



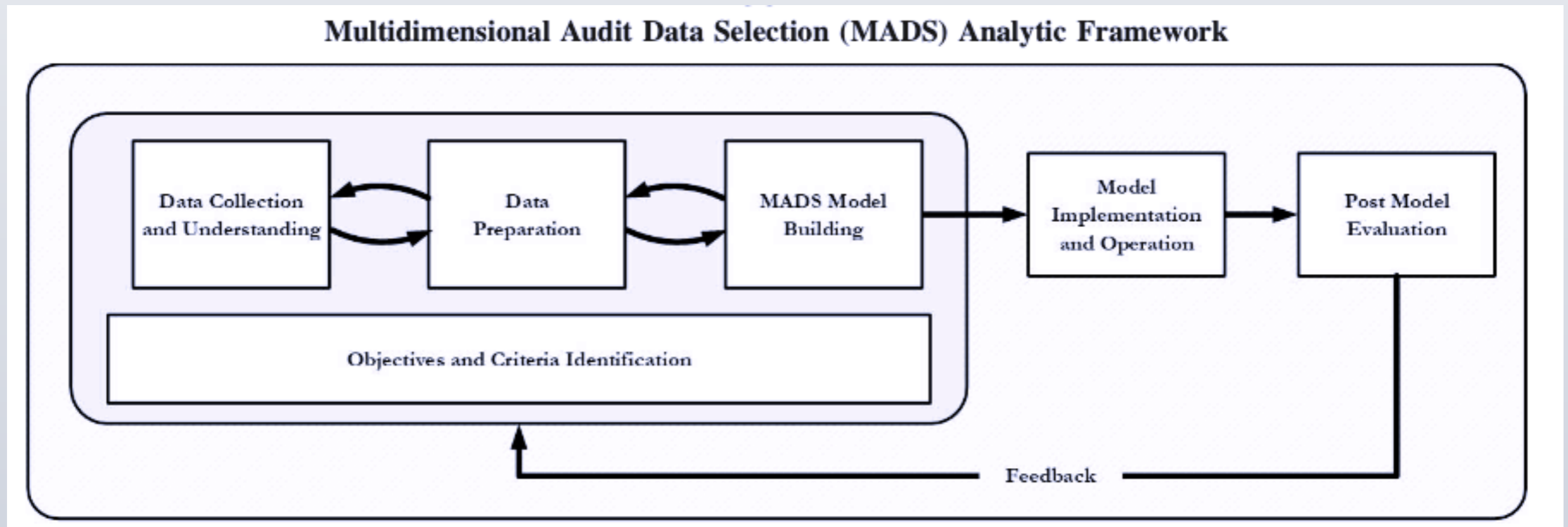
CAN LOW RISK GO LOWER

A Multidimensional Audit Data Selection (MADS)
Case Study on Hospital Payroll Cycle

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RESEARCH BACKGROUND

LITERATURE REVIEW - MADS METHODOLOGY



Multidimensional audit data selection (MADS) approach (No et. al, 2019)

Allow the auditor to focus on the more problematic items when performing substantive tests

TRADITIONAL AUDIT
SAMPLE PROJECTION



FULL POPULATION TESTING

RESEARCH BACKGROUND

RESEARCH QUESTION

Is MADS applicable to the payroll cycle audit?

1. What are the **motivations** for Hospital to implement MADS?
2. How to design MADS model?
What **attributes** & What **methods**
3. Would applying MADS make auditing the payroll cycle more **effective** and/or **efficient**?

RESEARCH BACKGROUND

LITERATURE REVIEW - PAST CASE STUDIES

- Application of the Multidimensional Audit Data Selection Framework: Payroll Process (Tojiboyev et. al, 2019)

MADS model development for external audit

Received feedback from AICPA regarding the reasonability and practicality

- Designing CA/CM to fit not-for-profit organizations (Appelbaum et. al, 2016)

The adoption of continuous monitoring supports the NFPs with reporting requirements.

