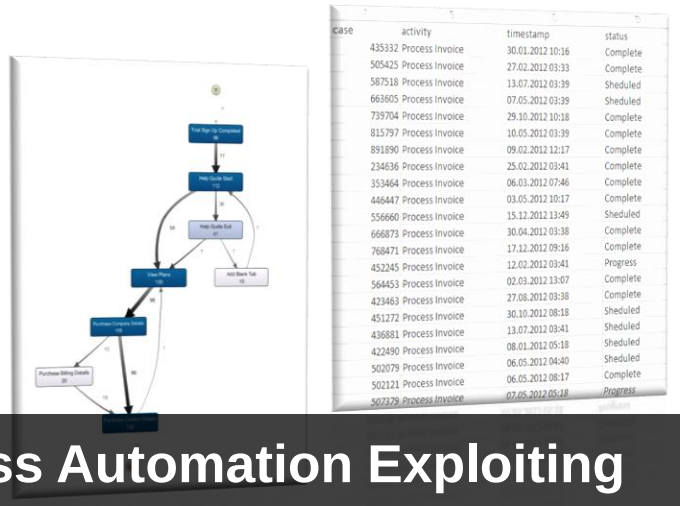
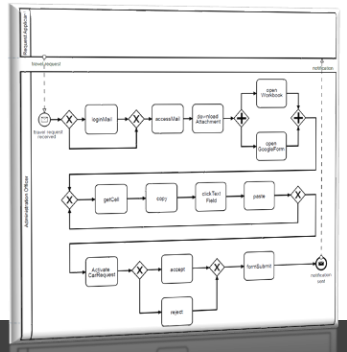


Data-driven Robotic Process Automation Exploiting Process Mining

Presented by: Najah Mary El-Gharib, Ph.D. Candidate, nelgh031@uottawa.ca

Supervisor: Dr. Daniel Amyot



4th Digital Transformation in Government Conference
13-16 June 2023

uOttawa

Today's Agenda

1) Problem Definition
2) Introduction to Process Mining
3) Introduction to Robotic Process Automation
4) Research Questions, Methodology, and Proposed Method
5) Canadian Process Mining Community

1. Problem Definition

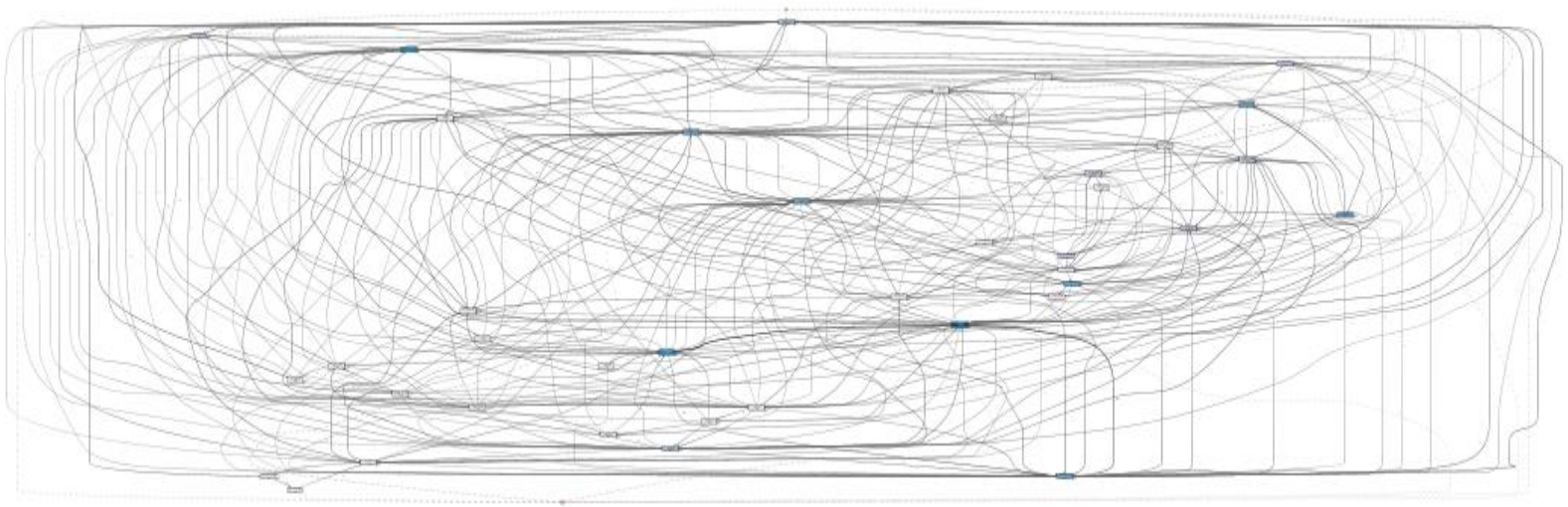
Problem Definition

Organizations are moving towards standard and sustainable processes to cut costs, improve efficiency, and drive their digital transformation plans.

In the past 5 years there has been a steep increase in the use of Robotic Process Automation (RPA).

Large amount of guess work in assessing the processes that can be automated.

Understanding the processes is the key to automate them properly.

