Foundations of Data Science & Analytics: Course Overview

Ezgi Siir Kibris

Introduction to Data Mining, 2nd Edition
by
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Instructor

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- Office hours:

Monday/Wednesday: 12:00 pm-1:00 pm

Friday: 12:00 am-1:00 pm and 3:00-4:00pm

Zoom: https://rit.zoom.us/j/8189920424

Github

- Syllabus
- Assignments
- Slides

https://github.com/ezgisiir/fds

Assignment 0

- Create a Github account
- Write it to Google sheet

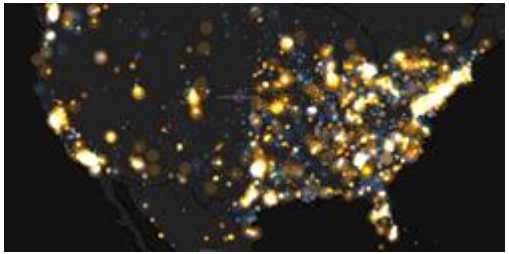
Data Mining is Everywhere

Cyber Security

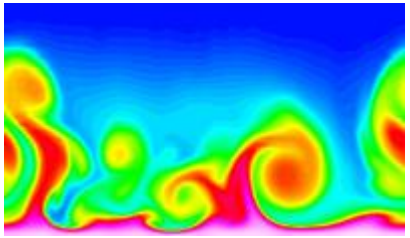
Traffic Patterns

Sensor Networks

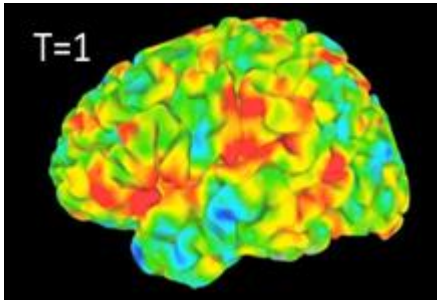
E-Commerce



Social Networking: Twitter



Computational Simulations



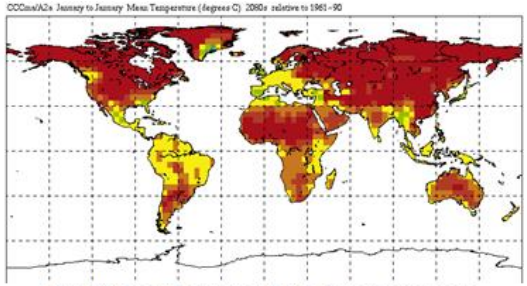
Brain Activity

Behind the Trend (Why?)

- Lots of data is being collected and warehoused
  - Yahoo has Peta Bytes of web data
  - Facebook has billions of active users
  - Amazon handles millions of visits/day
- Computers have become cheaper and more powerful

Great Opportunity

Improving health care and reducing costs



Predicting the impact of climate change

Finding alternative/ green energy sources

Reducing hunger and poverty by increasing agriculture production

Optimizing the development of software

What

What is data mining?

What is NOT Data Mining?

- Look up phone number in phone directory
- Query a Web search engine for information about “Amazon”

