driving cars collect a huge amount of data like location and personal details .This data can be sold out to third parties without the users consent.
- The Machine Learning algorithms implemented may not always make the right decisions at right time ,this can lead to accidents or injuries.

However the development of these self driving cars using any of these technologies should be done with proper considerations of these risks and also should implement a proper safeguard to overcome these challenges.

## Security aspects of Tesla's Self Driving Cars:

- Tesla have the concept of passive safety and active safety ,where it's aim is not only focused on the safety of Tesla drivers and passengers but also the drivers on the road.



- The Model S, Model 3, Model X and Model Y of Tesla self automating cars have achieved the lowest overall probability of injury as compared to any vehicles tested by the U.S. Government's New Car Assessment Program.
- The Tesla's battery packs are rarely damaged in accidents, it also ensures that its safety system works as intended.
- Tesla uses a Sentry mode in its cameras and sensors to scan its surroundings for any potential threats. It flashes the lights and displays a warning message on the central touchscreen, when an object is too close to your car. A notification is sent to the mobile app where the user can access the footage before the event occurred.
- The Dashcam feature in Tesla is used to save a recording of the events that triggered an accident into a local USB drive in the car.

## Conclusion

Due to the emerging technologies across the universe, autonomous vehicles will be the unborn mode of transportation globally and will be a revolution not just for drivers and traffic patterns but also for transportation industry as a whole. The legal, ethical and social counter-accusations of independent vehicles surround the ideas of reliability and effectiveness. Autonomous vehicles

will profit the frugality through energy effectiveness, the terrain through reduced carbon emissions, society through further togetherness, and the legal system through a simpler system of liability. Nevertheless, these ideas revolve around two central aspects of independent vehicles: how they work and how they are kept secure. As technology advances, the security technology regarding driver-less cars will also continue to grow to combat hackers, increase the delicacy of internal systems, and prevent accidents through the integration of blockchain, IoT and machine learning. Once all these technologies are optimal, society will become one step closer to the utopia of flying cars most people pictured of as children.

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## About the Authors



**Yogitha P.** is pursuing Bachelor degree in Computer Science Engineering at Global Academy of Technology, Bengaluru. Being passionate in innovative things, she aims at delivering effective and useful content for the betterment of mankind. Her area of interest lies in Machine Learning, cyber security and Artificial Intelligence.



**Sinchana S.** is pursuing Bachelor degree in Computer Science Engineering at Global Academy of Technology, Bengaluru. Being passionate in innovative things, she aims at delivering effective and useful content for the betterment of mankind. Her area of interest lies in Machine Learning, cyber security and Artificial Intelligence.



**Snigdha Sen** is currently working as an Assistant Professor in Department of Computer Science and Engineering, Global Academy of Technology, Bangalore, India. She is having around 10 years of teaching experience. She is pursuing PhD in Machine Learning from IIIT, Allahabad. She completed her Masters in Information Technology from Jadavpur University, Kolkata. Her area of interest lies in Machine Learning, Bigdata, Internet of Things and Cloud Computing.

# Smart Assignment led by AI driven methodologies

**Pinniti Gurunaidu**

Senior Data Scientist, Insurance Tech Company, Singapore. Email: [gurunaidupinninti@gmail.com](mailto:gurunaidupinninti@gmail.com)

## Introduction

Often job or task assignments to the work professionals used to be manual in nature or in the semi automated process by using some definite rules. This leads to a problem of finding the right person to attend to the right task. If the complexity of the task increases and finding the suitable professional is even more tedious and time consuming effort. The very same problem can be tackled smartly with the use of Machine learning, Natural Language Processing and Linear Programming methodologies if a certain amount of demographic information of the professionals and transactional details of past jobs or tasks are available in digital records either in flat files or database tables. Let's deep dive into addressing some of the approaches of Smart Assignment.

Before finding a solution to any problem thus identifying methodologies, the following questions need to be well thought of:

- What kind of tasks are going to be handled by workers?
- Do we know much about these workers in terms of their professional expertise ? Is that information readily available ?
- Are we tackling the big problem or small problem ?
- Are we going to throw garbage at the ML models ?
- How big is the task pool data ?
- Are there any required time constraints for making assignments?

Certain degree of understanding on the actual problem statement and purpose of the solution will give us finite clues to tackle the problem in a finite way rather than failing fast.

Although the assignment can be done in various ways, this article is focusing on the one [(1)] of the following two approaches;

## (1) Task Driven Approach

Smart Assignment is completely based on the nature of the task. The detailed discussion on this topic covered in the later part of this paper

## (2) User Driven Approach

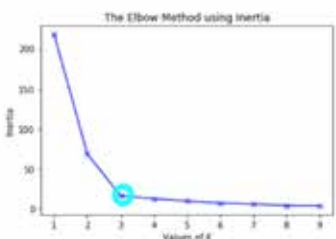
Smart Assignment is completely based on the different users attending the different tasks. In this approach, we try to identify if userA has done task1, can userB be able to attend task2 where task2 is similar to task1? This can be coined as profiling the users based on the tasks they have attended.

## Task Driven Approach

This methodology certainly uses all the historical tasks carried out by the workers. Then using clustering and word embedding models, tasks further then be grouped based on the similarities among the tasks. Each group thus contains the similar tasks that were carried out by different or same workers.

## Conceptual Understanding

Clustering can be done using Agglomerative Hierarchical clustering[i] or distance based K-means clustering and the word embeddings can be formed using either tf-idf aka Term Frequency - Inverse Document Frequency[iii], word2vec[iv], pre-trained sentence transformer BERT aka Bidirectional Encoder Representations from Transformers models either from spacy or Hugging Face[iii]. These embeddings will be fed to clustering models and the Elbow method will be used to determine the appropriate number







of clusters[v]. Silhouette Score can be used to further strengthen selecting the right embedding model and usually this score ranges from -1 to 1 where -1 denotes the data points that are not placed in right clusters though the clusters were formed with utmost separable distance between each cluster centroids, 1 denotes the data points that are placed in right clusters that were formed with utmost separable distance between each cluster centroids and 0 denotes that the clusters are completely overlapped or data points are not separable. The higher the positive score of the Silhouette score tends to vote the better the model.



As we are dealing with text based data, it is better to form Word-clouds[vi] using each embedding model and further tune if the model results were not satisfactory. The word clouds needs to be further examined using Domain Knowledge and subject matter expert(SME) advice thus it requires careful pre-processing of the data.

## Detailed Methodology

### Pre-Processing

Each task that was completed has the username, description, start and end times along with the task notes. Those tasks for certain period data have been collected via a set of SQL queries. For each task, task notes and description were appended in the sequence that were recorded so as not to lose the actual meaning of the task.

Each task further then be named as a document in NLP for understanding purpose. Each document has been pre-processed by removing stop words, special characters and applied lemmatization and stemming (techniques that used to find root and similar words) and using some business oriented regex rules.

### Model Training

These processed documents are the final documents that need to be supplied for the embeddings. Pick the standard splitting of the documents as training and test sets. On the training data set, embeddings have been created using different models like tf-idf, pre-trained bert models like all-mpnet-base-v2, paraphrase-MiniLM-L3-v2 etc and those embeddings be further submitted to k-means clustering models to group them into finite number of clusters. Each document will be assigned a cluster number based on k-means fitted model.

Our main task is to identify the best embedding model. This can be achieved in different ways, silhouette score and processing time of the model were used to determine the best model in this paper. The best aka highest positive silhouette score and least processing time that model yields will be voted as the best model. But, strictly depending on this method may induce some incorrect results, so need to apply further business logic by consulting SME(Subject Matter Experts) and further tune the embedding models.

### Prediction

On the Test data set, embeddings will be created using the best model that have been selected in the training phase for each document. Then use the same k-means model to predict the cluster for each document. Then validate the clusters manually and with SMEs to further fine tune the models by retraining if the induced results were not satisfactory

### Recommendation

For every new task, do the pre-processing, predict the cluster using the chosen embedding model and k-means clustering. Once the cluster is identified, pick the same cluster data from training data set and identify the most frequent unique top n usernames and recommend them as the workers can attend the task to complete the work in the initial stages. Run these recommendations for a certain amount of period and validate the results with SMEs and see if further re-training is needed. If the recommendations were satisfactory for a finite period, proceed to Assignment Phase

### Smart Assignment

Once the recommendations were satisfactory, to do the direct worker assignment smartly, there are many ways of doing it. One approach is with the help of Linear Programming[vii]. It does require

- **Initialize Model:** either it could be a maximisation or minimization problem that depends on the motto we are achieving and accordingly that model will be initialised.
- **Define Decision Variable:** The key variables used for optimising the problem are the worker demographics(worker timings, worker experience, education levels, proficiency, past work performance), complexity of the work, etc
- **Define Objective Function:** Pick either maximisation or minimization model
- **Define the Constraints:** for each decision variable need to have boundary conditions and either in combinatory or mono

- **Solve Model:** then solve the problem using the initialised model. The model yields the optimised values for each submitted decision variables

For the new document, predict the cluster and pick the same cluster documents from trained data. Then apply the optimization model on all the available workers from that group, choose the most optimised model score that belongs to the worker and that worker will be assigned to that task to attend the work. On the contrary, the hardest part is to extract real time worker demographics.

## Feedback and model Maintenance

Collect the feedback for each assignment, mark 1 if the user accepts the assignment, 0 if not. Get all the feedback score over a period of time and see the drift of the scores over day by day or shift by shift and alert or feedback to the management about the results and also update if the model retraining is required as declining rate is significant compared to acceptance rate or may be some sort of training to be given to workers to understand on the

approach in layman terms.

