Data Mining Process

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(partly using materials kindly provided by José Luís Borges)

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reference materials

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- JMM et al. ch. 1+7+app. A
- Chapman et al. parts I and II

reminder: data mining?

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- (or Knowledge Discovery in Databases)

- Is the non-trivial process of identifying
  - implicit (by contrast to explicit)
  - valid (patterns should be valid on new data)
  - novel (novelty can be measured by comparing to expected values)
  - potentially useful (should lead to useful actions)
  - understandable (to humans)
- patterns in data

- Data Mining
  - is a step in the KDD process
  - (arguable, but who cares anyway!...)

the KDD process

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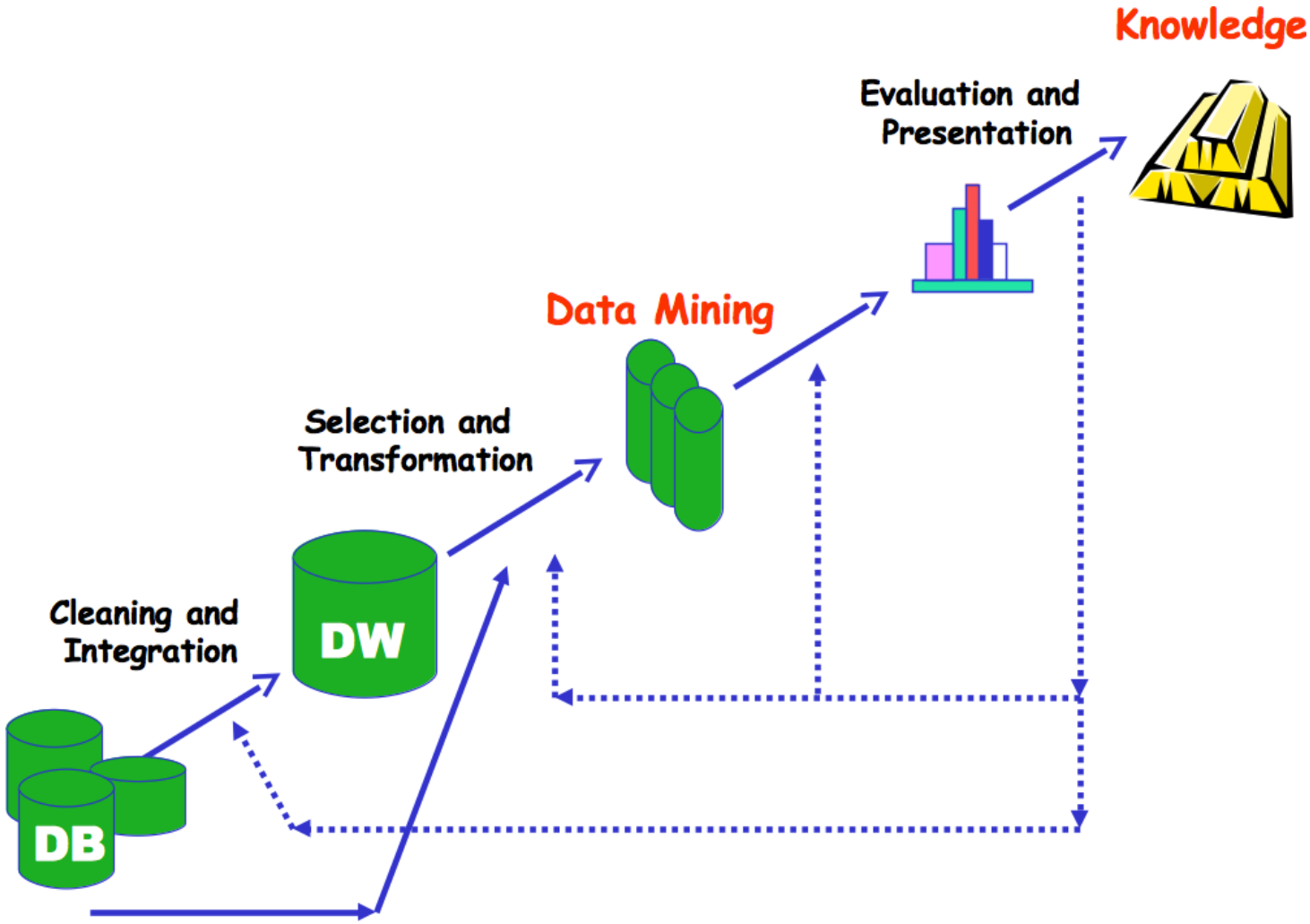