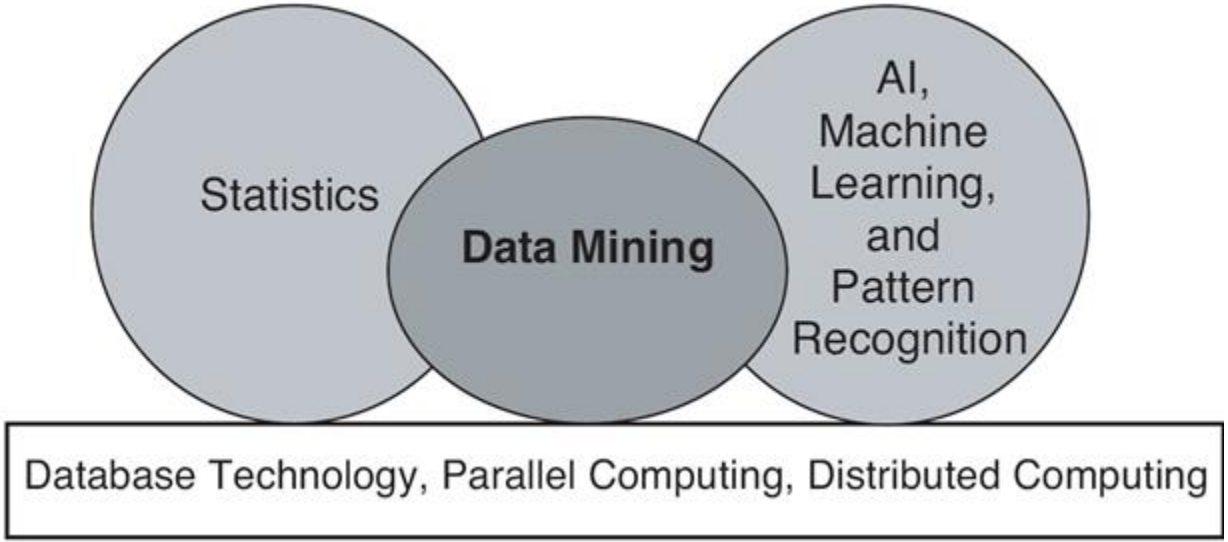
What is Data Mining?

- Certain names are more prevalent in certain US locations (O’Brien, O’Rourke, O’Reilly… in Boston area)
- Predict whether user want information on Amazon rainforest or Amazon.com when searching for “Amazon”