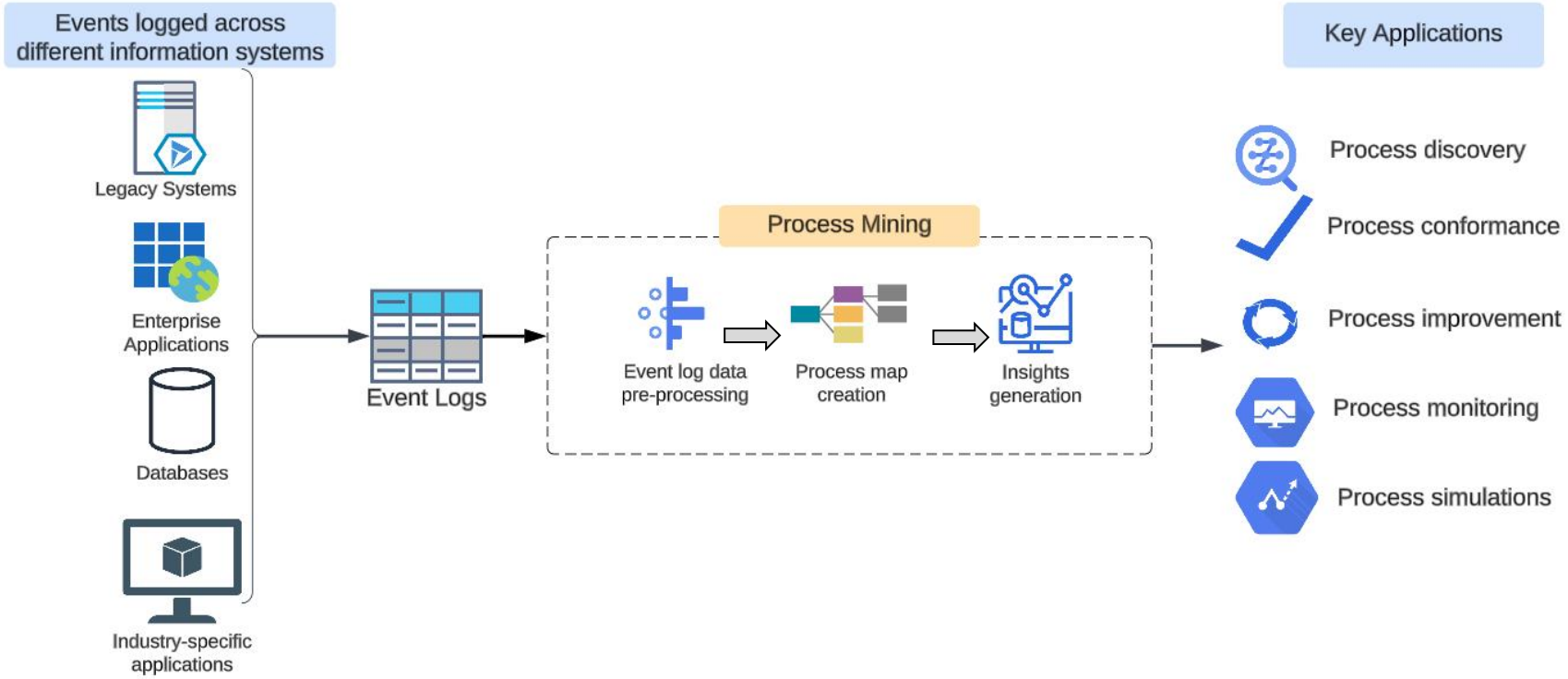


2. What is Process Mining?

Understanding Process Mining

Process mining techniques leverage event log data to extract insights.

Process mining is a fact-based approach to help discover, monitor, and optimize as-is processes by analyzing process-related information from event logs generated by information systems.



van der Aalst, W.M. (2011) Process mining - Discovery, conformance and enhancement of business processes. Springer, Heidelberg. DOI:10.1007/978-3-642- 19345-3

What is Process Mining?

STEP 1: Extract event logs

User ID | Event | Timestamp | Resource | Resource

User ID	Activity	Timestamp	Application Type	Loan Goal
User_1	A_Create Application	08/01/2016 00:00:00	New credit	Home improvement
User_1	A_Submitted	08/01/2016 00:00:07	New credit	Home improvement
User_1	A_Concept	08/01/2016 00:00:10	New credit	Home improvement
User _19	O_Create Offer	08/01/2016 00:00:11	Limit raise	Car
User_19	O_Created	08/01/2016 00:00:14	Limit raise	Car
User_2	A_Cancelled	08/01/2016 00:00:19	Limit raise	Vacation
User_3	A_Complete	08/01/2016 00:00:21	New credit	Other
User_8	W_Call after offers	08/01/2016 00:00:21	New credit	Business goal

STEP 2: Preprocess and clean the dataset

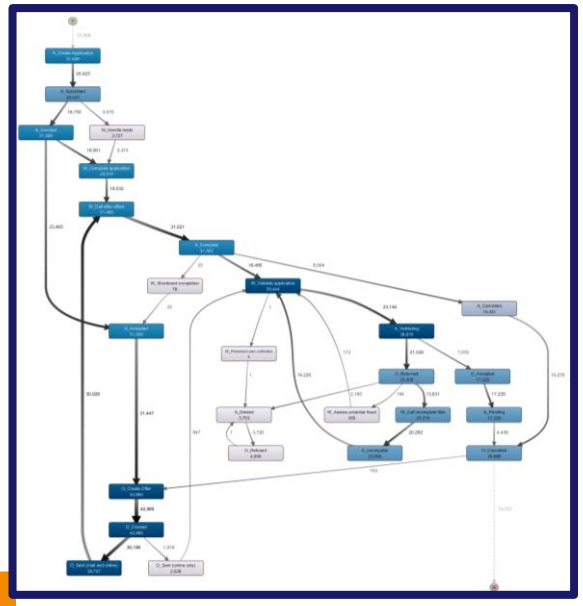
STEP 3: Import the dataset to PM Tools to generate process maps