Incremental contribution

- Methodology Practicability & Model Design:

Focus on internal audit and a more complex payroll cycle

- A new internal audit approach:

Improve internal control and operation process

RESEARCH BACKGROUND

AUDIT DATA DESCRIPTION

HOSPITAL SIZE

\$700 Million Total Income

\$500 Million Employee Expenses

DATASET DESCRIPTION

1 Million Pay Detail Records

7,000 Employees

300 Wage Types

Timesheet

SAP

Oracle

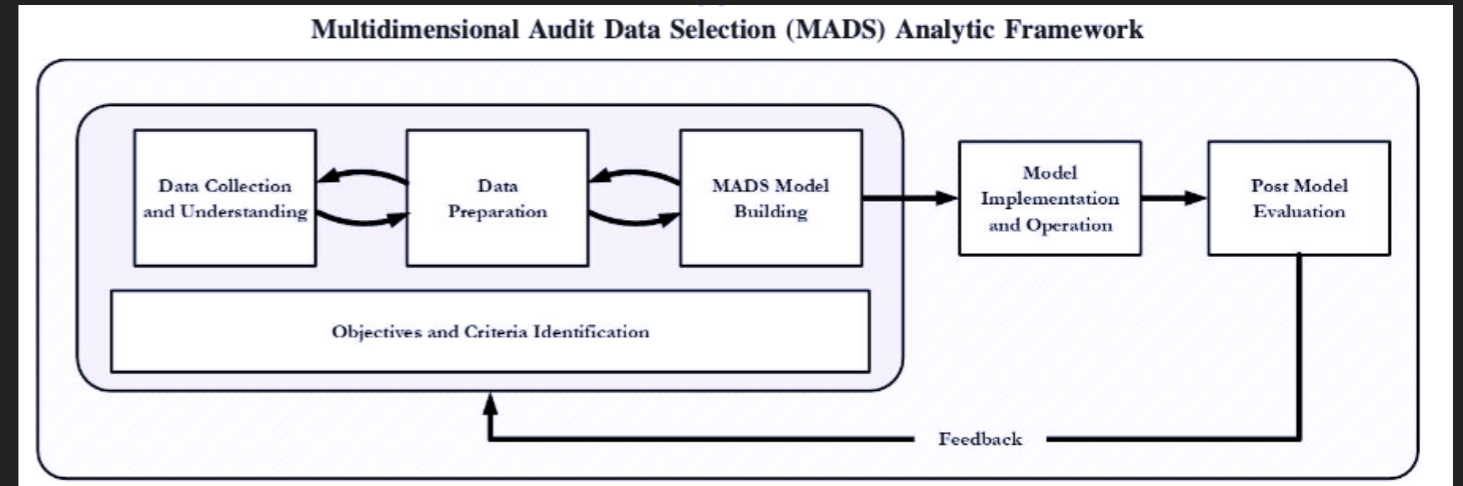
Management Input

BIG RISK? MANAGER'S INCENTIVES

- Paying employees in Australia is complex as it is highly regulated.
 - Payroll process complexity
- Continuous monitoring at granular level

STEP 1,2 RISK ASSESSMENT & TEST OF CONTROLS

Employee Subgroup	Full Time
WkHrs	80
Wage typeID	11
Wage Type	M/F Basic Rate
Amount	68754.4
Curr.	AUD5
Total	68754.4
PArea	H
Start date.1	05.02.2020
End date	31.12.9999



Huang et al. (2018)

- **Control** - Commencement documents are kept and authorized.
- **5 samples** - Audit is satisfied that payroll processes & controls around operating as expected.
- **Randomly selected samples & Small sample size**