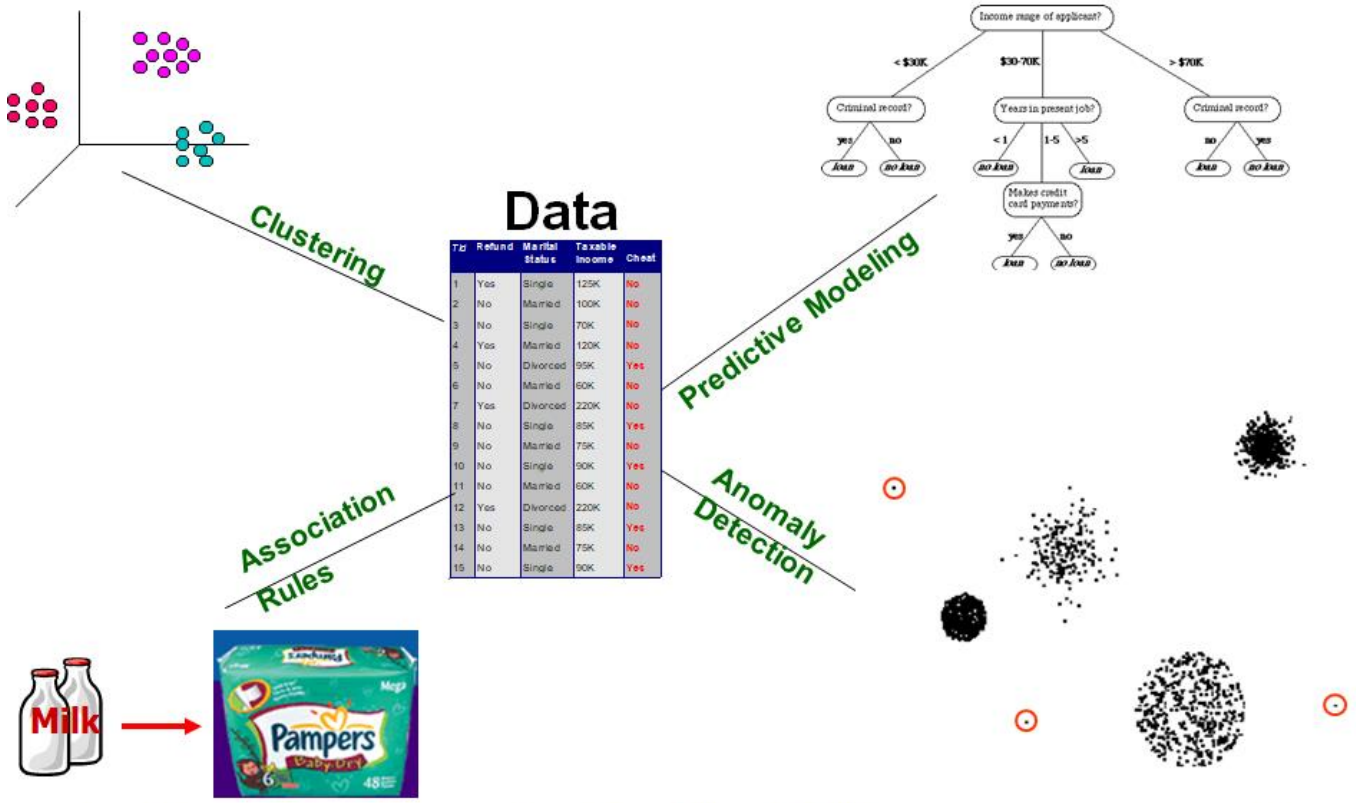
Origin of Data Mining

Especially for data:

- Large-scale
- High dimensional
- Complex
- Distributed



Tasks


Clustering
Data
Predictive Modeling
Association Rules
Anomaly Detection
Milk
Pampers
Income range of applicant?
< $30K
$30-70K
> $70K
Criminal record?
Years in present job?
Criminal record?
Makes credit card payments?
Tid
Refund
Marital Status
Taxable Income
Cheat
1 Yes Single 125K No
2 No Married 100K No
3 No Single 70K No
4 Yes Married 120K No
5 No Divorced 95K Yes
6 No Married 60K No
7 Yes Divorced 220K No
8 No Single 85K Yes
9 No Married 75K No
10 No Single 90K Yes
11 No Married 60K No
12 Yes Divorced 220K No
13 No Single 85K Yes
14 No Married 75K No
15 No Single 90K Yes

Predictive Modeling (supervised learning)

Independent Variable (Input)

Dependent Variable (Output)

Train:

Cat

Dog

Predict:

?

Predictive Modeling

	Output
Classification:	Classes / Categories
Regression:	Continuous Values

Predictive Modeling: Classification

Image Classification

Cat
Dog
Bird
Pig
Lion
...

Predictive Modeling: Classification

Sentiment Analysis (NLP)

You have been working on this for months.
I need to see your results, now!

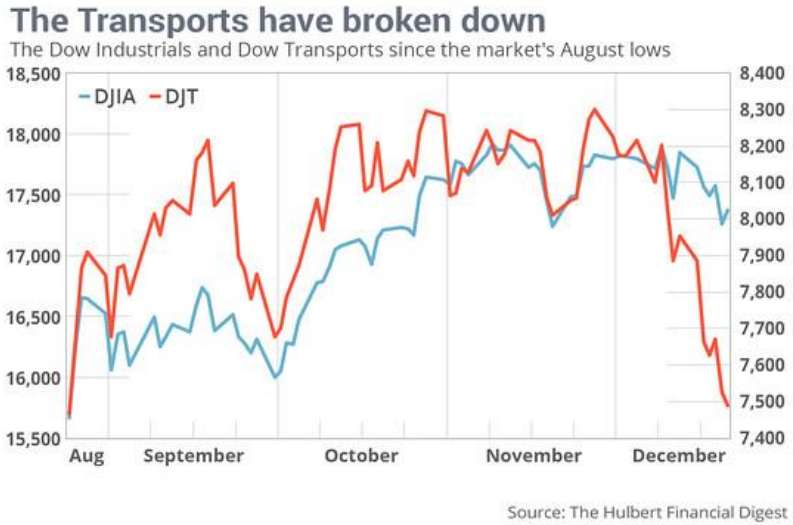
Positive

Neutral

Negative

Predictive Modeling: Regression

Time Series Analysis



What will DJIA and DJT be in January?

