UNIVERSITÀ DEGLI STUDI DI TRIESTE

Class 14: Project Proposal

Master Course:

Data-driven Systems Engineering (ML Operations)

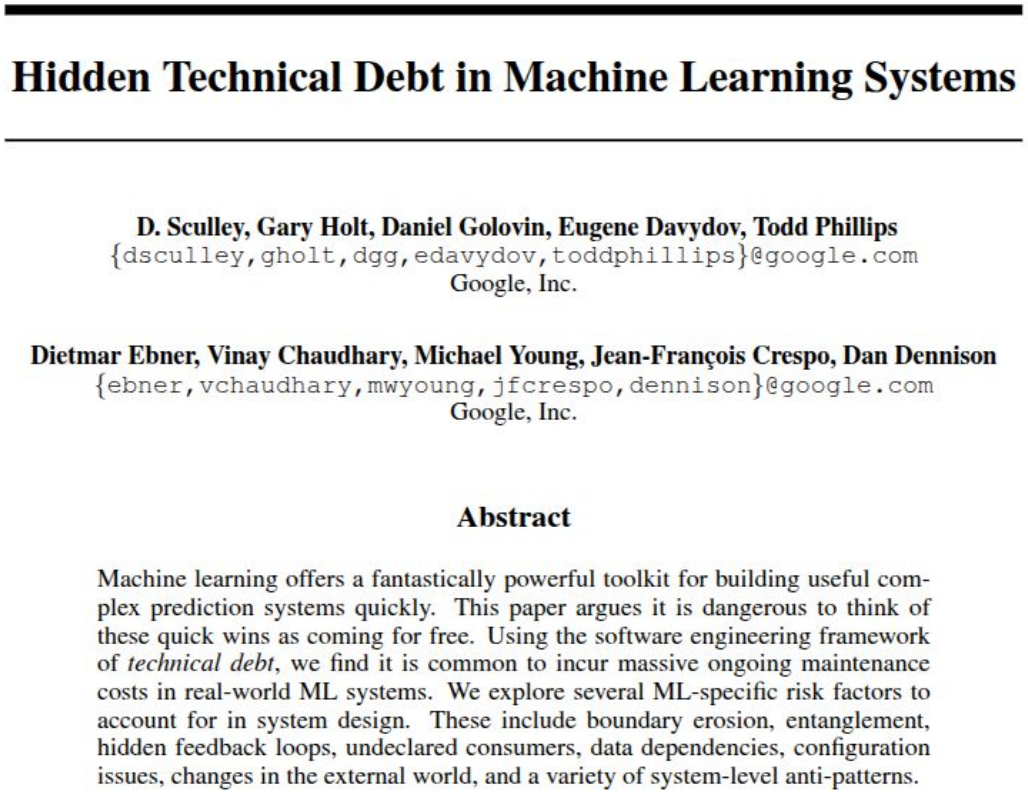
440MI and 305SM

Today's goal:

- Project Summary
- Deliverables
- Milestones
- Work Breakdown Structure (WBS)
- Gantt / Sprints
- Definition of Done (DoD) & Definition of Ready (DoR)

Why Planning Matters in MLOps

- ML systems are continuous
- Require multiple roles
- High failure rate
- Planning reduces friction



Hidden Technical Debt in Machine Learning Systems

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Abstract

Machine learning offers a fantastically powerful toolkit for building useful complex prediction systems quickly. This paper argues it is dangerous to think of these quick wins as coming for free. Using the software engineering framework of *technical debt*, we find it is common to incur massive ongoing maintenance costs in real-world ML systems. We explore several ML-specific risk factors to account for in system design. These include boundary erosion, entanglement, hidden feedback loops, undeclared consumers, data dependencies, configuration issues, changes in the external world, and a variety of system-level anti-patterns.

https://proceedings.neurips.cc/paper_files/paper/2015/file/86df7dcfd896fcaf2674f757a2463eba-Paper.pdf

What Is a Project Summary?

