

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

**B.LAHARI BHAVANI**

**(214G1A3243)**



**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.**

**2023 - 2024**

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**Department of Computer Science & Engineering (Data Science)**



**Certificate**

This is to certify that the internship report entitled “**Process Mining Virtual Internship**” is the bonafide work carried out by **B.LAHARI BHAVANI** bearing Roll Number **214G1A3243** in partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science and Engineering (Data Science)** for two months from May 2023 to July 2023.

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Place: Ananthapuramu

**EXTERNAL EXAMINER**

# **PREFACE**

The All India Council for Technical Education (AICTE) is a statutory body, and a national-level council for technical education, under the Department of Higher Education. Established in November 1945 first as an advisory body and later on in 1987 given statutory status by an Act of Parliament, AICTE is responsible for proper planning and coordinated development of the technical education and management education system in India.

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## **Business Activities:**

- Regulation and Accreditation
- Maintain standard norms
- Allocate Funds
- Grant approvals to institutions
- Ensure integrated developed
- Evaluate courses and programs
- Entrepreneurship Promotion

## 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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**B. LAHARI BHAVANI**

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## **LIST OF ABBREVIATIONS**

CRM	Costumer Relationship Management
ERP	Enterprise Resource Planning
EPA	Equal Power Allocation
MRI	Magnetic Resource Imaging
PDM	Process Diagnostic Method
ROI	Return on Investment
RPA	Robotic Process Automation
SAP	System Application and Products
SCM	Supply Chain Management
WFM	Work Force Management



# CHAPTER - 1

## INTRODUCTION

Do you know this? Sometimes work just isn't happening and the underlying problem is unclear. Normally you would spend hours searching in the depths of the process landscape, but there is a much simpler and more effective method: **Process Mining**.

With the help of this technology, real workflows are compared with theory, which leads to better transparency as well as insight into the processes. This is necessary because the reality of the process. This is necessary because the reality of the process usually does not correspond to the ideas of the process participants and the work steps in reality are usually much more complex. You can imagine this like the promo pictures of empty vacation beaches, which are then totally crowded in reality.

### 1.1 What is 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. Information systems, such as Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM) tools, provide an audit trail of processes with their respective log data. Process mining utilizes this data from IT systems to create a process model, or process graph. From here, the end-to-end process is examined, and the details of it and any variations are outlined. Specialized algorithms -can also provide insight into the root causes of deviations from the norm. These algorithms and visualizations enable management to see if their processes are functioning as intended, and if they aren't, they arm them with the information to justify and allocate the necessary resources to optimize them. They can also uncover opportunities to incorporate robotic process automation into processes, expediting any automation initiatives for a company.

## 1.2 Why Process Mining is important?

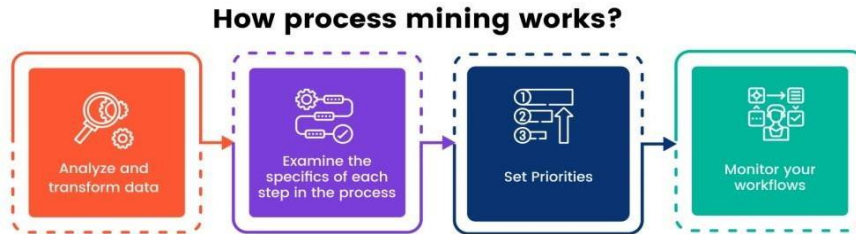
Increasing sales isn't the only way to generate revenue. Six sigma and lean methodologies also demonstrate how the reduction of operational costs can also increase your return-on-investment (ROI). Process mining helps businesses reduce these costs by quantifying the inefficiencies in their operational models, allowing leaders to make objective decisions about resource allocation. The discovery of these bottlenecks can not only reduce costs and expedite process improvement, but it can also drive more innovation, quality, and better customer retention. However, since process mining is still a relatively new discipline, it still has some hurdles to overcome. Some of those challenges include:

