Streamlining Process Discovery and Assessment with Process Mining and Task Mining

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Abstract

UiPath Task mining is an AI-powered feature that captures the user data performed on the desktop, records the granular level actions, including each mouse click and keystroke, and provides a visualization of the analyzed data captured with the help of Artificial Intelligence. Task Mining also helps users or business analysts identify the bottlenecks in the process and discrepancies and may even contribute to improving the process. This paper explores the usage and features of UiPath Task Mining. This research study also mentions the architecture overview of process mining, integrations, and dashboards, among other features. Different types of mining available in Task Mining are also discussed in this paper. Task capture usage, capabilities, and features are discussed. The relevance of Process mining related to streamlining business operations, usage of different available templates that are specific and tailored based on the use case, process apps, different fields in the analysis of process graph, and integration to automation hub are discussed in this research paper.

Keywords: Task Mining, Process Mining, Machine Learning, Artificial Intelligence, Task Capture, Process Definition Document, Process Discovery, UiPath, Process Improvement, Process graphs, App Templates, Automation Hub

1. Introduction:

Business Analysts and Project Managers analyze the process during the discovery phase, understand the steps, generate an overview, create a list of tasks that cannot be automated or need manual intervention, and then decide whether the process can be an automation candidate. This process is often time-consuming, tedious, manual, and poorly structured. UiPath provides an innovative way to automate the entire process using AI-powered Process mining and Task Mining. Process mining captures the information at a granular level, capturing each click to analyze bottlenecks or address inefficiencies in the process. Using Task Mining, specific business processes can be identified and analyzed using user's data on their desktops and determine if the process is the right fit for automation. The entire process of process discovery is automated using AI-powered features, eliminating the need for manual process. There are two modes in Task mining: unassisted mode and assisted mode. In this research paper, different aspects of Process Mining and Task Mining, how the AI-enabled features integrated into the automation suite provide analysis of processes, are mentioned. Using task capture, specific business process analysis can be captured by enabling users to record their actions and upload data to Process Mining. The insights generated by Task Mining through actions and data captured Task Capture enables stakeholders to analyze the feasibility of automation of a process.

2. About Process Mining:

UiPath Process Mining enables businesses to streamline their operations by analyzing the processes, figuring out the bottlenecks, and depicting the scope of automation. Automation efforts will be streamlined using Process Mining. Business Analysts or product managers manually capture a process, list down each step along with the screenshots, write a summary for each step, and then glance at the steps to understand the process or have an overview of steps that need to be automated. Often, the decision to select whether the captured process is an automation candidate is based on an intuitive understanding or analysis of the overview of the process[1]. This tedious and manual process is often time-consuming to capture the process during the discovery phase[2]. Using Process Mining, system-generated AI insights are provided after user actions are captured for a process. Machine Learning algorithms will be used to assess the complexity of the process and steps in the process and provide various metrics that could help decide whether a process can be moved to an automation pipeline. This process doesn't need manual intervention as business users within the teams will have the .exe file for Process Mining installed on their systems and capture every step of the process. The process doesn't interfere with the business process and captures the steps in the background. The recorded steps can even be exported as a Process Definition Document, saving much time instead of manually designing a Process Document.[3] Process Mining cycle involves Data Transformation, Data analysis, and continuous monitoring. During data transformation, UiPath Process mining extracts raw data, which is often not structured, from various systems and handles missing values and standardizing formats. The data analysis step is crucial as UiPath Process Mining incorporates the business rules and prepares the data for business use, enabling businesses to extract meaningful insights aligned with business objectives from process data. Continuous monitoring step in the Process mining cycle enables real-time monitoring once the process mining solution is deployed to users. Process owners can analyze the process from start to end, managers can identify bottlenecks and inefficiencies in the process, and executives can get high-level information and understanding about the process. These features collectively help to identify risks and track automation opportunities.