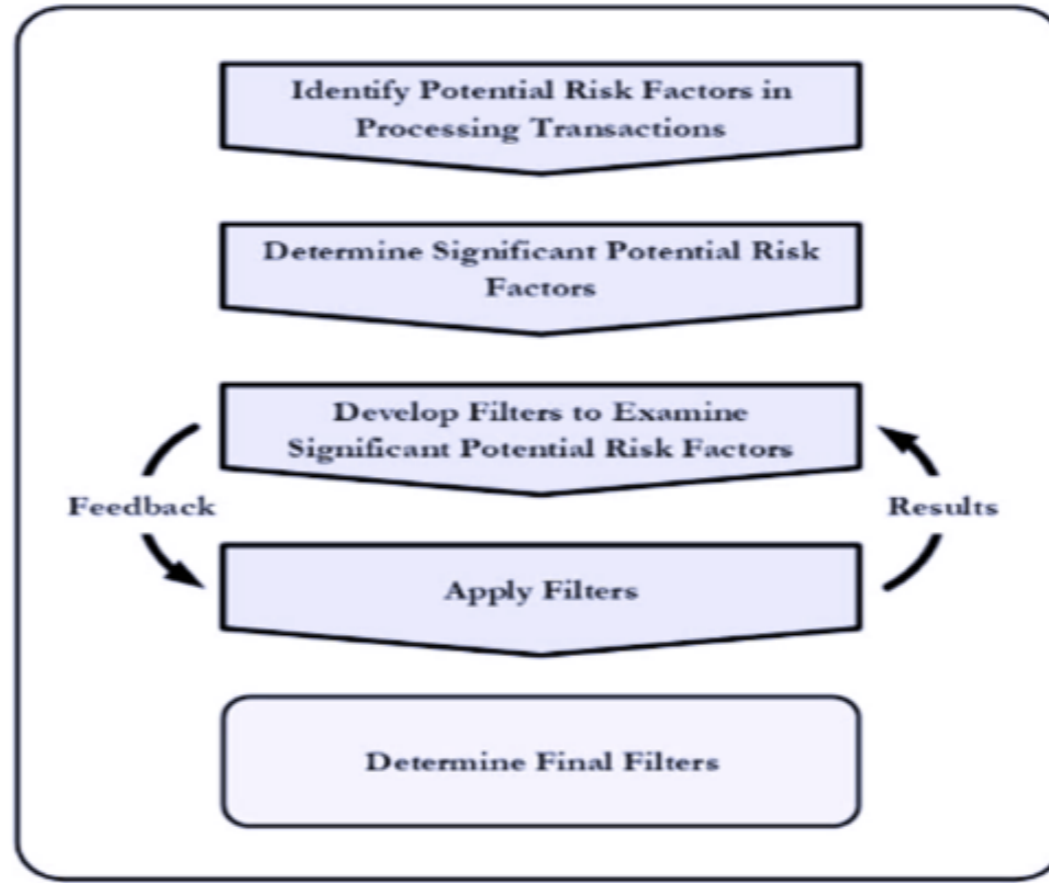
STEP 1,2 DATA COLLECTION & SYSTEM UNDERSTANDING

- Not limited to **Controls** - Payroll calculation rules, policies, recording of W&S
- In-depth understanding of the payroll data input, transformation, output, and integration across systems
- **Potential risk factors** in the payroll cycle identified