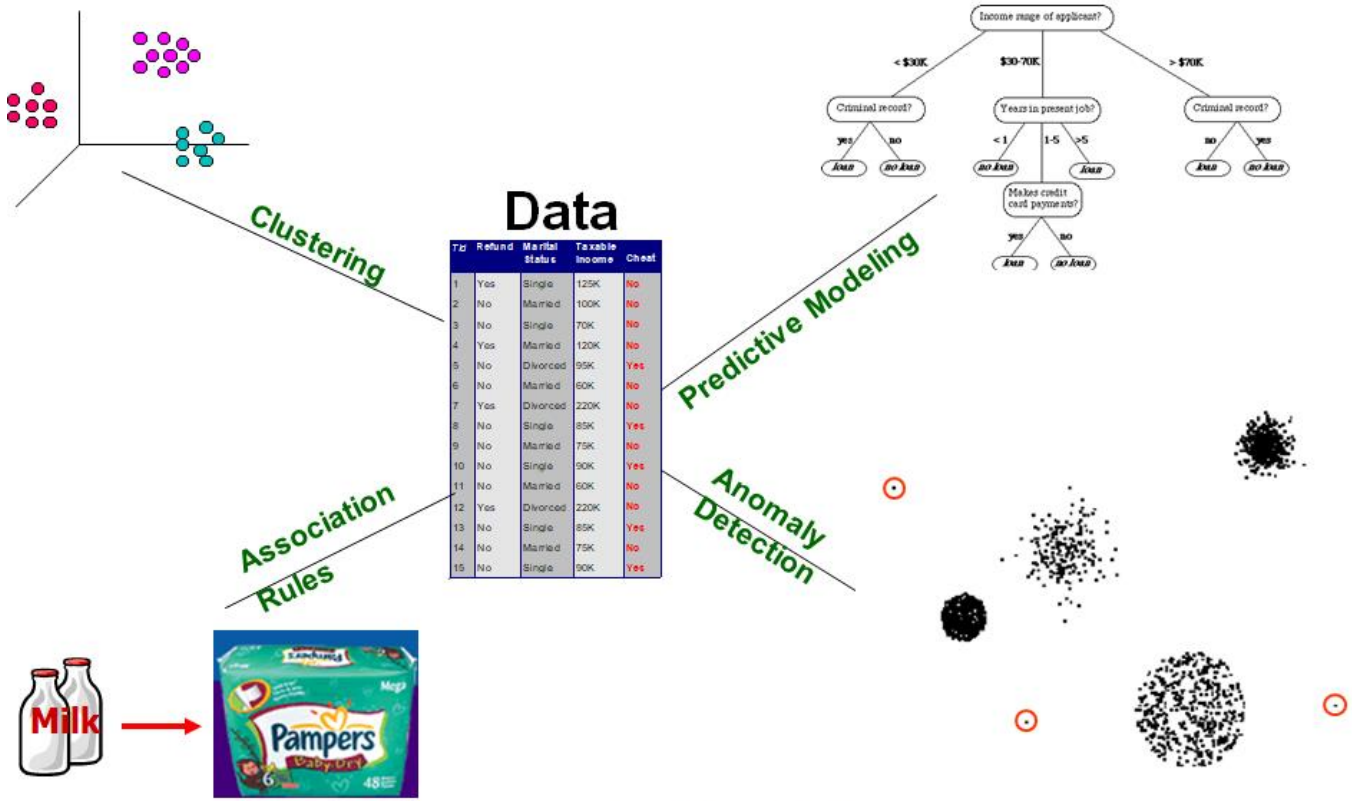
Predictive Modeling: Regression

ID	Name	Gender	GRE	Coding
001	Emily Wang	F	320	Yes
002	James Bond	M	320	Yes

Discrimination Problem?