- **Data Quality:** Finding, merging and cleaning data is usually required to enable process mining. Data might be distributed over various data sources. It can also be incomplete or contain different labels or levels of granularity. Accounting for these differences will be important to the information that a process model yields.
- **Concept drift:** Sometimes processes change as they are being analyzed, resulting in concept drift. Because process mining discovers, monitors and improves processes, it is important for improving day-to-day business operations. But on a wider scale, process mining is important as it can support business operations in driving resilient growth. According to a recent Gartner report, process mining supports the creation and maintenance of business operations resilience, which is a key driver of resilient growth. It does this by enabling people, processes and information systems to adapt to changing patterns, such as new competitors, products, services, channels, business models or operating technologies. The ability to alter operations with fact-based insights, continuously or on- demand, is monumental if driving efficiency, operating with agility and achieving growth is important to your business. Below are some of the ways that process mining can benefit a business's operations:

- Discover hidden behavior in massive amounts of data
- Drive Process Transformation Projects
- Check if processes behave like you expect them to
- Enhance your Process Description with real-world data

### 1.3 How does process mining work?

It allows all the stakeholders to examine the data to improve operational performance, optimize processes, and identify process aberrations that impact the business.



**Fig No.: 1.1 How does process mining works**

**1. Analyze and transform data:** The majority of firms now collect and retain information about their workflows in a database. Using process mining technologies, you may create event logs for each of your organization's process using these data sets. The software assigns a timestamp, a case id, and an activity to each item of data.

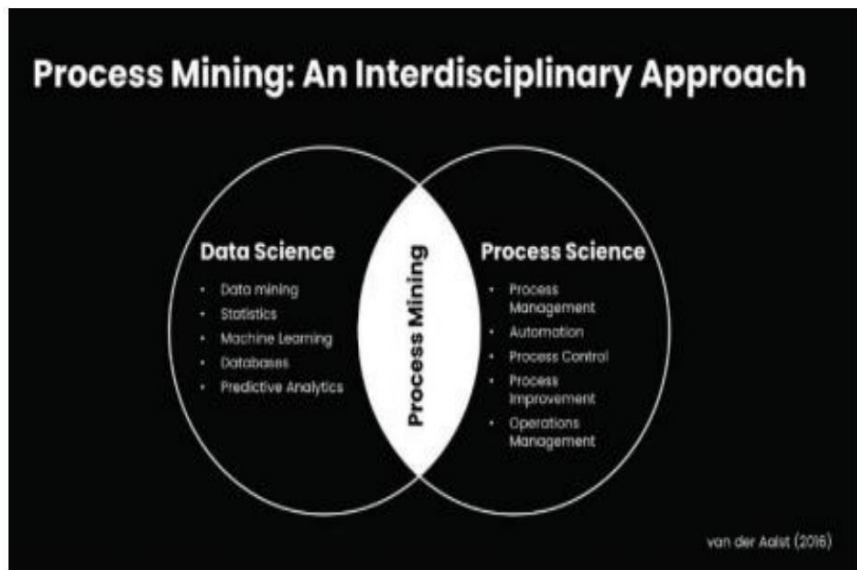
**2. Examine the specific of each step in the process:** Following is the creation of eventlogs, it generates process graphs that expose every small step in each of your workflows. With these detailed graphs, you can identify your organization's inefficiencies and find solutions for improving them.

**3. Set Priorities:** Your process can be visualized with process mining tools, including the exact time to complete various subtasks. With this data, you'll be able to identify which aspects of your workflows need the most attention and how to go about making those fixes.

**4. Monitor your workflows:** Even after you've made enhancements to your workflows, process mining software will continue to analyze and evaluate your processes. It can also help you identify if your workflows adhere to company policies or constraints.

### 1.4 Theoretical Foundations:

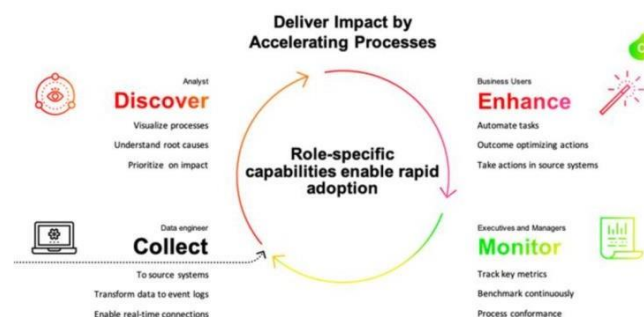
Process Mining is the combination of two disciplines: Data Science and Business Process Management. Process Mining essentially uses Data Science techniques, such as Big Data and AI, to address Process Science problems such as process improvement and automation.