## Future work

The very same assignment problem can be solved using collaborative filtering and different optimization algorithms to further add the smartness into the assignments

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# Digital Farming in the 21<sup>st</sup> Century: A Technical perspective

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## Introduction

As India is mostly an agriculture-based country, recent development and proliferation of advanced technologies is taking India to a greater height in agriculture sector. Old days are gone where farmers had to put lot of effort in their daily activities of crop production and selling. In recent days, we can hardly name few areas where Machine learning (ML), blockchain and IOT are not being used. Indeed, these technologies are omnipresent. Machine learning algorithms can analyse data collected from sensors and drones on the farm, such as weather patterns, soil moisture, and crop health, to help farmers make more informed decisions about irrigation, fertilization, and pest control. It can also be used to analyse data on foodborne illness outbreaks and predict potential risks. ML algorithms can analyse data on weather patterns and crop yields to help insurance companies better predict risks and set premiums.

When it comes to security aspects, Blockchain can be used to securely store this data, ensuring its integrity and preventing tampering. It can also be used to track the journey of crops from farm to consumer, allowing for greater transparency and traceability. After the outbreak and prediction of potential risks is being made by the ML models, Blockchain tracks the source of contaminated food, allowing for more targeted recalls and reducing the risk of widespread outbreaks. It can store different types of data provided to it, ensuring its integrity and preventing fraud.

Therefore, the integration of machine learning and blockchain can help farmers make more informed decisions, reduce waste and inefficiency in the supply chain, and improve food safety and sustainability. IoT sensors can collect data on different factors including soil moisture, temperature, road condition, financial transaction, etc. Which helps in passing these several types of data to the ML model to solve real-life problems.

## Challenges in the modern agriculture industry

The following is a list of the difficulties that the farming sector and agriculture face:

1. A shortage of labourers and resources
2. Environmental issues and climate change
3. Need for significant manual intervention
4. Insufficient monitoring
5. Challenges in analysing the large-scale unstructured data

## IoT in smart agriculture

The Internet of Things (IoT) is a network of real-world things such as machinery, cars, buildings, and other physical objects that are equipped with sensors, software, and network connectivity. IoT sensors can be used in agriculture to track environmental variables including humidity, temperature, and soil moisture.



Farmers may get real-time data and use it to optimise crop output by deploying IoT devices. For instance, farmers can immediately water the crops if the data indicates that the soil is too dry, lowering the chance of crop loss due to drought.



1. **Soil monitoring:** IoT sensors may be used to track soil moisture, pH, and nutrient levels, which enables farmers to make better decisions about irrigation and fertilisation.

IoT sensors can be buried in the ground to track important soil characteristics like moisture content and nutrient levels. Farmers can receive real-time information about the condition of their soil by connecting these sensors to a network that gathers and analyses the data. Using this knowledge, farmers may modify their fertilisation and irrigation methods to make sure that crops get the ideal balance of nutrients and water. This not only results in better crops but also has the potential to reduce water and fertiliser waste, improving the sustainability and profitability of farming.

2. **Weather monitoring:** Farmers can use IoT devices to gather information about weather patterns to assist them plan their planting, harvesting, and other farming activities.

The weather has a significant impact on agricultural productivity. Real-time data regarding temperature, humidity, wind speed, rainfall, and other weather variables can be gathered with IoT devices. Following that, farmers can utilise this information to make knowledgeable choices regarding planting, harvesting, and other farming operations. Farmers can utilise weather information, for instance, to choose the optimum time to grow crops or the best time to use pesticides or fertilisers. Farmers who have access to the most recent weather data can make better decisions that will increase the quality of their crops while lowering the risks connected with weather-related problems like drought and flooding.

## 1. Drone-based uses:

Technology has improved significantly and more quickly during the past few years. The use of drones in farming is a great example of this progression. Drones are being used in the agriculture sector to advance a variety of farming practises.

Both aerial and ground-based drones are used in agriculture for a number of functions, such as field analysis, irrigation, planting, pesticide application, crop health evaluations, and monitoring. These drones capture multispectral, thermal, and visual imagery while in the air.

Many applications for drones in agriculture exist, including soil analysis, crop spraying, and crop monitoring. The following are some benefits and drawbacks of employing drones in agriculture:



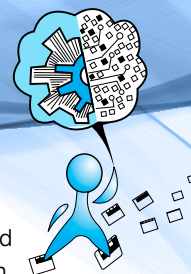
## Pros:

1. **Better Crop Monitoring:** Drones can be used to monitor crop health, spot stressed areas, and even spot early symptoms of disease or insect infestation. These drones may be fitted with cameras or other sensors. This can assist farmers in making timely corrections and minimising crop losses.
2. **Precision Agriculture:** Drones can be used to build comprehensive maps of farmland that include details about the crop yield, moisture content, and soil quality. This can save waste and help farmers make the most use of resources like water and fertiliser.
3. **Effective Crop Spraying:** Drones carrying sprayers can spray crops with fertilisers, insecticides, or herbicides. Traditional methods cannot accomplish this as well as drones, which can precisely target the areas that require treatment and hence reduce the overall amount of chemicals required.
4. **Labour Savings:** By using drones for agricultural monitoring and spraying, farmers can manage their crops more cheaply and easily by eliminating the need for physical labour.

In general, farmers may gain a lot from using drones in agriculture, including better crop monitoring, precision farming, and labour savings. The limited battery life, cost, technical expertise, and regulatory compliance are a few difficulties to take into account.

## 2. Smart Irrigation system

A form of irrigation system called "smart irrigation" employs technology to assist farmers and gardeners get the most out of their water resources. Usually, sensors and meteorological information are used to calculate when and how much water is required, and the system then automatically supplies the water to the plants.



used in agriculture to analyse data gathered by IoT sensors and forecast crop growth, production, and quality.



Source: GAO | GAO-20-1285P

#### Pros:

- 1. Water Conservation:** By providing the proper quantity of water to plants and preventing over- or under-watering, smart irrigation systems may help minimise water use. Water is conserved, and water costs are decreased.
- 2. Economical:** Smart irrigation systems are more cost-effective than conventional irrigation systems, which ultimately saves time and money.
- 3. Convenience:** With a smart irrigation system, you can forget to switch off the water or don't have to water plants by hand.
- 4. Improved Plant Growth:** By ensuring that plants receive the proper amount of water, smart irrigation systems can help produce healthier, more vibrant plants.

### 3. Tank level monitoring

IOT helps to remotely monitor the level of the water tank and configure the alerts when the specific level has been reached.



### Machine learning in smart agriculture

A form of artificial intelligence known as machine learning (ML) enables computers to learn and develop without having to be explicitly programmed. ML can be

For instance, ML algorithms can examine data on temperature, humidity, and soil moisture to determine when to sow crops. Farmers can use machine learning (ML) algorithms to make data-driven decisions that can increase crop yields and decrease waste.

#### 1. Crop Yield Prediction

By examining a lot of data on weather patterns, soil quality, and previous crop yields, machine learning can aid in the forecast of agricultural output. Machine learning can accurately estimate crop yields for a specific season by finding patterns and connections between these factors using algorithms and statistical models. The best crops to plant can be determined using historical data and the present weather, and machine learning can also be used to anticipate new crops that might do well in a specific location based on historical data.



By suggesting the best times and amounts for these inputs, machine learning may also assist farmers in optimising their use of resources like water, fertiliser, and pesticides. This helps minimise waste and increases crop growth and output.

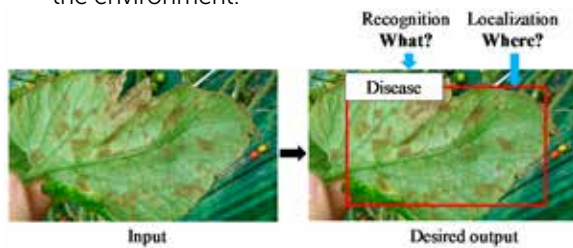
#### 2. Pests and Disease Detection:

- Picture Recognition:** Machine learning algorithms can identify diseases and pests in photos taken by field cameras or drones. Machine



learning can identify the traits that are indicative of a specific pest or illness by examining massive databases of photos, and it can then classify new images in that manner.

- **Sensor Data Analysis:** Sensors in the field, such as soil moisture sensors, temperature sensors, and others, can provide useful information on the circumstances that encourage pest and disease outbreaks. This data can be analysed by machine learning to provide early outbreak warning.
- **Precision Agriculture:** By evaluating data on the location and severity of outbreaks, machine learning can help farmers target their pest and disease management strategies more precisely. This can lower pesticide consumption, save money, and have a smaller negative impact on the environment.



As we can see in the above image how by using image processing and prediction models it's being derived from a patch of leaf that whether there's a disease or not.

### 3. Precision Farming:

By utilising data analysis to enhance agricultural techniques and maximise crop yields, machine learning aids in precision farming. The following are some applications for machine learning:

1. **Predictive analysis:** Machine learning algorithms can evaluate data from weather sensors, sensors for measuring soil moisture, satellite imaging, and other sources to forecast weather patterns, precipitation, and the best times for planting and harvesting.
2. **Soil analysis:** Machine learning may assist in analysing soil data to identify the best crops to produce, potential needs for soil amendments, and the amount of fertiliser to use.
3. **Crop health monitoring:** Algorithms that use machine learning can examine photos of plants to find illnesses, pests, and other problems that may affect crop health. Farmers are now able to act promptly to avoid crop losses.

### 4. Livestock Management:

ML algorithms can assist in enhancing livestock management in a number of ways, such as:

1. **Predictive analytics:** ML algorithms are able to assess data from a variety of sources, such as animal behaviour, weather, feed intake, and health records, to forecast possible issues and stop them from getting worse. They can signal symptoms of illness such as an animal's decreased appetite or agitation.