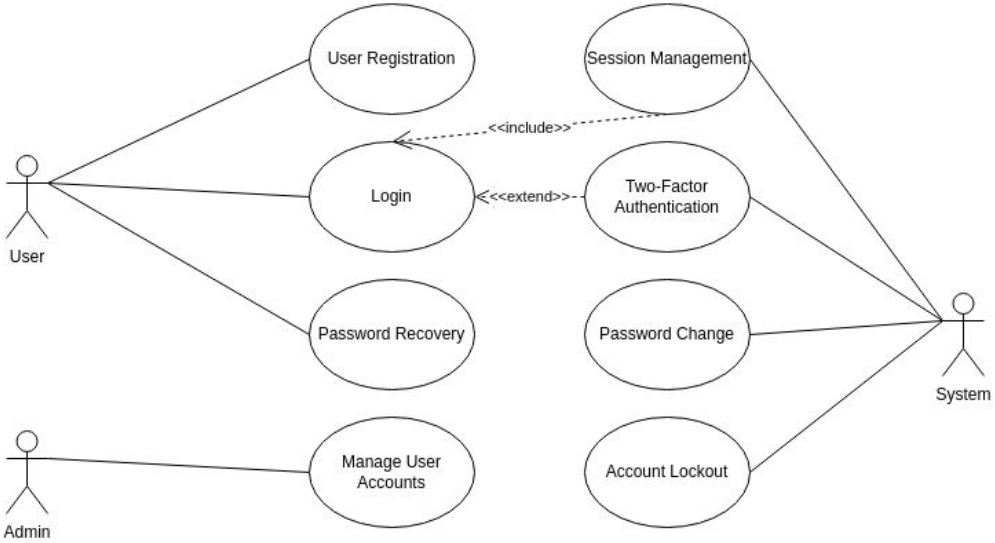
- High-level definition
- Goals and boundaries
- Success criteria

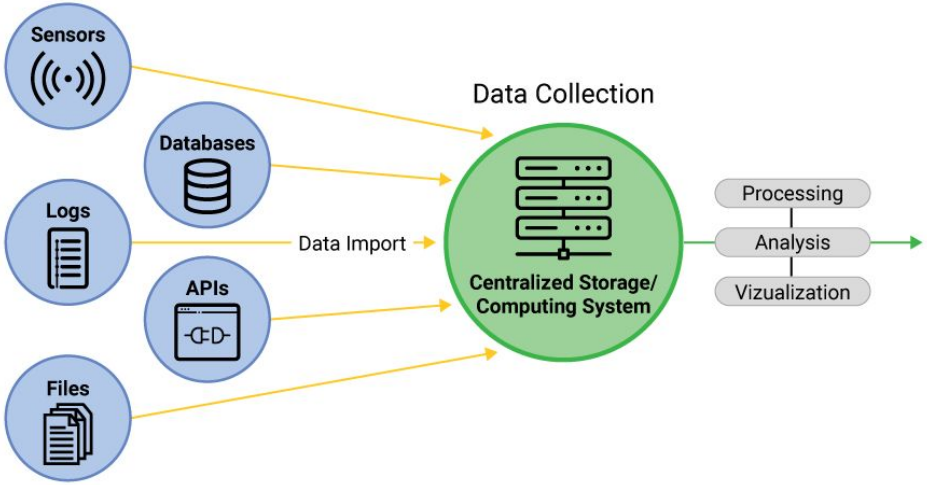
Business Project Summary Example

Project Title: Customer Service Improvement Initiative
Project Manager: John Doe
Project Duration: January 2024 – June 2024
Objective: Enhance customer satisfaction by improving response times.
Scope: Implement a chatbot for automated responses
Train customer support teams
Reduce average response time from 24 to 6 hours
Key Stakeholders: Customer Service Department, IT Team, Clients
Budget & Resources: $50,000 for software and training
Expected Outcome: Improved customer retention and satisfaction scores

Project Summary - Scope

- Use case
- Data sources
- Requirements
- Constraints





Project Summary - Objectives (SMART)

- **S**pecific
- **M**easurable
- **A**chievable
- **R**elevant
- **T**ime-bound

Example: 'Improve demand forecast accuracy by 15% within 8 weeks'

Project Summary - Relevance

- Business impact
- Technical innovation
- User needs
- Operational benefits

Multiple viewpoints:

- For business: increased ROI.
- For users: better insights.
- For technical teams: reduced manual work.

