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Enterprise Machine Learning Pipeline

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12 March 2020

Challenges

- Gartner says 80% of analytics insights will not deliver business outcomes through 2022 and 80% of AI projects will “remain alchemy, run by wizards” through 2020.

  - Gartner (Jan 2019)

- 73.4% of executives report that business adoption of big data and AI initiatives continued to represent a big challenge. 91.5% of firms reporting ongoing investment in AI, but only 14.6% have deployed AI into widespread adoption.

  - NewVantage Partners’ 2020 Big Data and AI Executive Survey

- Data Science initiatives stay at Experimental phase without getting to production?
- How can actuaries leverage data science production process to add value?

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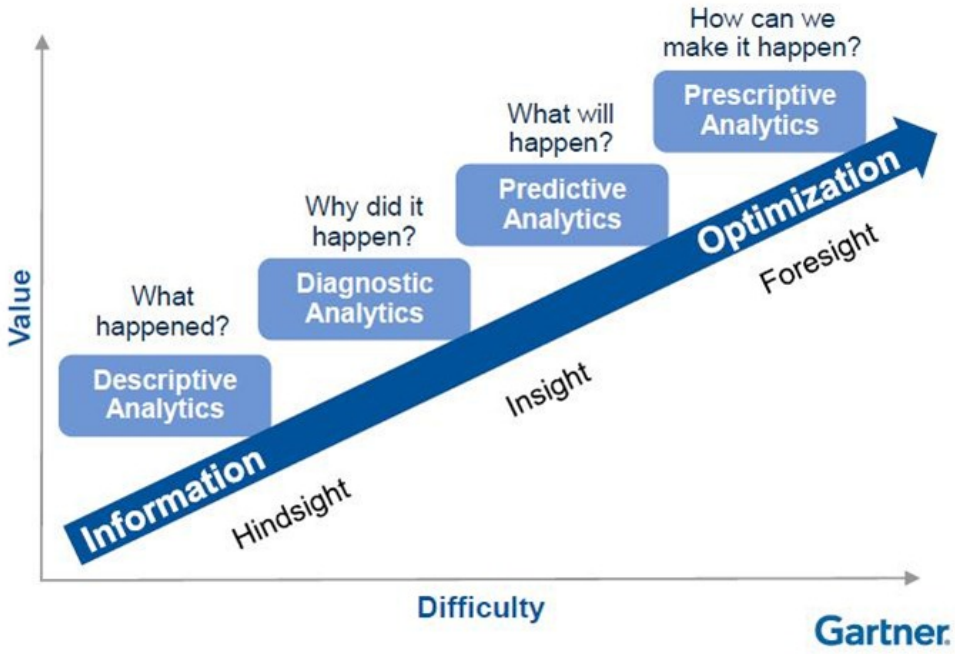
Agenda

- Objective
- Strategy
- AI/ML Pipeline
- Management
- Action

Objectives of Machine Learning Pipeline

- Speed
- Performance
- Integration
- Resilience
- Scalability

Gartner Analytics Ascendancy



Source: *Gartner (2012)*

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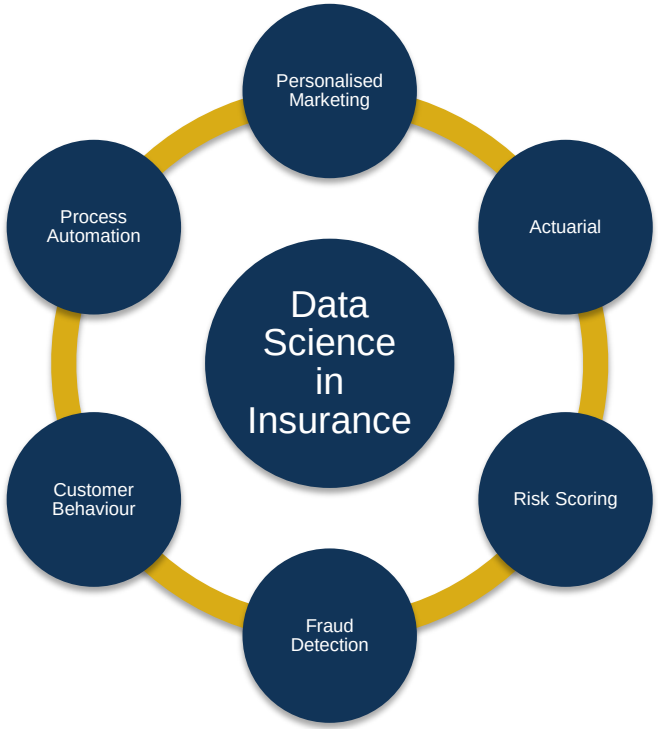
Data Science use cases in Insurance

