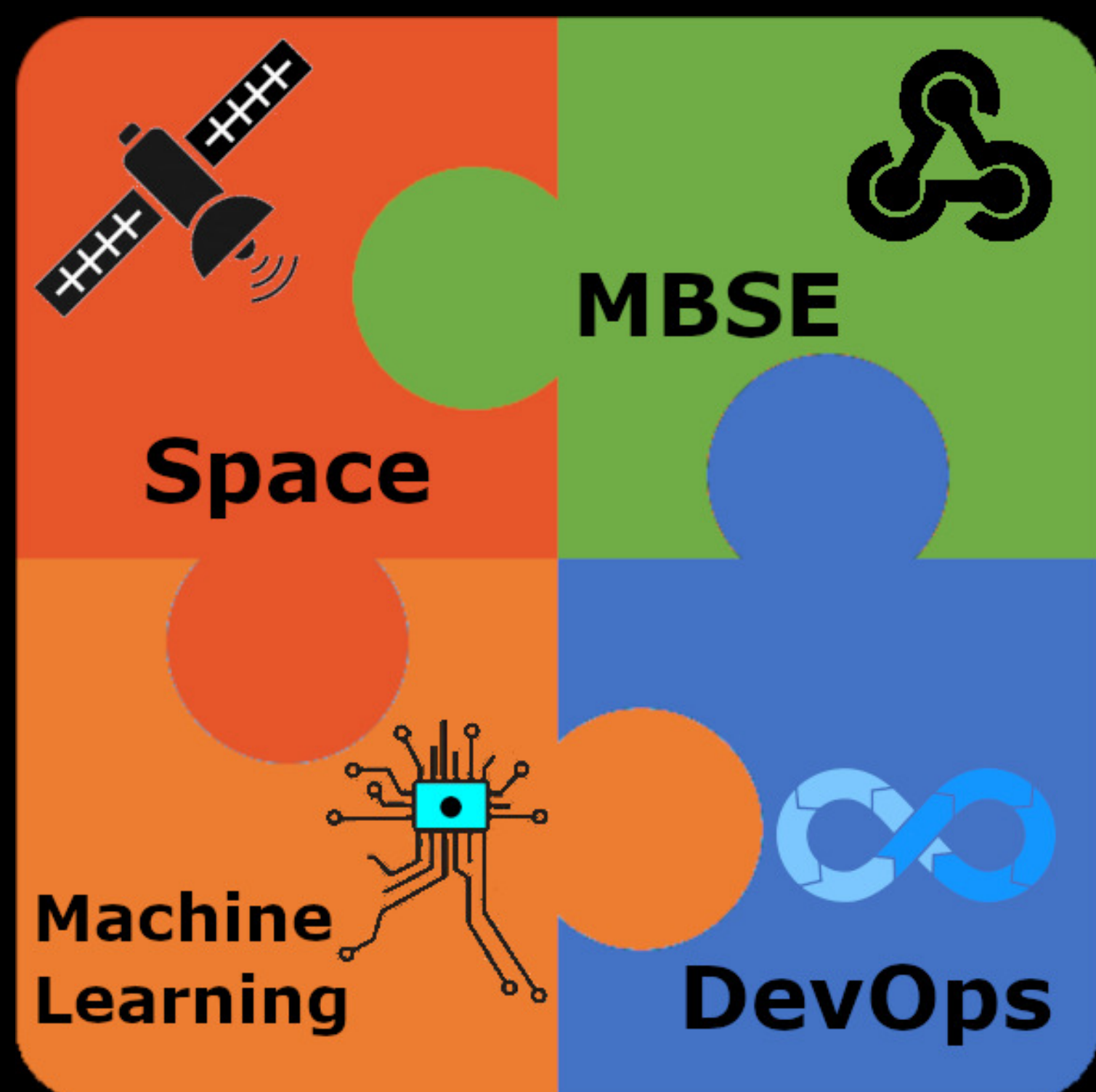


Evaluating Model-Based System Engineering for Machine Learning in Space Operations (MLSpaceOps)

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Objectives

MLSpaceOps aims to evaluate the use of Model-Based Systems Engineering (MBSE) methodologies for Machine Learning pipelines in satellite mission operations.