wanted: DM methodology

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- Framework for recording experience
  - Allows projects to be replicated
- Aid to project planning and management
- “Comfort factor” for new adopters
  - Demonstrates maturity of Data Mining
  - Reduces dependency on “stars”
- Encourage best practices and help to obtain better results

plan

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- methodologies
  - CRISP-DM
  - SCRUM-DM
- … and beyond
  - MLOps

why CRISP-DM?

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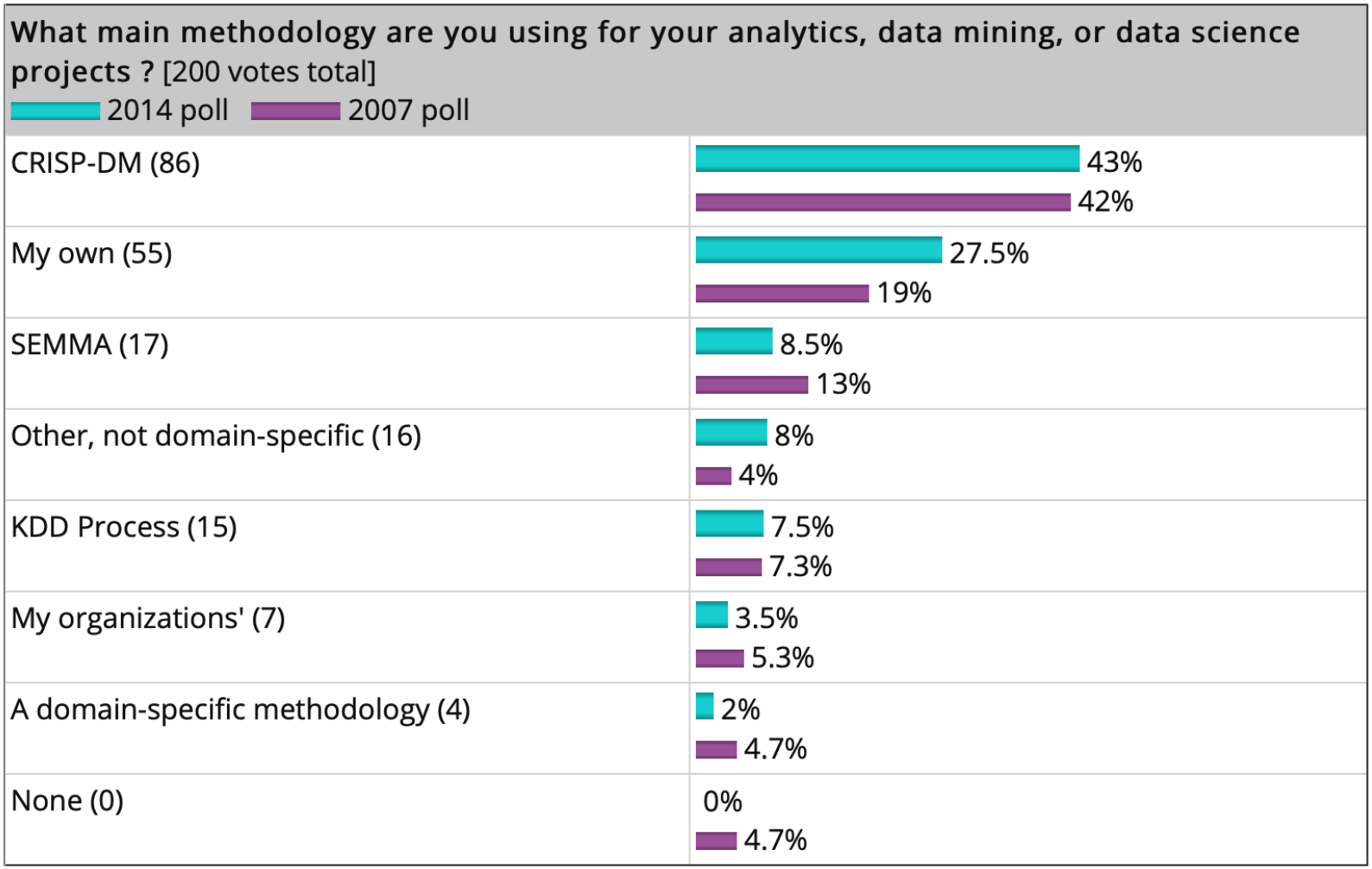