**Fig No.: 1.2 Process Mining uses Data science techniques to address science problem**

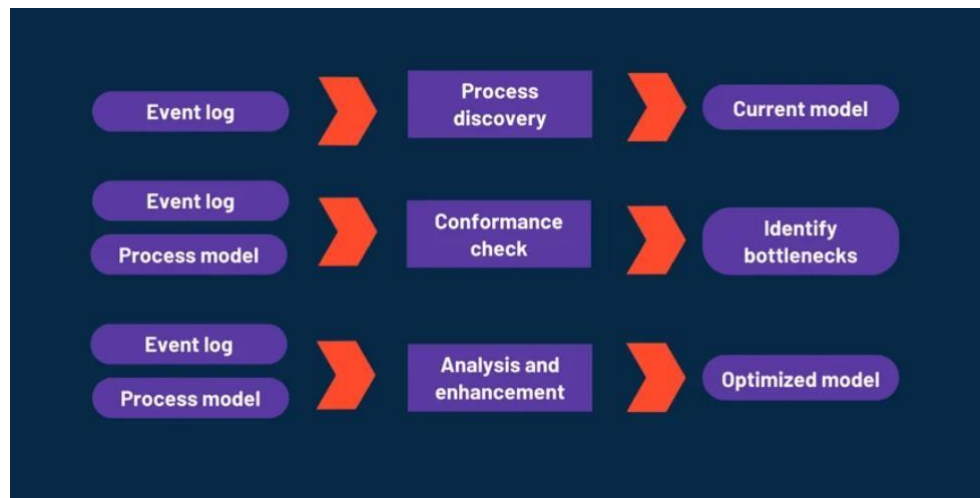
### 1.5 Stages of Process mining

Process mining is comprised of four phases: collection of event data from the transactional system; discovery of the actual business process as executed in the source system; enhancement of the process for optimal outcome; and monitoring the change for effectiveness and future enhancement. Businesses change over time, and every change impacts the business process. Process mining provides visibility into not only what the process is, but how well the process is being executed. As such, process mining helps reduce project risk, optimize internal and external effort, and realize the business value of your SAP investment.



**Fig. No: 1.3 Process Mining Stages**

## 1.6 Process Mining Techniques



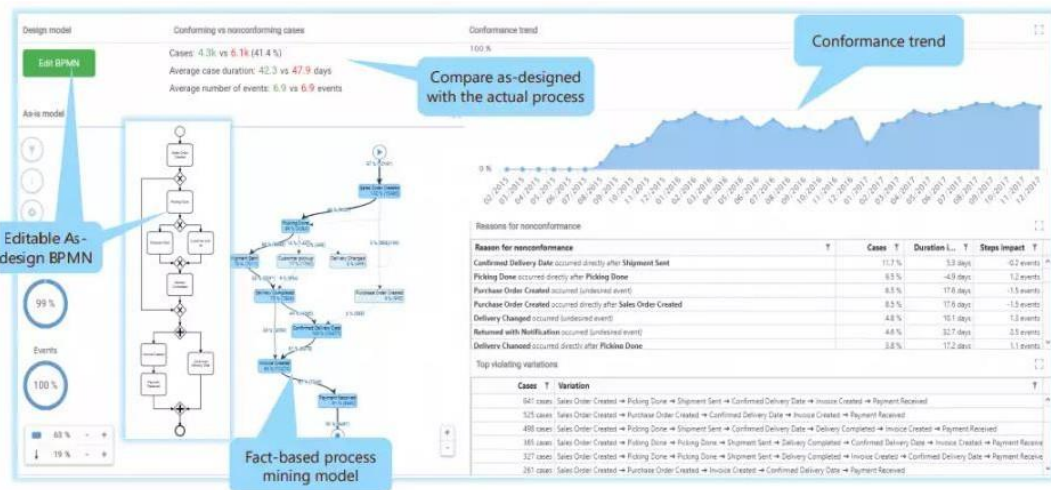
**Fig. No : 1.4 Process Mining Techniques**

Process mining techniques allow for the process of business analysis of process based on event logs. The basic idea of process mining is to discover, monitor, and improve real processes by extracting knowledge from event logs. Today many of the processes are either supported or monitored by information systems. Consider for example ERP, WFM, CRM, SCM, and PDM systems to support a wide variety of business processes while recording well-structured and detailed event logs.

