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How to Organize Interdisciplinarity?

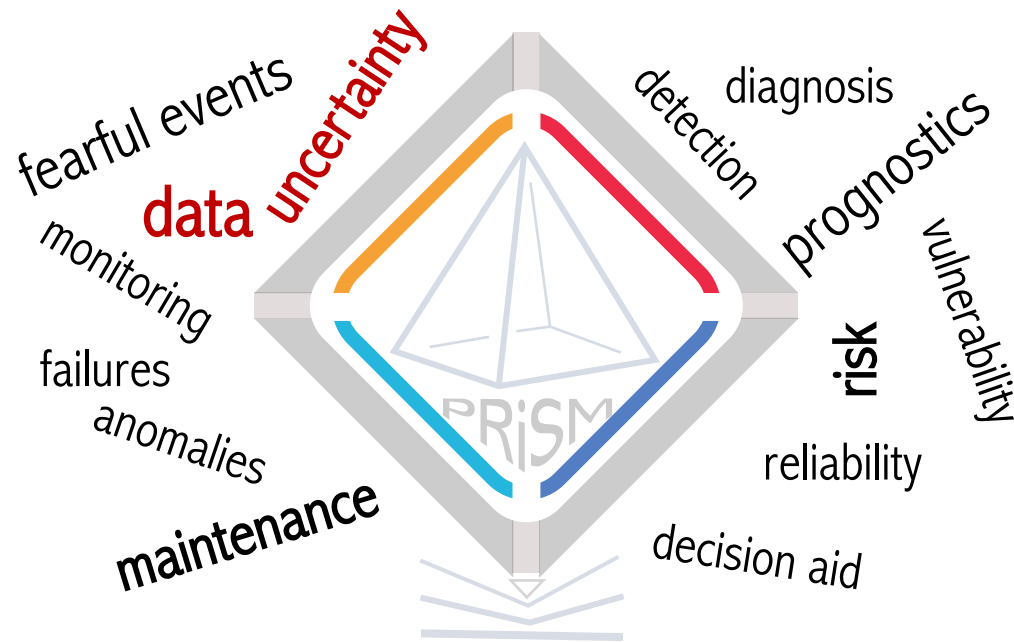
PRiSM Overview



Prognostics, **R**isk & **S**afety **M**anagement for Systems' Resilience



Natural
Systems



Data is all we need



Technological
Systems

Main Applications

- Maintenance
- Earthquakes
- Floods
- Public Health

Research Activities & Outcomes



Mastery of the Systems' Life Cycle



- Issues addressed aim at Characterising and Mastering the **Dysfunctional Behaviour**,
- Needs to **Monitor**, Collect Data, early Detect Anomalies, Diagnose Failures and Predict Useful Lifetime,
- Search for **Resilience** by Anticipating Degradations/Failures.

Useful Tools for Decision-makers



- Understanding the **hazards** that affect the proper functioning of systems,
- Intervention strategies, spare parts management, **cost** saving, etc.

Members main Skills



- **Artificial Intelligence** Methods, Models and Algorithms (Machine/Deep Learning),
- **Probabilistic** and **Stochastic** Models for Modelling Uncertainties,
- **Multi-criteria Decision** Methods,
- Techniques for Analysing the **Dynamic Behaviour** of Systems, etc.



Main Research Topics



- Interactions between components (characterization of the system)
- Data quality, relevance, obsolescence (collection and preparation)

(1) Analysis and specification of the proper functioning of the system

(2) Risk assessment

- Identification and characterisation of fearful events
- Criticality computation



- Reconfiguration, adaptation, reaction
- Adaptive intervention planning
- Search for robustness

