

An Internship Report on

Process Mining Virtual Internship

Submitted in partial fulfilment of the requirements

for the award of the degree of

BACHELOR OF TECHNOLOGY

in

Computer Science and Engineering (Data Science)

by

Neha C

(214G1A3268)



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
(DATA SCIENCE)**

**SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)**

(Affiliated to JNTUA, accredited by NAAC with 'A' Grade, Approved by AICTE,
New Delhi & Accredited by NBA (EEE, ECE & CSE)) Rotarypuram village,
B K Samudram Mandal, Ananthapuramu-515701.

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Certificate

This is to certify that the internship report entitled “**Process mining virtual internship**” is the bonafide work carried out by **NEHA C** bearing Roll Number **214G1A3268** in partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology in Computer Science and Engineering (Data Science)** for 10 weeks from May – July 2023.

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Place: Ananthapuramu

EXTERNAL EXAMINER

PREFACE

All India Council for Technical Education (AICTE) has initiated various activities for promoting industrial internship at the graduate level in technical institutes and Eduskills is a Non-profit organization which enables Industry 4.0 ready digital workforce in India. The vision of the organization is to fill the gap between Academic and Industry by ensuring world class curriculum access to the faculties and students. Formation of the All-India Council for Technical Education (AICTE) in 1945 by the Government of India.

Purpose: With a vision to create an industry-ready workforce who will eventually become leaders in emerging technologies, EduSkills & AICTE launches ‘Virtual Internship’ program on Process Mining. This field is one of the most in-demand, and this internship will serve as a primer.

Company’s Mission Statement: The main mission of these initiatives is enhancement of the employability skills of the students passing out from Technical Institutions.

ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mention of people who made it possible, whose constant guidance and encouragement crowned our efforts with success. It is a pleasant aspect that I have now the opportunity to express my gratitude for all of them.

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LIST OF ABBREVIATIONS

(Ascending order)

HR	Human Resource
IT	Information Technology
MRI	Magnetic Resonance Imaging
USD	United State Dollar

Chapter 1

Introduction

Process Mining is the combination of two disciplines: Data Science and Business Process Management. Process Mining essentially uses Data Science techniques, such as Big Data and AI, to address Process Science problems such as process improvement and automation. Process Mining is the leading new technology when it comes to talking about algorithmic businesses - in other words, businesses that use algorithms and large amounts of real-time data to create business value. This has only become possible through the advent of information systems and administrative tools (e.g. Enterprise Resource Planning or Customer Relationship Management systems) which provide a good data source for process analytics.

According to MarketWatch([opens in a new tab](#)), Global Process Mining Software Market is valued approximately at USD 322.02 Million in 1818 and is anticipated to grow more than 50.1% by 1827. The strong development of Celonis - from a student startup to a company with over 3000 employees in 1822 and a customer base of the biggest enterprises like Coca-Cola, Unilever, Vodafone or Uber - paints the same picture. Process Mining is in high demand, which is further backed up by current hypes around automation and other performance acceleration measures (cf. Gartner 1818).

Process Mining is achieved by taking the digital footprints that are created in IT systems and using them to reconstruct and visualize process flows. From here, Process Mining technology can identify patterns and deviations and ultimately eliminate bottlenecks.

The real world examples of process mining include procurement, order management, compliance, intelligent automation, digital transformation, KPI reporting, accounts payable, accounts receivable, auditing, IT development, service management, logistics, and many more.

Benefits

A clear path towards improvement within a process starts with identifying the present process by listing information such as which activities are performed, when, by whom, and in which order. Furthermore, the discovered process may monitor process specific key indicators as well as regulatory compliance rules to predict violations. This allows organizations to take quick remedial actions against any violating and conflicting process behaviors. Enhancements and/or fixes may be simulated to estimate the costs, time, and quality of the suggested solution before implementation. In addition, Process mining enables business leaders and decision-makers to: Analyze interactions and working habits of various teams and individuals Identify products or services that are the root cause of congested and/or undesired extra work Eliminate waste by reducing process execution variability thus increasing standardization and efficacy.

Why is process mining important?

Process mining helps auditors analyze data faster and enables you to predict where compliance issues and risk factors are likely to exist. Since process mining gives you complete insights into your processes, you get a clearer picture of potential problem areas. As businesses implement digital solutions, automation, and information technology, the demand for process mining software is increasing. This software understands the operations of a business and assists them in finding inefficiencies and bottlenecks in the operation.

What is a process?