According to the process mining manifesto, there are three main groups of process mining techniques.

**(Automated) Process discovery** is a primary technique and implies extracting and visualizing process models from an event log. It is especially useful for quickly revealing activities beyond the most common ones.

**Conformance checking** compares the actual process with a predefined model to discover deviations. So, it's used to check if the reality conforms to an existing pattern.



**Fig. No: 1.5 conformance analysis**

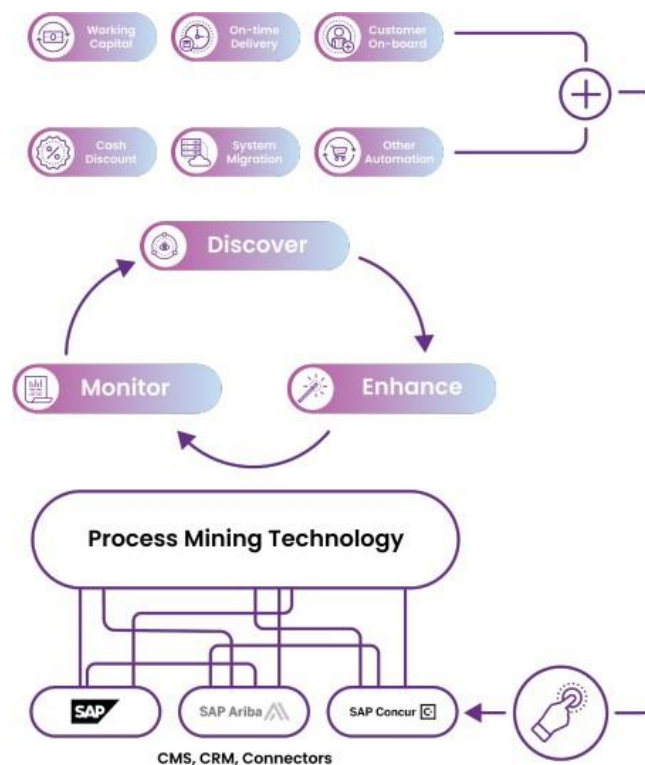
**Enhancement** goes beyond measuring and comparing. It's focused on extending the model with additional information, such as location data, costs, attributes helps improve its performance and conduct more advanced

## CHAPTER-2

### TECHNOLOGY

#### 2.1 Process Mining Technology

Process mining **applies data science to discover, validate and improve Work flows.** By combining data mining and process analytics, organizations can mine log data from their information systems to understand the performance of their process, revealing bottlenecks and other areas of improvement.



**Fig no 2.1: Process mining technology**

Process mining technology is a data-driven approach that enables organizations to gain insights into their business processes by analyzing event data from various sources, such as software systems, applications, and databases. The main goal process mining is to improve the efficiency, transparency, and effectiveness of process.

## How it works:

**Data Collection:** Event logs are collected from different systems that capture activities, timestamps and relevant data as they occur during the execution process. These logs are provided a detailed record of how processes are being executed.

**Data Preprocessing:** The collected event logs are cleaned and transformed into a structured format, eliminating any inconsistencies or errors.

**Process Discovery:** Process mining tools analyze the event logs to create visual process models that represent the actual process flow. These models can take the form of flow charts, petri nets, or other process representations.

**Performance Analysis:** Process mining allows for measurement of process performance metrics, such as cycle times, waiting times, and resource utilization. This data helps in identifying areas where processes can be optimized.

**Root Cause Analysis:** By tracing the event logs, process mining can uncover the root causes of issues, helping organizations understand why certain problems occur.