Grade in DSCI-633

Tasks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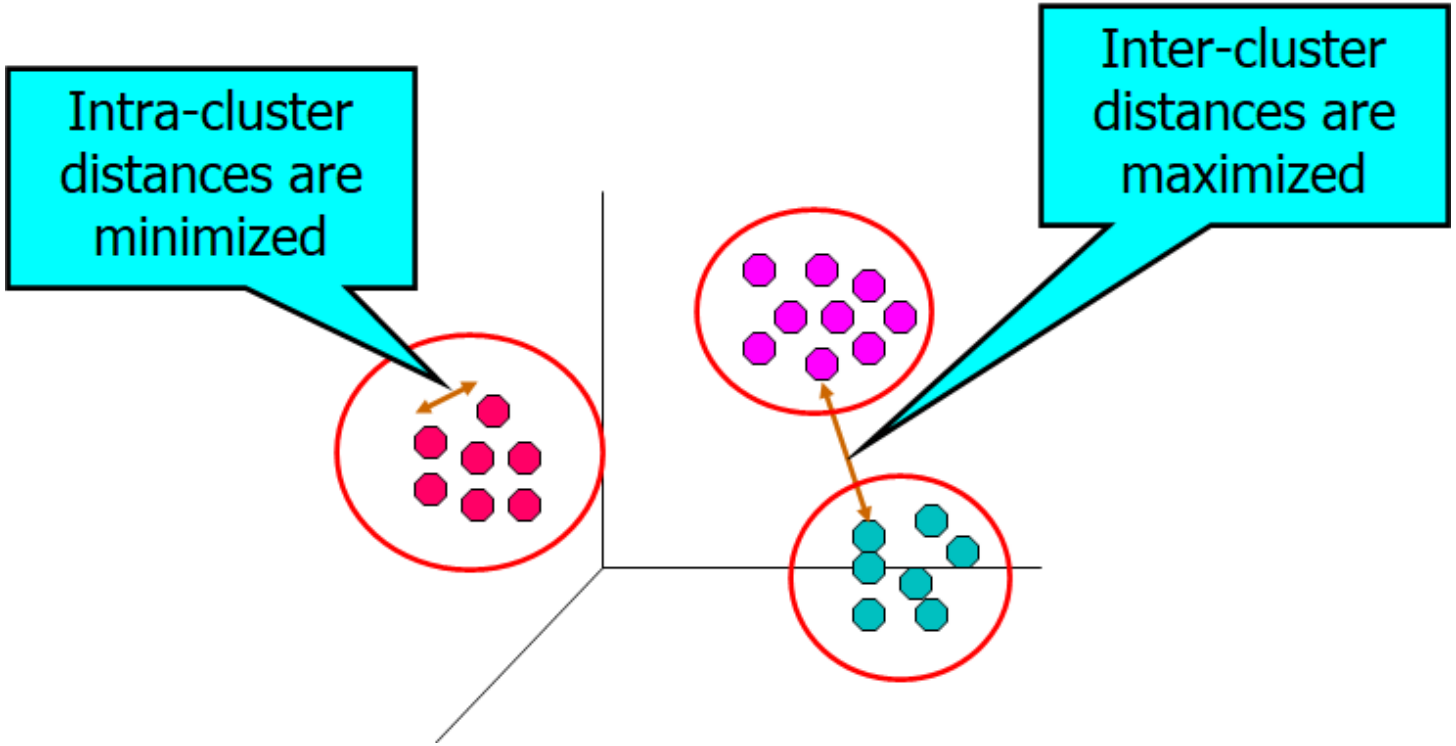
Clustering (unsupervised learning)

Independent Variable

Clustering (unsupervised learning)

Independent Variable

Clustering (objectives)



Clustering (applications)