https://www.kdnuggets.com/polls/2014/analytics-data-mining-data-science-methodology.html

CRISP-DM: overview

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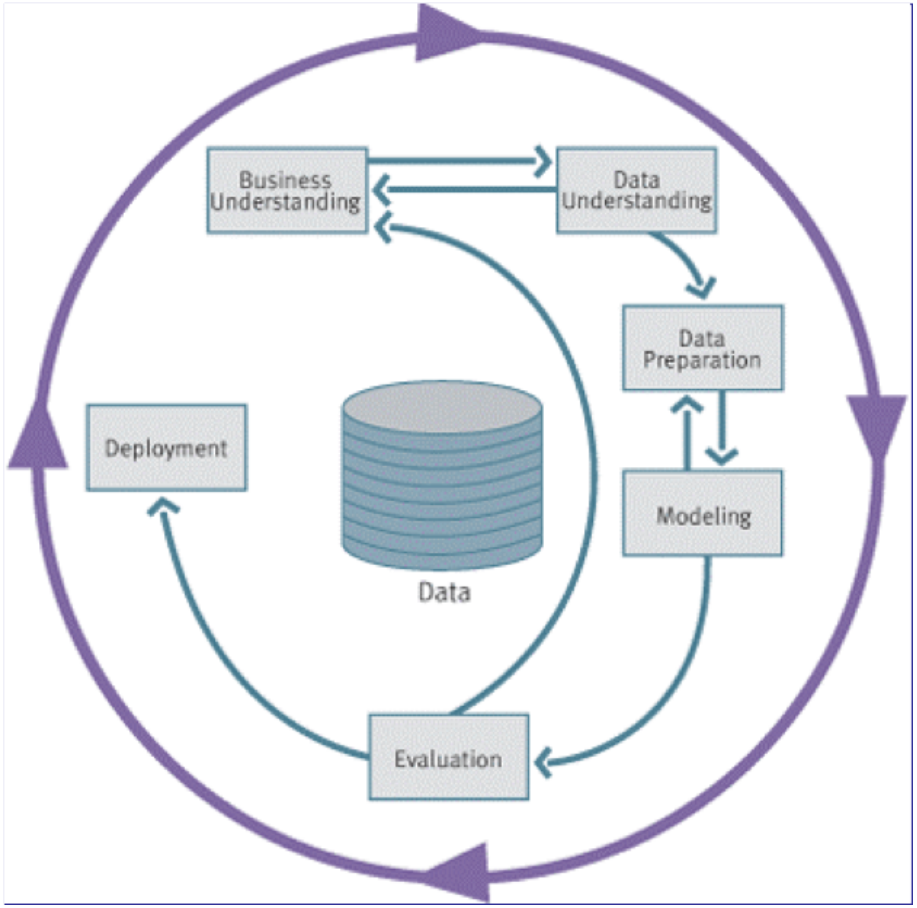
- cross-Industry Standard Process for Data Mining (CRISP-DM)
- European Community funded effort aiming to
  - cheaper, faster, and more reliable data mining
  - widespread adoption
  - reduce skills required for data mining
  - capture experience for reuse
- characteristics
  - non-proprietary
  - application/industry neutral
  - tool neutral
  - focus on business issues
    - as well as technical analysis
  - framework for guidance
  - experience based
    - templates for analysis