- Call Center Automation
- Chat-bots
- Robo-Advisors
- Paperwork automation

- Conversion
- Persistency/Renewal
- Churn
- Cross-Selling
- Customer Segmentation
- Customer Life-Time-Value (LTV)
- Recommendation Engine



- Pricing Accuracy
- Pricing Sensitivity
- Pricing Optimisation
- Reserving
- Capital Modelling
- Mortality and Morbidity
- Sentiment Analysis

- Claims Prediction
- Risk Granularity
- Automated Underwriting
- Motor Telematics
- Healthcare analytics
- Portfolio Analytics

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The Architecture

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Enterprise Machine Learning Pipeline

1. Business Problem
2. Data Module
3. Modelling Module
4. Deployment Module
5. Monitoring Module

Opportunity | Information | Insight | Execution | Result

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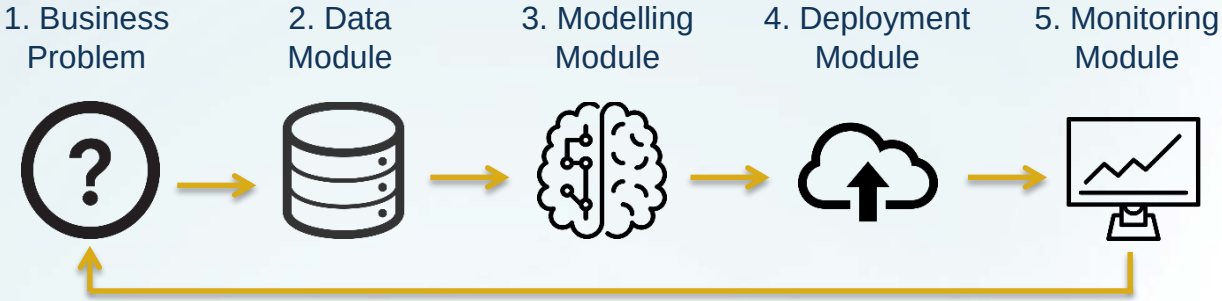
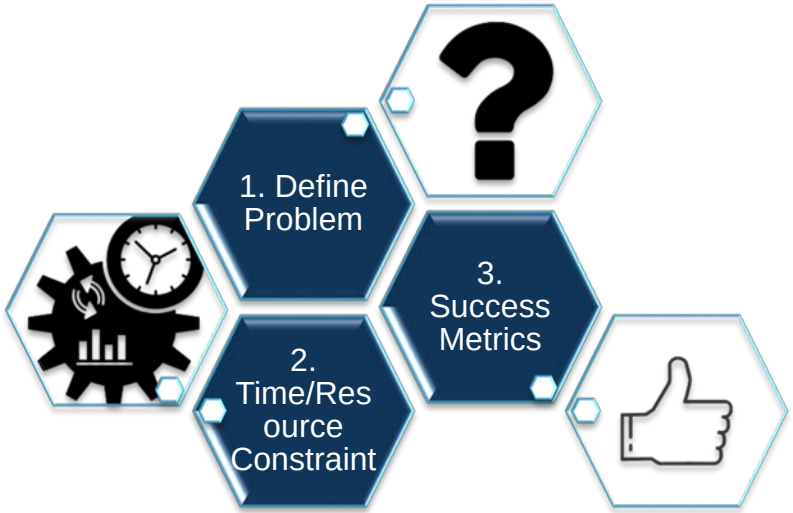
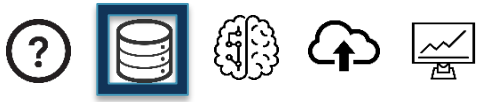


Actuarial Control Cycle

Business Problem



Data Module



Sourcing & Data Engineering

- Data Sources
- Data Connectivity
- Data Engineering
- Data Warehouse

Data Cleaning & Preparation

- Assess Quality
- Formatting
- Outliers
- Missing Data
- Trends

[Auto Reporting]

Data Dictionary

Exploratory Data Analysis (EDA)

- Statistics
- Correlations

[Auto Reporting]
[Auto Visualisation]

Feature Engineering

Feature ..