User ID	Titanic	Die Hard	Avatar
001	Yes	Yes	No
002	Yes	No	Yes

Groups of users that like similar movies

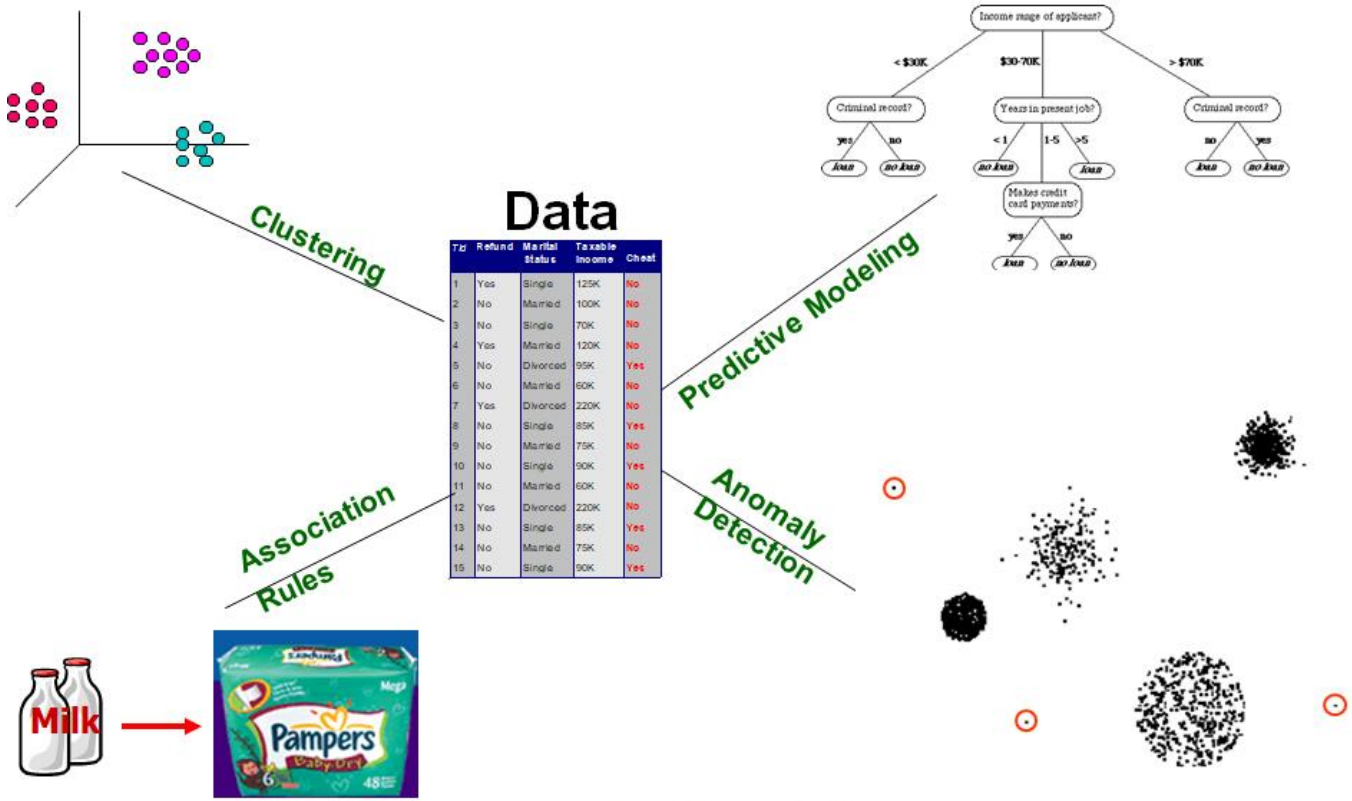
Clustering (applications)

Topic Modeling

Area soccer players earn all-state selections.