(4) Post-prognostics / Recommendations

(3) PHM / SHM

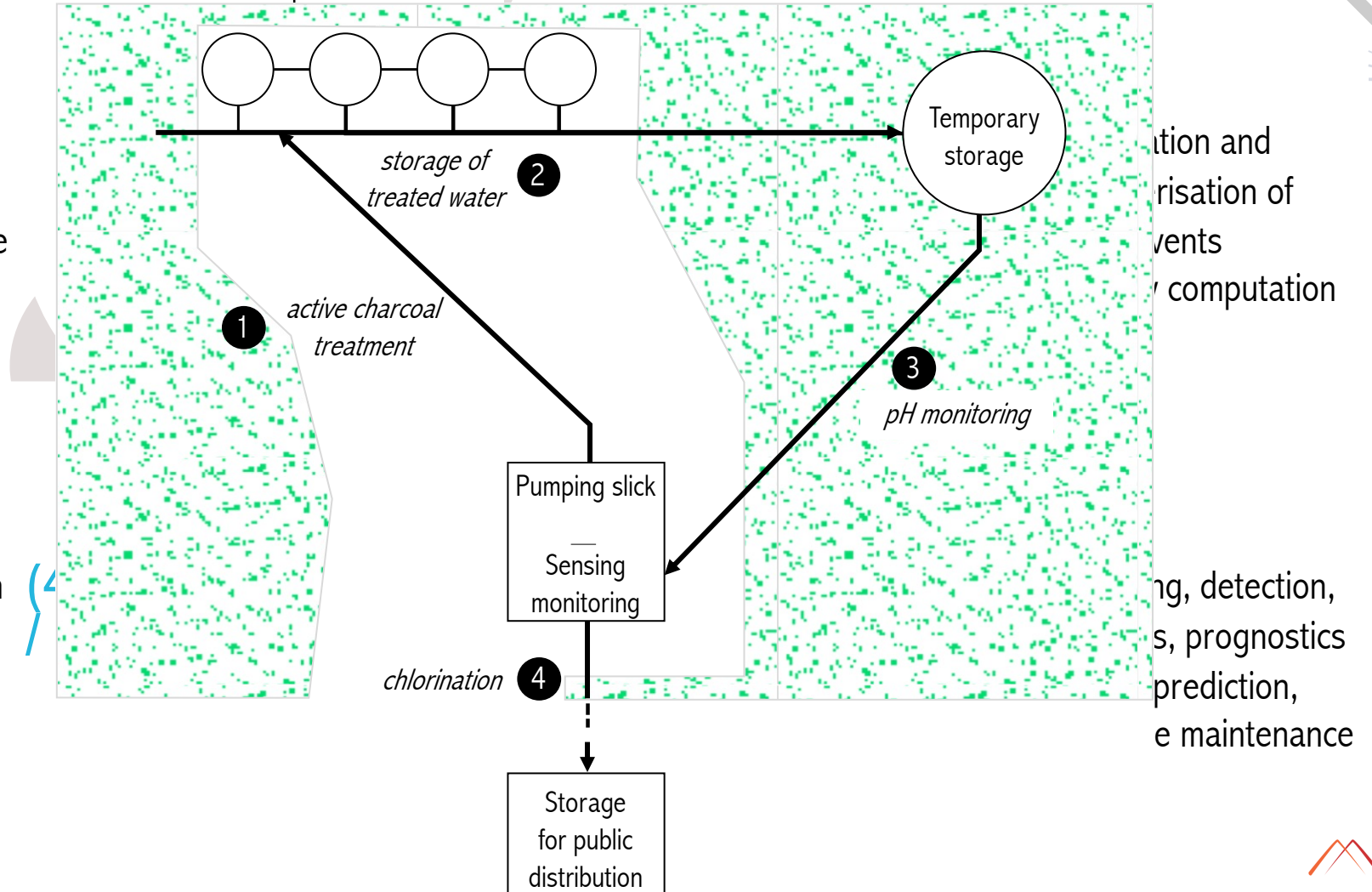
- Monitoring, detection, diagnosis, prognostics
- Lifetime prediction, predictive maintenance