**Predictive Analysis:** Some advanced process mining tools can predict future process behavior based on historical data, helping organizations anticipate potential bottlenecks or delays.

**Continuous Improvements:** Armed with insights from process mining, organizations can make informed decisions to optimize process, enhance operational efficiency, and ultimately deliver outcomes.

Process mining technology is used across various industries, including manufacturing, healthcare, finance and logistics, to streamline operations, reduce costs, and enhance customer satisfaction. It bridges the gap between the theoretical process design and the actual execution, providing a data-driven approach to process improvement.

## 2.2 Process Mining and RPA

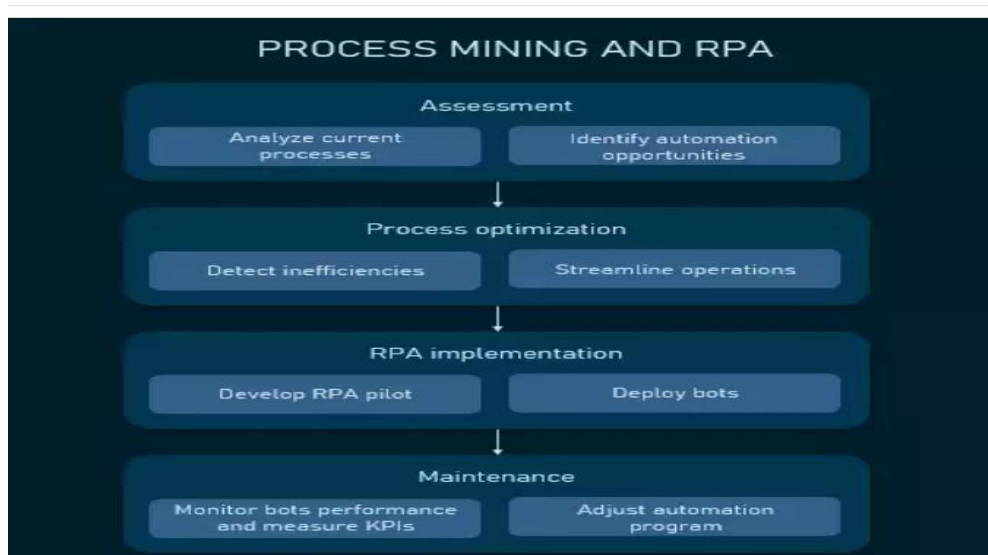
RPA is focused on automating repetitive business processes to increase efficiency. QPR, one of the largest providers of process mining software, claims that process mining can reduce RPA implementation time by 50 percent and RPA project risk by



60 percent. And according to UI path, one of the leading RPA companies, “78 percent of people who automate say process mining is key to enabling their RPA efforts.”

Here’s why.

1. Process mining discovers areas that need improvement and can benefit from automation.
2. Processes can be optimized to ensure that you’re not automating a mess.
3. Process maps can be used as a guide or template to train bots, outlining the sequence of necessary steps.
4. Process mining helps assess results and monitor RPA KPIs.
5. With the help of advanced tools, you can simulate the workflow to predict how RPA implementation impacts performance.