Deliverables

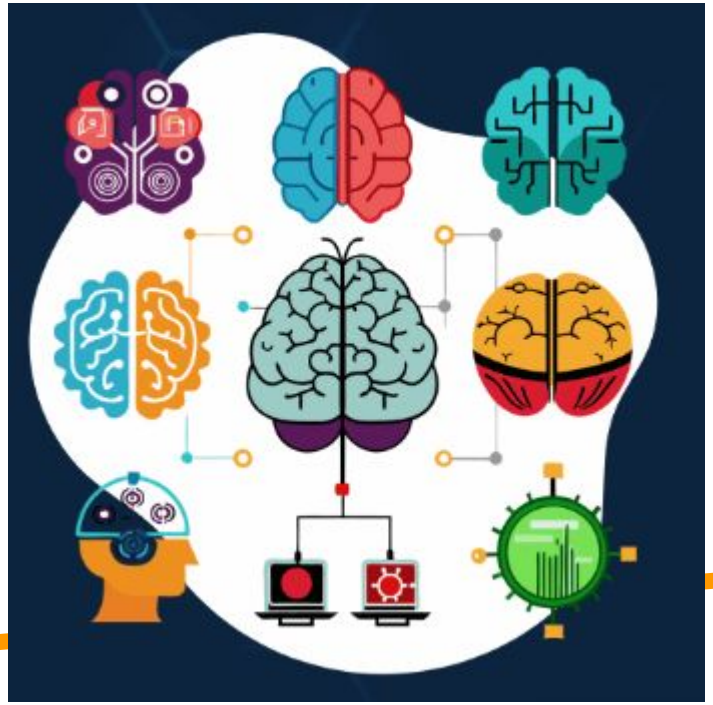
- Data pipeline
- ML kernel
- CI/CD
- Monitoring