Sports	Politics	News	Movie
0.4	0.18	0.4	0.02

Tasks



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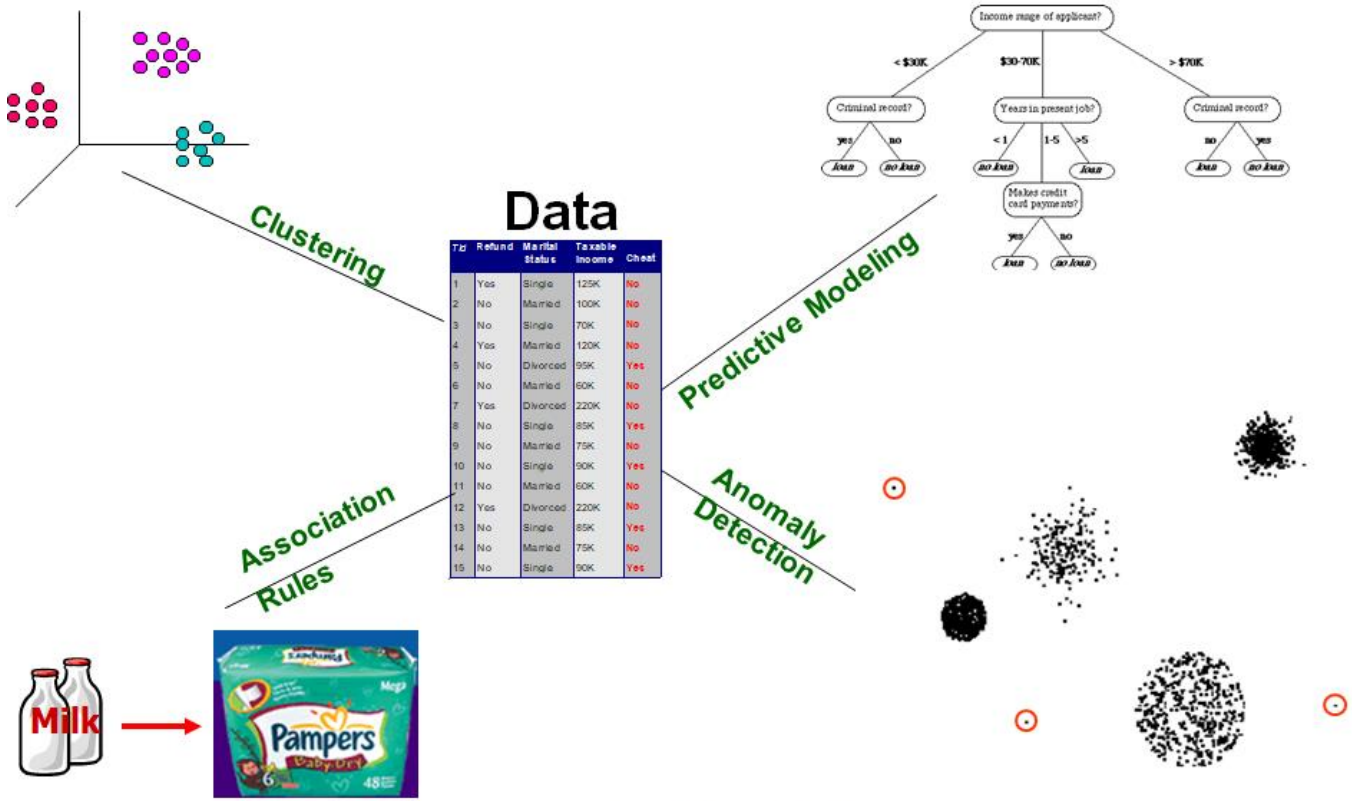
Association Rule Mining

User ID	Titanic	Die Hard	Avatar
001	Yes	Yes	Yes
002	Yes	No	Yes

People who watched Titanic will also watch Avatar

Tasks



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Anomaly Detection

Purchase	11/03/2019	11/13/2019	11/23/2019	12/03/2019	12/04/2019
001	Titanic	Avatar	Die Hard	Aliens	Hunter X Hunter

Anomaly Detection Tasks

- Credit card fraud detection
- Network intrusion detection