Discovery

Enhancement

Conformance

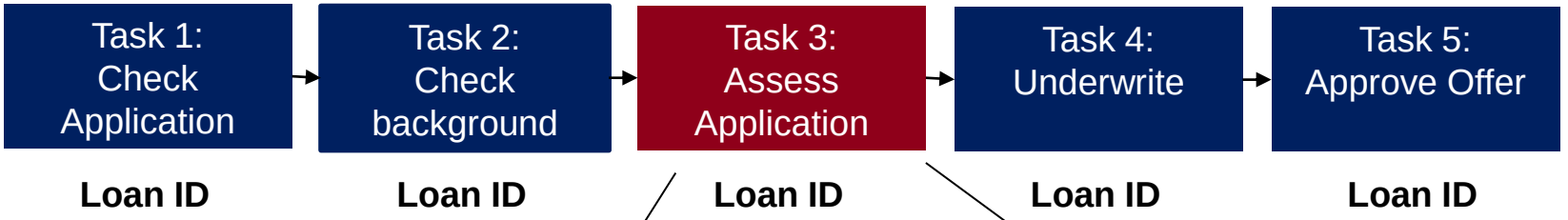
STEP 4: Generate the process model



Why Process Mining?

Processes, Tasks, and User Interactions

Loan origination process instance



Worker's interactions with IT systems

Analyzing Task UI Logs with Process Mining

User Workstations

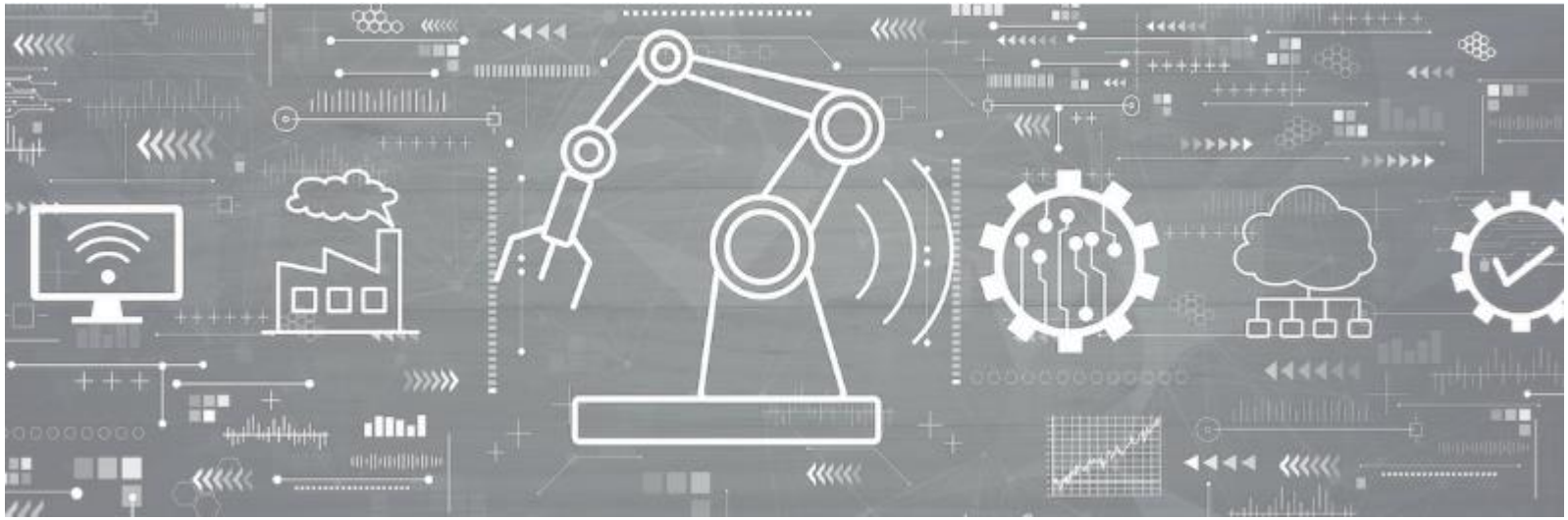
- Task Mining probes are deployed on user workstations to gather user interactions (UI) logs on performed tasks using screenshot and image processing.
- Raw UI data is pushed to a Data Processing Server.

Data Preprocessing Server

- The Task Mining configuration module allows analysts to provide input for data processing for data preprocessing.
- The Task Mining data processing engine pre-processes the raw UI data using the configuration.

Process Mining Tool

- Processed UI logs are fed into the process mining tool.
- This data can be used to discover the underlying routines inside each task, analyze performance and compliance at the sub-task level, analyze worker performance, etc.



3. Introduction to Robotic Process Automation

What is Robotic Process Automation ?

