

# PROCESS MINING : REVIEW AND CASE STUDY

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*Choice and preference  
analysis for quality  
improvement and seminar  
on experimentation*

*Centro Studi*

*Process Development & Applied Research*

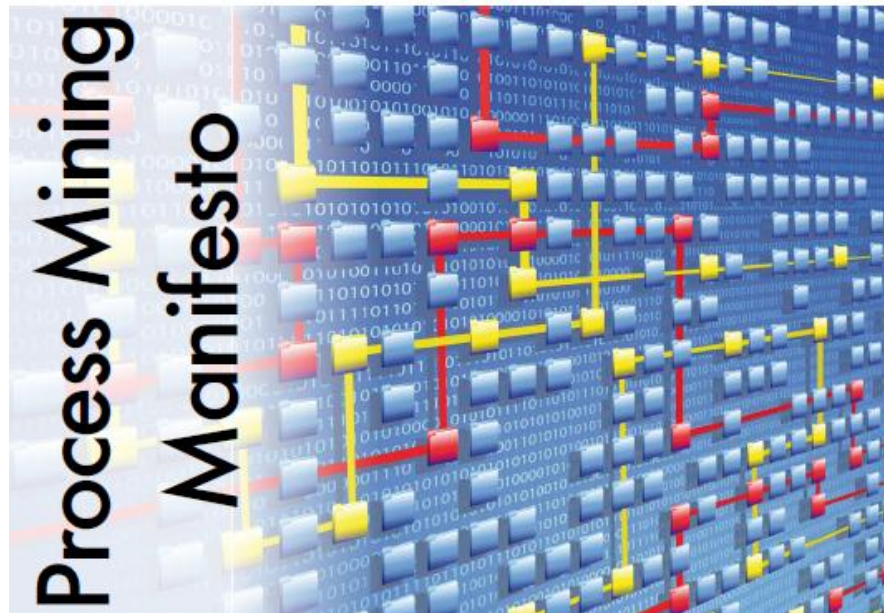
 **gruppo orizzonti holding**



10/07/2015 - BARI

# PROCESS MINING

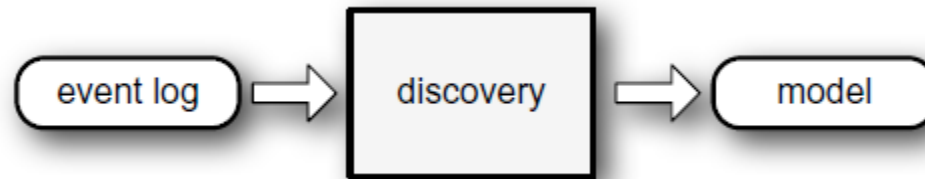
PROCESS MINING is as a research “to discover, monitor and improve real process (i.e., not assumed processes) by extracting knowledge from event logs readily available in today’s system” [W. van der Aalst]



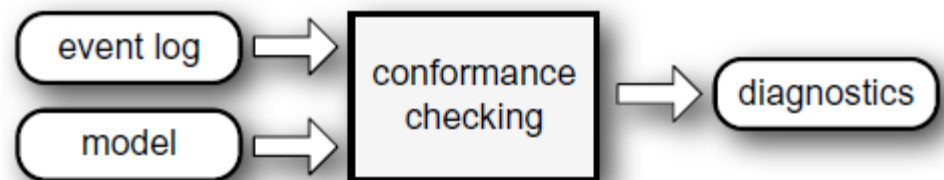
# PROCESS MINING STEPS

Process mining aims to

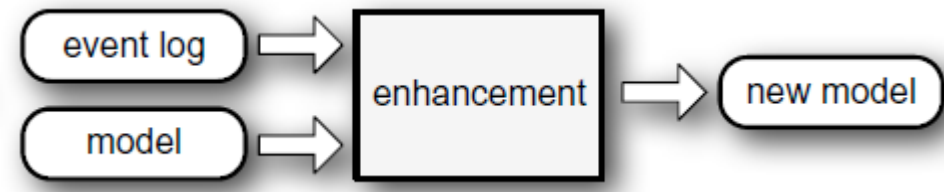
[W. van der Aalst]



Design a Process Model (Discovery Mining)



Identify the differences between a real process and a model (Conformance Checking)



Extend and improve the devised process model (Enhancement)

# STATE OF THE ART

## Big Data meets Process Mining: Implementing the Alpha Algorithm with Map-Reduce

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### Process Mining Can Be Applied to Software Too!