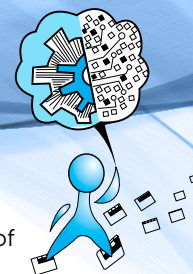
2. **Disease detection and prevention:** Machine learning algorithms can assist in identifying early symptoms of illness, tracking disease outbreaks, and recommending preventive actions to stop the spread of the disease by analysing data from electronic health records.
3. **Feed and nutrition optimisation:** Machine learning algorithms can assist in optimising the types and amounts of feed given to certain animals or groups of animals based on their nutritional requirements, weight increase. This is done by studying animal behaviour data.
4. **Breeding and herd management:** Using genetics, prior performance, and other characteristics, machine learning can assist breeders in selecting the best animals to breed. Also, it can assist in herd management by creating individualised care plans for individual animals and monitoring their development to make sure they're achieving their performance targets.

In general, machine learning helps generate insights that can enhance the health and productivity of livestock, which can boost farm profitability and contribute to global food security.

### Blockchain in smart agriculture

Blockchain is a distributed ledger technology that makes





it possible to store data in a safe and unchangeable way. Blockchain technology can be utilised in agriculture to establish a safe and transparent supply chain.

Blockchain can be used, for instance, to trace the origin of food goods, guaranteeing that they are produced in an ethically and sustainably. In addition to giving farmers a fair price for their goods, this can assist build consumer confidence in the food supply chain.

### 1. Digital identity:

A crop's digital identity is created by capturing and archiving information about the crop on the blockchain. Information about the type of seed that was used, the date of planting, the application of fertilisers and pesticides, and the date of harvest can all be found in this data. Farmers and other stakeholders may monitor a crop's development and make sure it satisfies consumer and regulatory expectations by giving each crop a digital identity.

#### Benefits:

1. Stakeholders can quickly access and verify information on the movement of the crop from the farm to the consumer by storing data on the blockchain. By doing so, you can increase stakeholder trust and make sure the supply chain is running smoothly.
2. It may contribute to greater sustainability. Farmers can choose better crop management strategies by keeping track of facts like the use of pesticides and fertilisers.

### 2. To predict actual prize of crop/land of the farmer.

A transparent and secure platform for recording the ownership and transaction history of real estate properties might be offered via blockchain technology. Yet estimating the cost of land that will be sold is a challenging task that calls for a combination of market research, data science, and knowledge of the real estate sector.

Here are some potential uses of blockchain to forecast the cost of land that will be sold:

**Smart Contracts:** Self-executing contracts, or "smart contracts," are agreements that automatically uphold the terms of a contract between two parties. Blockchain can lower the possibility of human mistake and offer a more secure and efficient transaction process by using smart contracts to automate the purchasing and selling of land.

Blockchain-based decentralised applications (DApps)

can offer a platform for the research of the real estate market.

**Tokenization:** Real estate assets can be tokenized using blockchain technology, enabling investors to buy a portion of an asset. This could improve the real estate market's liquidity and possibly offer more precise price data based on the worth of individual tokens.

#### Land Registry:

A safe and impenetrable land registration can be built using blockchain technology. This would lessen the possibility of fraud and eliminate the necessity for manual record-keeping. Land registration data might be safely and transparently tracked changes in ownership, mortgages, and other transactions by using blockchain technology to record the data.

### 3. To provide land for lease:(IN OFF SEASON)

A safe and transparent platform for renting out land to farmers can be made using blockchain technology. The following are some applications for blockchain in this context:

**Immutable Records:** Blockchain technology enables the production of immutable records, which means that a transaction cannot be changed after it has been recorded on the blockchain. By doing this, the lease agreement is made impenetrable and offers a high level of protection to both the landowner and the farmer.

**Decentralized Platform:** Farmers can access accessible land directly and without middlemen by using a decentralised platform. The platform can be made to enable peer-to-peer leasing between farmers and landowners, which lowers transaction costs.

**Verification:** The identity of the farmer and landowner can be confirmed via blockchain. This guarantees that both the farmer and the landowner are legitimate owners of the property.

Blockchain can make payments between the farmer and the landowner secure and transparent. This can be accomplished via cryptocurrencies or other electronic payment methods, which eliminates the need for currency transactions and offers a safe and effective payment system.

#### Pros of smart agriculture:

1. **Increased efficiency:** Smart agriculture can help farmers optimize their use of resources such as water, fertilizer, and energy, resulting in increased efficiency and reduced costs.

2. **Higher yields:** By monitoring crop growth and environmental factors, smart agriculture can help farmers improve crop yields and quality.
3. **Improved sustainability:** Smart agriculture can help reduce the environmental impact of farming by reducing water and fertilizer use, minimizing the use of pesticides and herbicides, and reducing greenhouse gas emissions.

## Conclusion:

In conclusion, incorporating IoT, ML, and blockchain in smart agriculture can offer a number of advantages to farmers, consumers, and other industry players. ML algorithms may analyse this data to produce insights and make data-driven decisions regarding irrigation, fertilisation, and pest control by employing IoT sensors to gather information about crop status, weather, and other variables. A tamper-proof and transparent log of all transactions can be created by storing this data on a blockchain, enhancing supply chain traceability and transparency. The supply chain can be automated through the use of smart contracts, and stakeholders

can access data through a user interface to collaborate and make decisions more effectively. In general, smart agriculture that incorporates IoT, ML, and blockchain can increase production, sustainability, and efficiency in the agricultural sector.

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## About the Authors



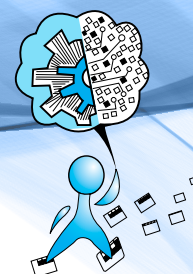
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# IT Service Management

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## Introduction

IT service management -- often referred to as ITSM -- is simply how IT teams manage the end-to-end delivery of IT services to customers. This includes all the processes and activities to design, create, deliver, and support IT services.

The core concept of ITSM is the belief that IT should be delivered as a service. A typical ITSM scenario could involve asking for new hardware like a laptop. You would submit your request through a portal, filling out a ticket with all relevant information, and kicking off a repeatable workflow.

## The importance of ITSM

ITSM benefits your IT team, and service management principles can improve your entire organization. ITSM leads to efficiency and productivity gains. A structured approach to service management also brings IT into alignment with business goals, standardizing the delivery of services based on budgets, resources, and results. It reduces costs and risks, and ultimately improves the customer experience.

Benefits of ITSM to include:

- Aligning IT teams with business priorities tracked through success metrics
- Enabling cross-department collaboration
- Bringing IT teams and development teams together through streamlined project management approaches
- Empowering IT teams to share knowledge and continuously improve
- Improving request coordination for more efficient service
- Promoting customer-centricity with self-service and better processes
- Responding more quickly to major incidents, and preventing future ones

## ITSM processes

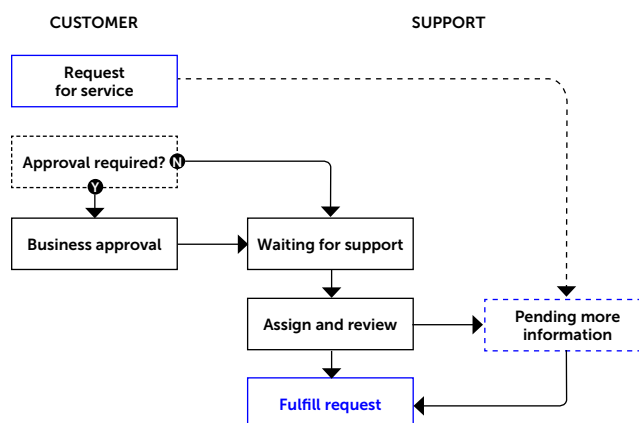
What are ITSM processes? IT service teams use

organizational resources and follow repeatable procedures to deliver consistent, efficient service.

A few of the core ITSM processes include:

## Service Request Management

Service request management is a repeatable procedure for handling the wide variety of customer service requests, like requests for access to applications, software enhancements, and hardware updates. While there are some variations in the way a service request can be captured and fulfilled, it's important to focus on driving standardization to improve overall service quality and efficiency. The following process represents a simple request fulfillment process based on ITIL recommendations. This can be used as a starting point for adapting existing ITIL processes or defining new ones.



## Knowledge Management

Knowledge management is the process of creating, sharing, using, and managing the knowledge and information of an organization

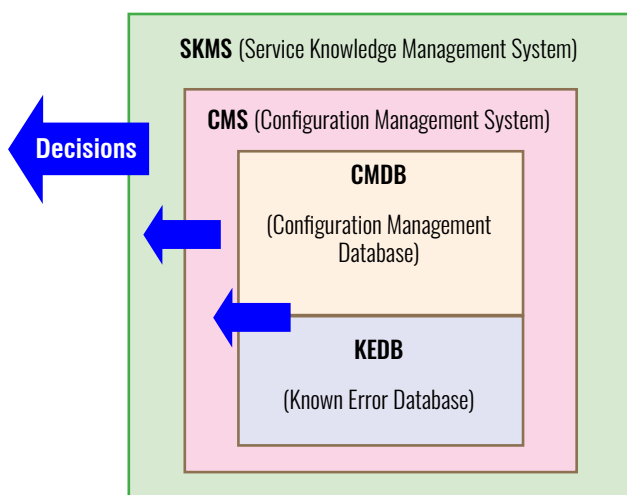
## What is Service Knowledge Management

The Service Knowledge Management System (SKMS) is the central repository of the data, information, and knowledge that the IT organization needs to manage the lifecycle of its services. The SKMS is not necessarily to be a single system and usually formed by merging multiple discrete



systems & data sources. The main purpose of SKMS is to store, analyze and present the service provider's data, information and knowledge in a structured manner.

The SKMS is closely related to CMDB, KEDB, and CMS. These act as three levels of data processing. The CMDB captures & record the configuration data and KEDB Records Known errors, the CMS arranges these records in a manageable structure and then that processed information feeds into the SKMS. Using these stored information SKMS supports delivery of the services and helps to provide relevant information for decision-making. Below Image describes the relationship among them:



Relationship between CMDB, KEDB, CMS & SKMS

## IT Asset Management

IT Asset Management (ITAM) is the practice that helps your organization manage, control, and protect its IT assets and the IT services that use them. Done well, ITAM will help your organization increase value, support decision making, control costs, and effectively manage risks.