STEP 3 DATA ANALYTICS FILTERING

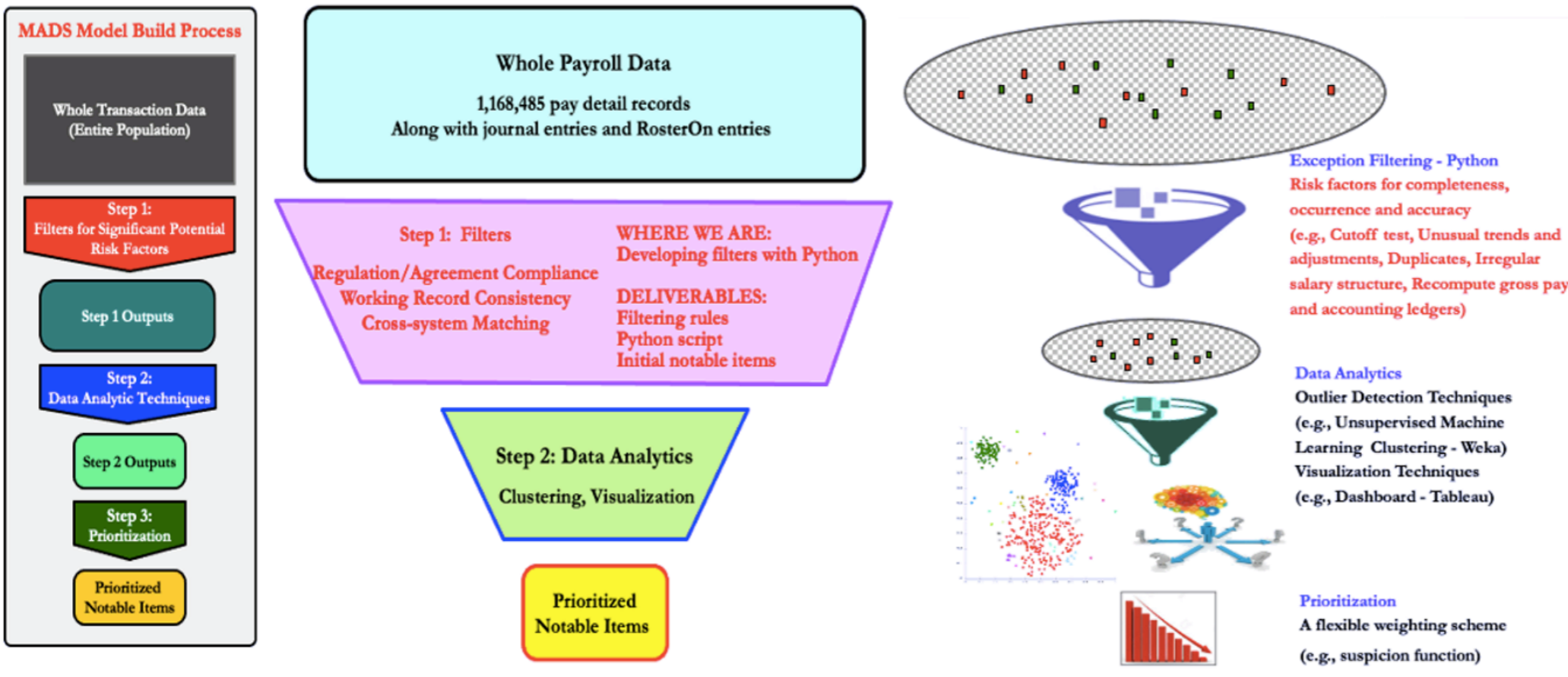
Filter development
(i.e. identify characteristics of risky transactions)

Step 1 of the MADS Model Building Process



Feedback & Refinement

Huang et al. (2018)



- *Timing*
- *Amount*
- *Matching*
- *Compliance*
- *Trend*
- *Structure*
- *Classification*