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### Legal Aspects of Process Mining 07/01/2014

Łukasz Czynienik and Zbigniew Paszkiewicz

### Application of Mining Algorithms using ProM and Weka Tools

<sup>1</sup>Saravanan. M.S, <sup>2</sup>Dr. Rama Sree .R.J

### The Proposition of a Framework for Semantic Process Mining

Yong-xin Liao<sup>1,a\*</sup>, Eduardo Rocha Loures<sup>1,2,b</sup>, Eduardo Alves Portela Santos<sup>1,c</sup>  
and Osiris Canciglieri Junior<sup>1,d</sup>



# SCOPE OF THE WORK

This work shows the potentiality of Process Mining about data retrieval on Enterprise Resource Planning (ERP) Systems (e.g. Microsoft Dynamics NAV).

# MICROSOFT DYNAMIC NAV



Immagini del NAV di Sudelettra

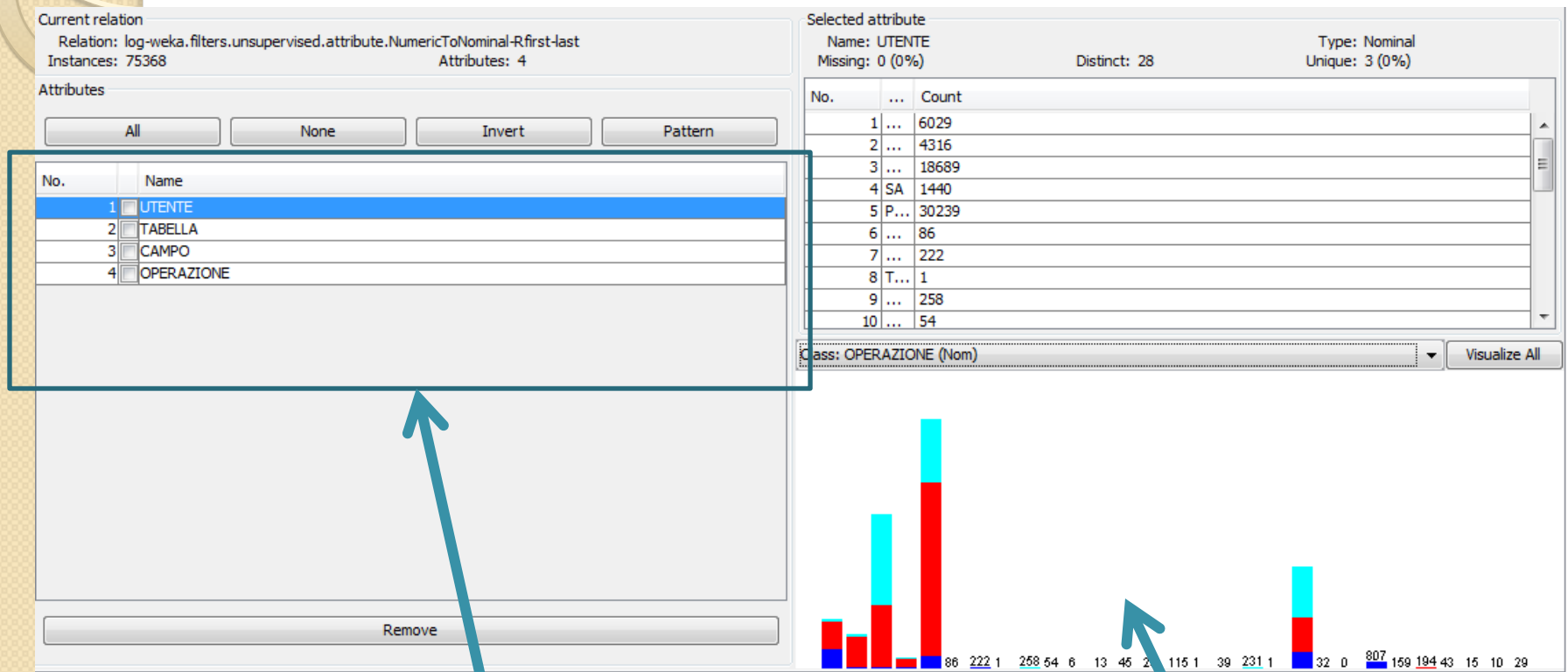
# TOOLS FOR PROCESS MINING

For data retrieval from log, data mining tools can be useful to knowledge discovery