Process-specific metrics and KPIs can be created using App templates in Process mining. Several predefined app templates are available, along with generic ones, to start capturing any process. These templates can be customized for the business needs and can be published with a specific set of dashboards, enabling business users to monitor specific data points for the process. After creating a process app, users must upload the data before publishing the process app. The end-user's experience of performance is directly related to the data volume and, specifically, the number of rows. Number of columns matters only once the data is loaded into the database. Generally, processes with about 600k objects and 100M events per process are ideal. However, with more data and objects, creating a visualization might take more time, causing the speed of presenting the visualization to decrease. Hence, checking the parameters discussed above is recommended to optimize or limit the dataset. Customization of the created apps can be made using a dashboard editor, data manager, and data transformations. Process app will have different stages, a development stage and a published stage. Only apps that are published are available on the process apps tab. The new app, once created, will be in the development stage until the app is published. As each stage has its own data set, developers can customize the development without affecting the users already using published dashboards. The process tab is the starting point for business users to analyze the processes. They can analyze the process and figure out why a certain task is delayed. They can determine the root cause from the dashboard and act on the step that causes delays. Developers can create and customize the dashboards in the development tab. Process mining is part of the automation suite and needs to be enabled by the administrator. Log into the automation suite with a UiPath account, go to admin settings, select the process mining tile, and add it to the services.

Process Apps use data to visualize and analyze the end-to-end process. Process apps contain multiple dashboards depicting different parts of the input data[4].Dashboards will be created for each chart that depicts certain data. KPIs are Key Performance Indicators that are displayed on the top of the dashboard and used to assess performance over time. They enable us to check progress and quality over time. In most dashboards, event throughput time as mentioned in Figure 1–**Throughput time, wait time and cycle time** and event cycle times are available. Event throughput time is the time from the event end time to time until the end of another event, taking into consideration the wait time between the event end and event start. Event cycle time is the time that it took to complete just the event, excluding the wait time. Event cycle time is only available if both event_start and event_end are defined in the dataset. Fields and metrics control how data is displayed in the dashboards and charts[5].
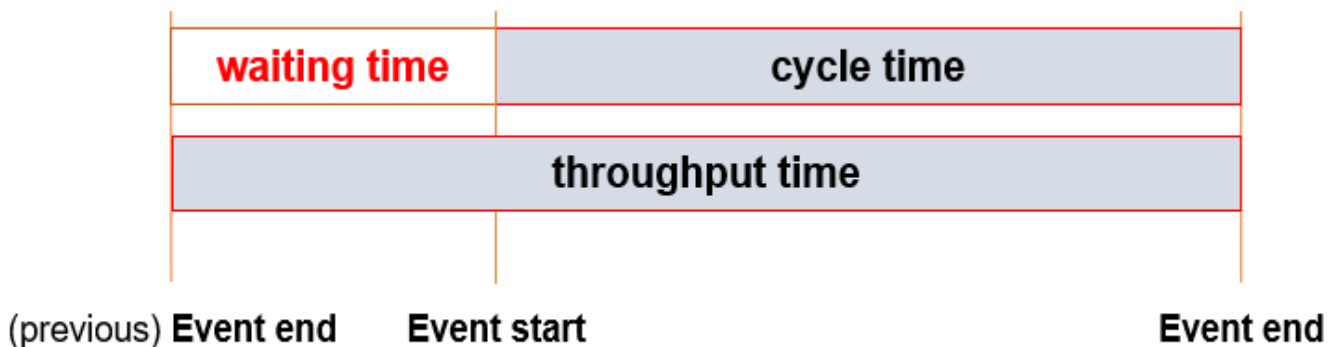

Figure 1–Throughput time, wait time and cycle time

Users can customize how data is displayed in the charts by changing different fields and metrics. This flexibility enables users to flexible analysis, comparative insights, and enhanced decision-making. For example, a firm's invoices are approved across the globe, and there were some bottlenecks overall. Analyzing throughput time and comparing it across different regions can identify which region is taking longer to approve because of wait times. This way, inefficiencies can be investigated and addressed in a reliable way. Bar charts in Process Mining provide a highly customizable way to analyze processes. Overall, by customizing fields, metrics, and resizing charts, users can achieve the stage of actionable insights on the process. The process graph is the visual representation of the order in which a sequence of events is captured. Tracy's technique is followed in the representation of the layout of the graphs. When capturing a process, normally, the start activity will be the first step, and the end activity will be the finishing step of the process. With Tracy, all the activities are positioned and placed in such a way that, when looked at first glance, it makes sense. Instead of a random and cluttered flow, Tracy arranges the process from left to right or top to bottom, making it easier to follow. It identifies the core process and makes it a primary flow, ensuring the core process is always clear. While using filters to display happy paths or filter out the data, Tracy minimizes changes to the process graph. Process graph uses the discover model, or BPMN model, and process mining uses a selected type of model during app creation. The following types of nodes are used in a Discover or BPMN process model. Exclusive choice, as mentioned in Choice Either A or B happens. The topmost gateway is called the open gateway, indicating where the choice begins. The bottommost gateway is the closed gateway, indicating where the process choice behavior ends.
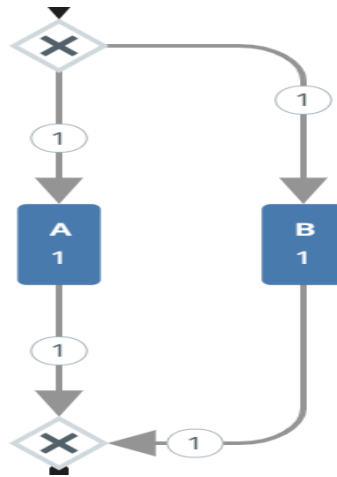
Figure 2 – Exclusive Choice