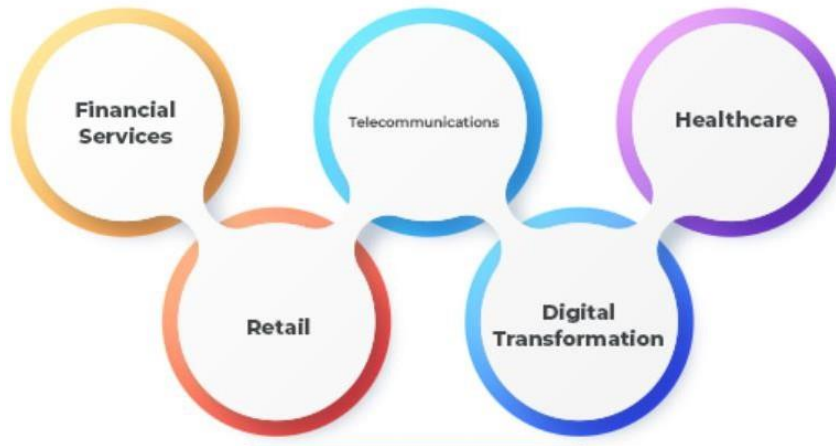


**Fig. No.: 2.2 Process Mining and RPA life cycle**

## CHAPTER-3

### APPLICATIONS

#### 3.1 Applications of process mining



**Fig. No.: 3.1 Process mining applications**

#### **Financial Services:**

Because of the rise in transaction volume and the digitization of more industries, aberrant activity is harder to detect using manual methods. Companies in the financial services sector have the chance to continually and thoroughly identify issues within high-volume processes thanks to process mining, which is a solution to the increased regulatory and audit requirements.

#### **Telecommunications:**

As subscriber quantities increase and activations become more and more automated, there is a greater danger of unsuccessful activations. When telecom companies get more orders, process mining gives them the chance to identify pricey issues and client blowback in their Order-to-Activation processes.

**Healthcare:**

The risks associated with preserving population health and achieving individual patient journey objectives rise as data about patient experiences and results keep growing. Process mining supports the delivery of effective and high-quality end-to-end patient journeys for healthcare organizations dealing with the exponential growth of data, from before a first doctor appointment through treatment regimens to closed treatment cases.

**Retail:**

Due to technology or process problems, retail businesses have seen expensive consumer fallout from complicated e-commerce operations. Process mining assists merchants in ensuring that consumers can complete transactions efficiently and without issues despite rising transaction volumes.

**Digital Transformation:**

Process mining is frequently used in larger-scale digital transformation initiatives because it can give you the precise insights needed for process improvement, allowing systems to run more quickly, smoothly, and efficiently, as well as objective data-driven insights into the causes of delays and inefficiencies within business process.

## **CHAPTER-4**

### **MODULES**

#### **4.1 Process Mining**

Process mining applies data science to discover, validate and improve your process log data from their information systems to understand the performance of their 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.

#### **4.2 Process Mining Cloud**

While the process mining service in automation cloud, you can create new processes 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 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 that you can use as the starting point for creating your process apps. You can customize these apps templates to your business needs and publish them with a set of dashboards and KPIs to enable business users to monitor and analyze the process in detail. When creating a process apps, you can upload data from .csv or file, or you can setup a connection to a source system using the extraction tools CData Sync or Theobald X tract Universal. You can also use Data Bridge Agent to use custom connectors to upload data from your source system.

### 4.3 Process 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 process 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 event log.

&

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

### 4.4 Process Mining is the MRI process

Process mining technology is 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 the 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 see to diagnose the state of workflows. Process mining is changing the way of companies operate and manage their business operations.

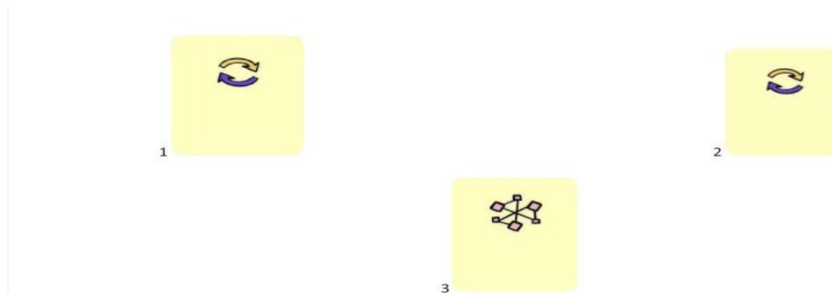
### 4.5 Mining Algorithms

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

**Deterministic algorithms:** An algorithm produces only defined and reproducible results. It always delivers same result for same input. This algorithm is one of the first algorithm capable of handling concurrency.

**Heuristic algorithms:** It also uses deterministic algorithms. However, they refer to 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 to complex problems.

**Genetic algorithms:** They use an evolutionary approach that mines the process of natural evolution. They are not deterministic. This algorithm follow 4 steps: Initialization, Selection, Reproduction, and Termination.