This work addresses:

- i) integration of MBSE [4] to bridge the gap between the domain experts and the data scientists,
- ii) by applying ML for satellite mission operations,
- ii) with guidance on quality assurance [3], where quality is not only defined by the product's fitness for its purpose, but the quality of the task executions (Quality Gates) in any phase during the development of the ML application,
- iv) by following the complete workflow for deployment and operations inspired upon the CRISP-DM [2], CRISP-ML [5], and MLOps [1].

Advantages

Allow a more autonomous process to support business understanding, design, verification, and validation of the ML models used in satellite operations by formalising the knowledge of Space Systems and ML domains in an MBSE model (SysML, RDF/OWL, between others).

Quality Gates

Ensure the data quality, representativeness, robustness, and trustworthiness of the ML models. The following are Quality Gates (QG) related to the Figure shown in the Architecture.

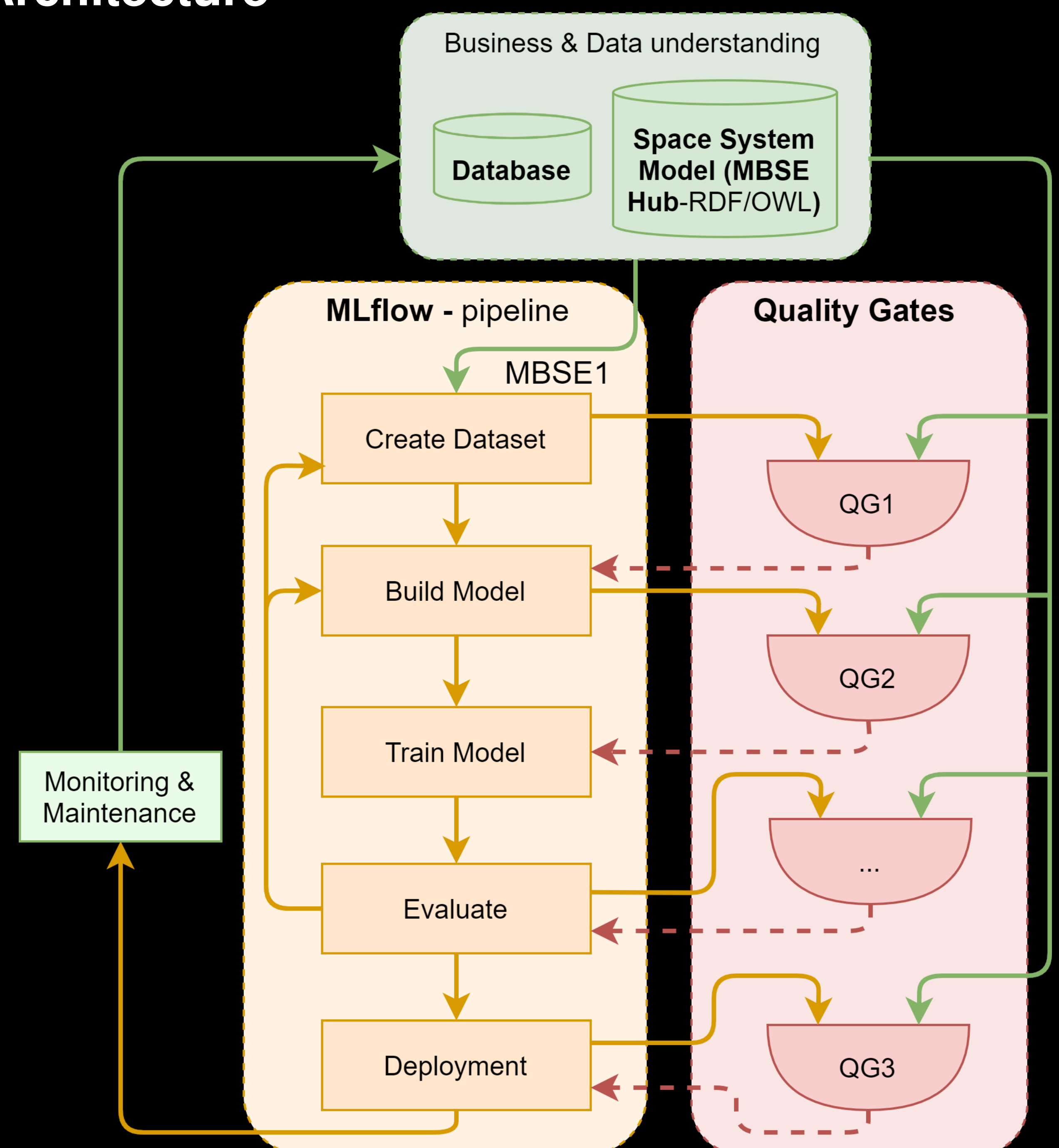
QG1 The data is representative.