In the loop as mentioned in Figure 3- Loop C is executed first, and then D is executed. Once the top gateway is passed, C is executed, and then D is executed. There's also one bottom gateway at the end, indicating where the loop behavior ends.
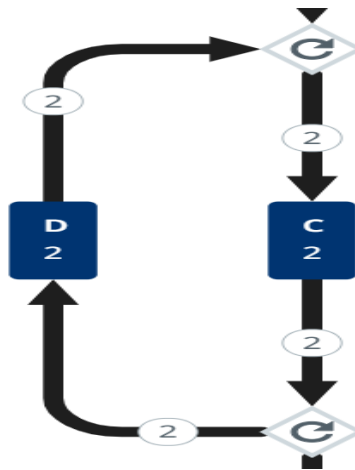

Figure 3- Loop

As mentioned in the Figure 4- Parallelism, E and F happen in parallel. One common gateway is the entry point for E and F. Then, E and F happen at the same time. Once executed, there's only one end gateway, and it will be executed.
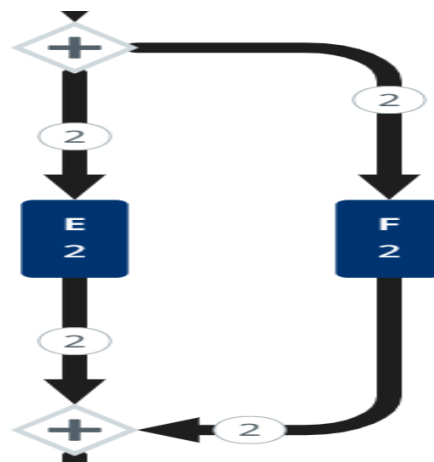

Figure 4- Parallelism

The information in the dashboards can be exported. The Export as .png file option is available by clicking Export->Export as .png from the menu. The downloaded file will contain an image of the chart or process graph. Also, export as .csv option is available, capturing all the data points that depict the chart. Also, the Business Process Model Notation .bpmn file can be exported out just like the previously mentioned two options. Automation ideas can be sent to the Automation Hub. Different UiPath products work together to investigate, discover, and build automation. Automation Hub turns ideas for process improvements mapped in Process mining into implementations. In the Automation hub, the idea will be investigated and processed. Users can submit ideas for process improvements that are subject to automation directly from the process graph to the automation hub. Once the automation idea is investigated, evaluated, and built,the impact should be visible in Process Mining. When users identify bottlenecks in the process or scope for automation, they go to the process graph and submit automation ideas. Select Submit to Automation Hub, select an activity that is indicated in the drop-down list for automation, enter the name of the automation idea, provide a description, select the name of the category, select a number of ways to complete the process, enter the percentage of digital input, and enter the percentage of structured input. In the description field, the information of the name of the activity, number of events, total throughput time, total event cost, average event cost, number of users, percentage of automation, and URL to display the activity from the automation hub is filled[6]. Hence, automation ideas can be submitted to the Automation Hub by analyzing bottlenecks and opportunities from Process Mining. Process Mining is the discovery and analysis tool, while Automation Hub facilitates automation idea management and implementation.