Robotic Process Automation (RPA) is an emerging technology that allows organizations to automate repetitive clerical work by executing scripts (RPA bots) that encode sequences of fine-grained interactions with Web and desktop applications.

RPA robots utilize the user interface and capture data and manipulate applications just like humans do.

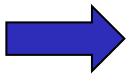
Attended automation
Robots that collaborate with a human worker

Unattended automation
Stand-alone robots that perform workflows

van der Aalst, W. M., Bichler, M. and Heinzl, A. (2018), "Robotic process automation". Business & Information Systems Engineering, 60, pp.269-272. DOI:10.1007/ s12599-018-0542-4

Automatable Task Example

A	B
First Name	Albert
Last Name	Rauf
Date of Birth	11/04/1986
Phone Number	613 999 9999
Email	arauf@gmail.com
Country of Origin	Canada
Address	75 Laurier Ave E, Ottawa, ON K1N 6N5



New Record

Full Name
Albert Rauf

Country of Origin
Canada

Date of Birth
11-04-1996

Email
arauf@gmail.com

Phone
613-999-9999

City
Ottawa

Street
75 Laurier Ave E

Province
ON

Postal Code
K1N 6N5

Country
Canada

Submit

Why Robotic Process Automation?

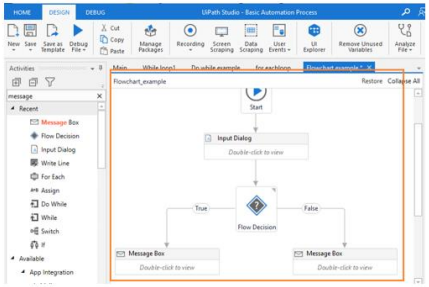
- Error rates reduction
- Cycle time reduction
- Flow standardization (consistency)
- Cost efficiency

Processes best-suited for RPA

- Repetitive
- Rule-based
- Structured

How to conduct an RPA Project ?

1) Determine which routines are good candidates to be automated
2) Model the selected routines in the form of flowchart diagrams that define the behavior of a software robot
3) Develop each modeled routine by generating the software code required to enact the associated software robot on a target computer system
4) Deploy the software robots in their environment to perform their actions
5) Maintain the routines over time to eventually enhance their behavior



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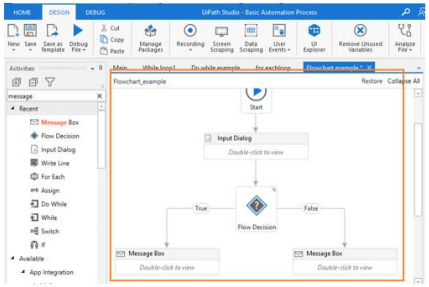
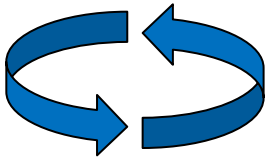
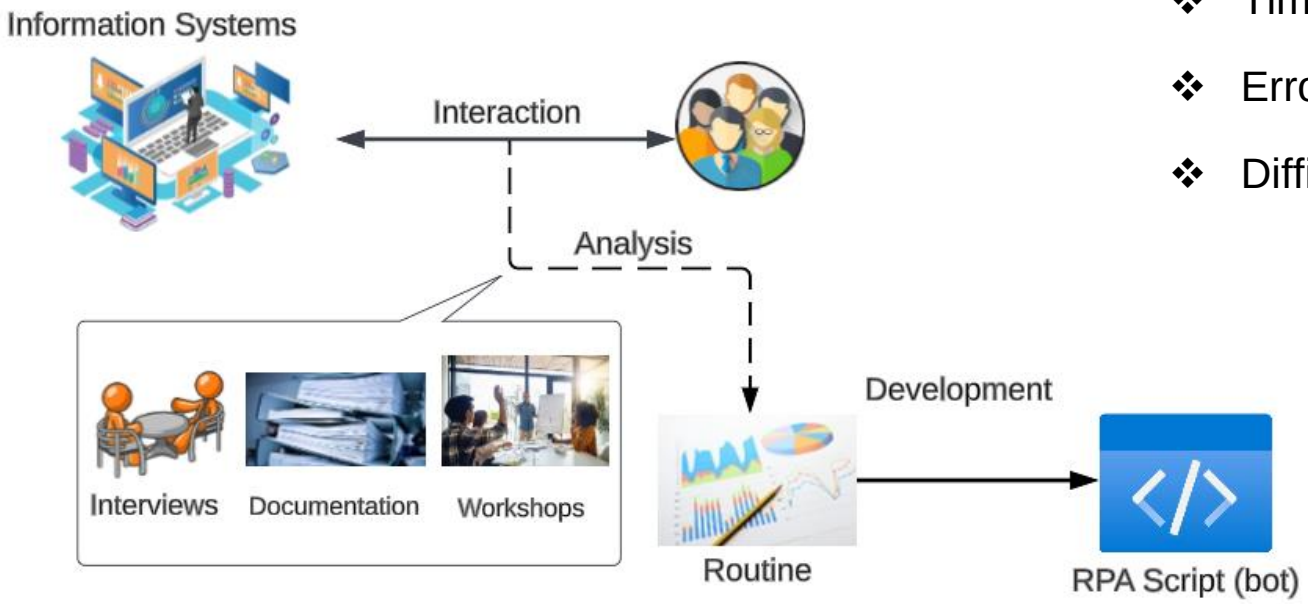