1. Extraction
2. Transformation
3. Selection

- Expert Driven
- Automatic F.E.

[Auto Reporting]

Feature Store

Data Segregation

Data into

- Train Set
- Test Set
- Validation Set

[Auto Reporting]

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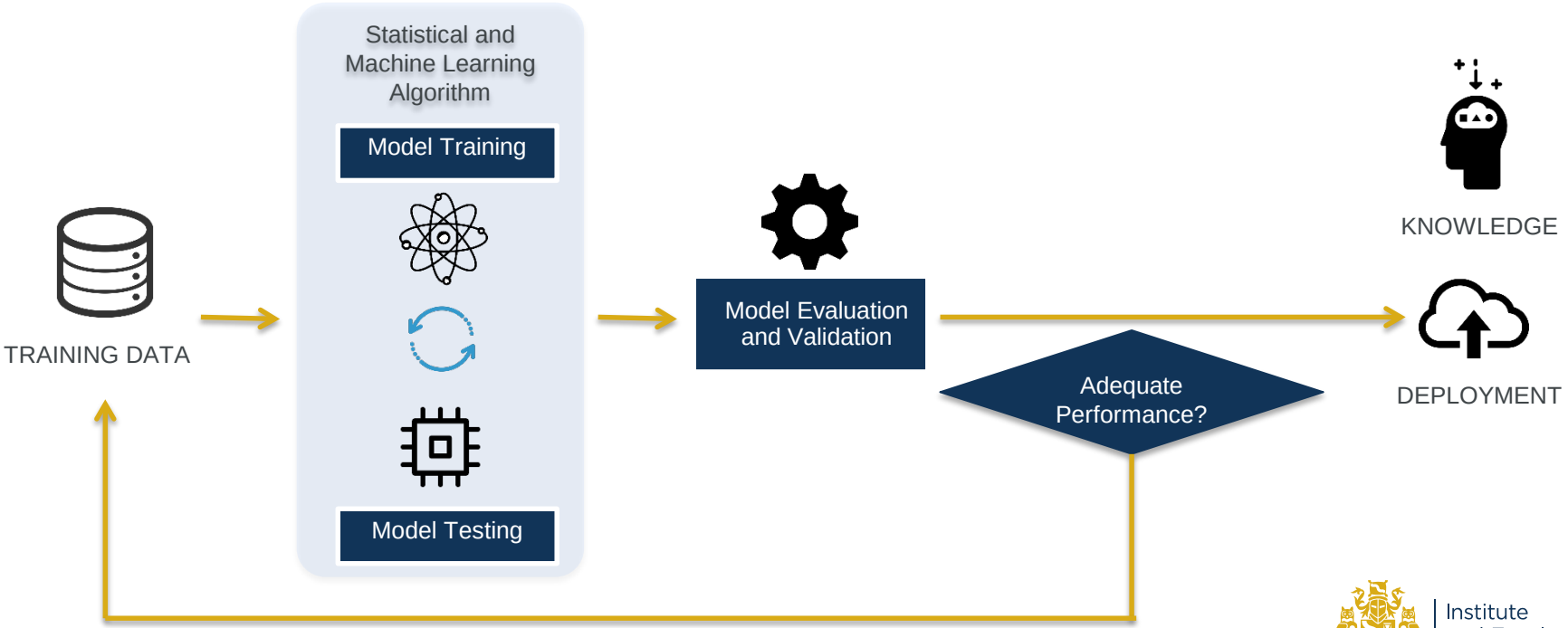
Modelling Module



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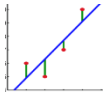
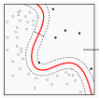
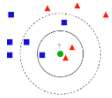
Modelling Module

Model Catalogue | Optimisation Metric | Hyperparameter Tuning

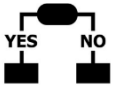

Linear Regression


GLM & Regularization

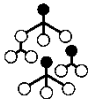

SVM


K-Nearest-Neighbour


Survival Modelling



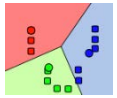
Decision Tree

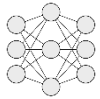

Random Forest


Gradient Boosted Machines (GBM)

XGBoost
Extreme Gradient Boosting


Natural Language Processing (NLP)