- Weka
- ProM
- RStudio



# EXAMPLE OF PROCESS MINING



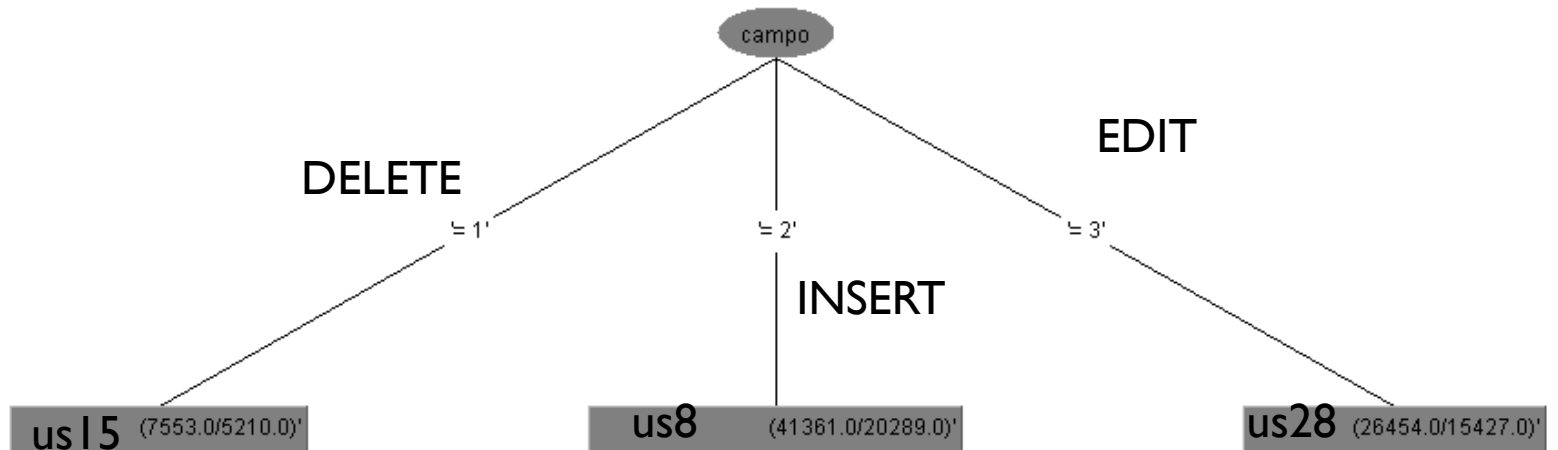
Attributi del Database

Distribuzione dei valori di un campo  
rispetto ad un altro



# EXAMPLE OF PROCESS MINING

TREE EXTRACTION on the relation USER/OPERATION



# EXAMPLE OF PROCESS MINING

## TREE EXTRACTION on the relation USER/TABLE/OPERATION

J48 pruned tree

```
-----  
  
OPERAZIONE = 1  
|   TABELLA = 76058: UTENTE100 (50.0/25.0)  
|   TABELLA != 76058  
|   |   TABELLA = 76057: UTENTE101 (50.0/35.0)  
|   |   TABELLA != 76057  
|   |   |   TABELLA = 169: UTENTE102 (2521.0/1468.0)  
|   |   |   TABELLA != 169  
|   |   |   |   TABELLA = 203: UTENTE102 (1187.0/464.0)  
|   |   |   |   TABELLA != 203  
|   |   |   |   |   TABELLA = 210: UTENTE107 (3205.0/1679.0)  
|   |   |   |   |   TABELLA != 210: UTENTE108 (540.0/281.0)  
OPERAZIONE != 1  
|   OPERAZIONE = 2  
|   |   TABELLA = 76058: UTENTE103 (514.0/398.0)  
|   |   TABELLA != 76058  
|   |   |   TABELLA = 50024: SA (229.0/4.0)  
|   |   |   TABELLA != 50024  
|   |   |   |   TABELLA = 50023: SA (36.0/3.0)  
|   |   |   |   TABELLA != 50023  
|   |   |   |   |   TABELLA = 76052: SA (5.0)  
|   |   |   |   |   TABELLA != 76052  
|   |   |   |   |   |   TABELLA = 210: UTENTE107 (15.0)  
|   |   |   |   |   |   TABELLA != 210: UTENTE108 (40562.0/19490.0)  
|   OPERAZIONE != 2  
|   |   TABELLA = 70503: UTENTE104 (25804.0/14777.0)  
|   |   TABELLA != 70503  
|   |   |   TABELLA = 167: UTENTE102 (9.0/1.0)  