CRISP-DM: phases and tasks

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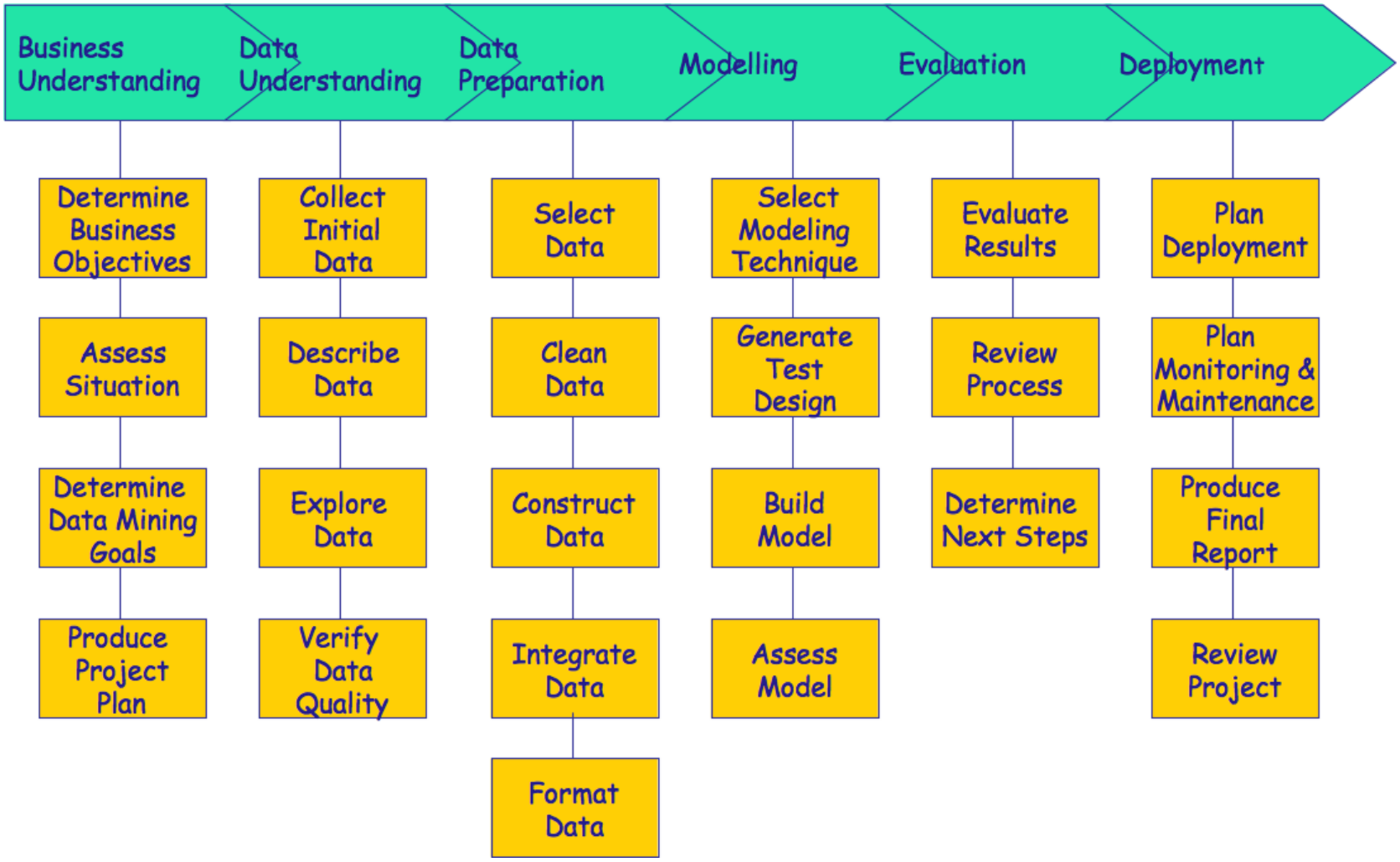