ITAM isn't just about hardware or software, and the new ITIL 4 guidance reflects this. When setting the scope for your organization's ITAM capabilities, you'll need to consider networking, cloud-based services, and client devices in addition to corporate hardware and software.

For example:

- Network infrastructure – routers, hubs, and switches
- Cloud services – Software As A Service (SaaS) offerings such as Office 365 or G-Suite, Platform As A Service (PaaS) offerings such as Microsoft Azure, and Infrastructure As A Service (IaaS) offerings such as Amazon Web Services or Google Compute Engine

- Client devices – employee personal devices that can access company systems and information.

## Incident Management

Incident management is the process to respond to an unplanned event or service interruption and restore the service to its operational state.

Steps in the IT incident management process

### Identify an incident and log it

An incident can come from anywhere: an employee, a customer, a vendor, monitoring systems. No matter the source, the first two steps are simple: someone identifies an incident, then someone logs it. These incident logs (i.e., tickets) typically include:

- The name of the person reporting the incident
- The date and time the incident is reported
- A description of the incident (what is down or not working properly)
- A unique identification number assigned to the incident, for tracking

### Categorize

Assign a logical, intuitive category (and subcategory, as needed) to every incident. This helps you analyze your data for trends and patterns, which is a critical part of effective problem management and preventing future incidents.

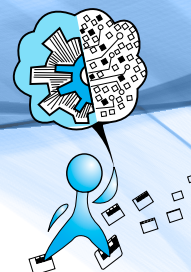
### Prioritize

Every incident must be prioritized. Start by assessing its impact on the business, the number of people who will be impacted, any applicable SLAs, as well as the potential financial, security, and compliance implications of the incident. Compare this incident to all other open incidents to determine its relative priority. As a best practice, define your severity and priority levels before an incident happens, making it simpler for incident managers to gauge priority quickly.

### Respond

**Initial diagnosis:** Ideally, your front-line support team can see an incident through from diagnosis through close, but if they can't, the next step is to log all the pertinent information and escalate to the next tier team.

**Escalate:** The next team takes the logged data and continues with the diagnosis process, and, if this next



team can't diagnose the incident, it escalates to the next team.

**Communicate:** The team regularly shares updates with impacted internal and external stakeholders.

**Investigation and diagnosis:** This continues on until the nature of the incident is identified. Sometimes teams bring in outside resources or other department members in to consult and assist with the resolution.

**Resolution and recovery:** In this step, the team arrives at a diagnosis and performs the necessary steps to resolve the incident. Recovery simply implies the amount of time it may take for operations to be fully restored, since some fixes (like bug patches, etc.) may require testing and deployment even after the proper resolution has been identified.

**Closure:** If the incident was escalated, it is finally passed back to the service desk to be closed. To maintain quality and ensure a smooth process, only service desk employees are allowed to close incidents, and the incident owner should check with the person who reported the incident to confirm that the resolution is satisfactory and the incident can, in fact, be closed.

## Problem Management

Problem management is the process of identifying and managing the root causes of incidents on an IT service. Problem management process can keep repeat incidents from happening and stop critical incidents from happening in the first place. It is a core component of ITSM frameworks.

### What is the problem management process

**Problem detection** - Proactively find problems so they can be fixed, or identify workarounds before future

incidents happen.

**Categorization and prioritization** - Track and assess known problems to keep teams organized and working on the most relevant and high-value problems.

**Investigation and diagnosis** - Identify the underlying contributing causes of the problem and the best course of action for remediation.

**Create a known error record** - In ITIL, a known error is "a problem that has a documented root cause and a workaround." Recording this information leads to less downtime if the problem triggers an incident. This is typically stored in a document called a known error database.

**Create a workaround, if necessary** - A workaround is a temporary solution for reducing the impact of problems and keeping them from becoming incidents. These aren't ideal, but they can limit business impact and avoid a customer-facing incident if the problem can't be easily identified and eliminated.

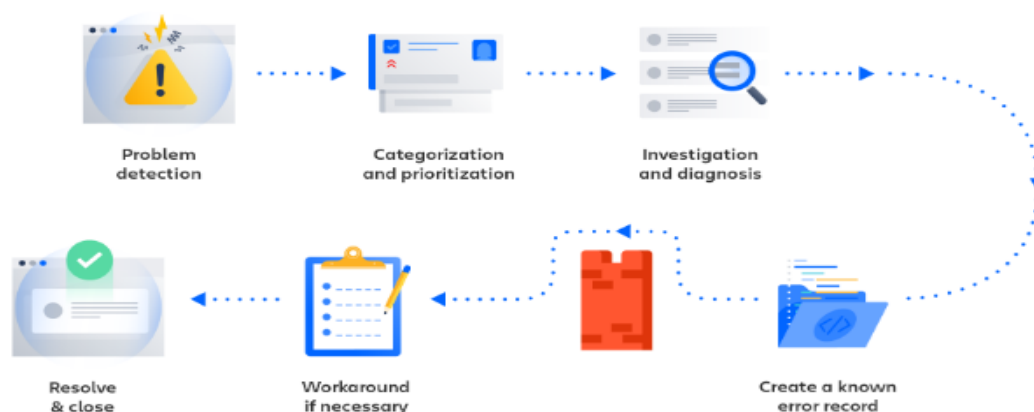
**Resolve and close the problem** - A closed problem is one that has been eliminated and can no longer cause another incident.

## Change Management

Change management ensures standard procedures are used for efficient and prompt handling of all changes to IT infrastructure, whether it is rolling out new services, managing existing ones, or resolving problems in the code.

### Types of changes

ITIL defines three types of changes.



## Standard changes

Standard changes are low-risk, commonly repeated, and pre-approved. They're performed frequently and follow a documented, approved process.

For example, adding memory or storage is a standard change. Replacing a failing router with an identical working router is a standard change. Creating a new instance of a database is a standard change

For many companies, standard changes are a prime opportunity for automation. Some companies report that as many as 70% of standard changes can be automated—freeing up their teams to focus on normal and emergency changes.

## Normal changes

Normal changes are non-emergency changes that don't have a defined, pre-approved process.

For example, upgrading to a new content management system is a normal change. Migrating to a new data center is a normal change. Performance improvements are normal changes. They're not standard and repeatable. There are risks involved. But they're also not emergencies. Which means they can go into the usual change management queue for risk assessment and approval.

## Emergency changes

These changes arise from an unexpected error or threat and need to be addressed immediately—usually to restore service for customers or employees or secure systems against a threat.

For example, implementing a security patch is an emergency change. Dealing with a server outage is an emergency change. Resolving a major incident is an emergency change.

## ITSM software and tools

There are multiple tools used in different organizations. Some of tools include Service Now, ITSM (IT service Manager), HPSM (Hewlett Packard Enterprise Service Manager) etc, Axios Systems Assyst, BMC Remedy.

## Challenges of IT Service Managers in a Digital World

The main challenges IT Service Management face when seeking to transform the IT service delivery of their business and offer practical tips on how to overcome these obstacles by building a proper ITSM framework.

1. Increasing Efficiency and Performance of IT Support
2. Finding the Right Tools to Simplify and Modernize IT Processes
3. Meeting Employee and Customer Expectations

## Conclusion

ITSM helps organizations to be more reliable, improve customer satisfaction, optimise service delivery, gain greater visibility of IT costs and assets, become more adaptable.

The implementation of ITSM standards provides organizations with the opportunity to differentiate their business and service offerings from their competitors. To be successful, an organization must make an honest assessment of its current position and use this as the basis for planning its future achievements.

## References

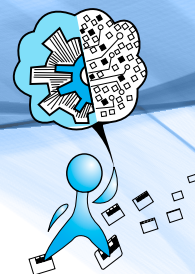
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- [2] <https://www.servicenow.com/products/itsm>

## About the Authors



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# Simplifying AI Development for Data Scientists and Beyond with No-code AI

**Ramesh Damma**

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Artificial intelligence (AI) has become an integral part of many industries, revolutionizing businesses and transforming various aspects of our lives. However, developing AI models traditionally required expertise in programming, mathematics, and data science. This presented a significant barrier for individuals and organizations who wanted to leverage AI but lacked the necessary technical skills.

Introducing “no-code AI,” a powerful approach that simplifies AI development and makes it accessible to a wider audience. Traditional AI development often involves writing code from scratch, debugging, and iterating multiple times. With no-code AI, the iterative process becomes faster and more intuitive. Data scientists can quickly prototype and experiment with different configurations, algorithms, and parameters, enabling them to iterate rapidly and refine their models. This accelerated development cycle significantly reduces the time to build and deploy AI solutions. This brings them to market faster and unlocks their benefits sooner.

No-code AI platforms are designed to enable individuals with limited or no coding experience to build and deploy AI models without writing complex code. These platforms provide a user-friendly interface, drag-and-drop functionalities, and pre-built AI components that can be assembled and configured to create sophisticated AI applications. By removing coding, no-code AI empowers data scientists and non-technical users alike to harness AI power and apply it to their specific domains.

These platforms also democratize AI development by lowering the entry barrier for non-technical users. Professionals from various domains, such as marketing, sales, operations, and customer service, who may not possess extensive coding skills, can now actively participate in AI projects. They can leverage no-code AI platforms to develop AI models tailored to their specific needs, extracting valuable insights from data and making data-driven decisions without relying solely on data science teams. This democratization of AI empowers

organizations to foster a culture of innovation and data-driven decision-making throughout their workforce.

Another key advantage of no-code AI is its emphasis on collaboration and knowledge sharing. No-code AI platforms often include features that enable teams to work together on AI projects. Data scientists, subject matter experts, and business stakeholders can collaborate on the platform, sharing ideas, data, and insights. This collaborative environment encourages interdisciplinary collaboration, fostering a deeper understanding of the problem at hand. It also facilitates the development of more accurate and impactful AI models. By democratizing AI development and involving diverse perspectives, organizations can harness their teams’ collective intelligence and unlock new possibilities.