|   |   |   TABELLA != 167  
|   |   |   |   TABELLA = 210: SA (90.0)  
|   |   |   |   TABELLA != 210  
|   |   |   |   |   TABELLA = 50024: SA (82.0/37.0)  
|   |   |   |   |   TABELLA != 50024
```

# CASE OF STUDY :

## Maintenance Extinguishers process

### SCENARIO



PARCO CLIENTI



DISPOSITIVI ANTINCENDIO



PARCO MACCHINE DISPONIBILI

AUTOMEZZO (TIPO,CARBURANTE,CAPACITA')



—RISORSE UMANE DISPONIBILI

*G. Gaudiano  
M. Colucci  
T. Minerva*

# DISCOVERY MINING

- From Eugenio/PassPartout -> LOG
- Questionary -> t
- On real case

# DISCOVERED MODEL

$$T = \sum_i^n (o_i \times t_i) + 0,16\varphi_1 + 0,66\varphi_2 + 0,33\varphi_3 + 0,2\varphi_4 + 0,16\varphi_5 + 0,16\varphi_6$$

$o_i$  tipologia di operazione

KIND OF OPERATION

$t_i$  tempo per la tipologia di operazione

NUMBER OF CLIENTS

$\varphi_1$  penalità rappresentata dal numero di clienti serviti nella giornata

NUMBER OF CITIES

$\varphi_2$  penalità rappresentata dal numero di città diverse attraversate durante la giornata (considerando una penalità per il trasferimento da sede operativa alla città di Matera)

TRAFFIC

$\varphi_3$  penalità rappresentata dal meteo del periodo ( 1 per maltempo, 0 in caso di buon tempo)

PARK AVAILABILITY

$\varphi_4$  penalità rappresentata dal traffico (da 0 a 2 a seconda delle dimensioni delle città attraversate)

WEATHER

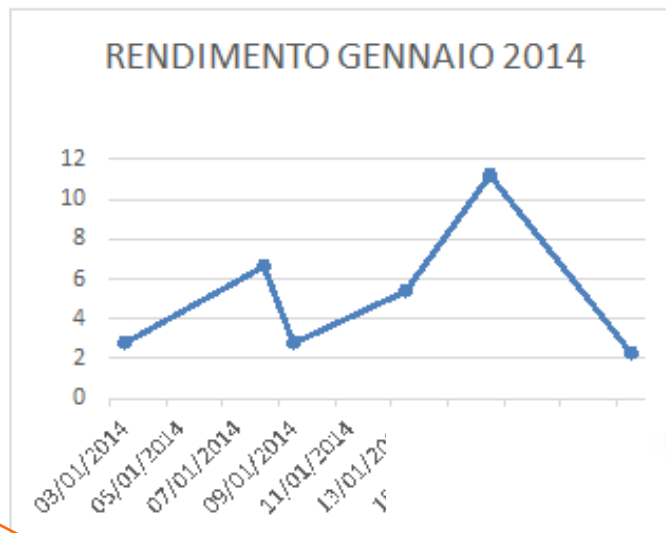
$\varphi_5$  penalità rappresentata dalla difficoltà nel trovare parcheggio (da 0 a 2 a seconda della difficoltà)