K-means clustering


Artificial Neural Network


Custom Model

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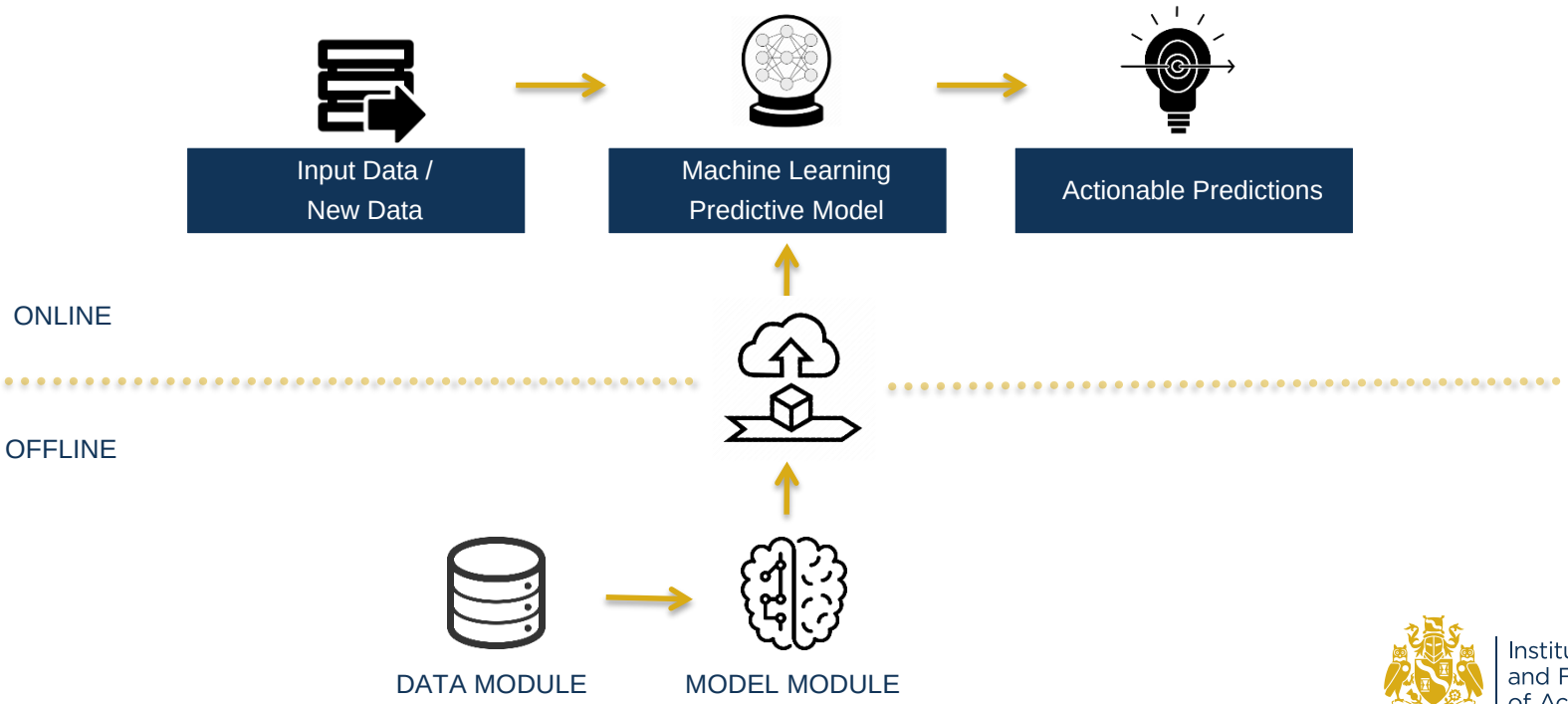
Deployment Module



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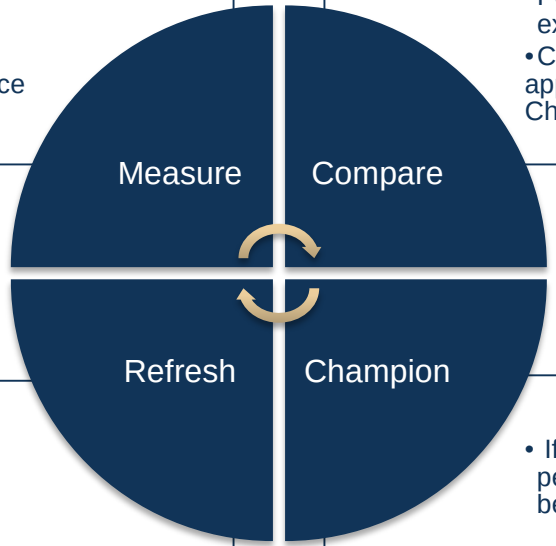
Monitoring Module