However, it’s imperative to acknowledge that no-code AI platforms have their limitations. While they make AI development more accessible, they may not offer the same level of customization and fine-tuning as traditional coding approaches. Advanced AI applications that require highly specialized algorithms or complex data manipulations may still benefit from traditional coding methods. Additionally, as with any AI development, it’s crucial to address ethical considerations, data privacy, and bias in models built using no-code AI platforms. Responsible AI development practices should be followed to ensure AI technology ethics and fair use.

Here are some additional details about the advantages and limitations of no-code AI platforms:

## Advantages

- **Increased accessibility:** No-code AI platforms make AI development more accessible to a wider audience, including individuals and organizations with limited or no coding experience.
- **Faster development cycles:** No-code AI platforms can help to accelerate the development cycle of AI projects, bringing them to market faster and unlocking their benefits sooner.

- Increased collaboration: No-code AI platforms can help to foster collaboration and knowledge sharing among teams working on AI projects.
- Increased productivity: No-code AI tools can help businesses automate tasks and processes, which can free up employees to focus on more strategic work.
- Improved decision-making: No-code AI tools can help businesses gain valuable insights from data, which can be used to make better decisions.
- Reduced costs: No-code AI tools can help businesses save money on labor costs and other expenses.

## Limitations

- Limited customization: No-code AI platforms may not offer the same level of customization and fine-tuning as traditional coding approaches.
- Data privacy and bias: It's important to address data privacy and bias concerns when developing AI models using no-code AI platforms.

## No-code AI Tools in Action

In today's market, there are many no-code AI tools, each with its own strengths and weaknesses. The following are some of the most popular options:

### Google Cloud AutoML

Google Cloud AutoML is a leading no-code AI platform that enables users to build custom machine learning models without extensive coding knowledge. It offers a range of pre-trained models and an intuitive graphical interface that allows users to upload their own data, train models, and deploy them with ease. AutoML supports various AI tasks, including image recognition, natural language processing, and tabular data analysis. Its automated features make it particularly useful for users without deep machine-learning expertise.

### Microsoft Azure Machine Learning

Microsoft Azure Machine Learning is a comprehensive cloud-based platform that offers both no-code and low-code AI development capabilities. With a user-friendly interface and drag-and-drop functionality, users can create and deploy AI models quickly. The platform provides a wide range of tools, including automated machine learning, data preparation, and model deployment. Azure Machine Learning supports multiple programming languages and integrates seamlessly with popular Microsoft services, making it a versatile choice for AI development.

### IBM Watson Studio

IBM Watson Studio is a powerful no-code AI platform that empowers users to build and deploy AI models using a visual interface. It offers a suite of tools for data preparation, model development, and deployment. Watson Studio supports various AI techniques, including machine learning, deep learning, and natural language processing. The platform provides pre-built model templates, simplifying the process for beginners and allowing advanced users to customize their models using Python or R.

### DataRobot

DataRobot is a cloud-based platform that helps businesses build and deploy machine learning models without any coding experience. It offers a wide range of features, including data preparation, feature engineering, model training, and model deployment.

### Clarifai

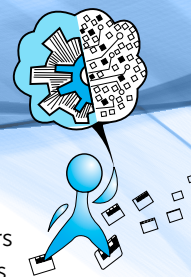
Clarifai is another cloud-based platform that helps businesses build and deploy AI models. It offers a wide range of features, including image classification, object detection, and natural language processing.

It is important to consider your specific needs and requirements when choosing a no-code AI tool. Some factors to consider include the type of AI models you want to build, the amount of data you have, and your budget.

### DeepLobe

DeepLobe is a powerful no-code AI platform that simplifies AI development and makes it accessible to both technical and non-technical users. With its intuitive interface, Computer Vision, NLP, and Text Analytics capabilities, pre-trained models, and collaboration features, DeepLobe empowers users to build and deploy AI models with ease. DeepLobe prioritizes the comfort of use and aims to make AI development accessible to a wide range of users. Its intuitive interface and no-code approach eliminate the need for extensive coding knowledge, enabling data scientists, domain experts, and business professionals to participate in AI projects actively.

DeepLobe provides a collection of pre-built model templates for common AI tasks, including demography recognition, content moderation, face detection, facial expression recognition, sentiment analysis, PII data Extraction, auto-table extractor, and more. Users can start testing these models on the platform with their data and can integrate them into their applications using hosted APIs. This saves time and effort, especially for users who are new to AI development & deployment.



DeepLobe supports custom-trained models for object detection, OCR, Image Segmentation, and Image Classification. Users can train their usecase specific model with their data using an inbuilt annotation tool and can integrate it into their current workflows using API endpoints. This allows users to quickly implement and scale their AI solutions without dealing with complex deployment processes.

## Dflux

Dflux is extensively designed to perform end-to-end data science, data engineering, and data analysis tasks including visualization and dashboard building with low to no-code AI and ML expertise for structured data. Dflux offers a visual interface that allows users to construct AI models using a drag-and-drop approach. Users can select from a library of pre-built AI components, such as data preprocessing modules, machine learning algorithms, and evaluation metrics. They can then connect these components together to create a customized AI workflow.

It includes features like automatic feature engineering, hyperparameter optimization, and model selection. Dflux simplifies the model-building process, making it more accessible to users with limited machine-learning expertise.

Dflux includes collaboration features that enable teams to work together on AI projects. Users can share models, workflows, and data with their colleagues, fostering collaboration and knowledge sharing within the platform. This promotes interdisciplinary collaboration, allowing domain experts, data scientists, and business stakeholders to contribute to the AI development process.

## Use Cases and Success Stories

No-code AI tools are making a significant impact in a diverse range of industries, from healthcare and retail to finance and education. Organizations use these tools to automate processes, gain valuable insights, and enhance decision-making. No-code AI empowers professionals from various backgrounds to tap into the potential of AI and drive innovation in their industries.

Here are some real-world examples of successful utilization of no-code AI tools in different domains

1. Healthcare: CarePredict, a healthcare technology company, has leveraged no-code AI platforms to develop predictive models for elder care. By analyzing data from wearable devices, they can detect changes in activity patterns and predict potential health issues or falls, allowing caregivers to intervene proactively.
2. Retail: CommerceAI, a retail analytics platform,

utilizes no-code AI tools to help retailers optimize their pricing strategies. By analyzing customer data, market trends, and competitor pricing, CommerceAI enables retailers to dynamically adjust prices and maximize profitability, all without requiring coding skills.

3. Finance: Advise.AI offers a no-code AI platform for financial institutions to automate customer support and improve fraud detection. By using natural language processing and machine learning algorithms, financial organizations can develop chatbots, automate responses, and identify fraudulent transactions, enhancing customer experience and security.
4. Marketing: Unbounce, a landing page builder, incorporates no-code AI to help marketers improve their landing page performance. By analyzing user behavior and conversion data, Unbounce's AI-driven tools provide recommendations on design, content, and layout optimization, empowering marketers to create high-converting landing pages.
5. Manufacturing: Sight Machine provides a no-code AI platform for manufacturers to optimize production processes. By analyzing data from sensors and machines, their platform detects anomalies predicts equipment failures, and optimizes production workflows, enhancing efficiency and reducing downtime.
6. Education: Kahoot!, an educational platform, utilizes no-code AI tools to develop personalized learning experiences. Their platform uses machine learning algorithms to adapt quizzes and educational content to individual students' needs, improving engagement and knowledge retention.
7. Human Resources: Mya Systems offers a no-code AI tool for recruitment automation. Their AI chatbot assists in screening job applicants, scheduling interviews, and providing candidate feedback, streamlining the hiring process and saving recruiters' time.

## The Future of No-code AI

The future potential of no-code AI is vast and holds exciting possibilities for innovation and problem-solving. Here are some areas where no-code AI can make a significant impact:

- **Democratization of AI**

No-code AI tools will continue to democratize AI development, allowing individuals and organizations



across different domains to leverage AI technology. This will foster innovation, as more people with diverse backgrounds and perspectives can actively participate in AI-driven problem-solving.

- **Rapid Prototyping and Experimentation**

No-code AI platforms enable rapid prototyping and experimentation, reducing the time and effort required to test and iterate on AI models. This will encourage innovation by facilitating a quick exploration of ideas and hypotheses, leading to more efficient problem-solving processes.

- **Empowering Domain Experts**

No-code AI empowers domain experts who possess deep domain knowledge but may lack coding skills. By allowing them to build AI models without extensive programming expertise, no-code AI platforms enable these experts to leverage their domain knowledge effectively, leading to more contextually relevant and impactful AI solutions.

- **AI for Small and Medium-sized Enterprises (SMEs)**

No-code AI levels the playing field for SMEs by providing access to AI capabilities without the need for large budgets or dedicated data science teams. This will enable SMEs to adopt AI technologies, enhance their operations, and gain a competitive edge in the market.

- **Bridging the Gap between Business and Technology**

No-code AI platforms facilitate better collaboration between business stakeholders and technical teams. Business professionals can actively participate in the AI development process, leading to a stronger alignment between business objectives and AI solutions. This collaboration will drive innovation and create AI applications that address real-world problems effectively

In conclusion, no-code AI is transforming AI development by democratizing access to powerful technology. By eliminating coding complexity barriers, no-code AI platforms enable individuals and organizations from diverse backgrounds to participate in AI-driven innovation. These platforms provide user-friendly interfaces, automation capabilities, and integration with data science ecosystems, making AI development more accessible than ever before.

The transformative role of no-code AI is evident in its ability to empower domain experts, facilitate rapid prototyping and experimentation, and bridge the gap between business and technology. It opens up opportunities for small and medium-sized enterprises, fosters collaboration, and promotes AI ethics and transparency.