Deliverables - Data Pipeline

- Ingestion
- Validation
- Feature engineering
- Storage & versioning

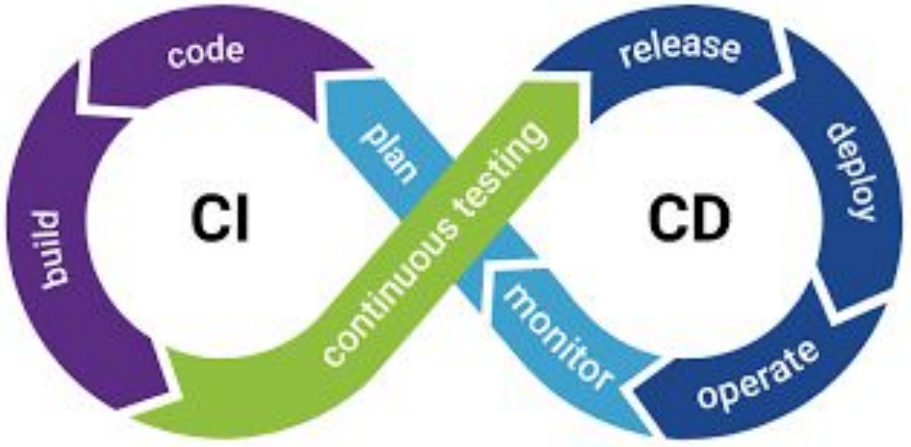
Deliverables - ML Kernel

- Baseline model
- Experiments
- Evaluation
- Packaging



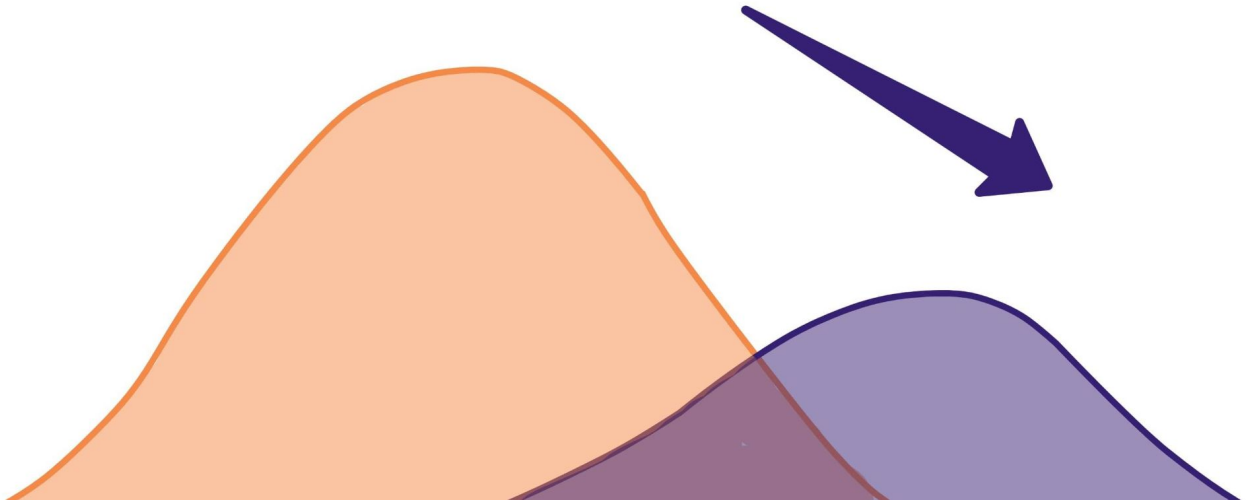
Deliverables - CI/CD Pipeline

- Tests
- Builds
- Deployments
- Rollback mechanisms



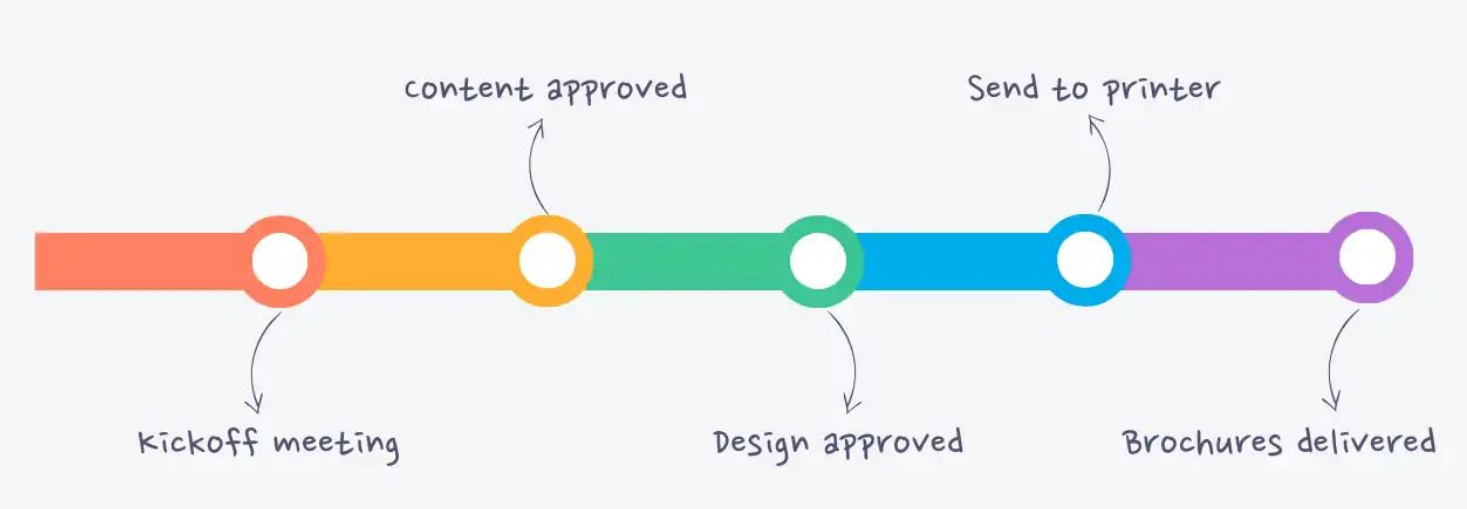
Deliverables - Monitoring

- Data drift
- Performance
- Alerts



What Are Milestones?