other methodologies

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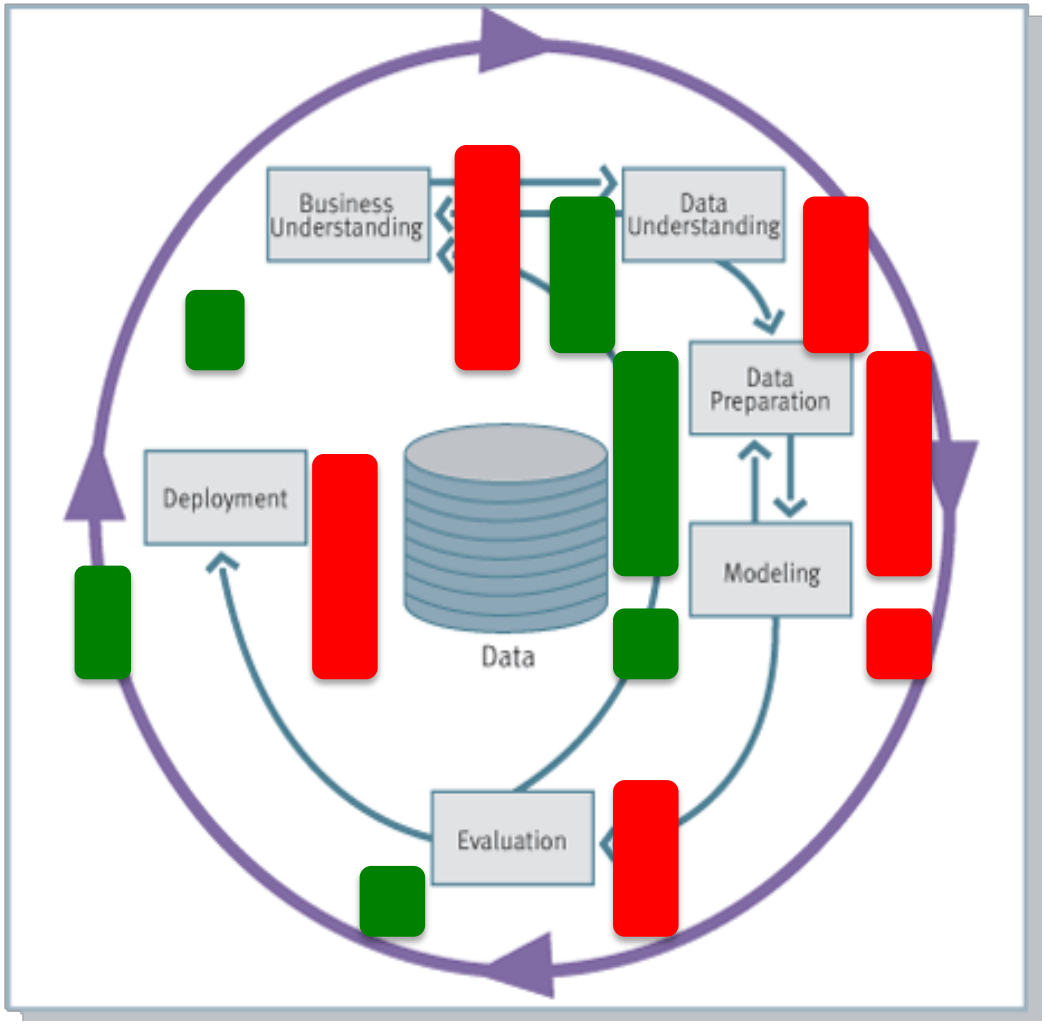
- SEMMA
  - http://www.sas.com/offices/europe/uk/technologies/analytics/datamining/miner/semma.html
  - SAS Enterprise Miner
- Others
  - specific
  - http://datalligence.blogspot.com/2008/12/data-mining-methodologies.html
- Essentially equivalent