There are different App templates in process mining, and users can choose a template based on the use case[7]. Event log and Custom process are generic Process mining templates that allow users to load any process data to start analysis of the process. The generic templates can be used if there are no defined templates for the use case.Process mining has out-of-the-box templates for several processes and can be used as a starting point for creating process maps.It can be possible that the name entered while creating a new app already exists, in which case it'll not allow creating a new one.There will be an option to select data sourcesfrom datasets. When users discover a process model in Process Mining, they're basically mapping out the process level details, including the intricacies of the steps. This helps users to understand the process on a granular level. With advanced features, Process Mining can identify relationships within the process, such as parallel activities, decision points, and loops. These are called process semantics, and they give structure to the process captured. Hence, capturing a process gives a full picture, including the path and condition the process follows. The process app created can also be exported and used across environments. The exported file with. pmapp extension will be encrypted, has all transformations and dashboards, and can only be visualized in Process Mining Automation Suite. It can then be imported by creating a new process app, and data must be added before publishing it.You can construct several views and arrange, group, and filter data in Process Mining by customizing the dashboards and choosing various options for charts, process graphs, and KPI bars.

3. Leveraging Task Mining to capture the process in user mode:

When there's little information about a process, and each step needs to be thoroughly analyzed,UiPath Task Mining is used. It collects employee data from user desktops, including each keystroke and clickleverages AI, and analyzes the data. This way, the journey of process discovery will be expedited using the AI-powered insights[8].As mentioned in Figure 5- Task Mining process , as a first step, AI-powered task mining collects data from the user's machine at a granular level, identifies different steps in the process, and presents a process graph containing detailed metrics. Unassisted task mining helps mine unknown tasks by

recording steps on the user's desktop and discovering repetitive tasks suited for automation and process improvement.
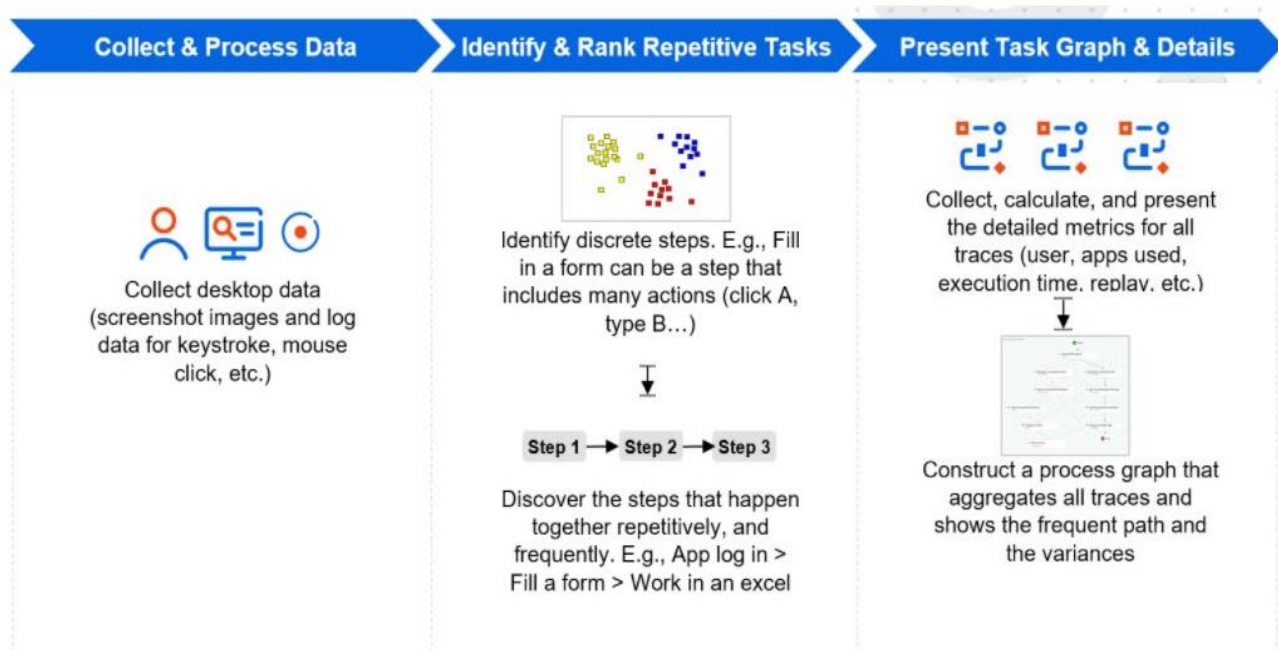

