



Title: The CRISP-DM methodology

Course: Data Mining

Instructor: Claudio Sartori

Master: Data Science and Business Analytics

Master: Artificial Intelligence and Innovation Management

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BOLOGNA BUSINESS SCHOOL

Alma Mater Studiorum Università di Bologna

Standard Process Model

- Can Data Mining be a **push-button** technology?

Standard Process Model

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- Data Mining is a process
- The process has **steps** and **complex choices**
- The standard defines the steps in a precise way

Benefits of a Standard Process Model I

DM requires

- a mix of good tools and skilled analysts
- a sound methodology
- project management
- a process model to manage interactions along the process

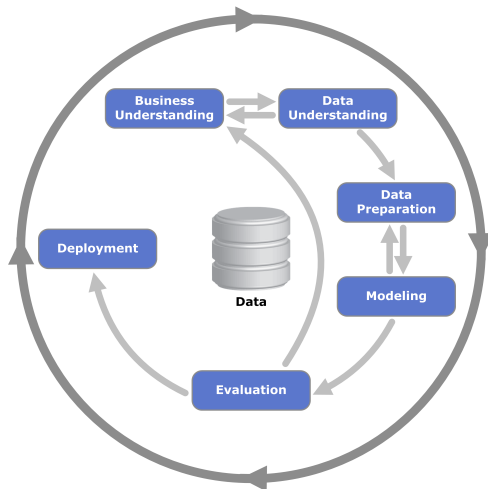
Benefits of a Standard Process Model II

Standardisation provides

- a common reference point for discussions
- a common understanding between the designers and the customers
- a basis for good **engineering practice**
- checklists
- clarity for expectations

The CRISP-DM methodology

From the problem to the application - https://en.wikipedia.org/wiki/Cross_Industry_Standard_Process_for_Data_Mining



Business understanding

- reformulate the problem in many ways, as necessary
- think about the scenario
- iterative refinement of problem formulation and scenario

Business understanding – Tasks I

- Determine
 - Business Objectives
 - Background Business Objectives
 - Business Success Criteria
- Assess Situation
 - Inventory of Resources
 - Requirements, Assumptions, and Constraints
 - Risks and Contingencies Terminology
 - Costs and Benefits

Business understanding – Tasks II

- Determine Goals
 - Data Mining Goals
 - Data Mining Success Criteria
- Produce Plan
 - Project Plan
 - Initial Assessment of Tools and Techniques

Data understanding

- which raw data are available?
 - they match rarely the problem needs
 - they are usually collected for different purposes (or for no purpose at all)
 - a customer database, a transaction database, and a marketing response database contain different information, may cover different intersecting populations, and may have varying degrees of reliability
- at which cost?
 - internal data are for free, external data may be not
 - interesting information may need to be collected with ad-hoc campaign
- possible forks in the project choices, according to the collected data

Data Understanding – Tasks

- Collect Initial Data
 - Initial Data Collection Report
- Describe Data
 - Data Description Report
- Explore Data
 - Data Exploration Report
- Verify Data Quality
 - Data Quality Report

Data preparation

- some analysis technique may require data transformations
 - converting to tabular format
 - converting between data types
 - e.g. from numeric to symbolic and viceversa
- some transformation can improve the quality of the results
 - normalization, scaling, guessing missing data, cleaning wrong data
 - ...
- *data leaks*
 - it is the case for supervised cases: the information necessary for the decision is not available at the decision time
- this task is usually very expensive and time consuming

Data Preparation – Tasks

- Data Set
 - Data Set Description
- Select Data
 - Rationale for Inclusion / Exclusion
- Clean Data
 - Data Cleaning Report
- Construct Data
 - Derived Attributes
 - Generated Records
- Integrate Data
 - Merged Data
- Format Data
 - Reformatted Data

Modeling

Capture patterns hidden in data



Modeling – Tasks

- Select Modeling Technique
 - Modeling Technique
 - Modeling Assumptions
- Generate Test Design
 - Test Design
- Build Model
 - Parameter Settings
 - Models
 - Model Description
- Assess Model
 - Model Assessment
 - Revised Parameter Settings

Evaluation

- rigorous assessment of the results of the data mining process
- compare different choices on a *qualitative* and *quantitative* basis
- evaluate the confidence of the derived models
- estimate the expected impact on the business
 - e.g. how many wrong decisions can we expect?
which will be the cost of wrong decisions?



Evaluation – Tasks

- Evaluate Results
 - Assessment of Data Mining results w.r.t Business Success Criteria
 - Approved models
- Review Process
 - Review of Process
- Determine next steps
 - List of possible actions
 - Decisions

Deployment

The results of the DM process (i.e. the models) are used in software systems to obtain some return of investments

- e.g. in *churn* analysis the model for predicting likelihood of churn can be integrated with a package for churn management, for instance sending special offers to selected customers considered *high-risk of churn*

Deployment – Tasks

- Plan Deployment
 - Deployment Plan
- Plan Monitoring and Maintenance
 - Monitoring and Maintenance Plan
- Produce Final Report
 - Final Report Final Presentation
- Review Project
 - Experience Documentation

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