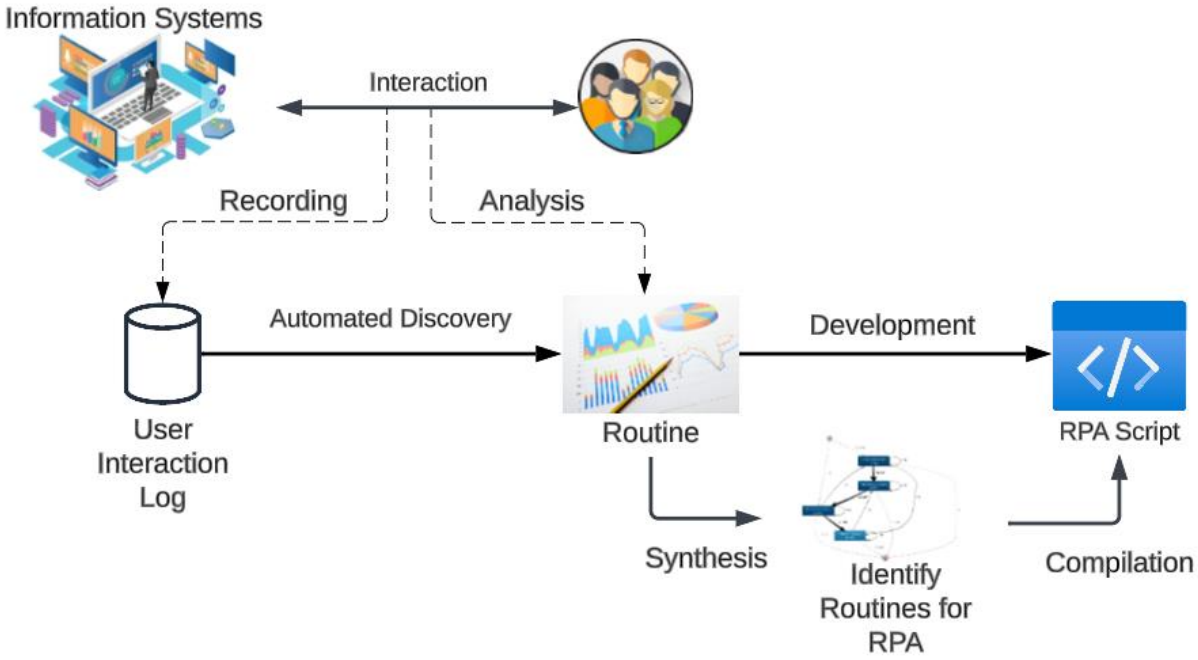
Trial-and-error approach repeated until success (often time consuming and error-prone).

Classical RPA Analysis and Development



- Time-consuming
- Error-prone
- Difficult to maintain

RPA with Process Mining



- ✓ Data-driven
- ✓ Objective
- ✓ Shortened time-frames

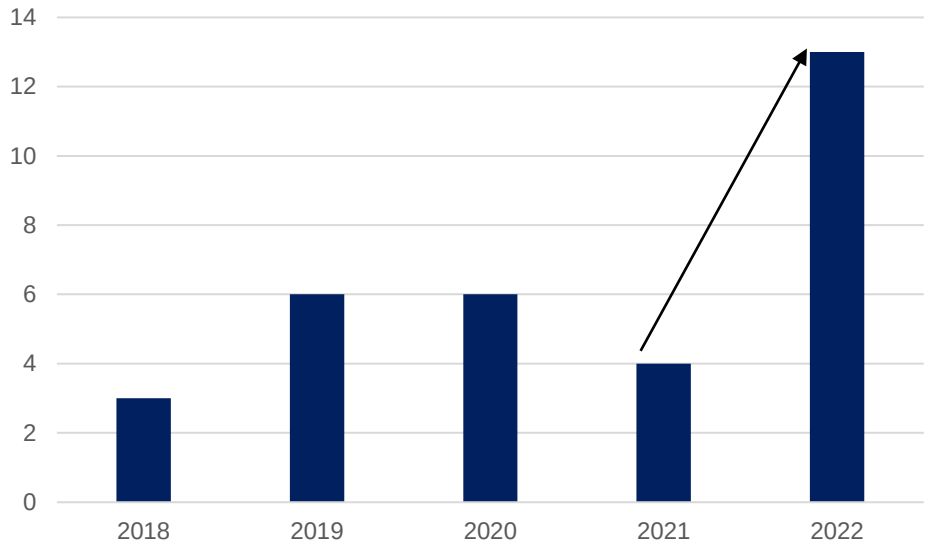
4. Research Questions, Methodology, and Proposed Method

Research Questions

- **RQ1:** How are process mining techniques applied to accelerate and improve robotic process automation implementations?
- **RQ2:** Which tools are used to apply both process mining and robotic process automation in an integrated way?
- **RQ3:** What are the challenges encountered when combining process mining with robotic process automation?

("process mining" OR "process discovery")
AND
("robotic process automat*" OR "intelligent process automat*" OR RPA OR "segmentat*" OR "UI log*" OR "user inter* log*" OR "task mining")

Significant Increase in Publications in Last Year



There is a steady increase in the number of publication in this domain, especially in 2022, which indicates a raining interest in combined use of process mining and RPA.