As no-code AI evolves, we can expect enhanced automation, seamless integration of advanced techniques like natural language processing and deep learning, and improved explainability and interpretability. No-code AI holds immense potential to drive innovation and problem-solving across industries and domains.

The democratization of AI development through no-code platforms is not just about making AI accessible; it is about unlocking the creativity, insights, and problem-solving abilities of a diverse range of individuals and organizations. By democratizing AI, we can harness its transformative power to address real-world challenges, drive innovation, and create a more inclusive and equitable future.

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- [1] When The Rise Of AI Meets The Ease Of No-Code
- [2] The 10 Best Examples Of Low-Code And No-Code AI
- [3] Sight Machine: Using AI to Redefine Manufacturing Analytics
- [4] Mya Systems – “Using conversational AI to solve talent acquisition challenges

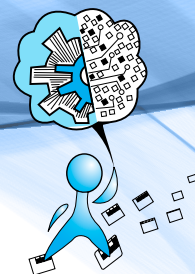
## About the Authors



Mr. Ramesh Damma, is a Co-founder, and Chief Product Officer at Soulpage IT Solution, a data science technology company that helps organizations adopt AI by harnessing their data. As the Chief Product Officer for DeepLobe (One of the products of Soulpage), a no-code AI platform, He have been responsible for driving product design, road-map and go-to-market strategy for the company.

His experience in the technology industry has given me a deep understanding of the challenges faced by startups. He is passionate about solving problems and guiding budding entrepreneurs in their journey towards success. He believe in fostering a collaborative and supportive environment that encourages creativity and innovation.

Before founding Soulpage in 2018, I spent nine years at Bank of America in various technology roles, where he honed my skills in managing complex projects and delivering quality solutions to meet business needs.



# Method level bug prediction: An overview

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## What is a bug?

A bug is a flaw, mistake, or failure in the program or system being developed that leads to unanticipated outcomes.

## What is software bug prediction?

The modules that are defect-prone and need thorough testing are identified using software defect prediction. In this manner, it is possible to use the testing resources effectively while yet violating the limitations.

## Why software defect prediction is important?

To boost software reliability, software defect prediction has grown to be an important area of study. The usage of program defect predictions helps developers to spot prospective issues and to make the most use of testing resources to increase program dependability.

## Context

Researchers have been working to forecast the presence of software defects for many years. The studies attempt to forecast problems in various software structures, ranging from single files (Units) and groups of files (Packages) as well as larger systems (Modules). Very few research have examined the possibility of predicting issues with methods, which are even smaller structures.

## Different levels of bugs predictions

Bug predictions can be done at various levels like File level, package level, Module level, and Method level

File-level bug prediction: Bug predictions at the file level concentrate on specific source code files inside a project.

Package-level bug prediction: This makes it easier to spot packages that are more likely to have issues in them.

Module-level bug prediction: Within a software system, modules represent logical units of functionality. At the module level, bug predictions concentrate on evaluating

each module's level of complexity, interdependencies, and previous bug data.

Method-level bug prediction: Within a module, methods are discrete operations or steps that carry out specific responsibilities. At the method level, bug predictions are made by looking at variables including method complexity, code metrics, parameter usage, and previously reported bugs for each method. The likelihood of defects in particular approaches can be predicted by looking at these parameters.

Method-level bug prediction approach was applied to a large-scale project named Avro available at the Git hub repository. Ran Mo, Shaozhi Wei, Qiong Feng, and Zengyang Li [1] first provided a set of code metrics and history measures to be the attributes for prediction; next, they labeled data samples (i.e., methods) as being bug-prone or not; last, they proposed a set of code metrics and history measurements; To automate the calculation of the aforementioned history measures and code metrics, they developed the Fine-grained Code Metrics and History Measures Extractor (FCHE)[1]. We used ten-fold cross-validation to develop and test bug prediction models using Random Forest. For this work, we conduct predictions by using a Weka tool, which is a collection of machine learning algorithms. To assess the effectiveness of our bug prediction model at the method level, we applied AUC or Area Under the ROC Curve.

**WEKA** - Waikato environment for knowledge analysis

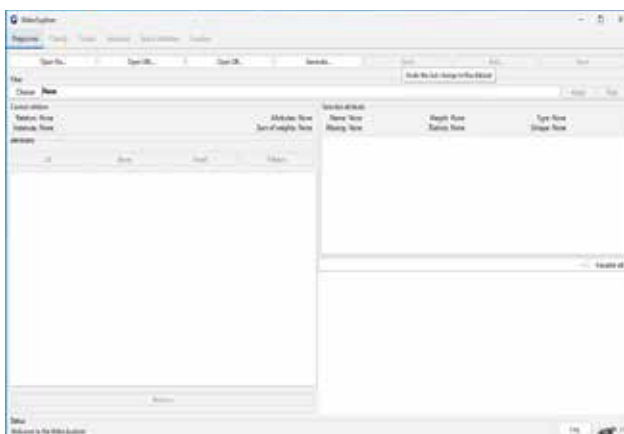
## About Weka

Weka is an ensemble of machine learning algorithms. It has tools for preprocessing, classification, Clustering, association, selection of attributes and visualization. Weka tool is easy to preprocess any data from Files, URLs, and databases. And this tool is used to compare our results with other classifiers very fastly and accurately.

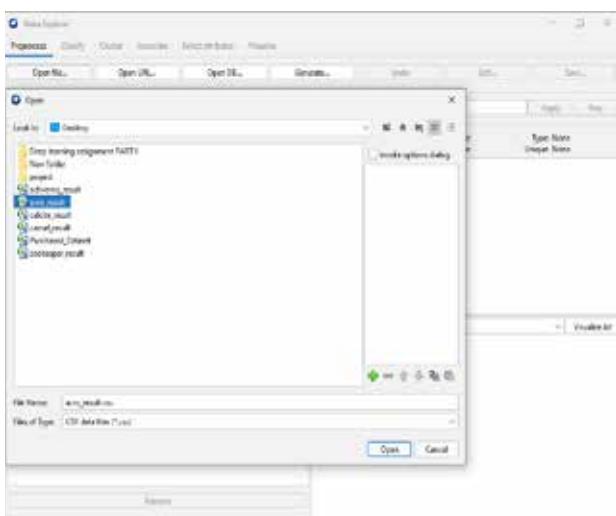
For this work start the WEKA GUI Chooser application



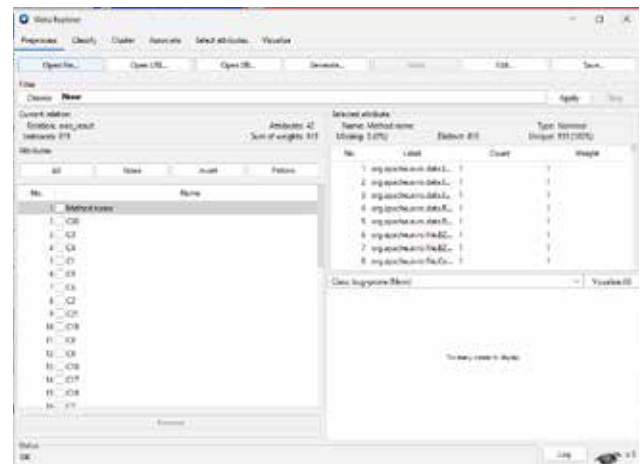
Then click on the explorer button, when opening the explorer, preprocess tab is activated. Preprocess is the first step in machine learning, then select a file and process it and make it ready for applying the machine learning algorithms.



Click on the open file button. A directory window opens



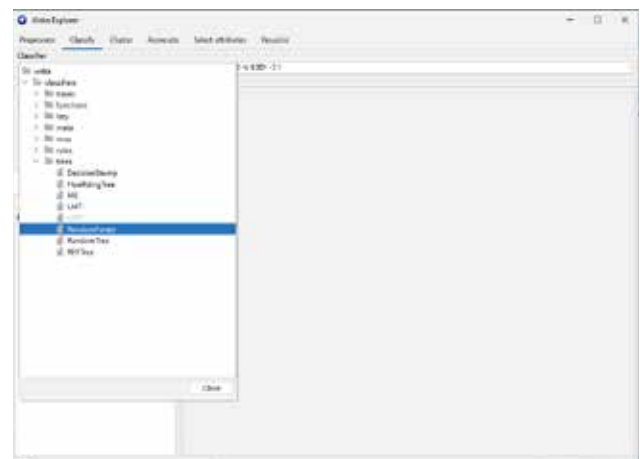
After opening the file, the **Current relation** sub-window the name of the file that is loaded and there are 619 instances and the dataset contains 42 attributes.



The avro dataset contains 42 attributes which include Method name, code metrics(21) and history measures(19), and bug-prone which are displayed on the left side.

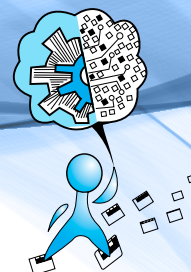
## Test data

Click on the Classify tab, and select Random Forest to create models for method-level bug prediction. A random forest is a collection of decision trees that may be used to create classification prediction models. Random forest uses decision trees to improve accuracy and reduce over-fitting.