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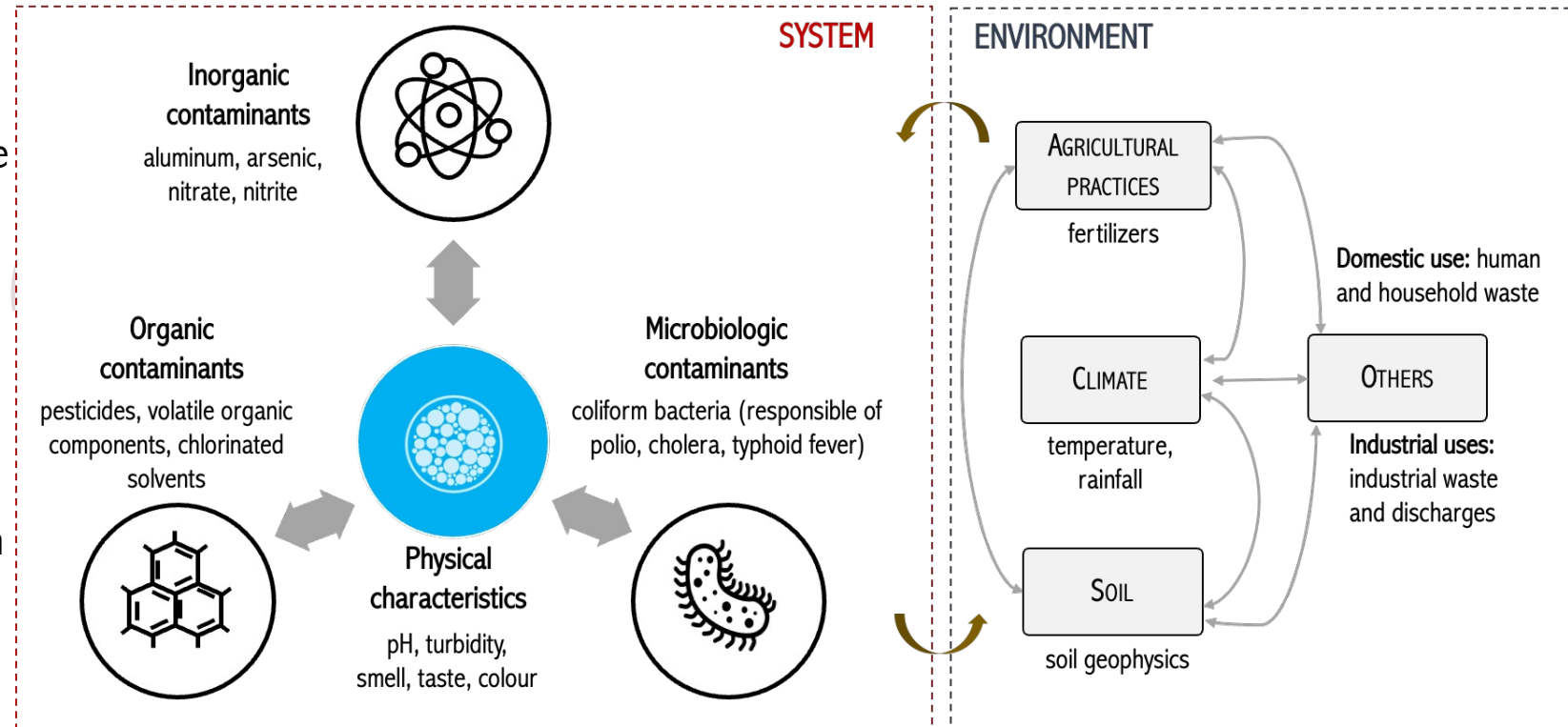
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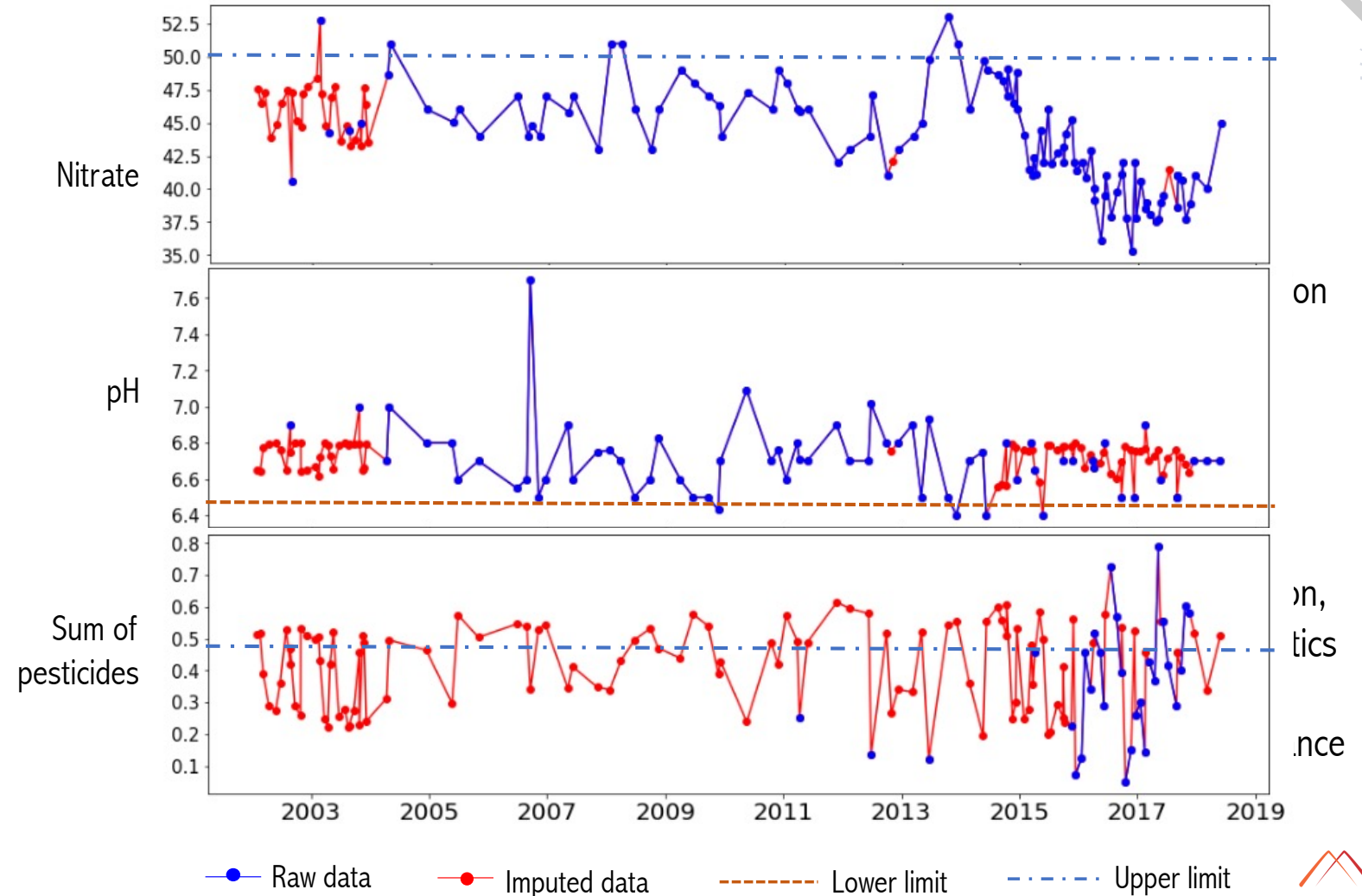