Systematic Literature Review Analysis

Techniques and Algorithms

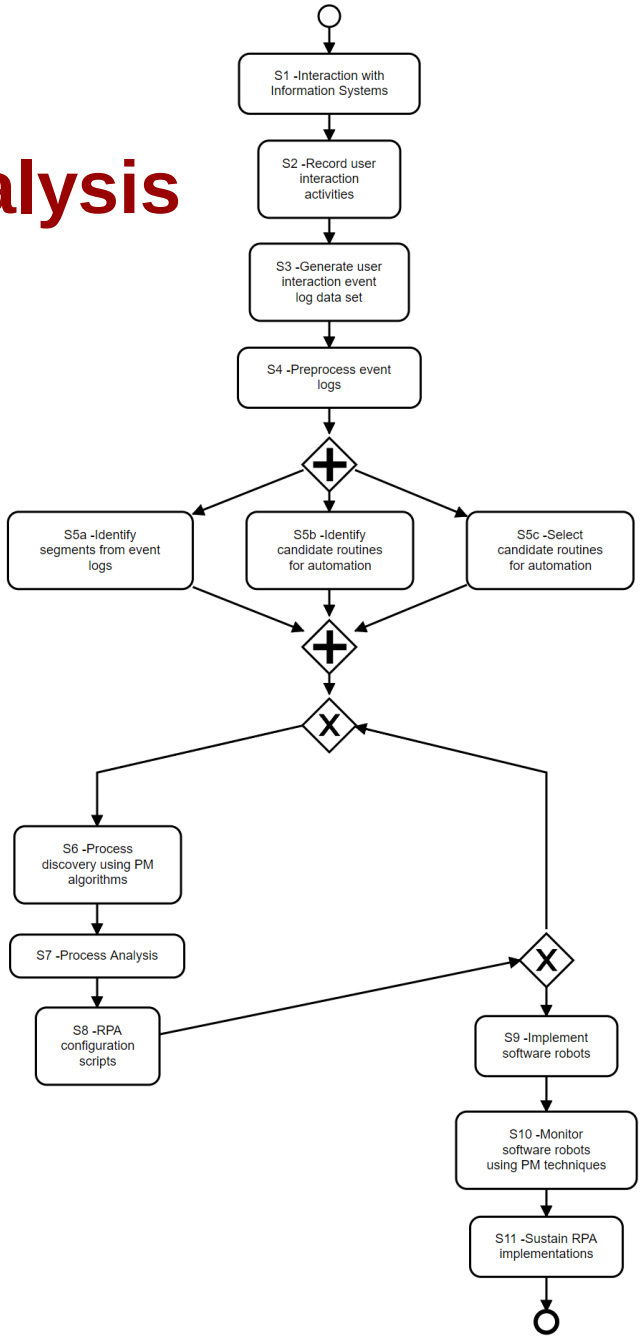
- Collecting interactions with information systems
- Recording activities and gathering event logs
- Preprocessing event logs
- Process discovery and analysis
- RPA configuration and sustainability
- PM and RPA from Start to End

Tools

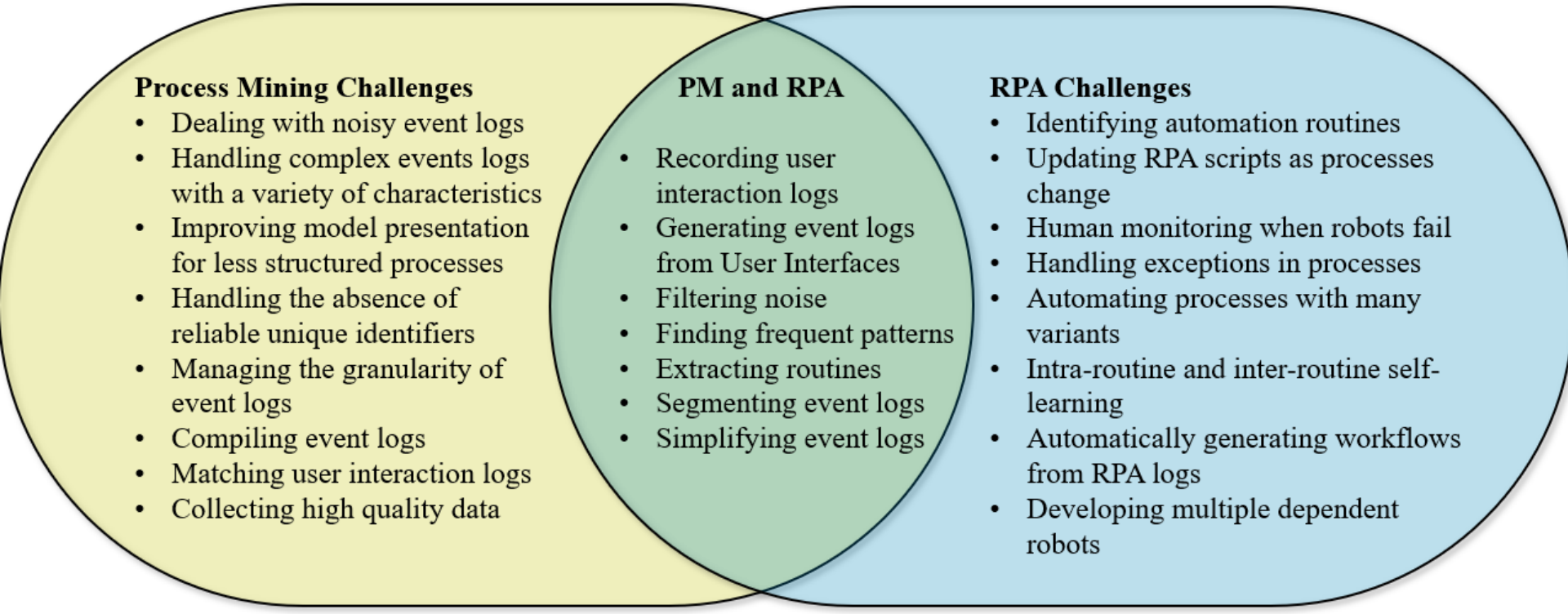
- Open-source tools: ProM , Apromore
- Commercial tools: Celonis, UiPath Process Mining, Disco