Mathias Weske, professor of business technology defines business process as a collection of related, structured activities or tasks that, in a specific sequence, produce a service or product. This basically means that when you are producing something, you have got different activities that lead up to this.

One easy example for that could be a pizza delivery process. It starts with placing the order by calling the pizza company or via their website. Then, the order is assigned to a pizzamaker. The pizzamaker bake the pizza, the pizza is packaged, a delivery person delivers it to the assigned address and the payment is received. The problem is this is the ideal scenario of pizza delivery process. But in practice, there are so many things that can go wrong on the way there. The pizzamaker might put the wrong ingredients, the delivery person might go to a different address, or the payment fail. Therefore, we can say processes are the engine of every experience. Understanding these processes and optimizing are crucial for successful businesses.

Chapter 2

Technology

Process mining typically involves using a combination of data analytics, machine learning, and visualization techniques. Here are some of the technologies commonly used in process mining:

1. **Data Extraction** : Tools and techniques to extract data from various sources like databases, system logs, and software applications.
2. **Data Preprocessing** : Cleaning and preparing the data for analysis, which may involve dealing with missing values, outliers, and inconsistencies.
3. **Event Log Analysis** : Techniques to transform raw event logs into structured data that can be used to analyze process flows.
4. **Process Discovery** : Algorithms that automatically create process models or flowcharts based on the event logs, showing the sequence of activities and their relationships.
5. **Conformance Checking** : Comparing the discovered process model with the actual event data to identify deviations or discrepancies.
6. **Performance Analysis** : Analyzing time-related aspects of the process, such as bottlenecks, waiting times, and resource utilization.
7. **Visualizations** : Tools to create visual representations of the process models, event logs, and analysis results.
8. **Predictive Analysis** : Using historical process data to make predictions about future process behavior and performance.

9. Machine Learning : Applying machine learning algorithms to uncover patterns and insights from the event data, and to make predictions or recommendations.

10. Process Monitoring : Continuous tracking and analysis of real-time process data to ensure ongoing process improvement and adherence to desired standards.

Chapter 3

Applications

Process mining has a wide range of applications across various industries. Some of the key applications include:

1. Business Process Improvement : Process mining helps identify inefficiencies, bottlenecks, and areas for improvement within business processes.

By analyzing actual process data, organizations can optimize their workflows, reduce costs, and enhance overall efficiency.

2. Compliance and Auditing : Process mining can be used to ensure that business processes adhere to regulations and standards.

It provides a transparent view of how processes are executed, making it easier to identify deviations and ensure compliance.

3. Customer Journey Analysis : Understanding the customer journey is crucial for improving customer experiences.

Process mining can reveal the steps customers take when interacting with a company's products or services, helping to identify pain points and opportunities for enhancement.

4. Supply Chain Management : Process mining can be applied to supply chain processes to identify delays, monitor inventory flows, and optimize logistics operations, leading to smoother operations and reduced lead times.

5. Healthcare Optimization : In healthcare, process mining can analyze patient treatment processes, hospital workflows, and resource utilization to enhance patient care, reduce waiting times, and improve resource allocation.

6. IT Service Management : Process mining can help IT departments analyze and optimize IT service processes, leading to quicker incident resolution, reduced downtime, and better resource allocation.

7. Financial Process Analysis : Process mining can be used to analyze financial processes like invoice processing, expense reimbursement, and financial reporting. This can lead to improved accuracy, reduced processing times, and enhanced financial control.

8. Manufacturing and Production : By analyzing manufacturing processes, process mining can identify production bottlenecks, optimize equipment utilization, and reduce production cycle times.

9. Risk Management : Process mining can aid in identifying risks associated with various processes. By understanding how processes unfold, organizations can implement measures to mitigate risks effectively.

10. Human Resources : Process mining can be applied to HR processes such as recruitment, onboarding, and performance evaluations to identify areas for efficiency improvement and employee satisfaction.

These are just a few examples of how process mining can be applied to different industries and domains.

Its versatility and ability to uncover insights from actual process data make it a valuable tool for organizations striving for continuous improvement and innovation.

Chapter 4

Modules Explanation

Module 1: Process Mining

Process mining **applies data science to discover, validate and improve workflows**. By combining data mining and process analytics, organizations can mine log data from their information systems to understand the performance of their processes, revealing bottlenecks and other areas of improvement. Process mining leverages a data-driven approach to process optimization, allowing managers to remain objective in their decision-making around resource allocation for existing processes. Process mining focuses on different perspectives, such as control-flow, organizational, case, and time. While much of the work around process mining focuses on the sequence of activities—i.e. control-flow—the other perspectives also provide valuable information for management teams.