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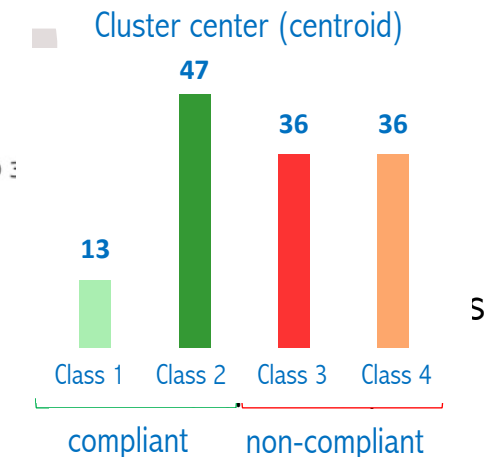
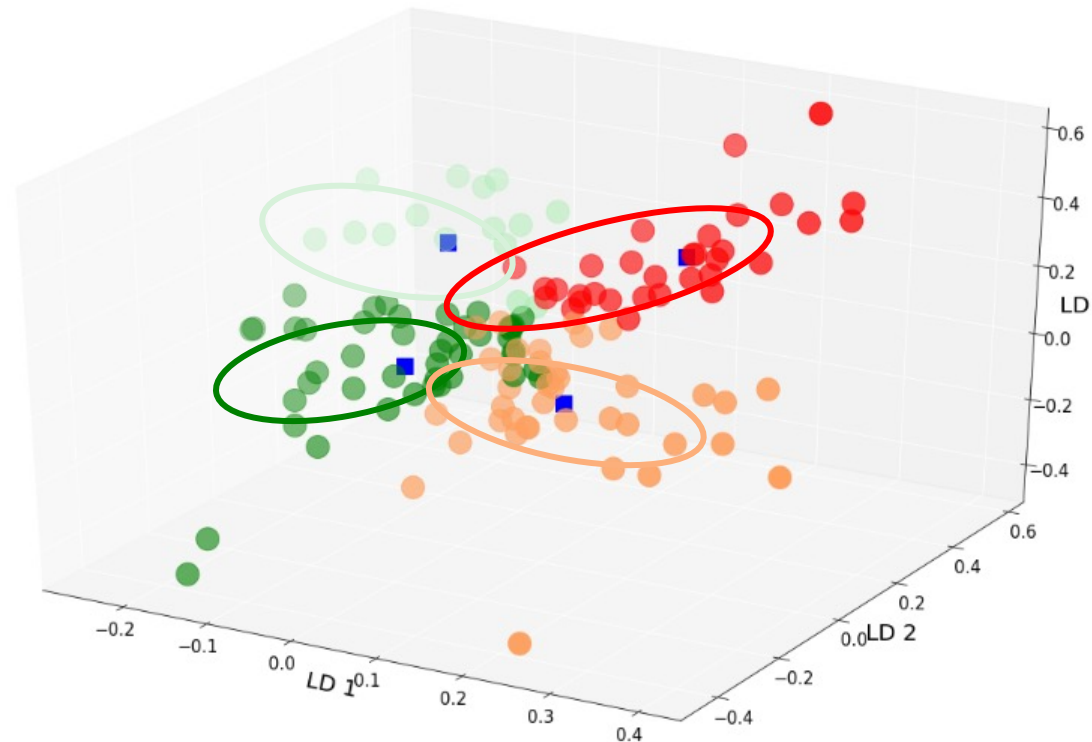
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Core Competency related to Data use