TIME FOR  
CONSULTING  
AND  
SELLING

$\varphi_6$  penalità rappresentata dal tempo impiegato nell'erogazione di attività di consulenza e vendita

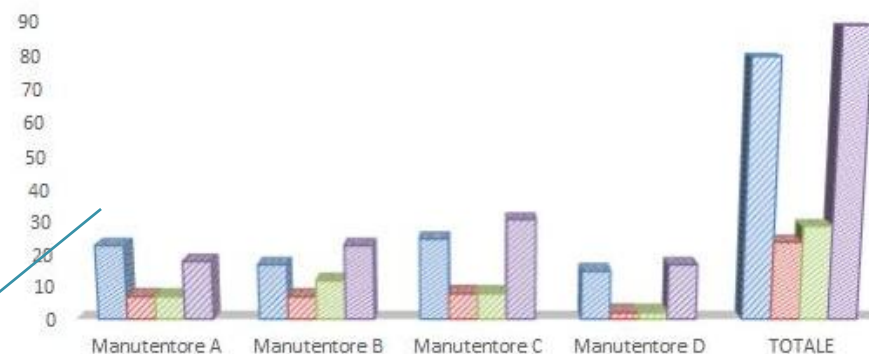
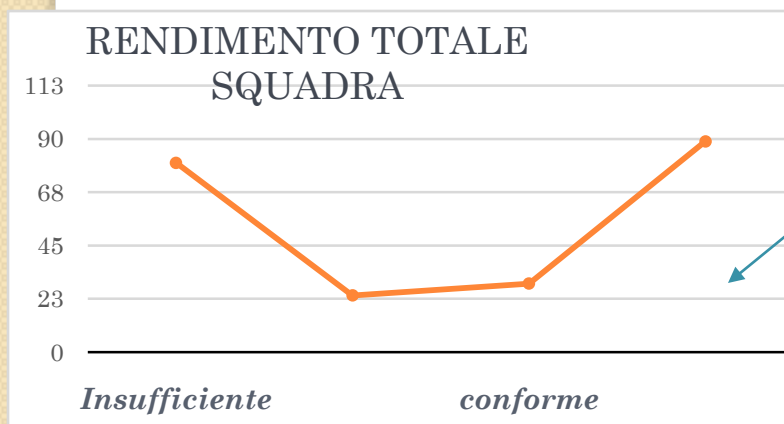
# CONFORMANCE CHECKING

| DATA       | RENDIMENTO |
|------------|------------|
| 03/01/2014 | 2,76       |
| 08/01/2014 | 6,64       |
| 09/01/2014 | 2,79       |
| 13/01/2014 | 5,39       |
| 16/01/2014 | 11,21      |
| 21/01/2014 | 2,25       |



TOTALE SQUADRA

INSUFFICIENTE MEDIOCRE CONFORME ECCELENTE



# ENHANCEMENT

“U” distribution can be due to:

- PDL Overload
- Underestimation of work plans given by the coordinator
- Wrong PDL



# REFERENCES

For more information  
and dataset visit



- [http://www.researchgate.net/profile/Maria\\_Dalessandro2](http://www.researchgate.net/profile/Maria_Dalessandro2)
- [http://www.researchgate.net/publication/278685290\\_PROCESS\\_MINING\\_REVIEW\\_AND\\_CASE\\_STUDY](http://www.researchgate.net/publication/278685290_PROCESS_MINING_REVIEW_AND_CASE_STUDY)