effort/impact on success



SCRUM-DM: an agile DM methodology

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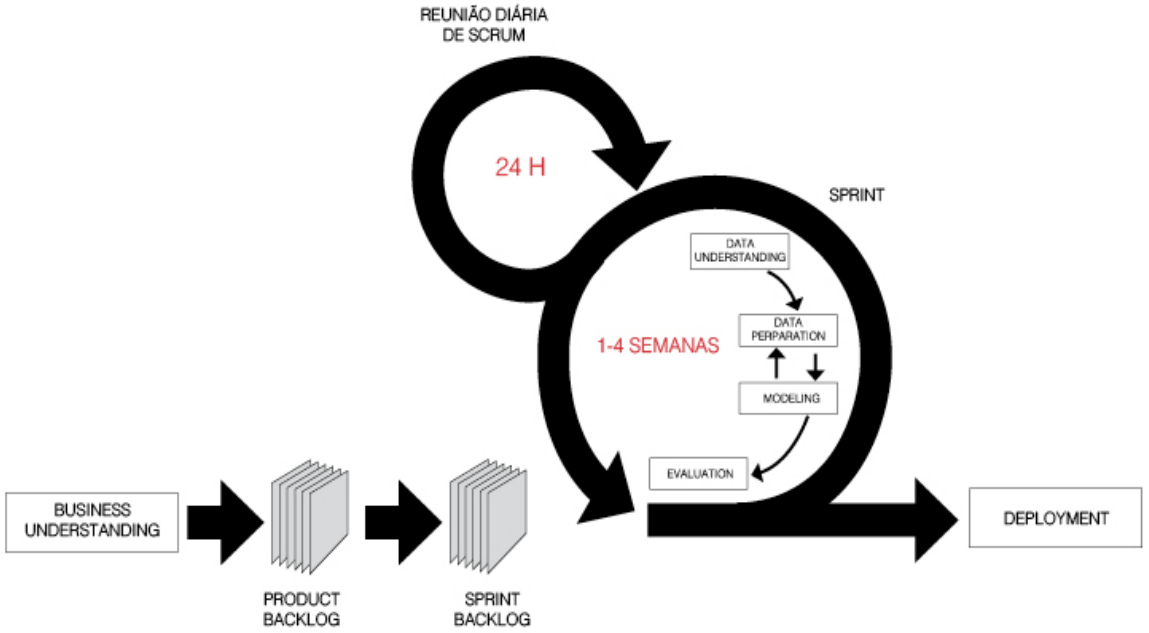
Scrum work management + CRISP-DM Data Mining

- 3 phases
  - Business Understanding
  - Sprint
  - Deployment
- 6 concepts
  - Product Owner
  - Scrum Master
  - Development team
  - Data Mining Story
  - Product Backlog
  - Sprint Backlog



M.Sc. of Diogo Nogueira, joint work with Ana Barros, Paula Gomes and Ademar Aguiar

AI/ML is not (only) software engineering

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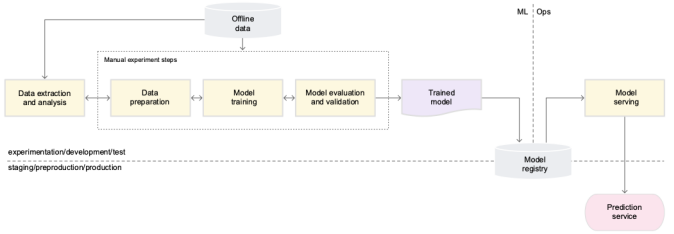
- versioning
  - data
  - model
- automation
  - development
  - testing
- collaborative model development
- deployment
  - monitoring
  - maintenance



