

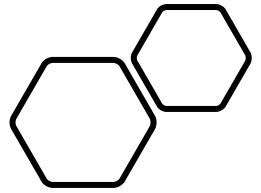


42028: Deep Learning and Convolutional Neural Network

Week 1 Lab

Introduction to AI Model
Lifecycle & MLOps

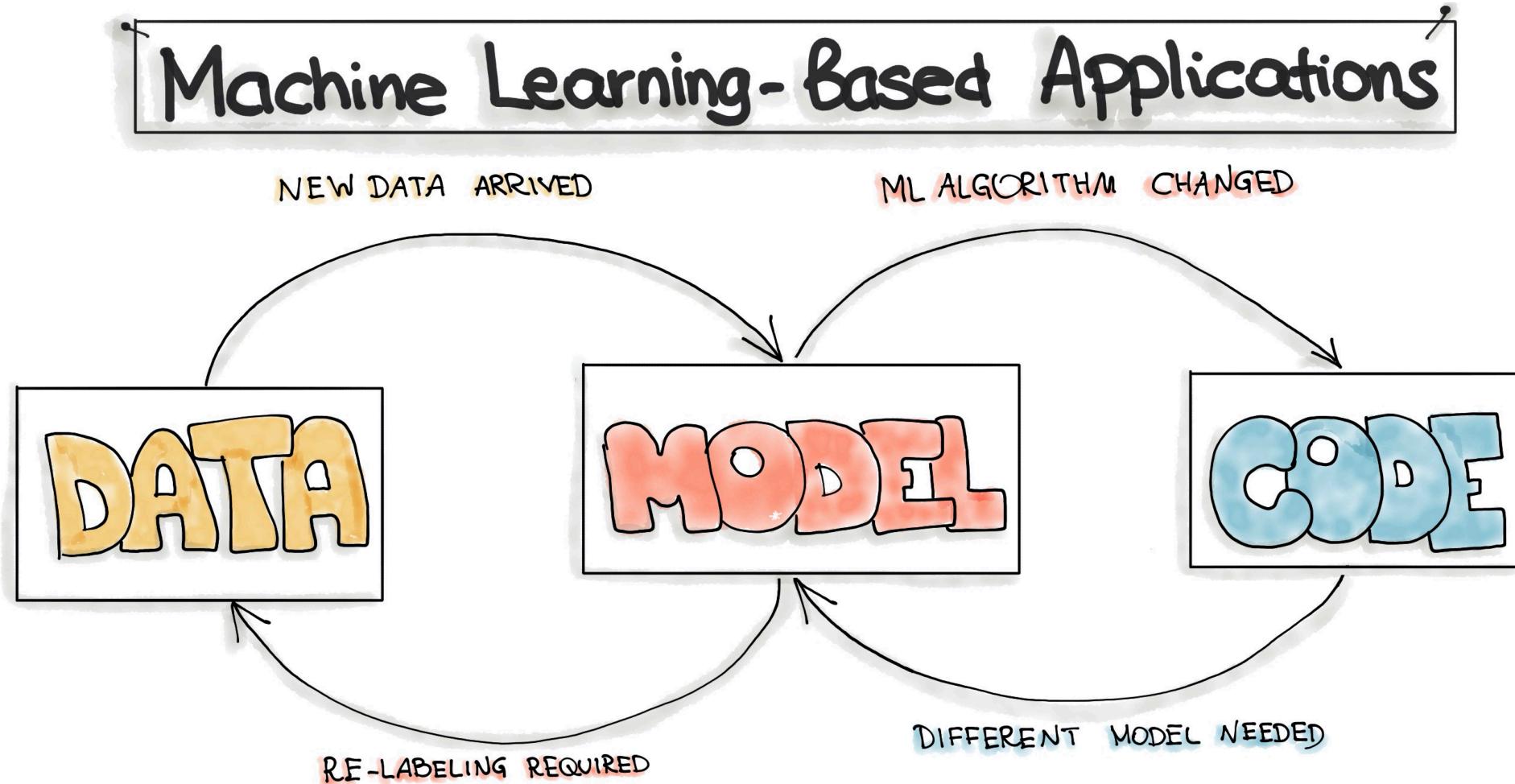




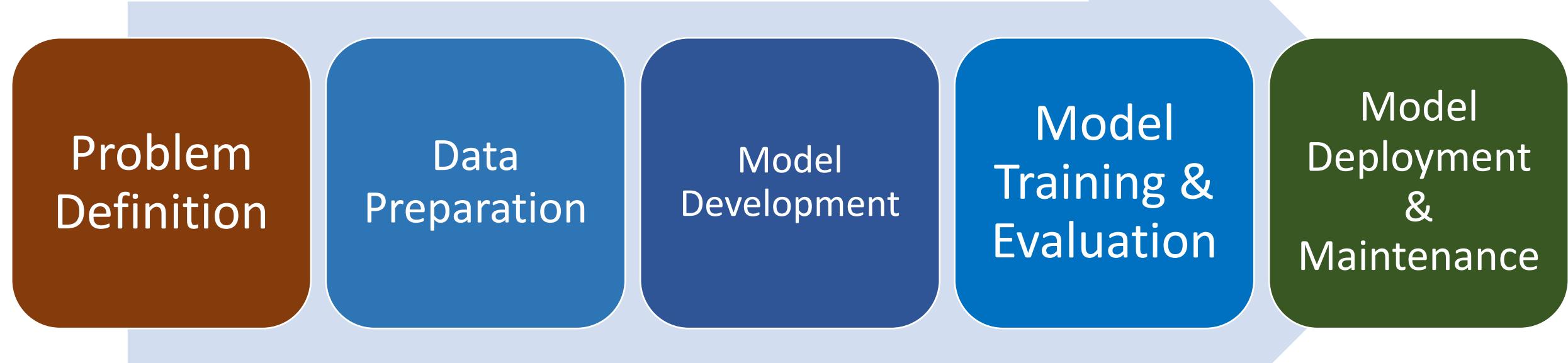
Outline

- Machine learning based applications/software
- The phases of the A.I. Lifecycle
- The importance of MLOps in the A.I. Lifecycle
- Key concepts and best practices for Computer Vision and MLOps

Understanding ML-Based Applications



AI Model Lifecycle (Generic)



Phases and Benefits of A.I. Lifecycle

Phases:

- Problem definition
- Data preparation
- Model development
- Model training
- Model evaluation
- Model deployment

Benefits:

- Increased efficiency
- Improved model performance
- Increased trust in models

Phase 1: Problem Definition

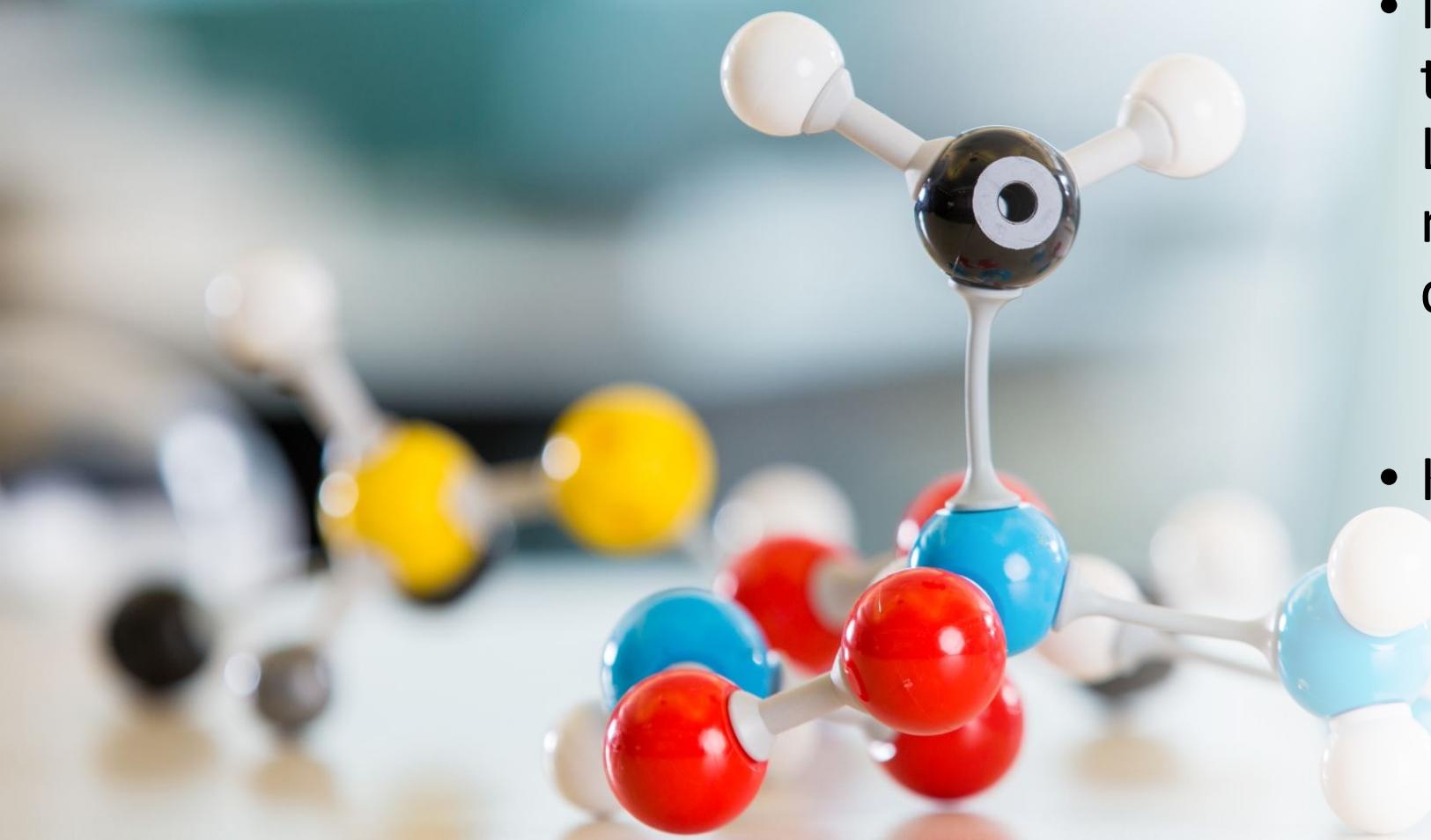


- Problem definition is the first phase of the A.I. Lifecycle, where the problem to be solved is clearly defined and understood.
- Key activities:
 - Defining the problem
 - Identifying relevant stakeholders
 - Gathering requirements