- Constant monitoring of newly deployed model using agreed Performance Metrics
- Actual vs. Expected Performance



- Perform Champion Challenger experiment (a.k.a. A/B testing)
- Compare against incumbent best approach/ rule/ model (Current Champion)

- Model will eventually degrade (change in data, market etc)
- Rebuild when metric dropped below a determined threshold

- If successful, promote the best performing challenger model to be the new Champion

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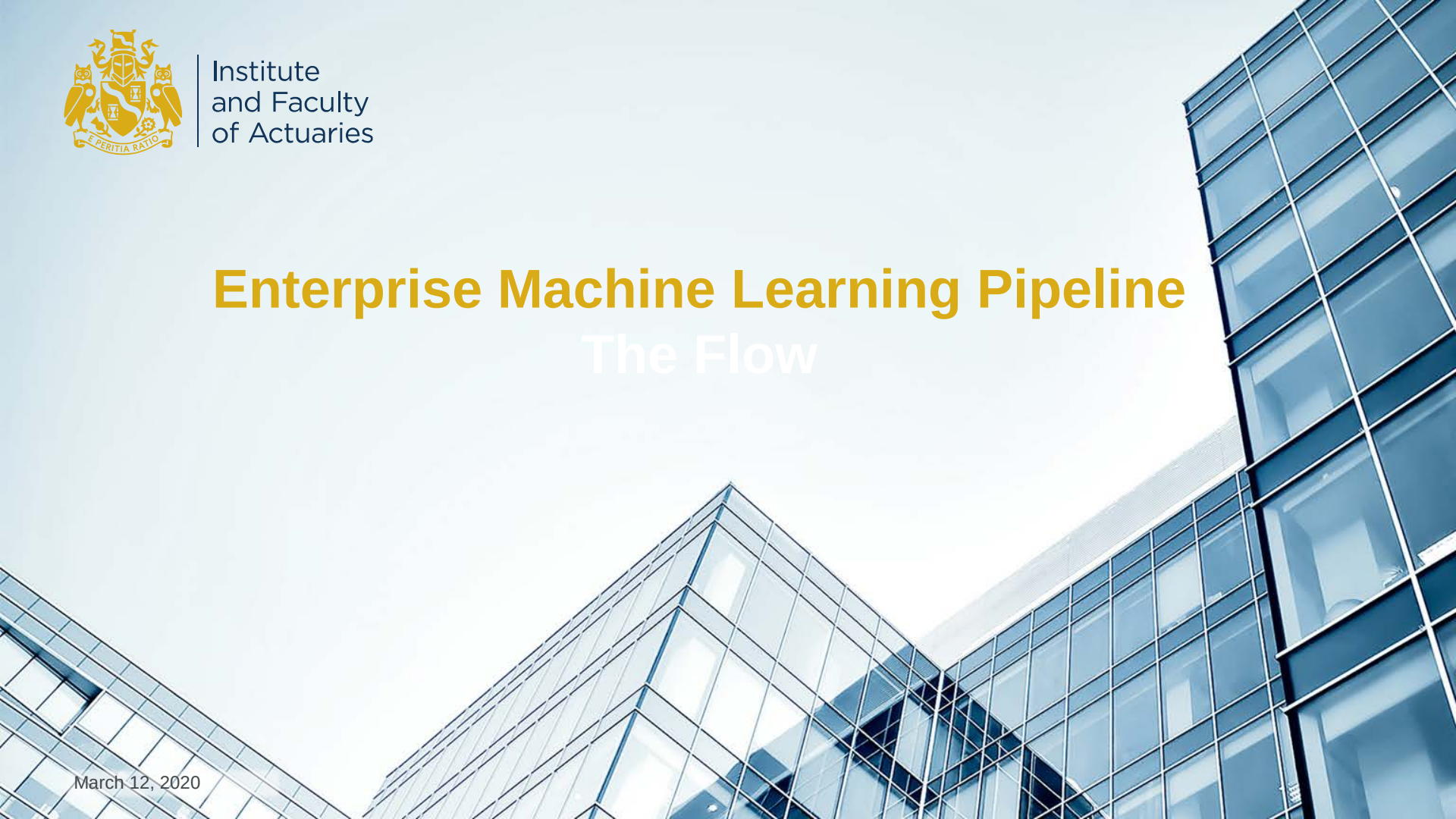