- Checkpoints
- Progress validation
- Risk reduction

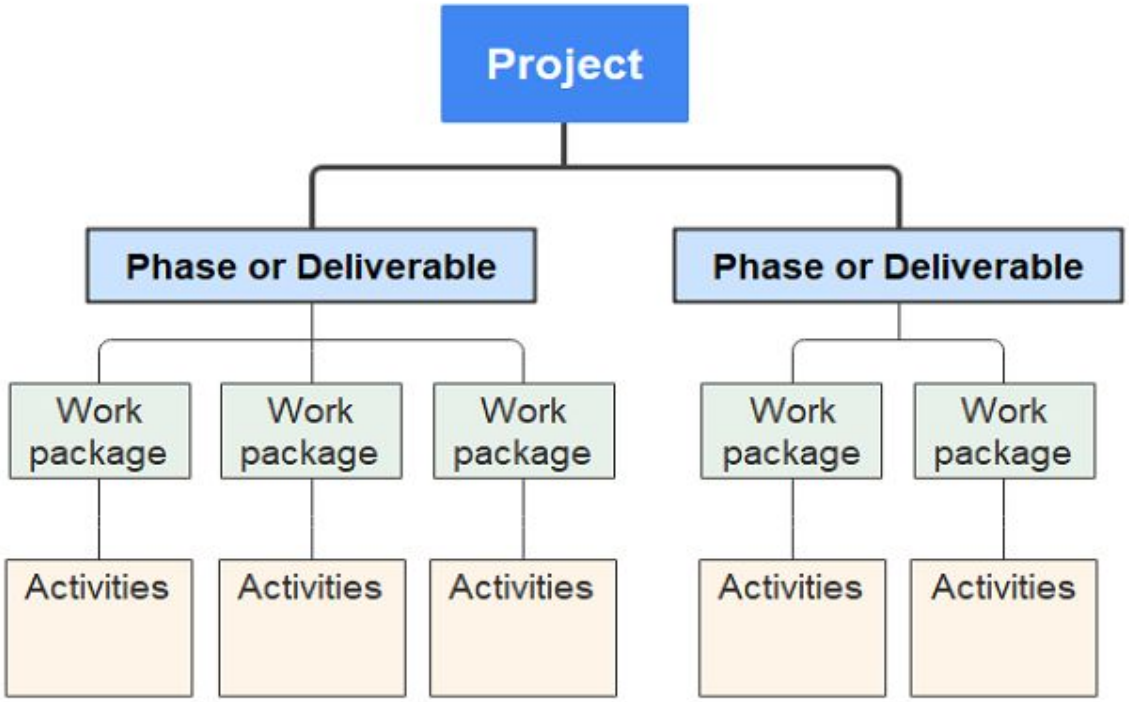


Typical Milestones

- Proposal approval
- Data pipeline MVP
- ML prototype
- CI/CD working
- Monitoring active
- Final demo

Work Breakdown Structure (WBS)

- Hierarchical decomposition
- 100% rule
- Work packages



WBS – Detailed Example

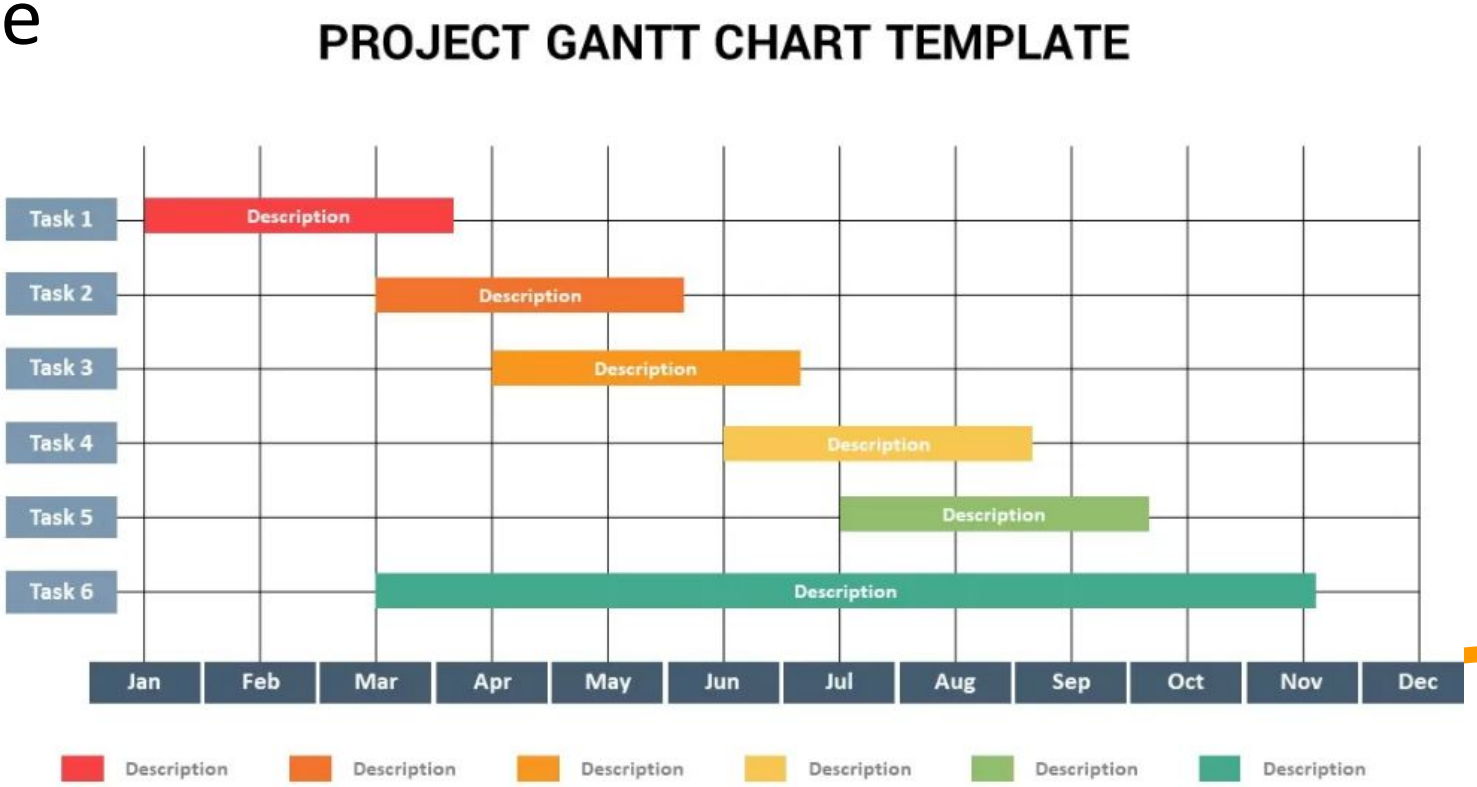
- Data ingestion
- Data validation
- Feature engineering
- ML baseline
- Training workflow
- API deployment
- Monitoring dashboards