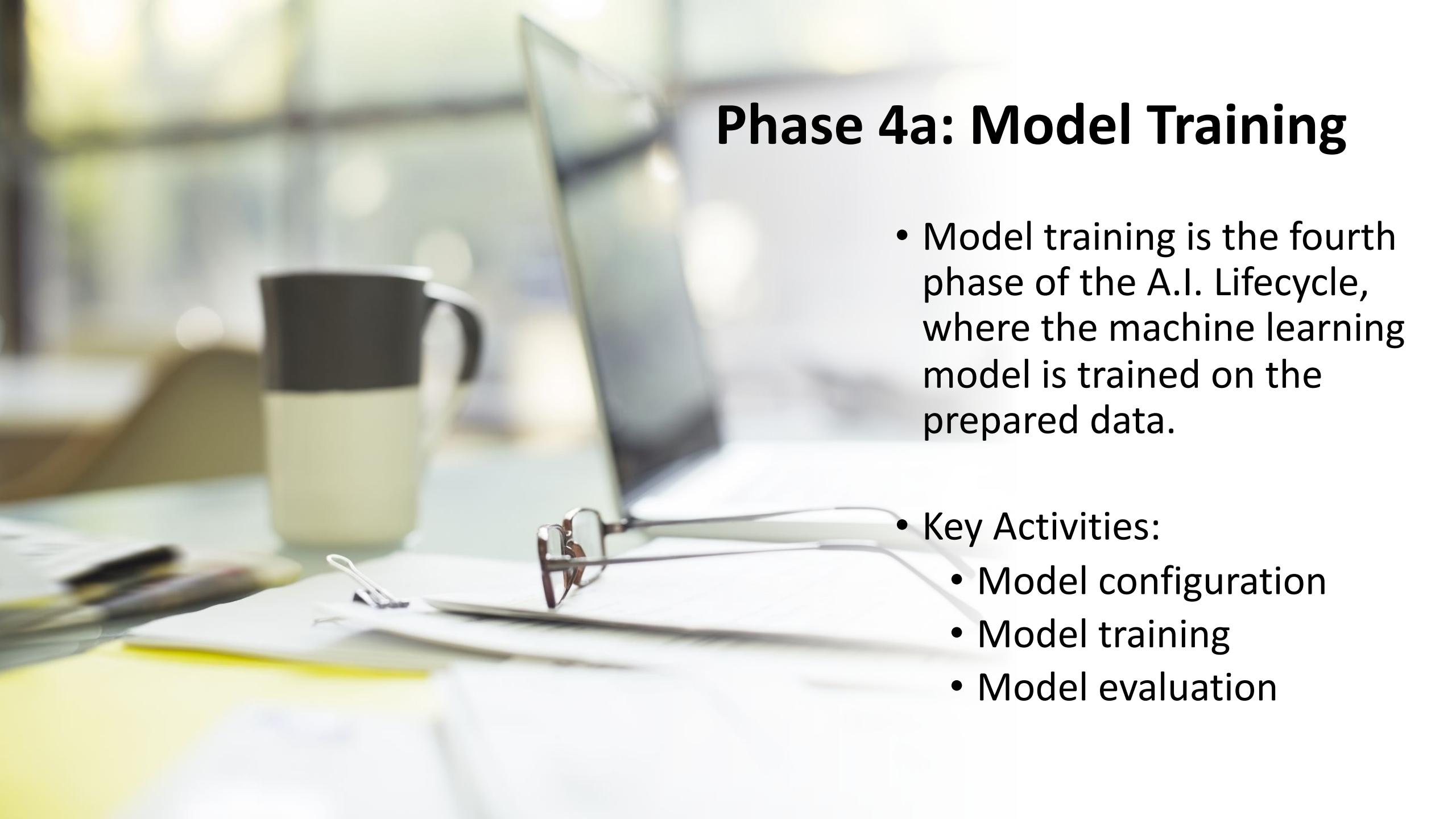
Phase 2: Data Preparation

- Data preparation is the second phase of the A.I. Lifecycle, where data is collected, processed, and prepared for use in model training.
- Key Activities:
 - Data collection
 - Data cleaning
 - Data transformation
 - Data splitting

Phase 3: Model Development



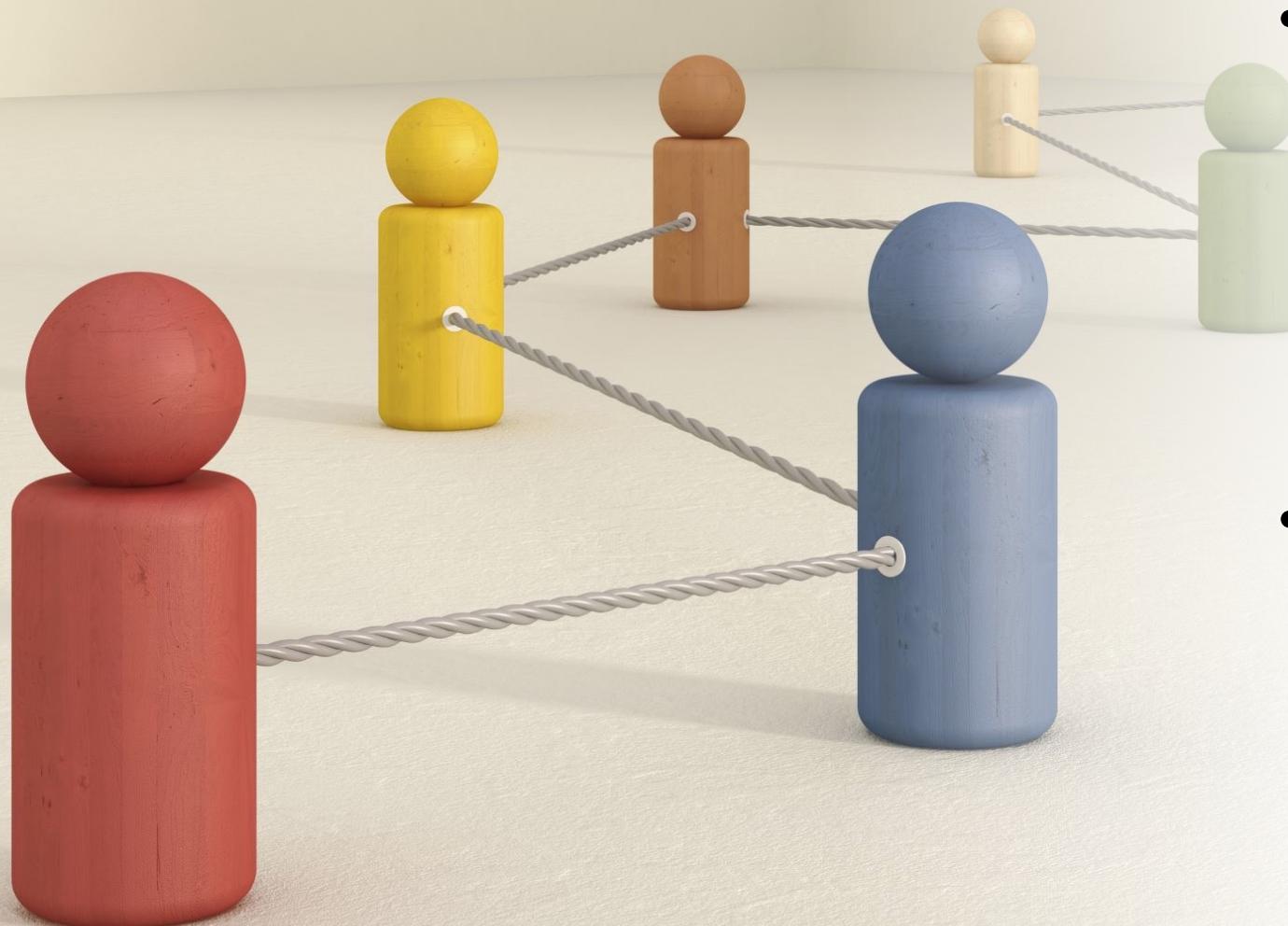
- Model development is the third phase of the A.I.model Lifecycle, where the machine learning model is developed and tested.
- Key Activities:
 - Model selection
 - Model prototyping
 - Model tuning



Phase 4a: Model Training

- Model training is the fourth phase of the A.I. Lifecycle, where the machine learning model is trained on the prepared data.
- Key Activities:
 - Model configuration
 - Model training
 - Model evaluation