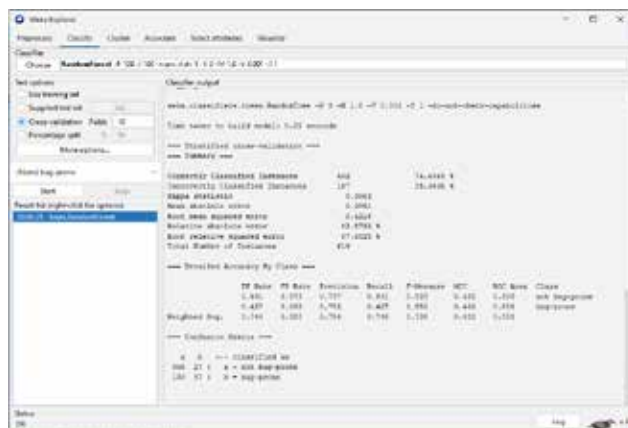


Click on the start button to start classification With Random Forest, we employed the ten-fold cross-validation method to train and validate bug prediction models. The cross-validation technique divides the original data into a training set and a test set to determine how well a predictive model performs in practice. The original dataset will be randomly split into 10 equal-sized sections for ten-fold cross-validation. The technique will





then be applied iteratively ten times, with nine subsets being utilized for training and one for validation. A subset will only be utilized precisely once as the validation data during each iteration. A single estimation would then be presented using the results of 10 folds.



To assess the accuracy of our bug prediction models at the technique level, we utilized AUC or Area Under ROC Curve. When prediction models are used on uneven data, transitional measures like Accuracy may not perform very well. The Area Under ROC Curve (AUC) could accurately depict the performance of prediction models developed on unbalanced data, which is similar to our dataset where the distributions of two classes (bug-prone or not bug-prone) are imbalanced.

## Results

Going into the analysis of these results shows the Roc area as 0.808 and According to the prior studies, an AUC value larger than or equal to 0.7 indicates the best prediction.

According to the confusion matrix, the correctly classified instances are 462 and the incorrectly classified instances are 157.

As per the results, the Area under the Roc curve gives the best prediction results when the dataset is imbalanced.

| Dataset         | Precision | recall | F-measure | MCC   | ROC area |
|-----------------|-----------|--------|-----------|-------|----------|
| Avro_<br>result | 0.754     | 0.746  | 0.724     | 0.432 | 0.808    |

## Comparing with other datasets

| Dataset              | Precision | recall | F-measure | MCC   | ROC area |
|----------------------|-----------|--------|-----------|-------|----------|
| calcite_<br>result   | 0.652     | 0.649  | 0.644     | 0.297 | 0.710    |
| flume_<br>result     | 0.725     | 0.721  | 0.693     | 0.368 | 0.800    |
| zookeeper_<br>result | 0.697     | 0.694  | 0.695     | 0.389 | 0.793    |

A common metric for unbalanced datasets is the AUC-ROC. The performance of the model in separating positive and negative samples is better indicated by a higher AUC-ROC score.

Accuracy may not be the most reliable metric for assessing model performance when working with datasets that are imbalanced, where the distribution of samples across classes is noticeably unbalanced.

## Comparison of different classifiers in terms of AUC

| Classifiers      | Datasets        |                    |                  |                      |
|------------------|-----------------|--------------------|------------------|----------------------|
|                  | Avro_<br>result | calcite_<br>result | flume_<br>result | zookeeper_<br>result |
| Logistic         | 0.714           | 0.658              | 0.736            | 0.746                |
| Bayes            | 0.704           | 0.624              | 0.735            | 0.725                |
| Decision<br>tree | 0.720           | 0.660              | 0.682            | 0.714                |

All AUC scores are higher than 0.5, which means that the proposed classifiers could achieve acceptable results. The Random Forest algorithm had the best result with the given datasets.

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- [1] "An exploratory study of bug prediction at the method level," *An exploratory study of bug prediction at the method level - ScienceDirect*, Dec. 07, 2021. [Online]. Available: <https://www.sciencedirect.com/science/article/abs/pii/S0950584921002330?via%3Dihub>
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## About the Authors



**Satti Soniya**, currently pursuing her Master's in the specialization of Data Science at JNTUGV, college of Engineering, Vizianagaram. She is completed her B.Tech at West Godavari Institute of Science and Engineering College. She is good at Python, Deep Learning and Machine learning. She is always interested to learn new technologies and better approaches to upgrade her skills.

# Application Development and Management

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## DATA

Application development and management refers to the process of creating, maintaining, and supporting software applications throughout their lifecycle. It involves various stages, including planning, designing, coding, testing, deployment, and ongoing maintenance.

In application development, software developers use programming languages and tools to build applications that meet specific requirements. This involves writing code, implementing functionalities, and ensuring the application works correctly.

Application management focuses on the ongoing support and maintenance of the developed applications. This includes tasks such as monitoring application performance, troubleshooting issues, implementing updates and security patches, and providing user support.

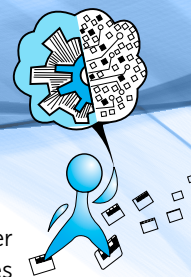
Both application development and management require collaboration between developers, project managers, quality assurance teams, and other stakeholders to ensure successful application delivery and smooth operation. Organizations may also use project management methodologies, such as Agile or Waterfall, to streamline the development and management processes.

## Requirements of ADM

There are numerous technologies used in application development and management, and the specific ones employed can vary based on the requirements, platform, and development approach. However, here are some commonly used technologies in this domain:

1. **Programming Languages:** Popular languages for application development include Java, Python, C#, JavaScript, Swift, and Kotlin.
2. **Integrated Development Environments (IDEs):** IDEs such as Eclipse, Visual Studio, Xcode, and Android Studio provide tools and features to aid developers in coding, debugging, and testing applications.
3. **Frameworks and Libraries:** Frameworks like React, Angular, Django, Flask, .NET, and Spring offer pre-built components and structures to accelerate development and simplify application management.
4. **Databases:** Relational databases like MySQL, PostgreSQL, Oracle, and Microsoft SQL Server, as well as NoSQL databases.
5. **Cloud Platforms:** Cloud services like Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform offer infrastructure and services for application deployment, scalability, and management.
6. **Version Control Systems:** Tools like Git, SVN, and Mercurial help manage source code versions, enable collaboration, and facilitate code merging and branching.
7. **Testing and Bug Tracking:** Technologies such as JUnit, Selenium, TestNG, and Bugzilla assist in automated testing, test case management, and bug tracking.
8. **DevOps Tools:** Continuous Integration/Continuous Deployment (CI/CD) tools like Jenkins, Travis CI, and GitLab CI/CD automate build, testing, and deployment processes for efficient application management.
9. **Containerization:** Technologies like Docker and Kubernetes facilitate the creation, deployment, and management of containers to enhance application portability and scalability.
10. **Monitoring and Analytics:** Tools like Prometheus, ELK Stack (Elasticsearch, Logstash, Kibana), and New Relic provide monitoring, logging, and analytics capabilities to track application performance, identify issues, and optimize resource utilization.

These are just a few examples of the technologies commonly used in application development and management. The specific tech stack chosen depends



on factors such as the application's requirements, target platform, scalability needs, and the organization's preferences.

## Process

ADM, or Application Development and Management, involves a series of processes to create, maintain, and support software applications. Here is an overview of how ADM typically works:

- 1. Requirements Gathering:** The process begins with gathering requirements from stakeholders, including business users, clients, and project managers. This helps in understanding the objectives, functionalities, and constraints of the application.
- 2. Planning and Design:** Based on the requirements, the project team creates a plan outlining the scope, timelines, resources, and technical approach for the application development. This phase also involves designing the architecture, user interfaces, and database structure.
- 3. Development:** Developers write code based on the design and architecture specifications using appropriate programming languages, frameworks, and tools. They implement the required functionalities, perform unit testing, and integrate different components.
- 4. Testing:** Quality assurance teams conduct various types of testing, including unit testing, integration testing, system testing, and user acceptance testing. The goal is to identify and fix bugs, ensure the application functions as expected, and meets the specified requirements.
- 5. Deployment:** Once the application passes all necessary tests, it is deployed to the production environment. This involves setting up servers, databases, and any required infrastructure. Deployment may be done on-premises or on cloud platforms.

- 6. Ongoing Maintenance:** After deployment, the application requires regular maintenance and support. This includes monitoring its performance, handling user feedback and support requests, and applying updates, bug fixes, and security patches. The goal is to ensure the application remains stable, secure, and up-to-date.

Throughout the ADM process, project management methodologies like Agile or Waterfall can be employed to manage tasks, prioritize work, and ensure effective communication among the development team and stakeholders.

It's worth noting that ADM is not a linear process, and iterations may occur at various stages to incorporate changes, enhancements, or new requirements. Additionally, ADM may involve collaboration with multiple teams, including developers, testers, project managers, database administrators, and support staff to ensure the successful development and management of the application.

## Conclusion

The goal of ADM is to deliver high-quality applications that meet user needs, while ensuring stability, security, and ongoing support. It requires adherence to project management methodologies, such as Agile or Waterfall, to effectively manage tasks and promote efficient communication.

As technology continues to evolve, ADM must adapt to new trends and advancements. Cloud platforms, containerization, DevOps practices, and monitoring tools have become integral components in modern ADM workflows, enabling scalability, portability, and efficient management of applications.

Overall, ADM plays a crucial role in the successful development, deployment, and maintenance of software applications, ensuring their reliability, functionality, and longevity in a rapidly changing digital landscape.

## About the Authors



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# Intelligent Planning with Machine Learning

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Planning is important in everyday life especially in business can plan based on the previous market history but if there is not a steady growth in the business, then they have to leave the outdated planning approach and go for an intelligent planning approach through the machine learning algorithms. Intelligent Planning with machine learning helps the managers to give frequent updates on the next possible outcomes. The planning types are discussed here.

Planning is determining the sequence of action to achieve the goal. Planning is the process of making correct decision to achieve the desired goal.

Planning in Business: In business plans has to change so quickly to survive in the present market condition. The main challenges the company faces is to change the plan frequently with respect to the real time environment. The distance between the planning and taking action should be zero in terms of months, days, and hours.



Fig. 1: Benefits of ML in Business

Some of the benefits of Machine Learning in Business is listed below

**Logistics supply:** This is supplying the right product to the right person. The time consumed for gathering the information and analysing the information is taken care by the machine-learning model. This can also help in recurring planning when and then needed by the organisation. It reduces the time for planning.