**Fig. No. : 4.1 Mining algorithms**

## 4.6 Starting Project in Mining

To start a project in stream of process mining one need to follow some basic requirement they are classified as follow:

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

**Identify the data:** Identify 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.

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



**Fig. No.: 4.2 Industrial use of mining**

## 4.7 Process Mining Software

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 entire business flow. In addition, the solution should have robust conformance checking that analyzes event logs to ensure that actions match process models. Ultimately through which software is right for job depends on the size of company, its business needs, and its goals.

## 4.8 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 process 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.

## 4.9 Industrial Usage of Mining

**Production:** In the manufacturing industry, timely and accurate delivery to a customer is the goal. When a company has multiple factors in different regions, there are usually differences the reliability of deliveries. All event data available in the system is suitable for use. In this way facts can be generated.

**Banking and Finance:** In this financial sector, it is important to comply with rules and regulations and to be able to provide evidence of this. By using the event data from systems, individual cases can also be visualized as a process flow.

**Telecommunication:** It is a highly competitive sector worldwide. The ability to improve operational processes is key to success and profitability. It helps telecom companies gain visibility into geographically dispersed operations, identify bottlenecks and ensure that customers receive products and service on providers.

## 4.10 Process Mining Software Providers



**Fig. No.: 4.3 Software Providers**



## CHAPTER-5

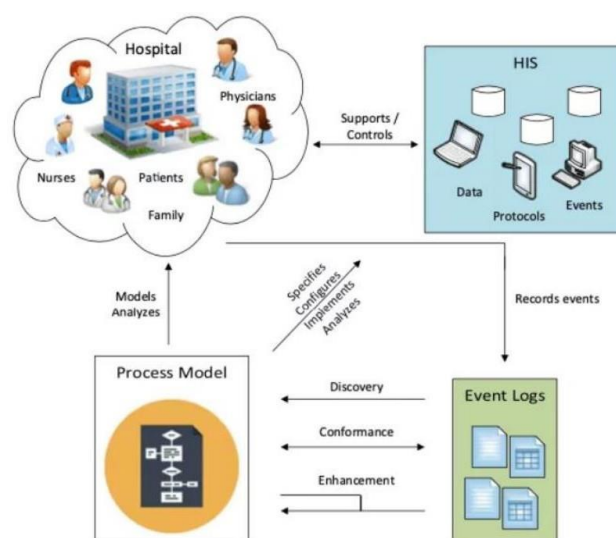
### REAL TIME EXAMPLE

#### Health care:

It can be used in healthcare to track and improve patient care pathways. For example, analyzing data from electronic health records(EHRs) can help healthcare organizations find ways to reduce the staying days, increase patient satisfaction, and improve clinical outcomes.

#### 5.1 How process mining used in healthcare?

Process mining is used in healthcare for the analysis of Hospital Information Systems (HIS) and other IT systems (EHR, ERP, LIMS, etc) as figure 2.3.1 illustrates. These systems store data for all interactions among units helping patients. Process mining extracts process knowledge from event logs from mentioned systems. In many cases, it requires systems storing diagnostic tests and treatments or laboratory systems with all tests performed on a blood sample. Process mining event logs contain all the data the patient, healthcare process, and steps taken in each process, as well as involved personnel and costs of the processes, in order to reflect an objective view on how processes are executed.



**Fig. No. : 5.1 How process mining used in healthcare**

## 5.2 Challenges to process mining in healthcare

Based on expert interviews including ZhiQian as well as our analysis of case studies, we see these as the reasons behind low levels of adoptions for process mining in healthcare:

### **Data related issues:**

**1. Data maturity / collection issues:** In private sectors, processes are designed as workflows and they are stored in IT systems as log data with clear time stamps. This is not often the case for healthcare organizations. There are electronic records for patients but not set out to record individual activity as an event with a timestamp hence significant amount of data prep and expertise may be required. Data can come from a variety of sources including individual spreadsheets which need to be linked to a pathway or referral before process mining analytics can be applied.

**2. Data privacy issue:** To provide useful actionable insights, organizations need to identify the specific patient and/or resident or the cohort of patients. Teams require additional approvals to use any individual identifiable datasets.