Phase 4b: Model Evaluation



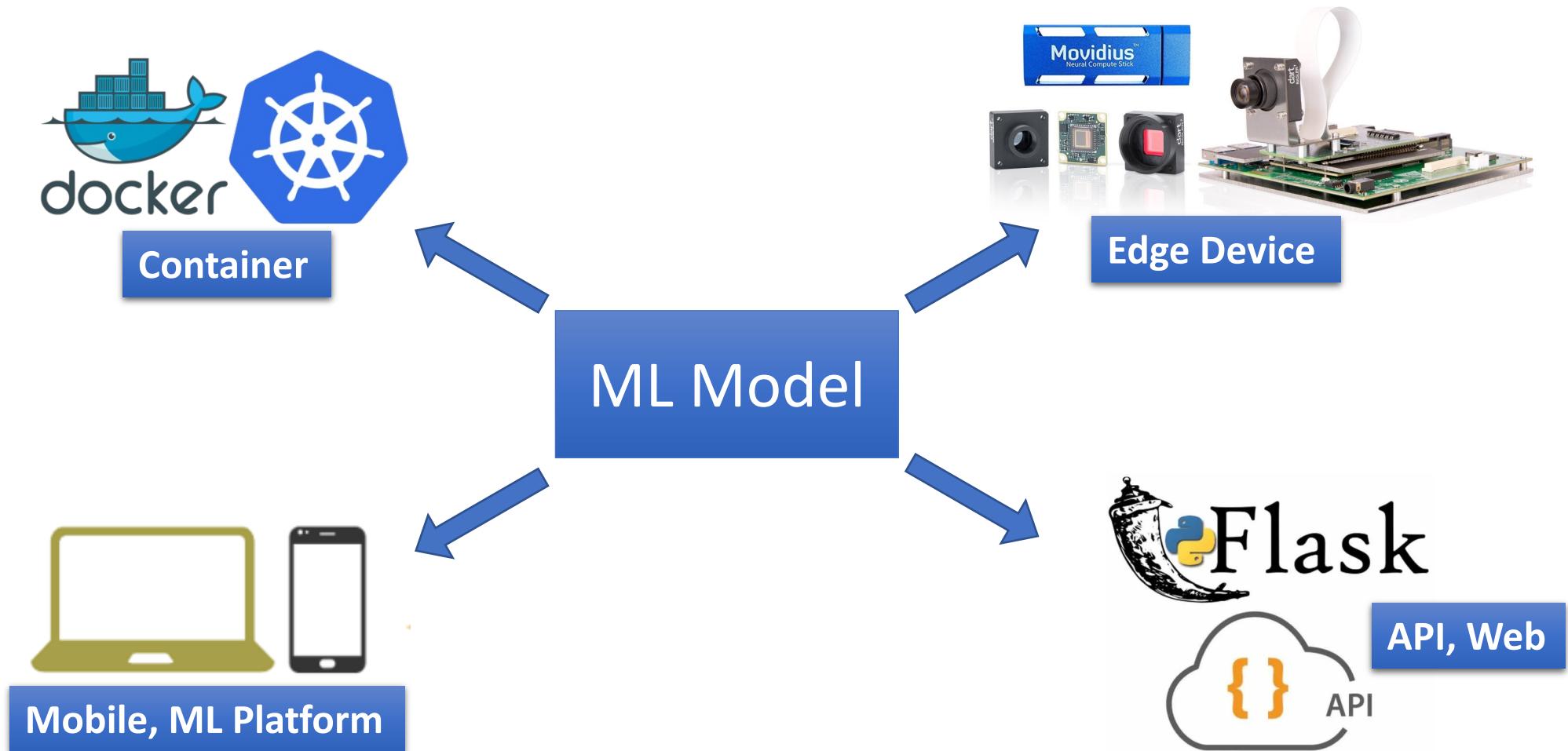
- Model evaluation phase of the A.I. Lifecycle, where the trained machine learning model is evaluated for performance and accuracy.
- Key Activities:
 - Model testing
 - Model validation
 - Model performance evaluation

Phase 5: Model Deployment

- Model deployment is the fifth phase of the A.I. Lifecycle, where the trained machine learning model is deployed into production.
- Key Activities:
 - Model integration
 - Model deployment
 - Model monitoring and maintenance



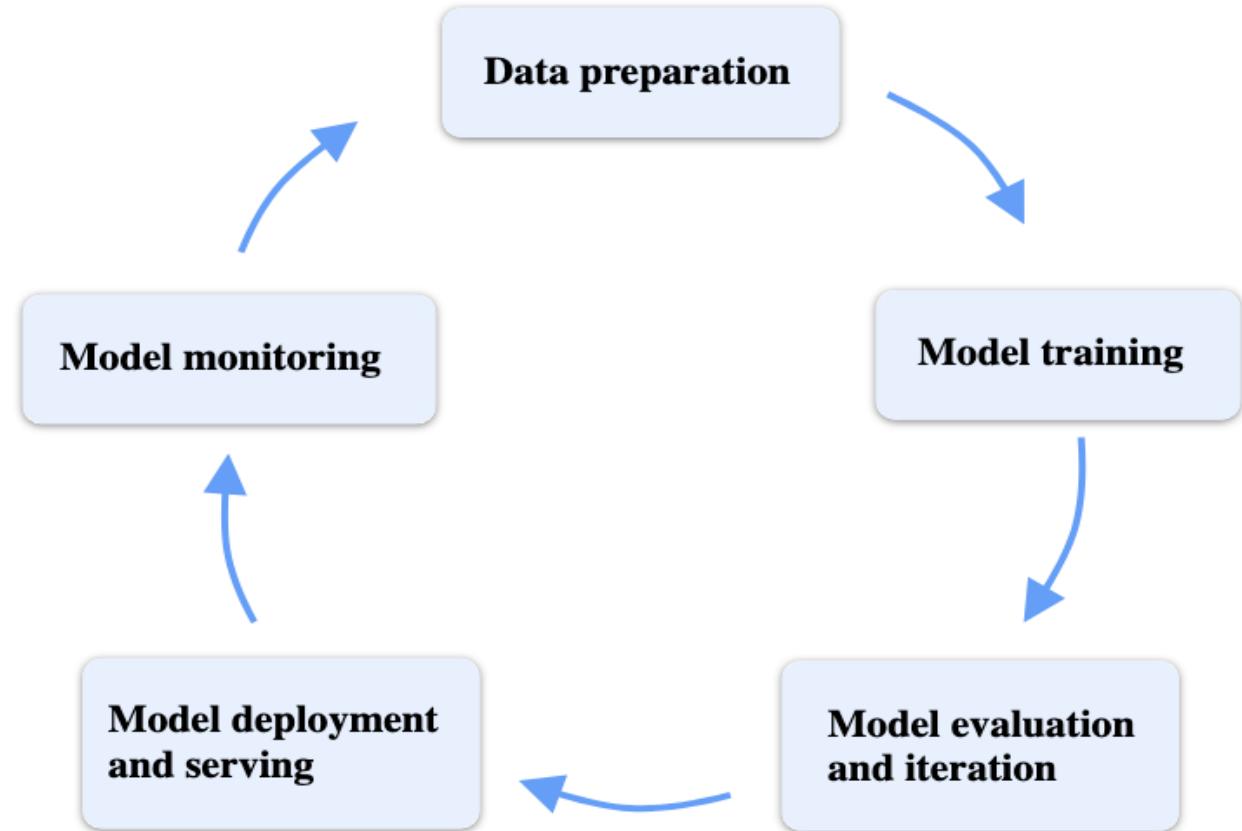
Machine Learning Model Deployment Targets