Figure 5- Task Mining process

Assisted Task Mining captures and improves tasks that are known with variations, and unassisted Task Mining records the user's actions on the desktop to identify new areas for automation candidates. Some prerequisites exist when working with Task Mining in Virtual Desktop Environments (VDIs). Each user should have a separate Windows session to prevent user data interference and to maintain data integrity. VDI must be persistent, meaning each user's configurations and settings remain intact across sessions. Users must have read and write permissions to write a folder for storing and capturing task data. However, for VDI environments, it is recommended that applications being analyzed should be installed directly on the same VDI where Task Mining agent is running, ensuring that Task Mining captures user interactions effectively. UiPath Task Mining benefits from multiple layers of security and policies that UiPath enforces. Task Mining has four main components: recording application, data preprocessor, analyzer, and admin portal. These components, together, run analysis on data captured and produce analysis on automation candidates and process maps. This analysis and data are controlled by the system administrator, and data collected to complete this process is encrypted, preserving users' privacy. All the users data is encrypted, whether it travels over the internet or within internal service components. The recorder client is a lightweight tool that will be downloaded on the user's machine, and it records screenshots and metadata of the task that is being completed.   The TaskMining.exe file enables you to install a user mode of the Recorder. The installation path - %localappdata%\TaskMining and all other advanced options are already configured to help you immediately get Task Mining up and running. The user mode doesn't require any administrator privileges, meaning it has rights limited to what the user has[9]. Unassisted Task Mining enables the recording of the actions on the user's desktop, analyzing them, and exporting the results, helping to identify automation opportunities that have repetitive actions by users, understand frequent paths and variances, and document the details of the process candidate. This benefits employees at all levels, including RPA COE leaders,

business analysts, employees, and developers. Users can be invited to capture the process during project setup, and there's a limit of 10 users per project.

An AI center project with a dataset is essential to run a Task Mining project. The data generated from the user's actions from Task Capture is analyzed, and results are generated using Machine Learning algorithms in the AI center by creating pipelines. Required permissions are automatically assigned in the AI center once the project is created in Task Mining. As Task Mining is within Automation Cloud, ensure that all the users that access Task Capture have access to Automation cloud. Task Mining relies on the AI Center to store the recorded data and run the ML pipelines to generate results on the data from the discovery phase. User permissions are added accordingly in the AI center for project administrators, business analysts, and recording users.The user will see the Unassisted Task Mining project results after running the Machine Learning model integrated from the AI center.Data analysis requires that at least 10,000 actions be configured, but a recommendation from UiPath is a baseline of 50,000 actions. It is prudent to note that the limit is 200k actions collected in a project. It is agreeable that seeing the huge number of actions might be overwhelming. However, the reordering in Unassisted mode isn't captured by just one user by a group of users. Running an analysis would cost 5,000 AI units, irrespective of the number of actions.To start the analysis, click run analysis on the project page; if actions are less than 50k, a prompt appears stating the same, and click on run anyway. The analysis results are automatically uploaded to the Task Mining project, and users will be informed about the analysis over an email. As mentioned in Figure 6– Task Mining Project Overview, an overview of the task mining project can be visualized after navigating to the corresponding project. The information about the number of tasks, number of actions captured, total time captured, and number of users will be mentioned along with other information.Unassisted Task Mining is designed to mine unknown tasks recorded by employees' desktop activities. and is suited for automation and process improvement.
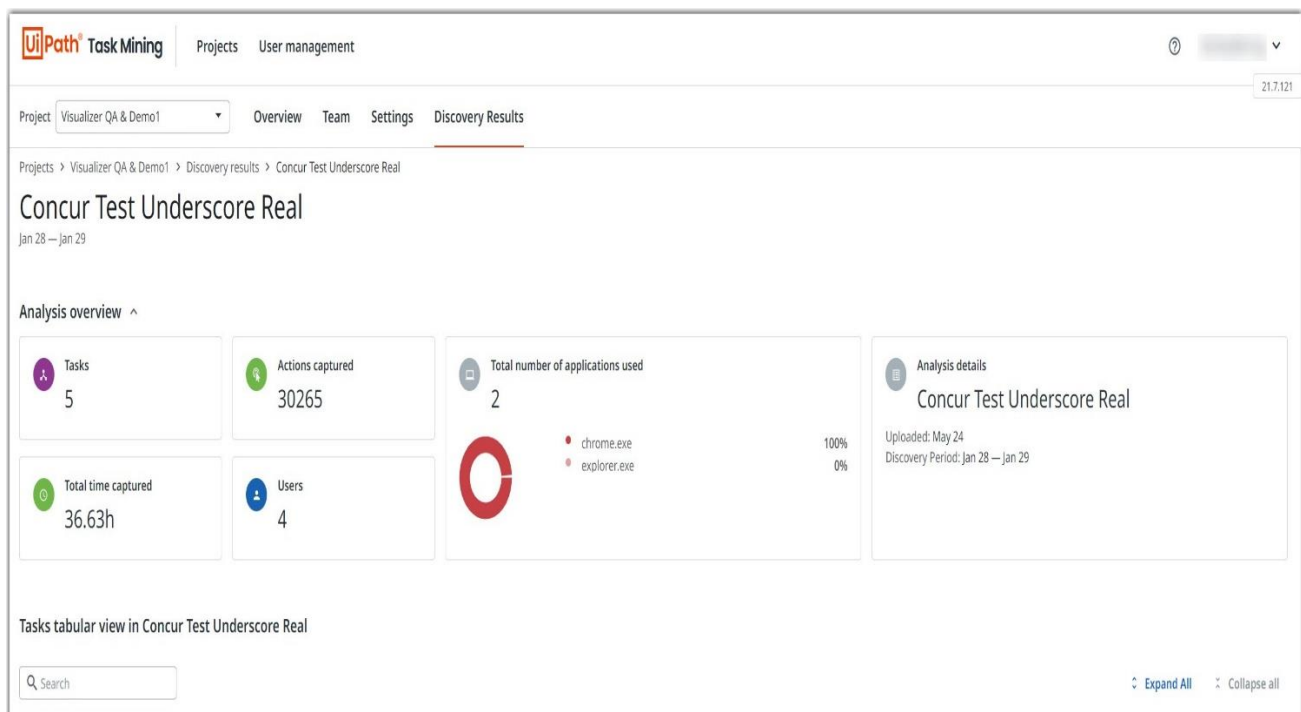