Sprint Plan

- Sprint 0: Setup
- Sprint 1: Data pipeline
- Sprint 2: ML kernel
- Sprint 3: CI/CD
- Sprint 4: Monitoring
- Sprint 5–6: Finalization

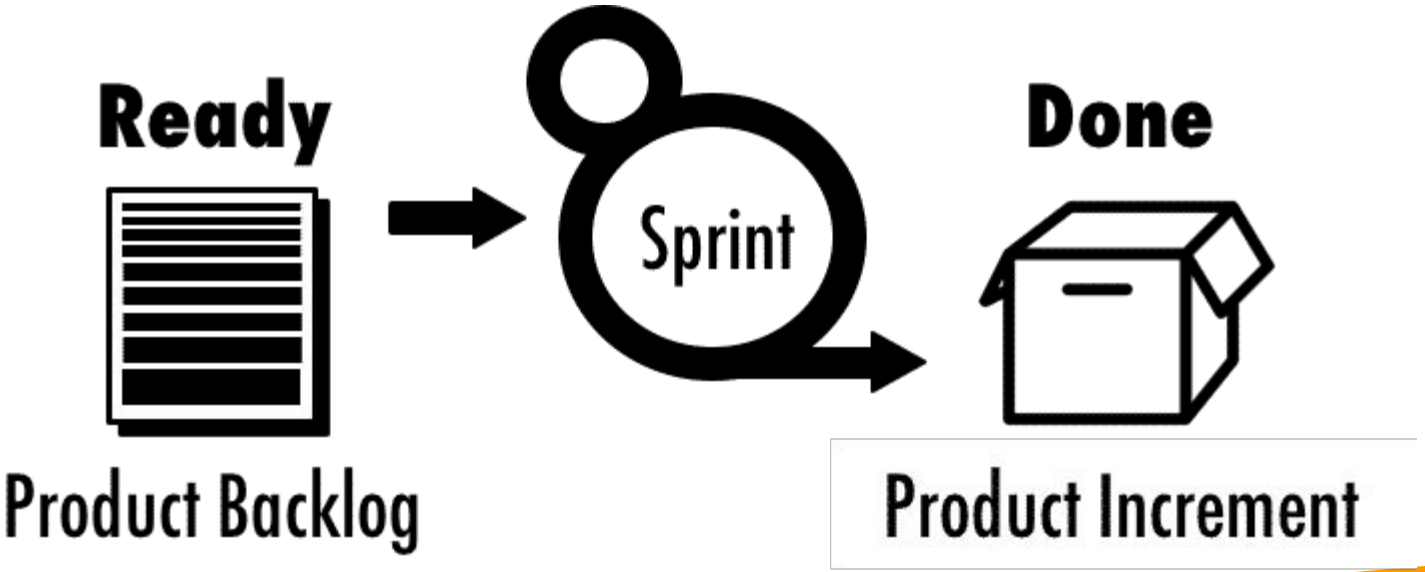
Gantt Chart – Concept

- Tasks
- Dependencies
- Timeline



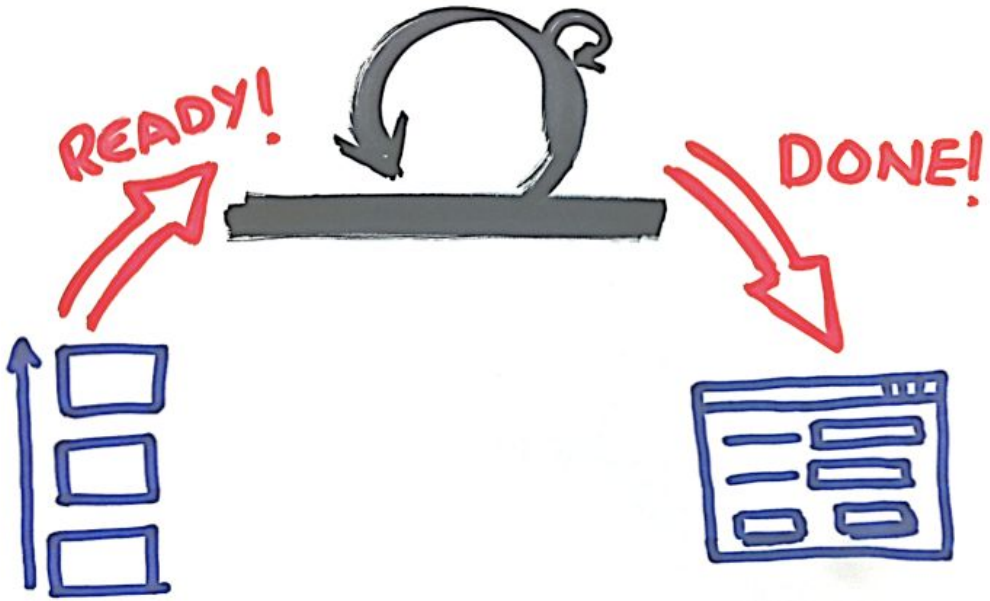
Definition of Ready (DoR)

- Clear description
- Acceptance criteria
- Dependencies resolved



Definition of Done (DoD)

- Tested
- Documented
- Reviewed
- Deployable



Closing

- Planning = success
- Documentation = continuity