Challenges

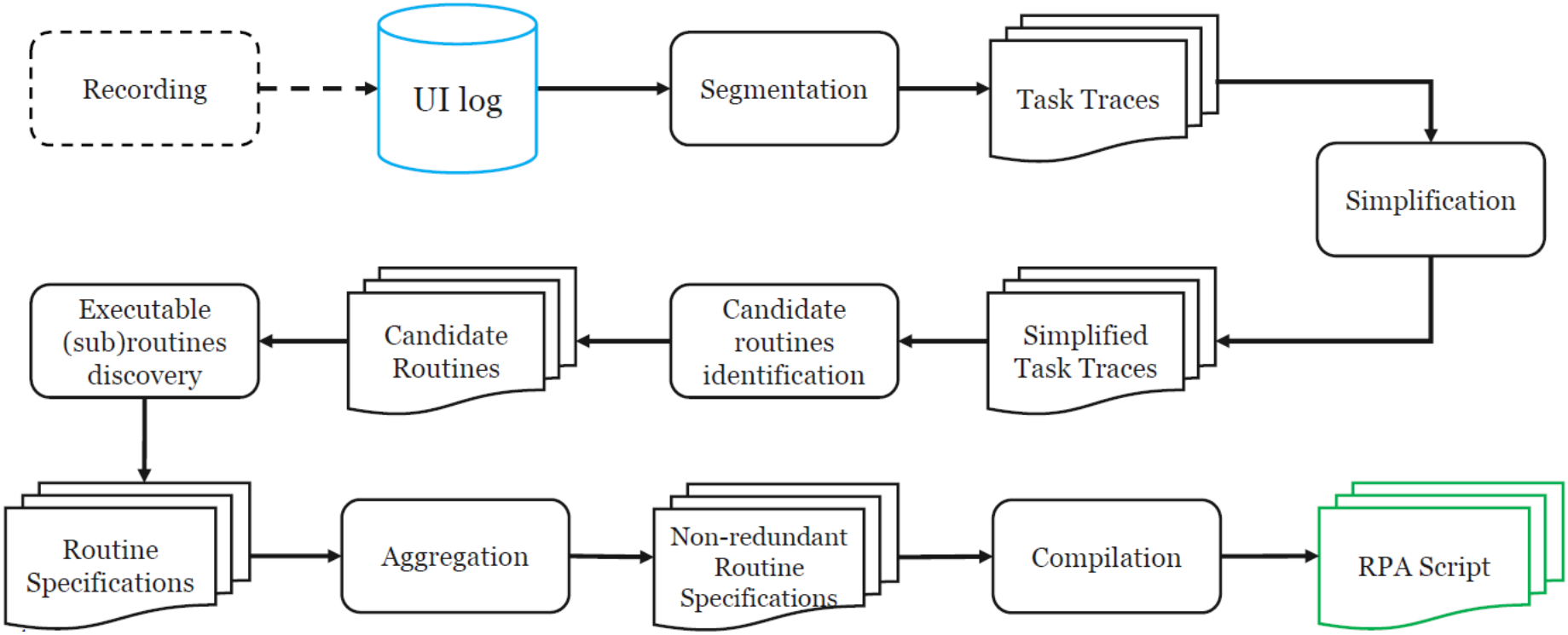
- Process mining challenges
- Robotic process automation challenges
- Intersection of process mining and robotic process mining challenges