PHYSICS GUIDED

Analytical Methods

Numerical Methods

Logical reasoning

Multi-criteria Decision

Multi-agent system

Physics Models

Decision Models

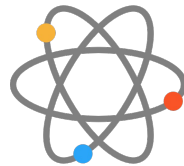
KNOWLEDGE-BASED



Not PRISM



PRISM



Temporal Data

Unstructured Data

Structured Data

No pdf

A priori knowledge

Static Analysis

Dynamics Analysis

DATA DRIVEN

Stochastic Methods

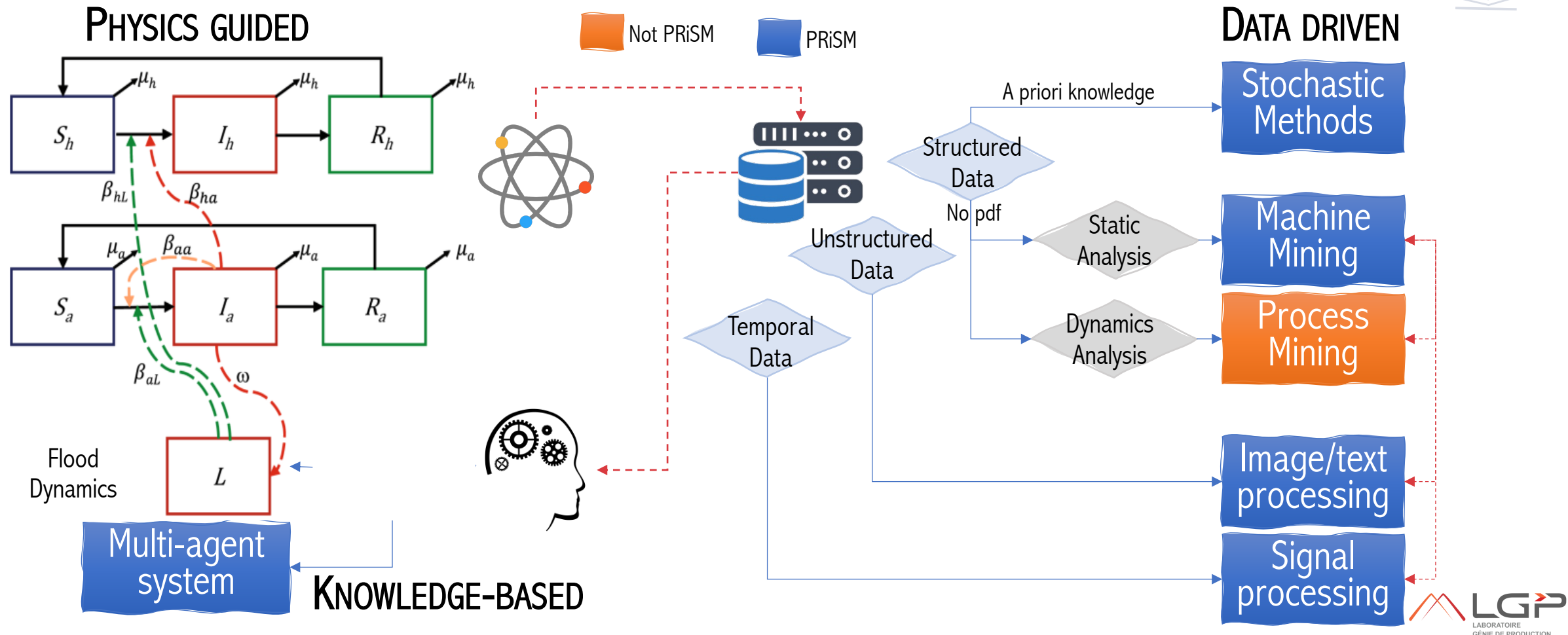
Machine Mining

Process Mining

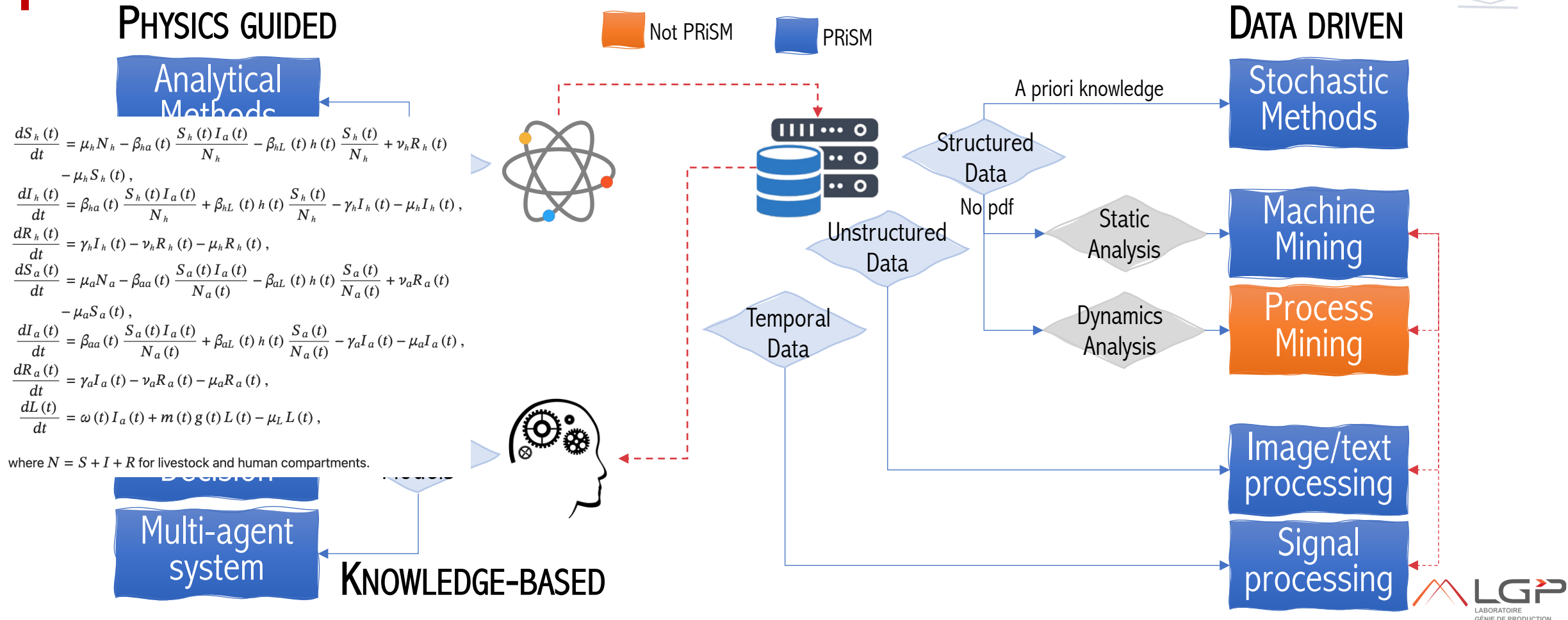
Image/text processing

Signal processing

Core Competency related to Data use



Core Competency related to Data use



Perspectives: Industry 4.0



DATA COLLECTION ISSUE

Deployment of (aquatic) drones in fleet



- Robust and agile coordination,
- Control architecture and generic and scalable methods (depending on the configuration of the water bodies, lakes, rivers or canals),
- Determination of optimal and adaptive trajectories with obstacle avoidance (obstacle detection e.g. barges, identification and localization processes).



Perspectives: Industry 4.0



HUMAN IN/ON THE LOOP ISSUE

Business Intelligence & Augmented Decision



- Reproduce and analyse the dynamics of the systems, and identify parameters and factors of influence (digital twin / simulation).
- Relieve decision-makers from depending on data specialists (semantic data analyses, natural language queries ...)

Thank you