QG2 The algorithm is appropriate.

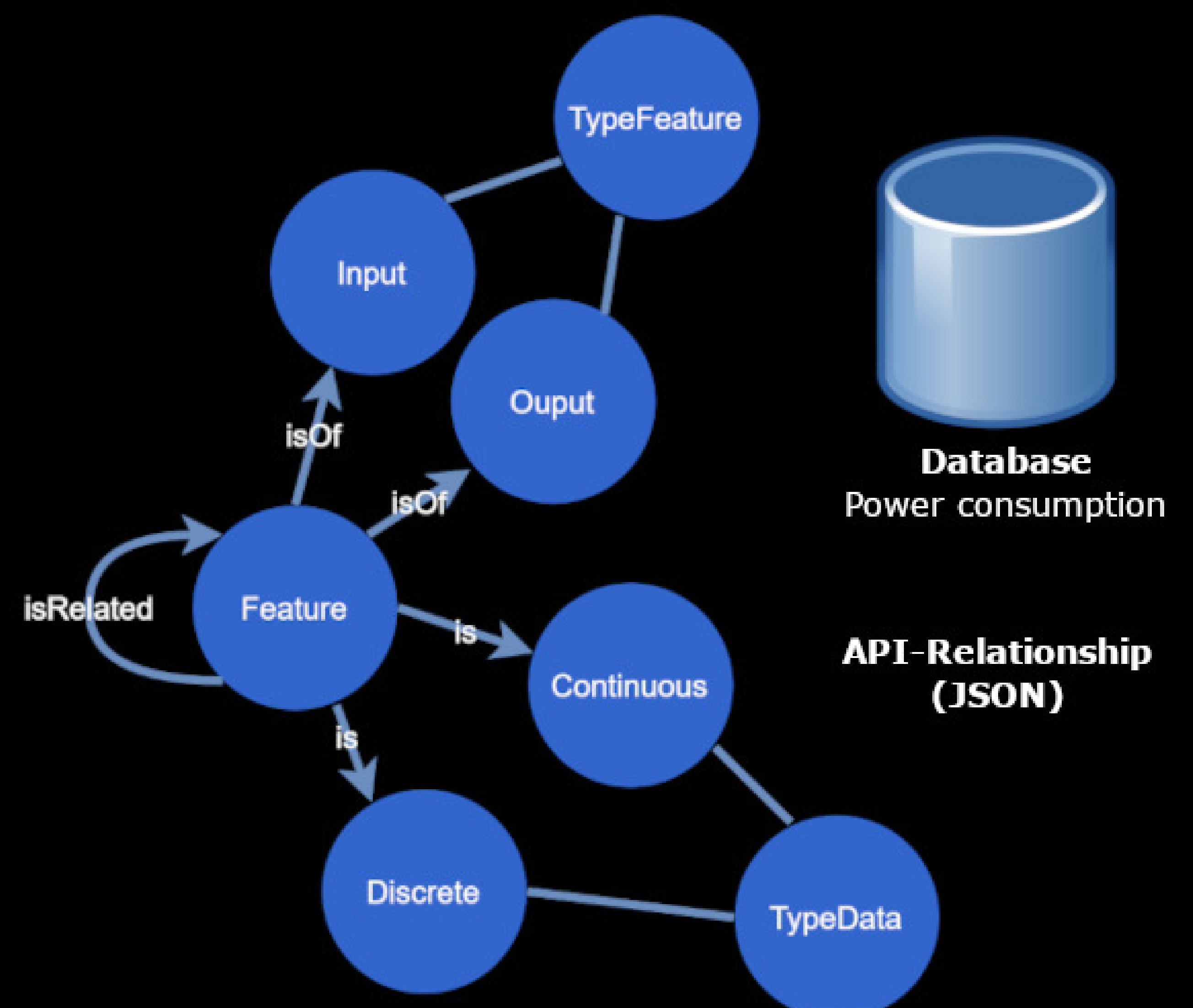
QG3 Final output model passes constraints.