Google vs Microsoft
vs Amazon

Machine learning workflow

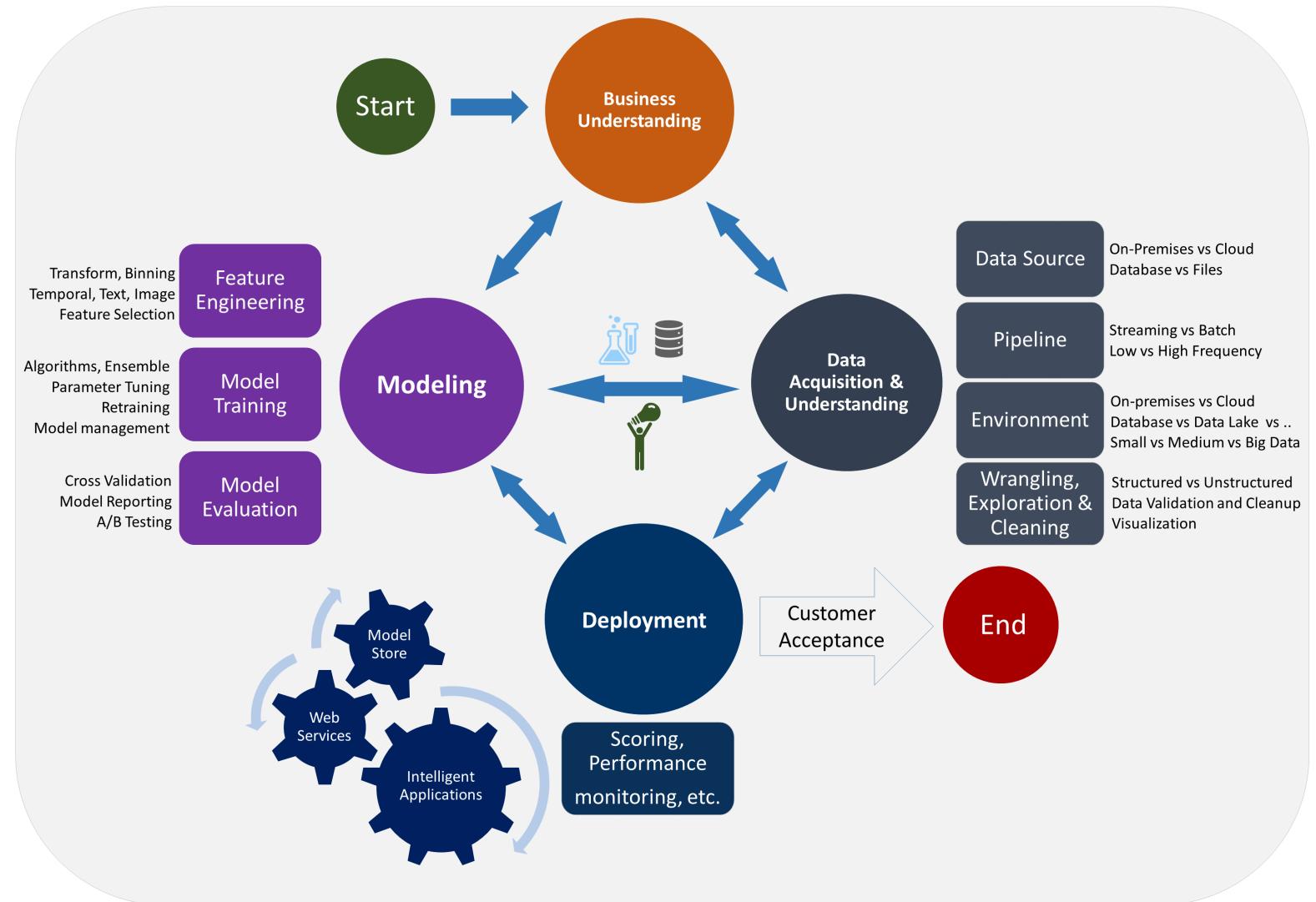
Google



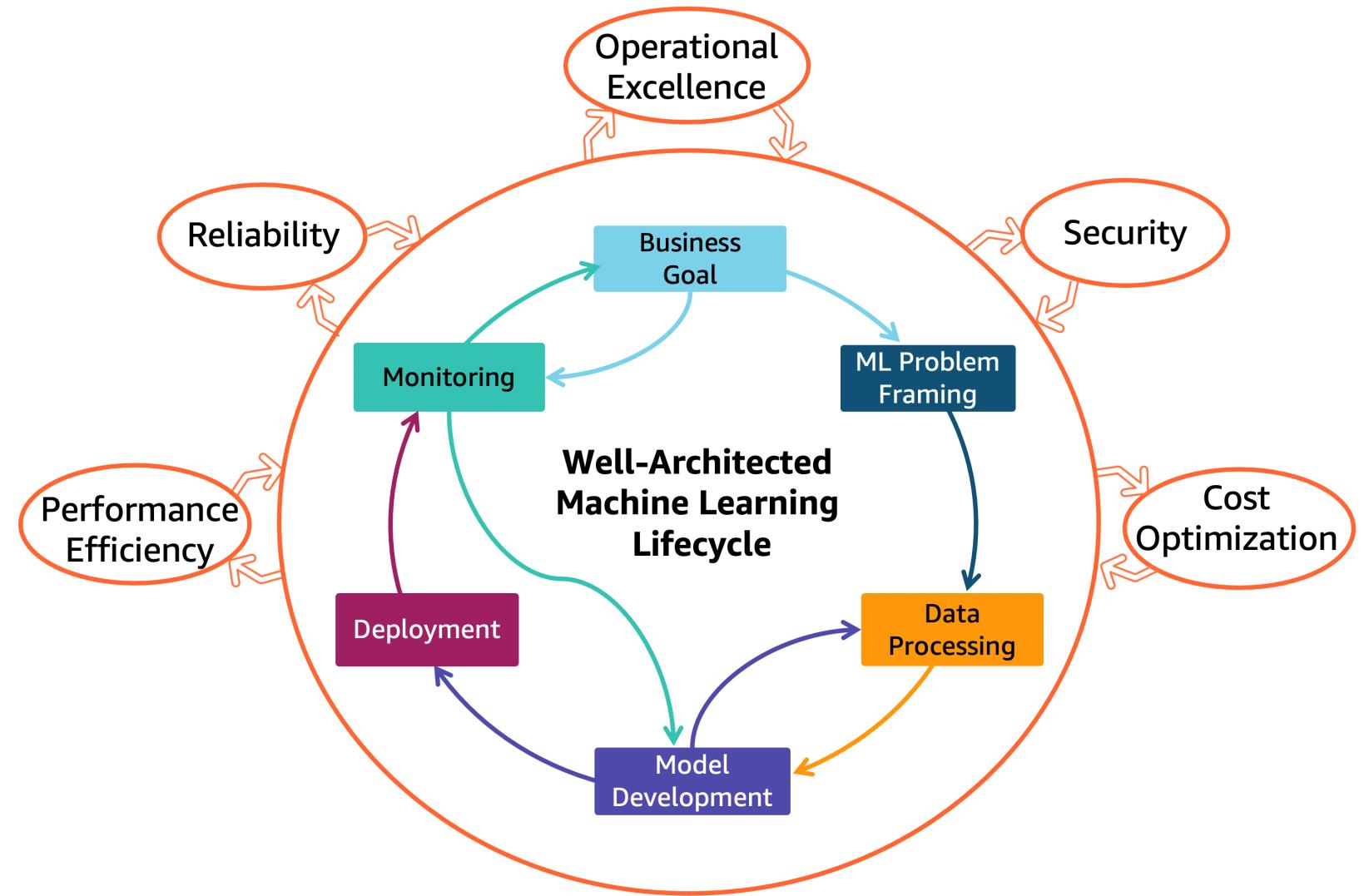
Microsoft



Data Science Lifecycle



Amazon