source: https://cloud.google.com/solutions/machine-learning/mlops-continuous-delivery-and-automation-pipelines-in-machine-learning

the time for AI/MLOps

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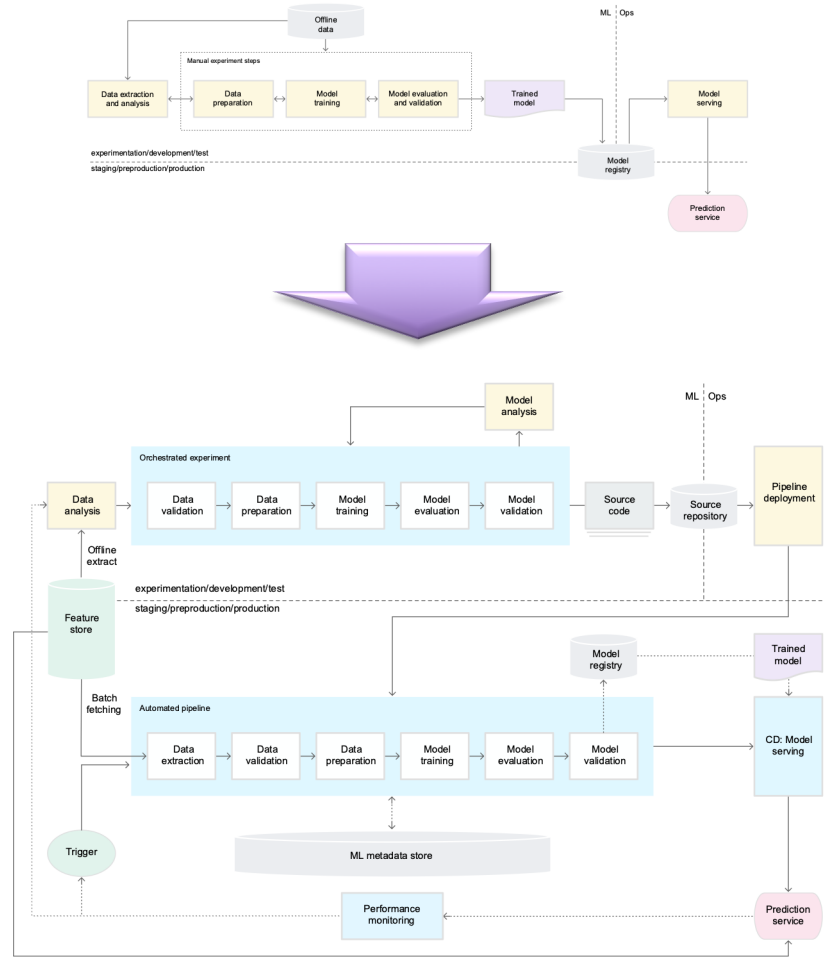
- methodologies
  - Microsoft's Team Data Science Process
    - https://docs.microsoft.com/en-us/azure/architecture/data-science-process/overview
  - Google's Practitioners guide to MLOps: A framework for continuous delivery and automation of machine learning
    - https://services.google.com/fh/files/misc/practitioners_guide_to_mlops_whitepaper.pdf
- tools
  - MLFlow
    - https://mlflow.org/
  - Kubeflow
    - https://www.kubeflow.org/
  - Data Version Control & Studio
    - https://studio.iterative.ai/



source: https://cloud.google.com/solutions/machine-learning/mlops-continuous-delivery-and-automation-pipelines-in-machine-learning

Don’t forget

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- Curb your enthusiasm…
- A data mining project should always start with an analysis of the data with traditional query tools
  - 80% of the interesting information can be extracted using SQL
    - how many transactions per month include item number 15?
    - show me all the items purchased by Sandy Smith.
  - 20% of hidden information requires more advanced techniques
    - which items are frequently purchased together by my customers?
    - how should I classify my customers in order to decide whether future loan applicants will be given a loan or not?
- Developing and deploying are entirely different beasts!