**3. Data interrogation issues:** Healthcare and community organizations are not routinely trained to conduct data interrogation to identify actionable insights. The analytics capabilities within healthcare and community providers are regularly understaffed and have limited opportunities to invest in testing and implementing new tools and techniques.

## 5.3 Benefits of process mining in healthcare

Process mining responds to the problems of rising costs, population aging and increasing demand for healthcare. Process mining technology provides insights about processes and patient behavior and help to drive efficiency by:

1. Identifying and understanding the real behavior of resources and the patients.
- Predicting the patient behavior through previous cases.
  - Improving resource management

## 2. Analyzing process performance

- Increasing capabilities to meet the increasing demand
- Providing insights to develop the collaboration across units and peers.

## 3. Suggesting to redesign the process

- Reducing the waiting and service time
- Reducing the cost of services
- Increasing process transparency.

## **CHAPTER-6**

### **LEARNING OUTCOMES**

After complete this training, we should be able to:

- Understand what process mining is and the basics of how it works.
- Gain an overall understanding of basic process mining concepts
- Identify business use cases for process mining.
- Learn how to find training courses to get started.
- Understanding how to discover, analyses, and improve business process using data driven techniques.
- will learn to extract insights from event logs, identify bottlenecks, inefficiencies, and opportunities for optimization.

## CONCLUSION

In conclusion, process mining within Celonis represents a transformative approach to understanding, optimizing, and innovating business processes. By harnessing real time event log data, Celonis enables organizations to unveil hidden insights, streamline operations, and drive informed decision-making. Through visualization and analysis, process mining empowers users to identify bottlenecks, inefficiencies, and compliance gaps, paving the way for targeted improvements. Celonis's Process Explorer and Variant Explorer provide intuitive interfaces to navigate and analyze process flows, enabling users to uncover patterns, root causes, and optimization opportunities. With Celonis advanced capabilities, process mining emerges as a vital tool for organizations aspiring to achieve operational excellence and competitive advantage in today's dynamic business landscape. process mining is a powerful technique that enables organizations to analyze and improve their business processes.

- Process mining fundamentals include data extraction, data transformation, and data visualization. These foundational elements are essential for effectively applying process mining techniques and deriving actionable insights from process data.
- Process mining is an important to approach to understanding and optimizing business process.
- Tools that help us to optimize our service costs.

## REFERENCES

- ❖ The references of this internship was done in the Celonis platform link\_  
<https://academy.celonis.com/learn/dashboard>
- ❖ Introduction to process mining\_  
<https://academy.celonis.com/learn/course/introduction-to-process-mining/introduction-to-process-mining/course-outline?client=academic-celonis>
- ❖ Process mining fundamental\_  
<https://academy.celonis.com/learn/learning-path/process-mining-fundamentals-for-students>



# Certificate of Virtual Internship

This is to certify that

**LahariBhavani Battini**

**Srinivasa Ramanujan Institute of Technology**

has successfully completed 10 weeks

**Process Mining Virtual Internship**

during May - July 2023

Supported By **celonis**



**Jerome Geyer-Klingeberg**  
Head of Academic Alliance  
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**Shri Buddha Chandrasekhar**  
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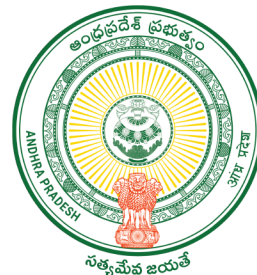


Certificate ID :e72dd7f8eb4d0d7b88b4221cb3e80c34

Student ID :STU62300195761911647313301



Andhra Pradesh State  
Council of Higher Education



# Virtual Internship Completion Certificate

This is to certify that

**LahariBhavani Battini**

has successfully completed 10 weeks

**Process Mining Virtual Internship**

during May - July 2023

Supported By **celonis**



**Prof. K. Hemachandra Reddy**  
Chairman, Andhra Pradesh State  
Council of Higher Education

**Jerome Geyer-Klingenberg**  
Head of Academic Alliance  
Celonis

**Dr. Satya Ranjan Biswal**  
Chief Technology Officer (CTO)  
EduSkills

Certificate ID :0f2c0d7b19a77013af115a83803cda05