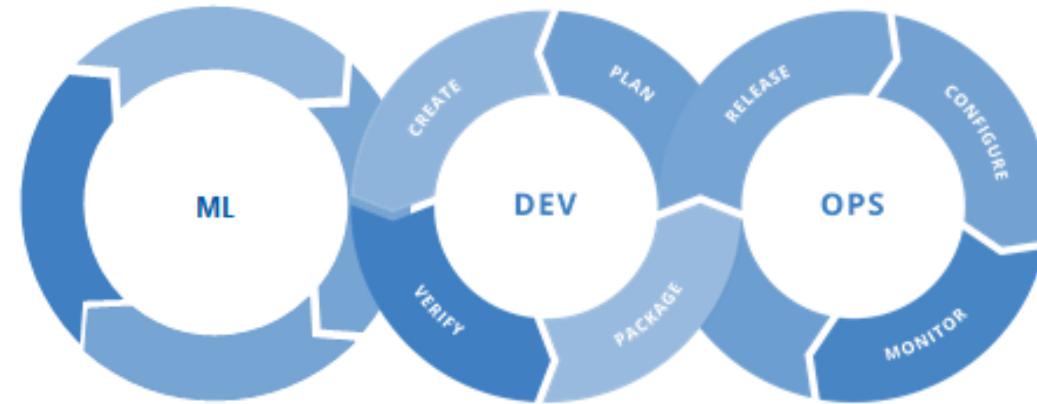
Introduction to MLOps

MLOps is the practice of collaborating and integrating development and operations teams to streamline the process of delivering machine learning models to production.