Figure 6– Task Mining Project Overview

The recording will only start after the user's consent[10].Users can record actions only on applications that they wish to record and deny recording on applications that users may deem concerning. There's an option to mask personal identifiable information, and user anonymization is possible. All in all, the goal of

recording the data is to understand the inefficiencies in the task in a better way and to optimize the task/process. Provide unique and relevant titles and descriptions while creating a project. Adding up to 10 users to the project is possible, and the recommendation is to add between 2 and 7 users. It is recommended to add users who are experts in the day-to-day job of completing the process manually so that the right data is captured without errors in the process. It is important to figure out what actions can be recorded and what actions shouldn't be recorded. Include the URL and/or application.exe in the allow list. Adding personal applications such as Slack, Microsoft Teams, or Gmail to the deny list is recommended as Task Mining doesn't need that data, and adding that data is considered noise and may interfere with the performance of generated results. Communicating to the users about the importance of relevant data is crucial. Hence, we recommend that users pause and resume recording when there's a need to navigate to day-to-day tasks that aren't part of the process. The recommendation is to capture between 20k and 70k actions to limit noisy data. The reviewers are expected to have an understanding of the process before starting the analysis because sometimes noise leads to results that are not relevant to the process. The reviewers are expected to find the difference between high-quality tasks and noise.

4. Conclusion:

In conclusion, Task Mining and Task Capture have become emerging product integration s to redefine business processes by identifying improvements and automation opportunities. This data is generated by Tsk Mining using AI-powered insights that are drawn out of the data from multiple users. Using Task Capture, when an automation candidate is identified, using the recorder option, each step of the process can be recorded and then exported as a Process Definition Document (PDD). This will save immense time as manually capturing screenshots, steps, and user actions can be eliminated as Task Capture generates the document. As organizations embrace this technology suite, Task Mining and Task Capture work hand in increasing efficiency, reducing manual effort, and enabling data-driven decision-making.In contrast to conventional process mapping techniques, task mining offers empirical proof of bottlenecks, enabling executives to decide on process enhancements with knowledge. Organizations can prioritize automation initiatives and increase return on investment (ROI) by utilizing this AI-based pattern recognition.

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