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The Flow

March 12, 2020

Pipeline Automation and Management

- Automation of Processes: Efficiency and Consistency
- Automated Logging, Reporting, Audit Trail
- Error Handling
- Simplify Machine Learning lifecycle development
- Version Control (e.g. GitHub)
- Platform for Business-As-Usual operations, R&D and Proof-Of-Concepts
- Integration into Enterprise
- Scalability

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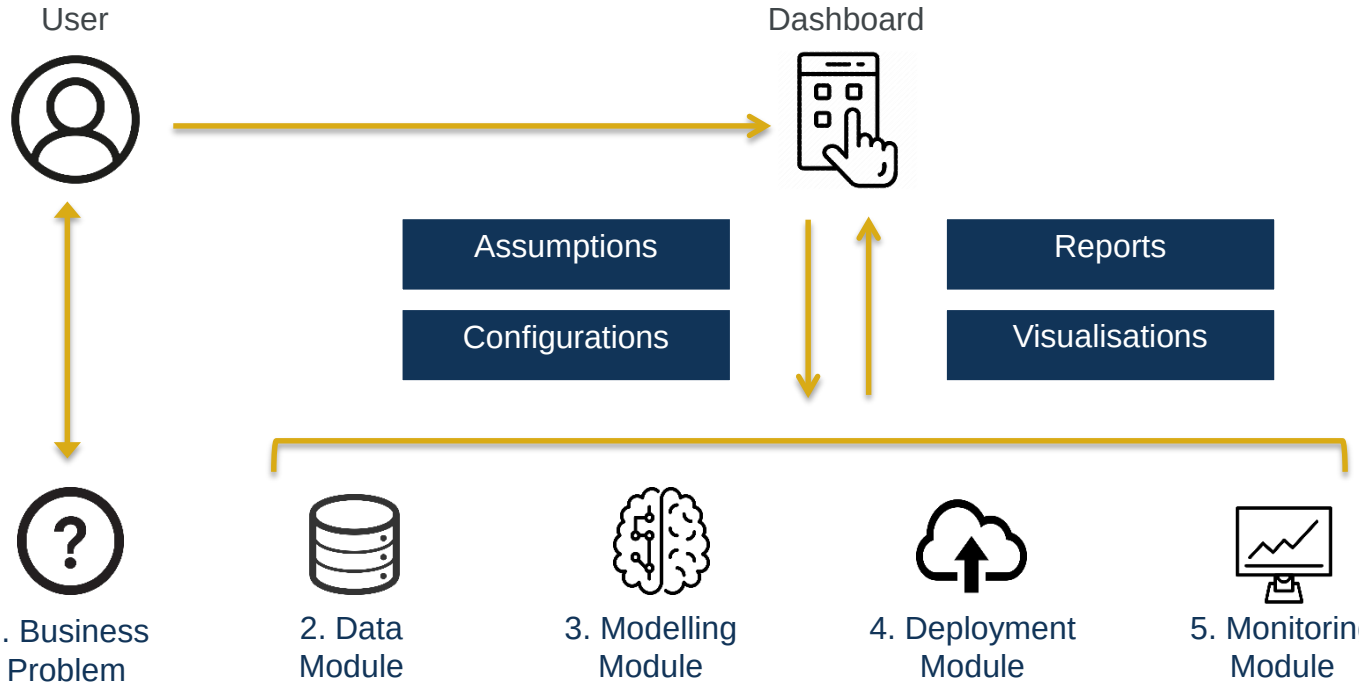
Pipeline Automation: Dashboard



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Pipeline Governance

- Iterative Improvement
- Implementation of Best Practices
- Data Protection
- Data Lineage
- Transparency
- Model Explanability
- Access Control and Security

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Action

Once having the right team, technology and data:

- Identify opportunities and the right questions
- Define goals and framework
- Build Minimum-Viable-Product that is scalable
- Modelling and Deployment
- Monitoring and Review performance
- Scaling and Maintenance

Actuaries, having business domain knowledge and technical skills, could harness the strength of data science and champion data-driven advancements at organisational level.

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Questions

Comments

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