Microsoft

MLOps = ML + DEV + OPS



Experiment

Data Acquisition
Business Understanding
Initial Modeling

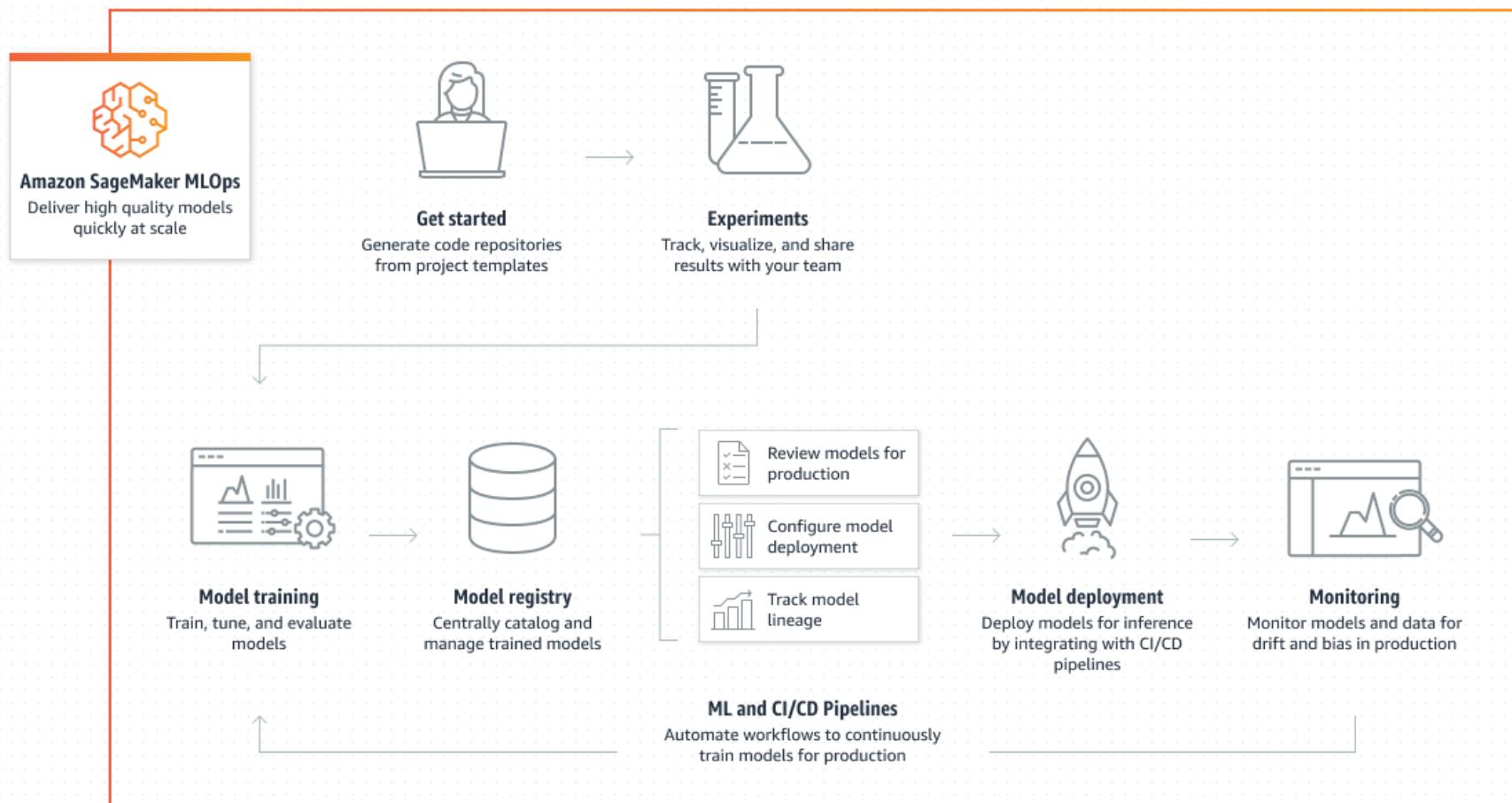
Develop

Modeling + Testing
Continuous Integration
Continuous Deployment

Operate

Continuous Delivery
Data Feedback Loop
System + Model Monitoring

Amazon



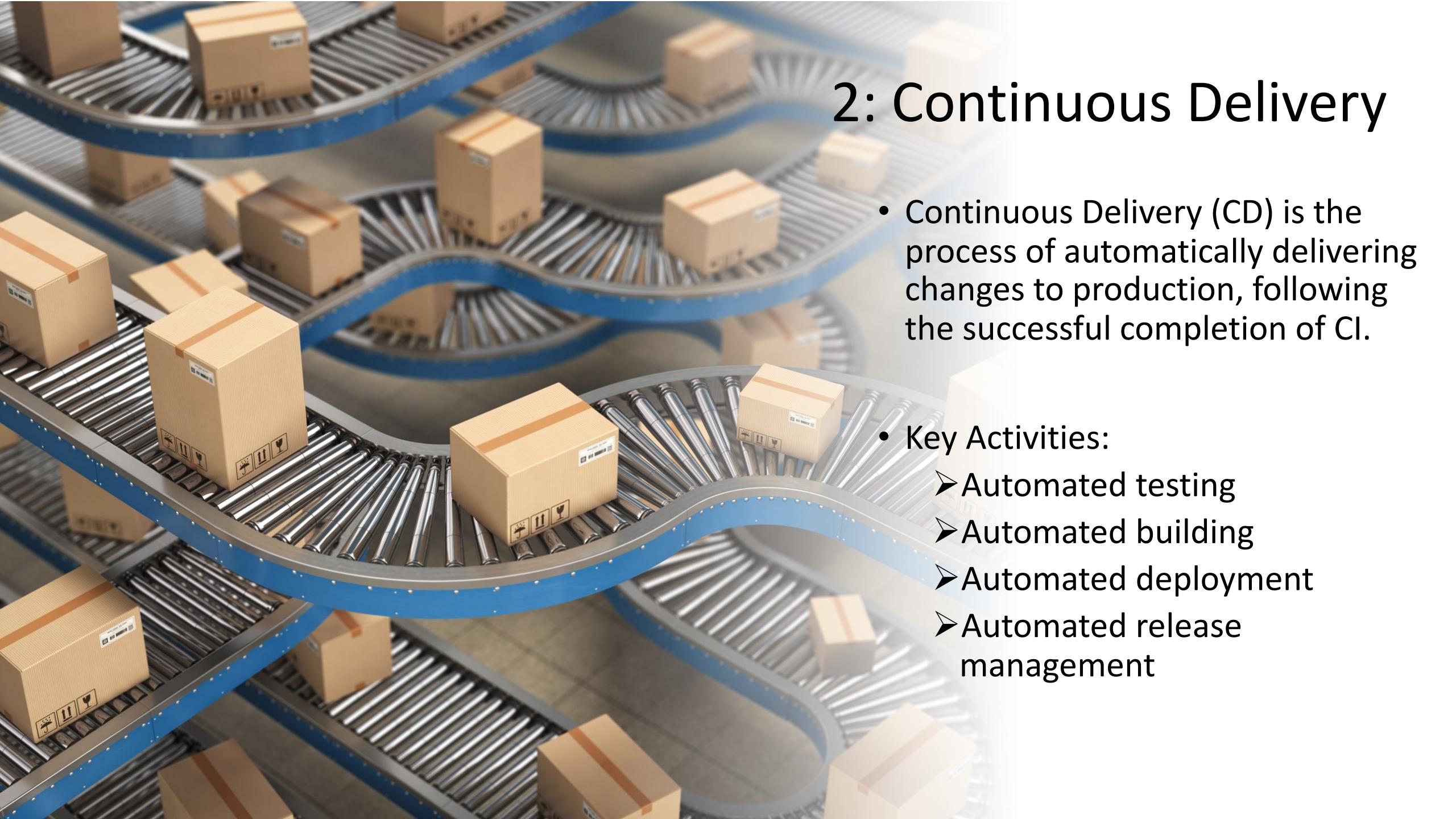


Key Components of MLOps

- Continuous Integration
- Continuous Delivery
- Model Monitoring
- Model Management
- Model Governance
- Model Retirement

1: Continuous Integration

- Continuous Integration (CI) is the process of continuously integrating code changes into a central repository, followed by automated builds and tests.
- Key Activities:
 - Code update
 - Automated testing
 - Automated building