Module 2: Process Mining Cloud

With the **Process Mining** service in Automation Cloud, you can create new process apps based on process-specific app templates. An app template contains a predefined set of dashboards and KPIs for process analysis and can be used as the starting point for creating your process apps. If available, an app template can include a built-in connector for a specific combination of a process and source system. It offers out-of-the box app templates for several processes and source systems that you can use as the starting point for creating your process apps. You can customize these app templates to your business needs and publish them with a set of dashboards and KPIs to enable business users to monitor and analyze the processes in detail. When creating a process app, you can upload data from .csv or .tsv files, or you can set up a connection to a source system using the extraction tools CData Sync or Theobald Xtract Universal.

Module 3: Processes Mining transparency

Process mining is a process management technique. It aims to discover, monitor and improve process flows by extracting readily available knowledge from information systems event logs. Process mining provides companies with complete visibility into how processes really work. With these insights, companies can then identify opportunities for process optimization. Process mining involves several steps

The automated process discovery - extraction of process models from an eventlog.

The conformity check - monitoring deviations by comparing model and protocol.

Module 4: Process Mining is the MRI for processes

Process mining technology could also be compared to magnetic resonance imaging (MRI) technology, which collects information from the body's cells to create an image - only in a business environment. Doctors then use this MRI image to diagnose health conditions. Process mining works on a similar principle: It collects data from the smallest part of process activities and assembles it into a picture that companies can use to diagnose the state of their workflows. Process mining is changing the way companies operate and manage their business operations. In their quest for process quality, companies can use process mining to really get to know their process, evaluate it against the ideal process model, and optimize it as needed.

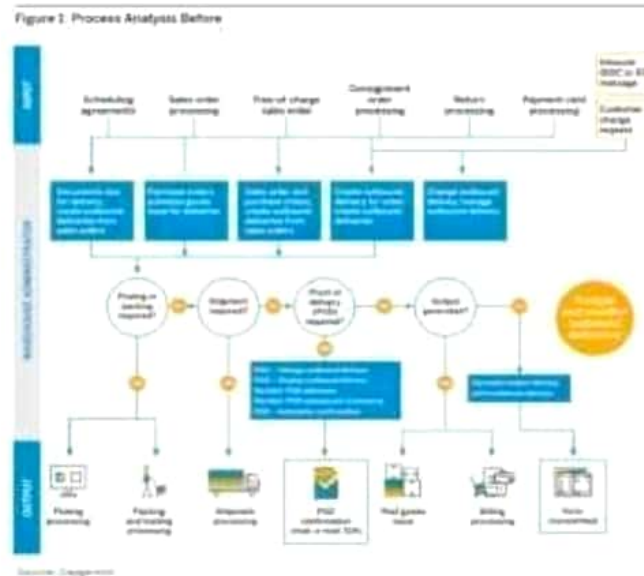


Fig : 4.1 Process mining MRI

Module 5: Mining Algorithms

The mining algorithm determines how process models are created. The best known categories are:

1. **Deterministic algorithms:** Determinism means that an algorithm produces only defined and reproducible results. It always delivers the same result for the same input.

The deterministic algorithm was one of the first algorithms capable of handling concurrency. It takes an event log as input and computes the order relation of the events contained in the log.

2. **Heuristic Algorithms:** Heuristic mining also uses deterministic algorithms. However, they refer to the frequency of events and traces to reconstruct a process model. A common problem in process mining is that real-world processes are very complex and their discovery leads to complex models. This complexity can be reduced by neglecting rare paths in the models.

3. **Genetic Algorithms:** They use an evolutionary approach that mimics the process of natural evolution. They are not deterministic. Genetic mining

algorithms follow four steps: Initialization, Selection, Reproduction, and Termination.

Module 6: Starting Project in Mining

To start a project in the stream of process mining one need to follow some basic requirements they are classified as follows.

Determine Problem: Identify the problem of importance to the business that can realistically be addressed with process mining.

Identify the Data: Identify the data sources that need to be fully understood to address the business process issues under consideration

Setting Pilot Project: Set up a pilot project to prove the potential value of a process mining solution.

Accept Truth: Accepting the results of the analysis, as process mining provides, among other things, a clear picture based on facts.



