Data and models in operations

5ARB0: DATA ACQUISITION & ANALYSIS (2022 – 2023)

Uzay Kaymak, Jheronimus Academy of Data Science, u.kaymak@tue.nl

Mastertrack: Artificial Intelligence & Engineering Systems

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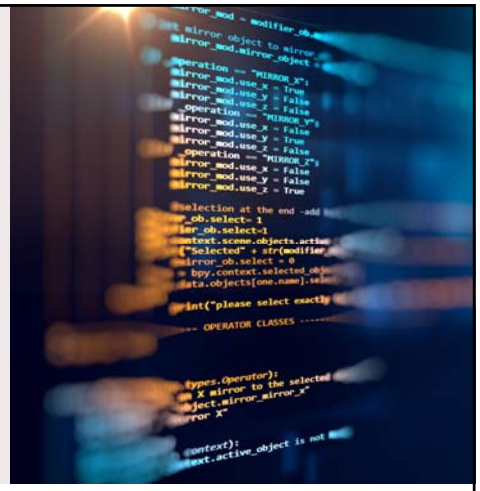
Outline

- Life cycle models
- Data-driven business operations
- ML-Ops



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Life cycle models

Many objects, products and concepts go through a number of phasesor stages during their life

A life cycle model identifies these phases from the inception to the disposal of the product

Life cycle model is a key concept in systems engineering

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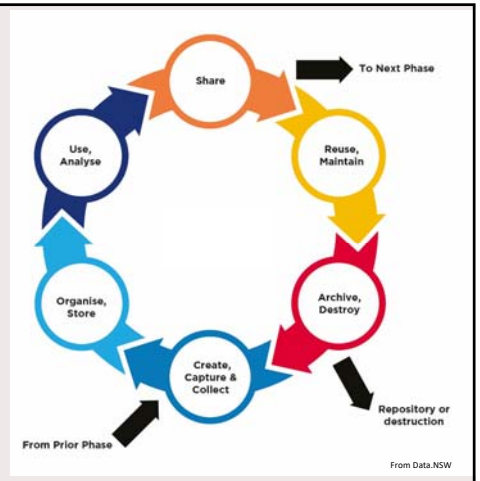
Data lifecycle

Data lifecycle covers the stages from the creation of data to its re-use (and possible removal)

Data lifecycle management is concerned with organizing the activities related to data during its lifecycle



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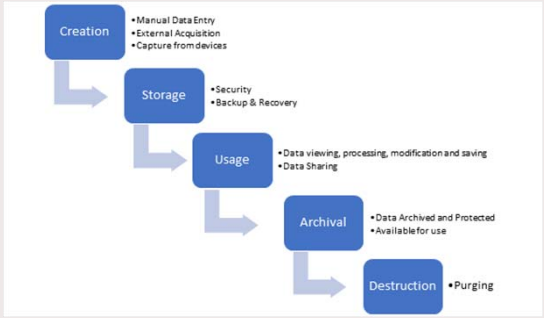
Data lifecycle management



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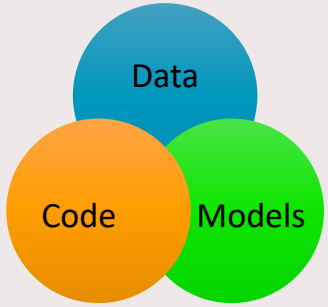
Data-driven business

Data-driven operations involve

- **Writing code**
- **Collecting and processing data**
- **Obtaining and maintaining (decision making) models**

In AI, models are learned automatically, and so they can be numerous and evolving



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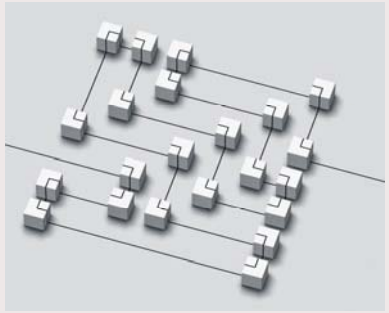
DevOps, DataOps, MLOps

DevOps – set of practices to quickly develop and deliver high-quality code continually

DataOps – set of practices, processes and technologies that combines an integrated and process-oriented perspective on data to improve quality, speed, and collaboration in data analytics

MLOps – set of practices that aims to deploy and maintain machine learning models in production reliably and efficiently



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Challenges in machine learning, data science operations

Complex models

Data and code dependencies

Feedback loops

Code "plumbing"

Complex configuration options

Dynamic interaction with the environment

Reproducibility and process management

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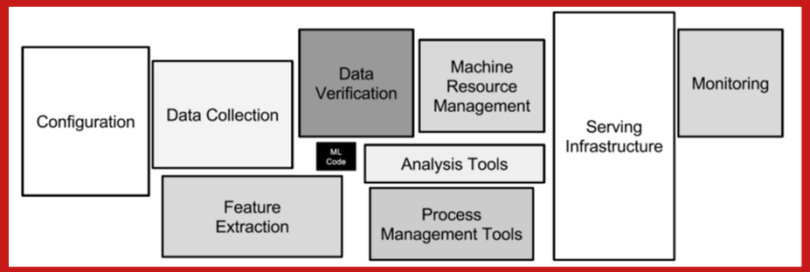
Code plumbing