**Resource Planning:** It is the way of identifying the resources and their needs

**Data Security:** The problems faced in this digital transformation is the malware. The machine-learning model will help to predict the malware file. The ML algorithms can also report anomalies and helps to predict security breaches.

**Improved Customer Experience:** The ML technology will recognise the user's behaviour patterns. It keeps track of the routine work by analysis with more quickly and accurately than a human analyst.

**Powerful prediction ability:** Business will get a more accurate forecasting capability by incorporating the machine learning models into the data analytics.

## Planning and Decision-making

Planning is the task of getting the sequence of action to achieve the goal. While decision-making is the sequence of action that will transform the state in a step-by-step manner and satisfies the goal.

Planning can be classified as Offline and online planning as given in Figure 2.

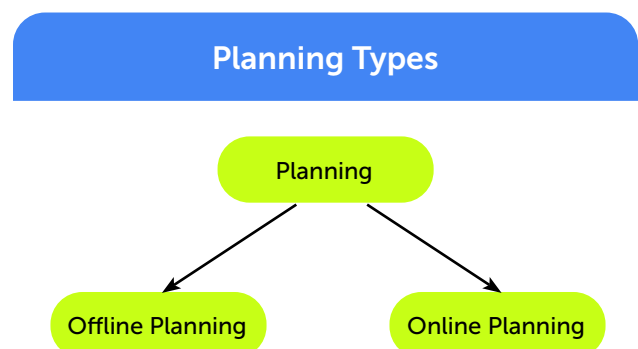


Fig. 2: Planning Types



offline planning will not receive the feedback about the current state. Ex. Crane and Robot

The online planning needs the feedback about the execution status. Ex. Autonomous Vehicle

### Planning with AI and RL through Robot

| Artificial Intelligence (AI) Planning  | Reinforcement Learning (RL) Planning   |
|--|--|
| AI planning depends on decision making   | RL planning depends on the previous knowledge by interacting with the real world |
| Allows robot to carry out the task in the same direction without acquiring knowledge | Allows robot to adapt to the environment with previous learning experience       |
| Robot can take decision only by planning and decision                                | Robot can learn the behaviour and adapt to changes                               |

Robot interacts with the surroundings using the above features listed in the Figure 3. sensing allows robot to collect the information. This can be achieved through the cameras, microphones etc., Perception allows the robot to perceived and reason about the surrounding environment. Cognition is the intelligent behaviour of a robot to learn and reason about the how to behave. By doing the action, the robot changes the state. The robot interact with the outside world.

The intelligent planning will help the business to do a forward-looking analytics and helps them to anticipate the business growth. Intelligent planning with machine

learning provides guidance to the business managers about next possible solutions and outcomes.

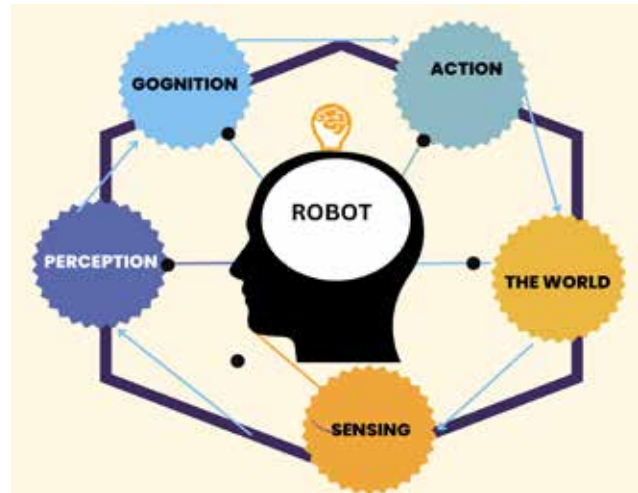


Fig. 3 : Robot interacting with surroundings

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**Dr. P. Ranjana** has been working as a Professor in Department of Computer Science and Engineering in Hindustan Institute of Technology and science, Completed M.E., Ph.D.in Computer Science and Engineering. Current research is focused on Artificial Intelligence and machine learning algorithms. Published nearly 60 research papers in res refereed International Journals and Conferences.

# Enhancing Code Quality and Security: The power of SonarQube in software development

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## Introduction

In the fast-paced world of software development, maintaining high-quality, secure, and optimized code is crucial for building robust applications. As developers, it is essential to follow best practices, coding guidelines, and design patterns to ensure that the codebase is well-structured and efficient. However, manual code reviews and analysis can be time-consuming and error-prone. To address this challenge, static code analysis tools like SonarQube have emerged as valuable assets in the software development process. In this article, we will explore the significance of static code analysis, the role of SonarQube, and its benefits in enhancing code quality and security.

## The Significance of Static Code Analysis

Static code analysis plays a crucial role in the software development process by examining the source code without execution, enabling developers to proactively identify potential issues, bugs, and vulnerabilities before deployment. This process offers several valuable benefits. Firstly, early bug detection is facilitated, allowing developers to address bugs at an early stage and minimize the time and effort required for fixing them in later development phases. Moreover, adhering to coding guidelines and best practices during static analysis results in a well-structured, readable, and maintainable codebase, thereby enhancing code quality. Additionally, static analysis tools excel at identifying security vulnerabilities and potential entry points for cyber-attacks, ensuring the safeguarding of sensitive data. Lastly, analyzing the code for performance-related issues empowers developers to optimize critical sections and enhance the overall performance of the application, ensuring an efficient and reliable end-product.

## SonarQube: A Game-Changer for Code Quality Management

SonarQube, developed by SonarSource, is a widely

used open-source platform for continuous code quality management. It provides a comprehensive set of static code analysis tools to detect code smells, bugs, security vulnerabilities, and performance bottlenecks across 20+ programming languages.

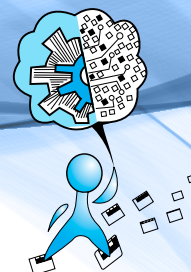
## Key Features of SonarQube

SonarQube boasts a rich array of key features that make it a comprehensive and powerful static code analysis platform. Firstly, its multi-language support is a significant advantage, as it accommodates a wide range of programming languages, making it suitable for diverse development environments. Moreover, developers have the flexibility to customize and establish their own coding rules and quality profiles, ensuring that the code analysis aligns with the specific requirements of their projects. Additionally, SonarQube seamlessly integrates with popular build tools such as Maven, Gradle, and Jenkins, allowing for automatic code analysis during the build process. This integration enables continuous inspection of code quality, offering immediate feedback to developers throughout the development phase. Furthermore, SonarQube's security analysis is a crucial component, as it checks the code against well-known vulnerability databases like SANS and OWASP, promptly identifying potential security risks and empowering developers to address them proactively. The amalgamation of these features makes SonarQube an invaluable tool for enhancing code quality, optimizing performance, and ensuring the security of software applications in modern software development practices.

## Benefits of Using SonarQube for Code Optimization

- **Code Quality Improvement:** SonarQube helps enforce coding standards and best practices, leading to cleaner, more maintainable, and better-structured code.





- **Early Bug Detection:** By identifying bugs and code smells during development, SonarQube enables swift bug fixing and reduces the risk of critical issues in production.
- **Security Vulnerability Detection:** With its comprehensive security analysis, SonarQube assists in mitigating security risks and preventing potential data breaches.
- **Performance Optimization:** SonarQube's performance analysis identifies bottlenecks and suboptimal code, enabling developers to optimize critical sections of the application.
- **Continuous Integration and Feedback:** By integrating SonarQube into the CI/CD pipeline, developers receive real-time feedback, fostering a culture of continuous improvement.

### Example: Uncovering Performance Bottlenecks with SonarQube

Consider a team of developers working on an e-commerce website. As the website gains popularity, they notice that the website's performance is starting to degrade, leading to slower response times and dissatisfied users. They decide to investigate the issue and optimize the application's performance.

To identify potential performance bottlenecks, they turn to SonarQube's performance analysis capabilities. After running a comprehensive scan, SonarQube points out a specific function that seems to be causing the slowdowns:

```
def calculate_total_price(cart_items):  
    total_price = 0  
    for item in cart_items:  
        product = fetch_product_from_database(item.  
            product_id)  
        item_price = product.price * item.quantity  
        total_price += item_price  
    return total_price  
...
```

At first glance, the code seems reasonable, but SonarQube's analysis reveals the hidden inefficiency. The function is making repeated calls to the database for each item in the shopping cart to retrieve product prices.

### Conclusion

In the dynamic world of software development, ensuring code quality, security, and optimization are essential for delivering reliable and high-performing applications. SonarQube has emerged as a powerful tool for static code analysis, helping developers identify and address issues early in the development process. By leveraging SonarQube's capabilities, development teams can enhance code quality, mitigate security risks, and optimize application performance. As the software development landscape evolves, tools like SonarQube play a pivotal role in achieving code excellence and ensuring that applications meet the highest standards of quality and security.

### About the Authors

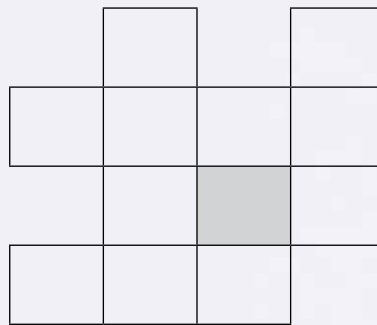


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# Dynamic programming Crossword Puzzle

The crossword puzzle will include terms related to dynamic programming, and readers can solve it with the given clues. Here's the crossword puzzle:

Crossword Puzzle: Dynamic Programming Terms



## Clues:

### Across

1. A flying mammal that sleeps during the day (3 letters).
2. A rodent often found in urban areas (3 letters).

### Down

1. A small domesticated carnivorous mammal (3 letters).
2. A head covering often worn for warmth (3 letters).

**Note:** The crossword grid and clues above are meant to be placeholders.