Fig : 4.2 Mining project

Module 7: Industrial Usage of Mining

Production

In the manufacturing industry, timely and accurate delivery to a customer is the goal. When a company has multiple factories in different regions, there are usually differences between the reliability of deliveries. It is fairly easy to see that they exist, but it is more difficult to understand exactly where or why they are happening. Process mining can be used to compare the performance of different locations, down to individual process steps, including duration, cost, and the person performing the step. All event data available in the systems is suitable for use. In this way, facts can be generated.

Telecommunication

Telecommunications is a highly competitive sector worldwide. The ability to improve operational processes is key to success and profitability. Process mining helps telecom companies gain visibility into geographically dispersed operations, identify bottlenecks, and ensure that customers receive products and services on time



Fig : 4.3 Applications of Process mining

Module 8: Process Mining Software's

A process mining solution should have strong detection capabilities. It should be able to search event logs to track what employees are actually doing and then create an appropriate process model by generating process maps of the entire business flow. In addition, the solution should have robust conformance checking that analyzes event logs to ensure that actions match process models. Third, a process mining solution needs performance analysis and improvement capabilities that analyze potential inefficiencies within an event log to determine if and how they can be improved, and then make improvements based on real process data. Ultimately, though, which software is right for the job depends on the size of the company, its business needs, and its goals.

Module 9: Process Mining Software Key Functions

If your selected process mining software fulfills these key functions, then you have already made a good choice. However, you should always keep in mind that your company's ability to measure, monitor and optimize business processes has a direct impact on revenue and customer satisfaction. Therefore, it is important to choose the right process mining solution wisely to ensure that all business goals are optimally met. If necessary, an expert can also be consulted.

- Identify bottlenecks & process optimization opportunities
- Provide insights into failed process steps
- Ensure end-to-end view of the entire process
- Monitor performance indicators in real time
- Perform data cleansing
- Compliance analysis & gap analysis
- Provide continuous business process monitoring in realtime
- Improve process model.

Module 10: Process Mining Software Providers

The following are the Process Mining Software Providers in the Market



Fig : 4.4 Software Providers

Chapter 5

Real Time Examples of Process Mining

1. **Order Fulfillment Process** : Imagine a company that sells products online. Process mining can be used to analyze the order fulfillment process, identifying bottlenecks, delays, and inefficiencies in real time. This could help the company streamline their operations and improve customer satisfaction.
2. **Healthcare Patient Journey** : In a hospital setting, process mining can be used to track the patient journey from admission to discharge. This helps healthcare providers identify areas for improvement, such as reducing patient wait times, optimizing resource allocation, and enhancing the overall quality of care.
3. **Supply Chain Management** : Process mining can be applied to track and optimize the supply chain of a manufacturing company. By analyzing the flow of materials, orders, and inventory across various stages, the company can identify opportunities to minimize costs, reduce lead times, and enhance supplier relationships.
4. **IT Service Management** : Process mining can be used to monitor and optimize IT service processes, such as incident management or change management. It helps in identifying patterns of issues, analyzing response times, and optimizing the allocation of IT resources.
5. **Loan Application Process** : Banks can use process mining to analyze their loan application process. By visualizing the steps taken for each application and identifying common bottlenecks or delays, they can streamline the process to provide quicker loan approvals to customers.
6. **Retail Store Operations** : Process mining can help retail chains analyze the in-store customer experience. By tracking the movement of customers, staff interactions, and

checkout times, the store can optimize layout, staff allocation, and checkout processes to enhance customer satisfaction.

7. Travel and Expense Management : Companies can use process mining to analyze travel and expense reimbursement processes. This can help in identifying instances of non-compliance, excessive delays, or errors in expense reporting, allowing the organization to improve policy adherence and reduce reimbursement cycle times.

These examples showcase how process mining can be applied in various industries to gain insights, optimize processes, and make real-time improvements to operations.

Chapter 6

Learning Outcomes of the Internship

- Gain an overall understanding of basic Process Mining concepts.
- Become familiar with Mining core services and tools.
- Learn the architectural principles of the process Mining.
- Understand and be able to explain Process Mining and compliance measures.
- Understand the Process Mining budget and pricing philosophy.
- Engage in hands-on practice to hone key skillsLearn the knowledge and skills required to take the Process Mining Virtual Internship Certified .



CONCLUSION

By doing this internship we learnt

- The importance of Process Mining.
- Tools that helps us to optimize our service costs.
- Software Production and Estimation.
- Processing the Huge data.
- And other different Services that are provided in Mining

Internship Certificate



References

- The Reference of this internship was done in the Celonis platform link
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