Sculley *et al.* (2015)

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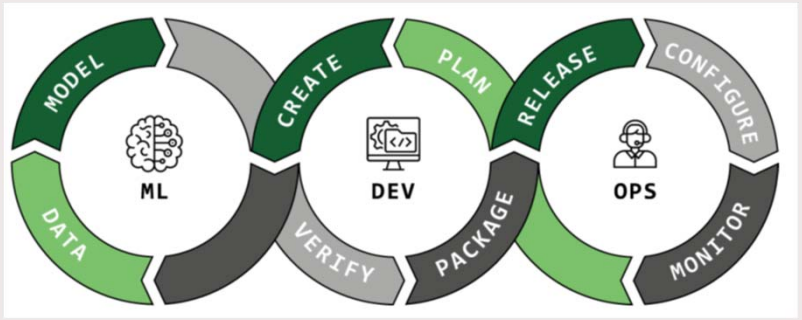
MLOps lifecycle



Symeonidis *et al.* (2022)

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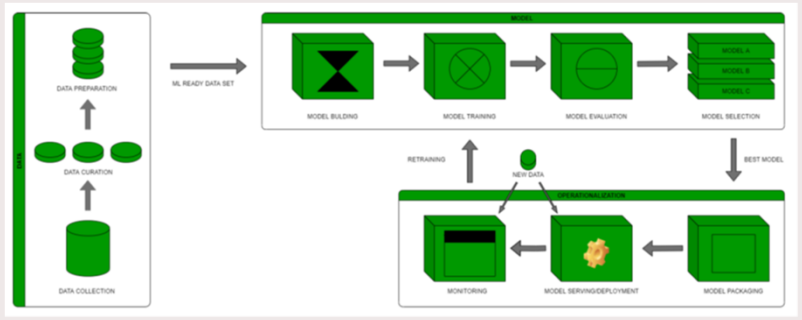
MLOps pipeline



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MLOps maturity models

Google maturity levels

Microsoft maturity levels

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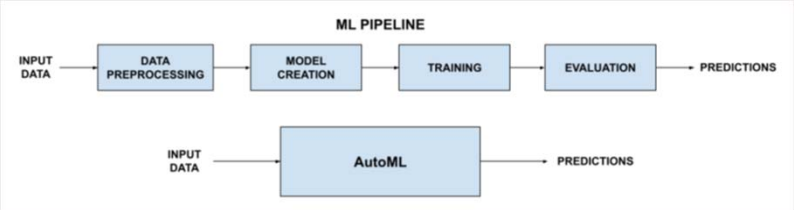
ML pipeline vs AutoML



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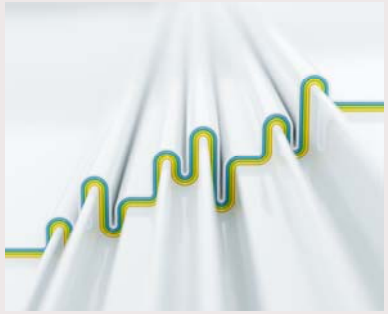
MLOps challenges

- **Efficient pipelines**
- **Re-training, adapting**
- **Monitoring**
  - Data
  - Model



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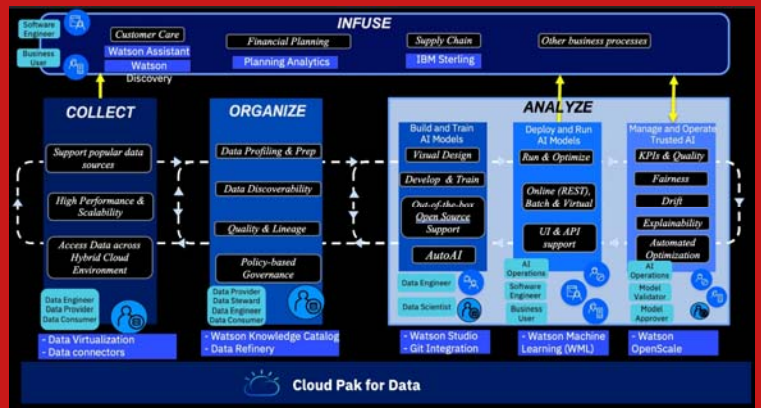
AI Model Lifecycle (IBM)



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Summary

Lifecycle models are useful for identifying the phases through which data, models and code (software, algorithms) transition

Data-driven business revolves around the interaction of data, code and models learned

MLOps deals with activities related to the lifecycle of machine learning models

- **Train**
- **Deploy**
- **Maintain**

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