- Automation = scalability
- Monitoring = stability
- Governance = compliance

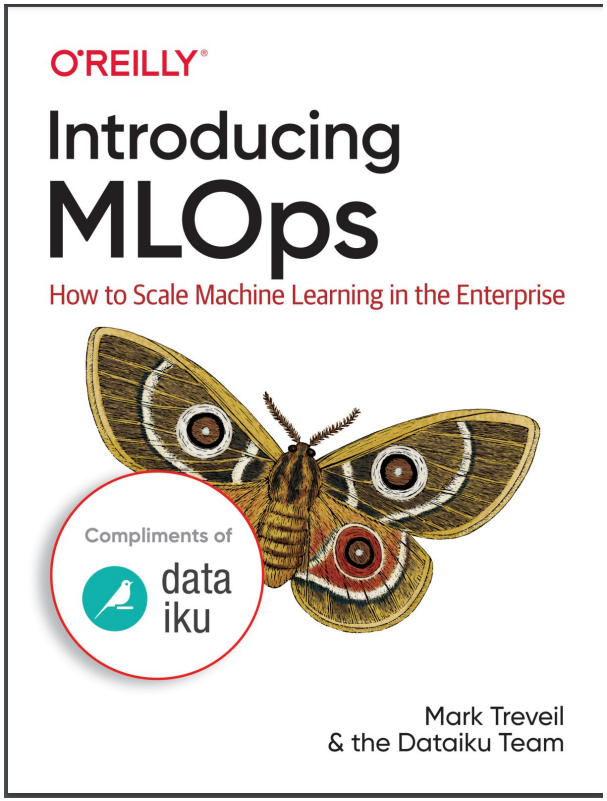
Calendar

27/11: CD/CI, Deployment, Docker (*R. Lamberti*)

02/12: Continuous Monitoring (Theory)
03/12: Project brainstorm and definitions
04/12: Comp. Engineering (Invited Speaker)

09/12: No lessons ******
10/12: Project Requirements
11/12: Presentation of Proposals

Textbook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Introducing
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