Process Mining and RPA Challenges

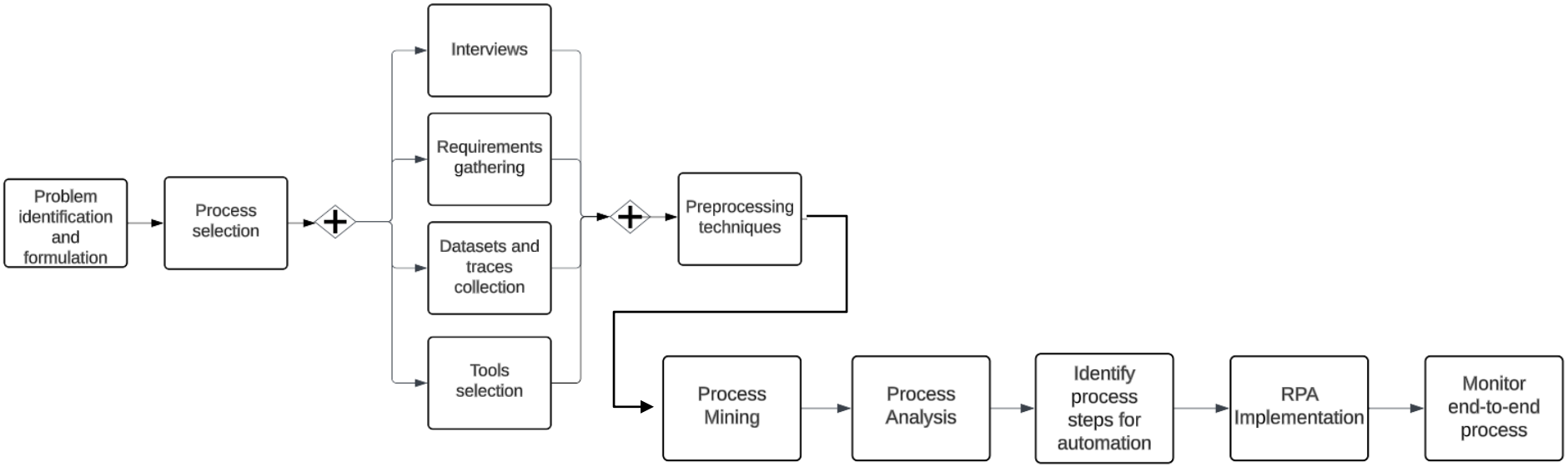


Robotic Process Mining



Leno, V., Polyvyanyy, A., Dumas, M., La Rosa, M., & Maggi, F. M. (2021). Robotic process mining: vision and challenges. Business & Information Systems Engineering, 63(3), 301-314.

Proposed Method (Work in Progress)



Evaluation plan consists of a case study (or more). The plan is to collaborate with an industry partner.

Process Mining is a Key Enabler for RPA

Process mining and RPA technologies are becoming a key element of digital transformation efforts.

Provides in-depth look and end-to-end perspective needed to improve processes and make sure automations deliver results

Helps improve processes before automating them to get the maximum benefit

Identifies the most valuable, impactful places to implement automation

Continuously monitors automation performance and ROI

Helps build an automation program on facts, data, and ongoing measurement

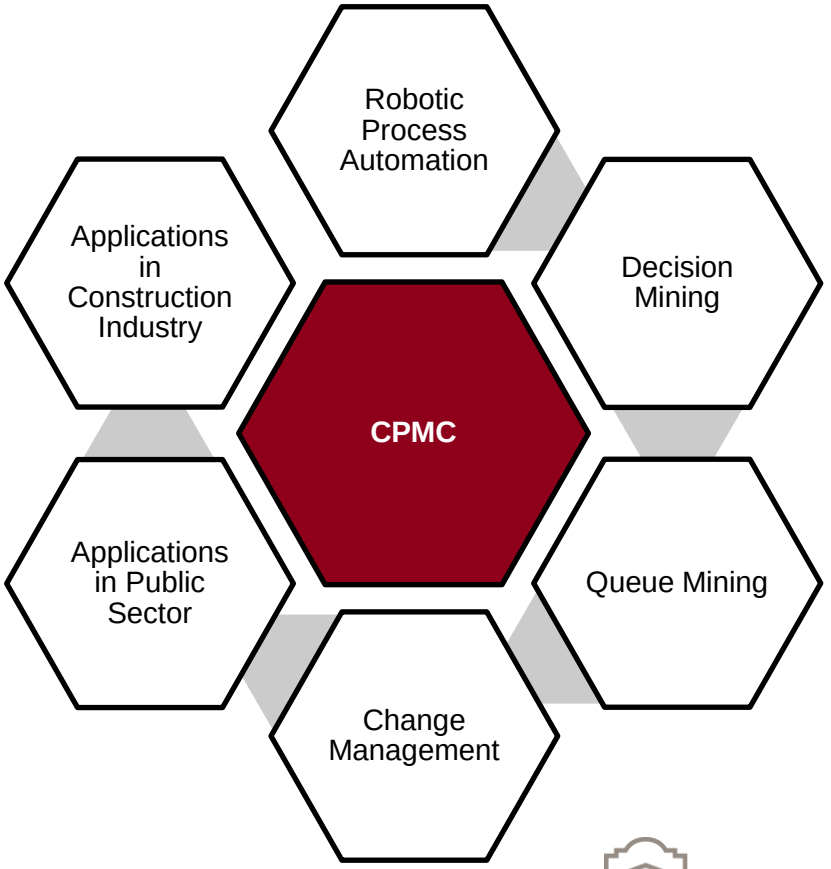
Links business rules with automation assessment which drives better outcomes

5. Canadian Process Mining Community

Canadian Process Mining Community

Brings together professors, students, and researchers in the field of process mining.

- University of Ottawa
- York University
- University of Toronto
- Concordia University
- McGill University
- Memorial University of Newfoundland



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You can join our LinkedIn group: **Canadian Process Mining Community**.

Thank You !

LinkedIn: Najah El-Gharib
Email: nelgh031@uottawa.ca