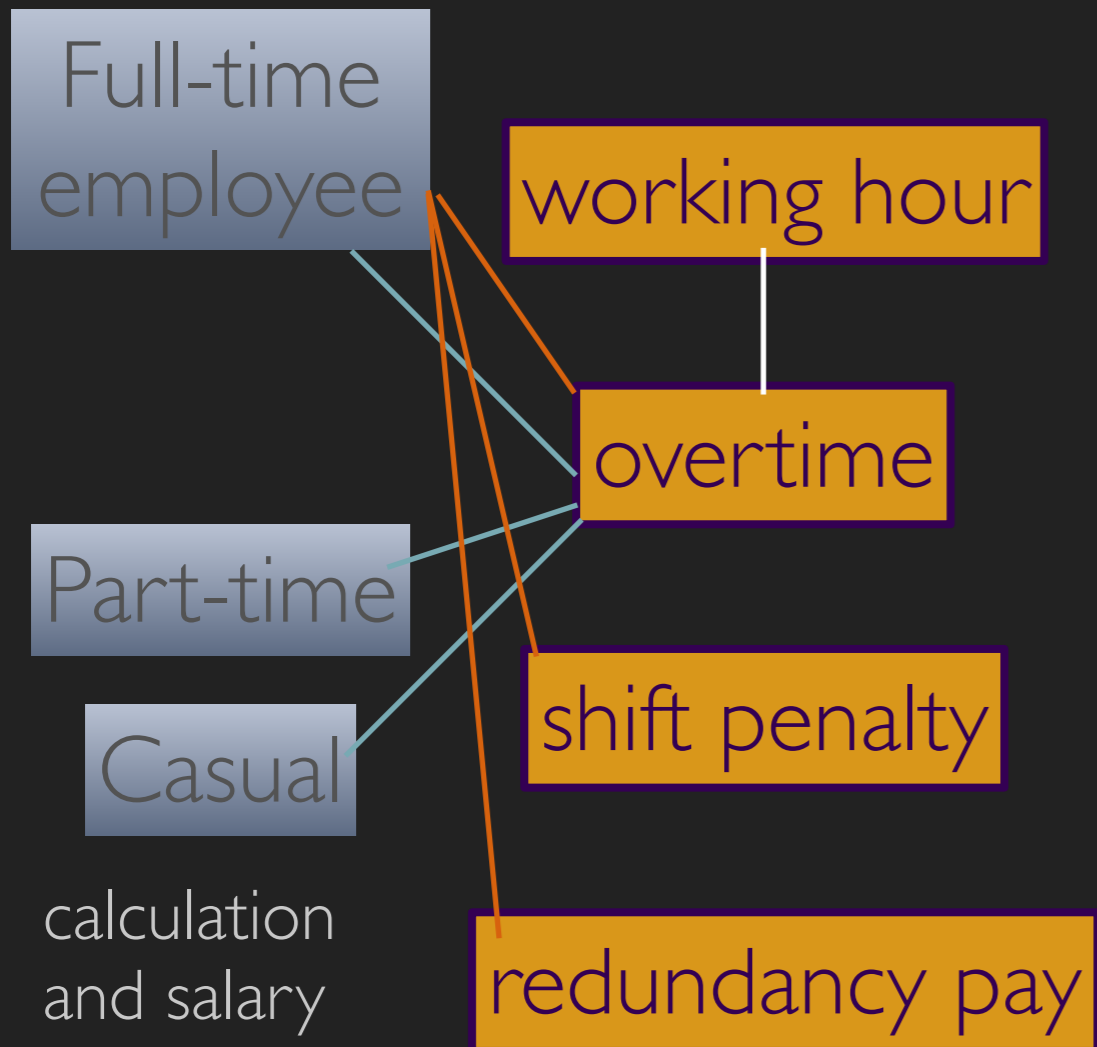
ATTRIBUTE DESIGN

Field Name	Field Description	data type	Example
Pernr	Employee_Code	string	760
W/Type	Wage type code	string	517
Act CstCtre	Actual Coster center code	string	A3102
Rate	Pay rate per hour	float	29.57631
Number	Number of working hours	float	1
Amount	Total amount	float	29.58
WkHrs	Contracted working hours	float	24
Leaving	End working date	date	19.12.1998
salary_structure	Salary structure for one period	dictionary	{'ordinary hour':1774.58, 'Night Shift':69.60}
date_equal	Difference in timesheet period & entry period	integer	26
Prev_annual	previous annual leave	date	19.12.1998

- Support filtering
- Support unsupervised machine learning

STEP 3 DATA ANALYTICS FILTERING

GROSS PAY



- calculation and salary structure
- contracted working hour
 - Benefits

- calculation base
- time base
 - occasion base
 - agreement base

TRENDS & ADJUSTMENTS

Category	Potential risk factors	Filters
Unusual trends & Adjustments	Working record with no proof and not authorized	difference in timesheet period & entry period ≥ 3
	SAP look-back not identified	sum of amount > first round of positive amount
	Wage type structure	amount > $3*SD$ (derived from same pay scale last period) other pay% > $3*SD$, Entropy