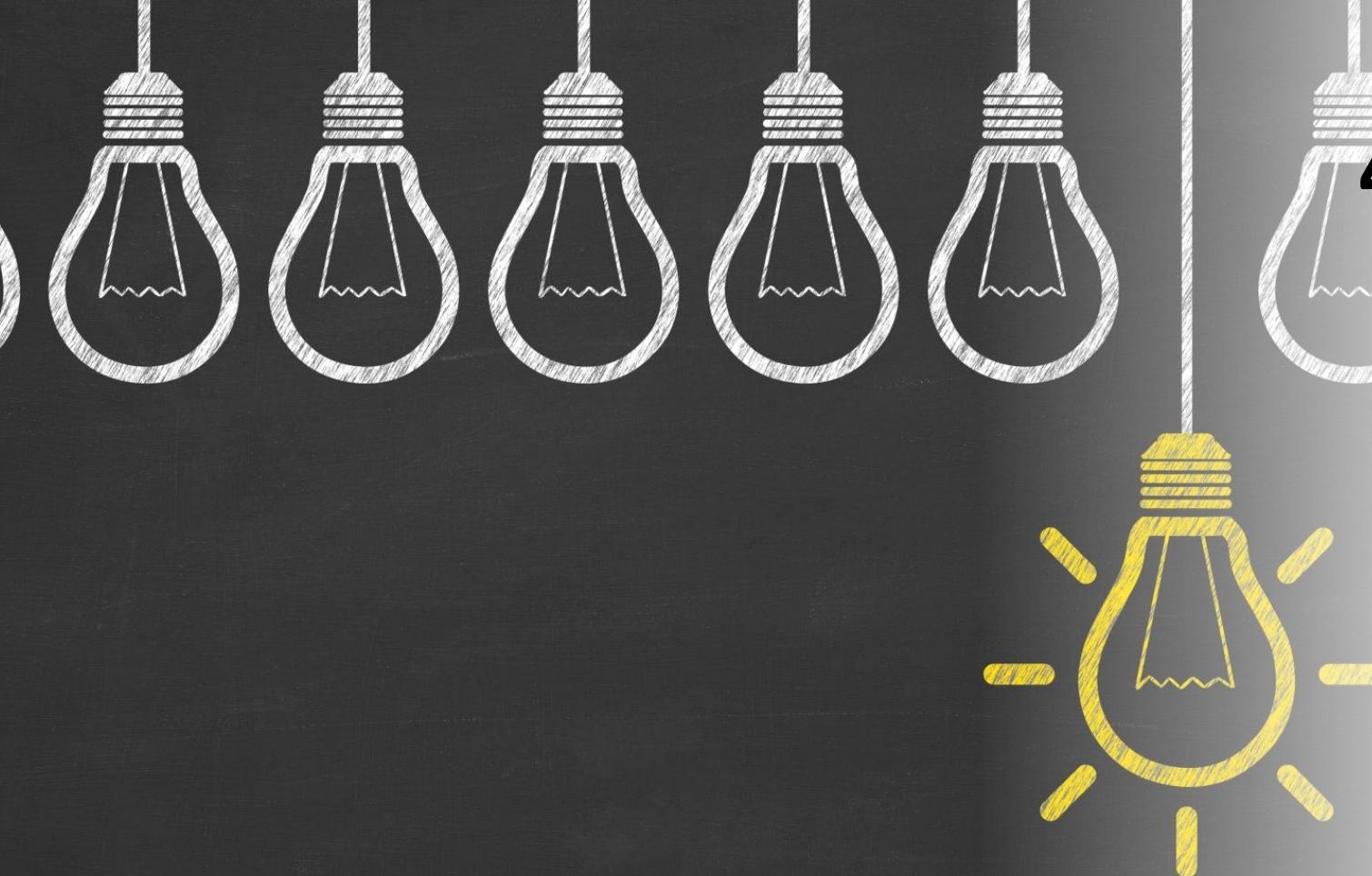
2: Continuous Delivery

- Continuous Delivery (CD) is the process of automatically delivering changes to production, following the successful completion of CI.
- Key Activities:
 - Automated testing
 - Automated building
 - Automated deployment
 - Automated release management



3: Model Monitoring

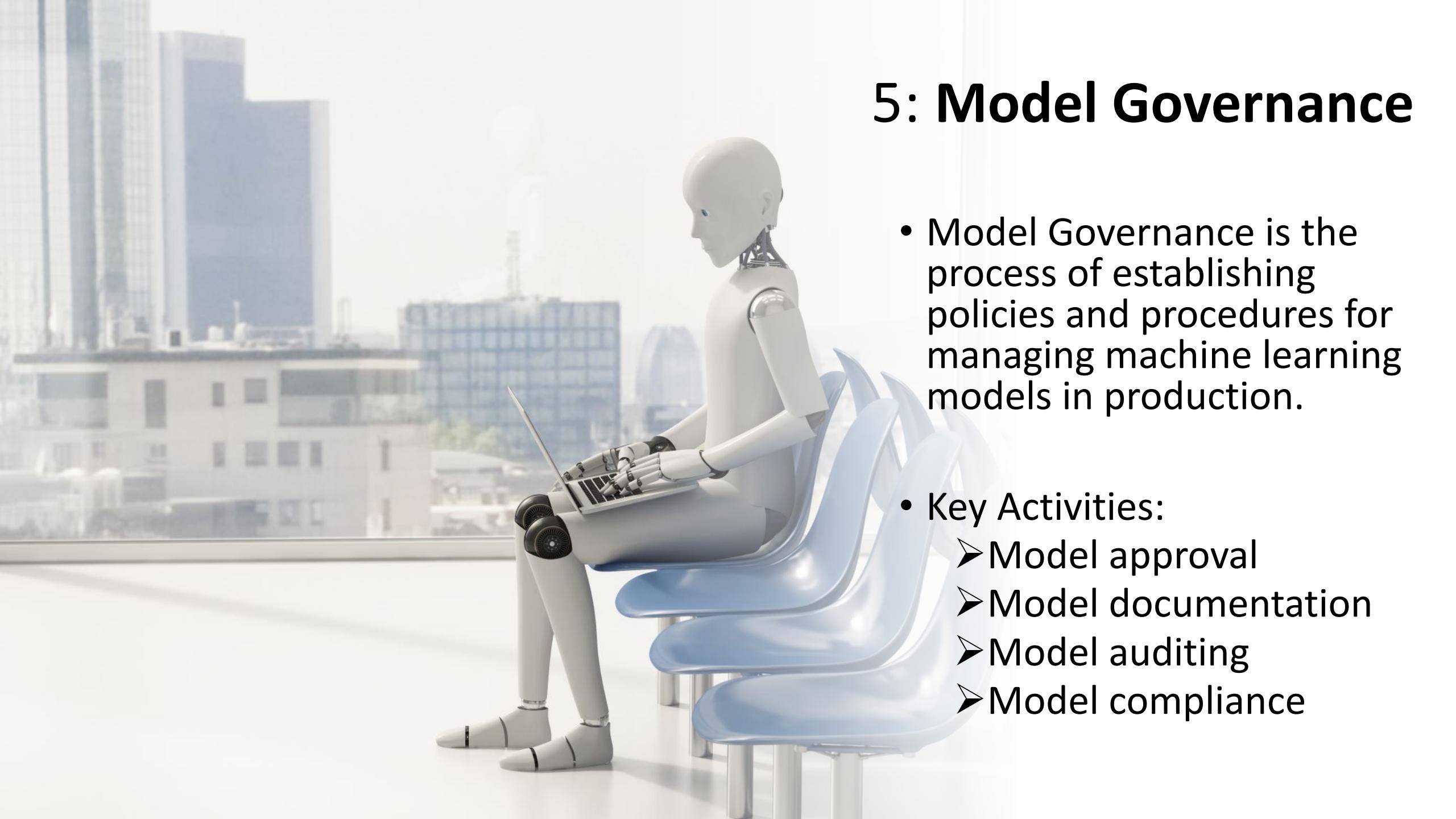
- Model Monitoring is the process of monitoring the performance and behaviour of machine learning models in production.
- Key Activities:
 - Model performance monitoring
 - Model behaviour monitoring
 - Model drift detection



4: Model Management

- Model Management is the process of managing the lifecycle of machine learning models, from development to retirement.
- Key Activities:
 - Model version control
 - Model documentation
 - Model archiving

5: Model Governance

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- Model Governance is the process of establishing policies and procedures for managing machine learning models in production.
 - Key Activities:
 - Model approval
 - Model documentation
 - Model auditing
 - Model compliance



6: Model Retirement

- Model Retirement is the process of retiring machine learning models that are no longer needed or have become outdated.
- Key Activities:
 - Model decommission
 - Model archiving
 - Model disposal

ClearML



Key Takeaways

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- A.I. Lifecycle and MLOps
- Importance of deploying ML models in a controlled and efficient manner
- Overview of the phases of the A.I. Lifecycle and key components of MLOps

References

- Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems by Aurélien Géron
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- Practical Deep Learning for Cloud, Mobile, and Web: An End-to-End Guide to Develop, Train, and Deploy Deep Neural Networks by Dipanjan Sarkar
- MLOps: Continuous Delivery and Continuous Training for Machine Learning by Vladimir Kislichenco and Igor Basko