- Management input
- Our initial findings in the data collecting stage
- Auditor's opinion

Flexible decision boundaries



STEP 3 DATA ANALYTICS: UNSUPERVISED MACHINE LEARNING

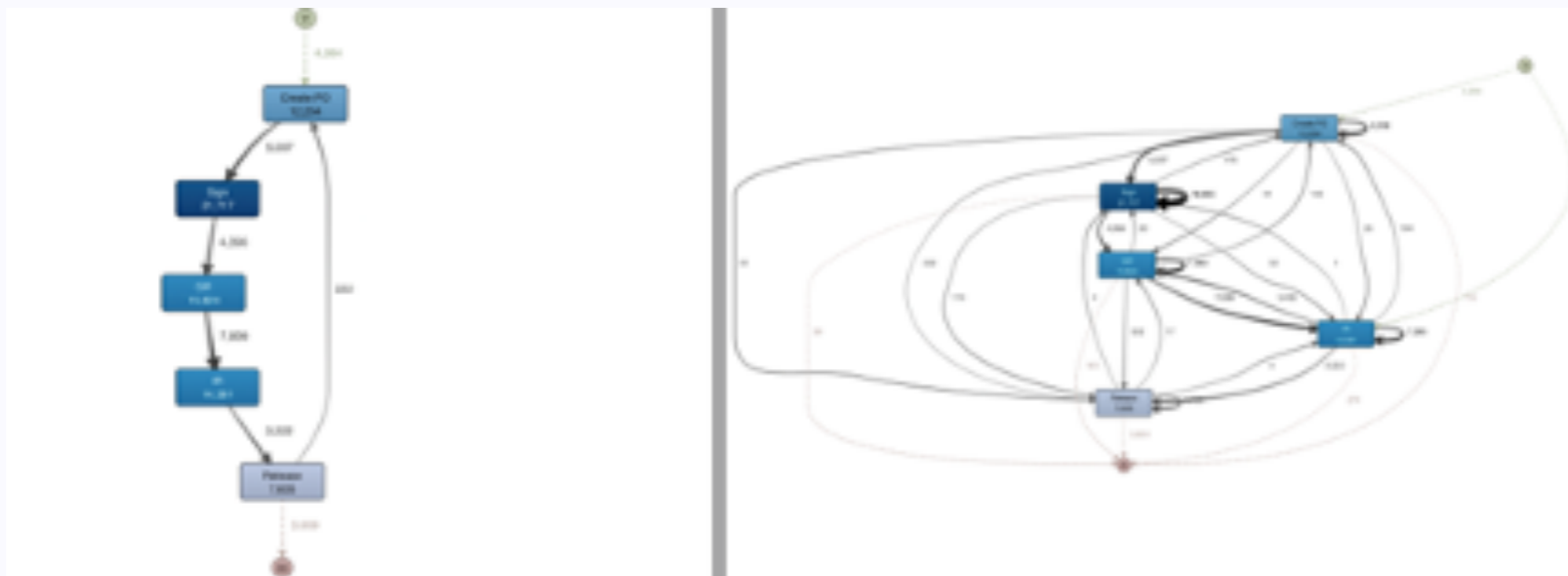
Filters Applicable
*ghost employees,
payments to
terminated employees,
rates in the systems
not matching what
was authorized*

MI Applicable
*salary structure,
base compensation
structure,
penalty ,
benefit provision*

*Errors (or fraud) identified have a common feature - Clustering
Error is 'one-off' anomaly - Anomaly Detection*

Future work

- Data analytic tool development and refinement
- Generating the prioritized risky records for the internal auditors
- Field testing and model evaluation
- ***Process mining: gather further insights into the positives and negatives of the current approach***
- ***Contract analysis and visualization (Dashboard)***



THANK

YOU

NEXT:

*“AUDIT WITH MACHINE LEARNING: APPLYING
AN UNSUPERVISED ALGORITHM ON GENERAL
LEDGERS OF AN AUSTRALIAN BANK”
BY DANYANG WEI*