Each Quality Gate has one or a set of Quality Checks.

Architecture

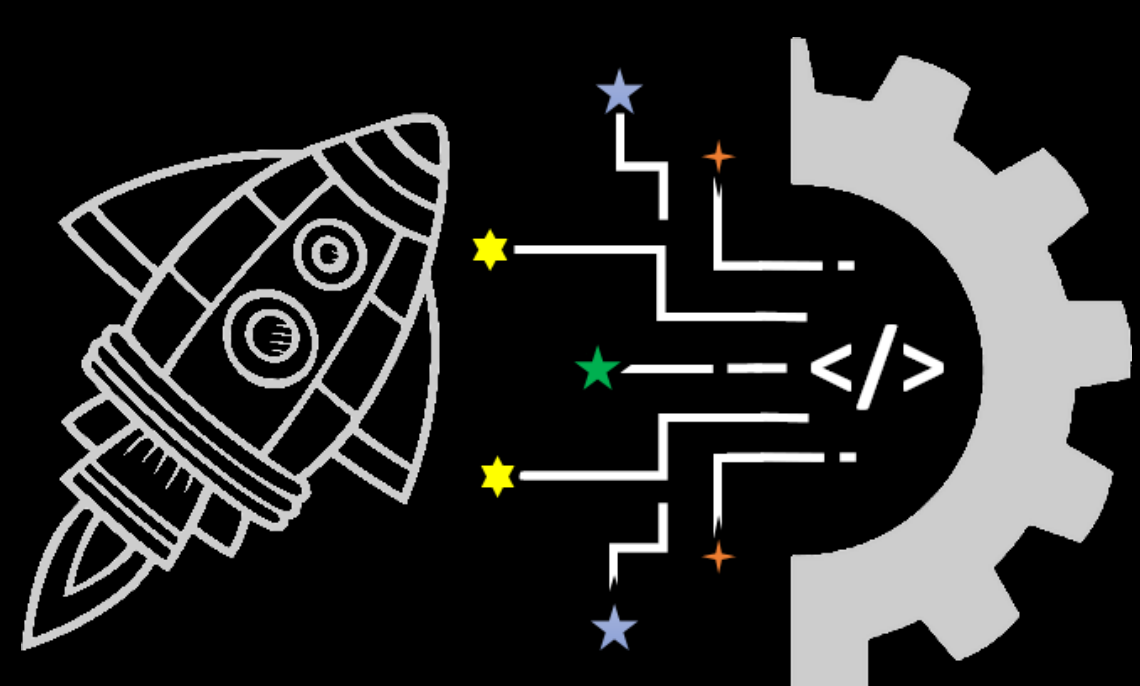


MBSE1 Search for the explanatory features



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MLSpaceOps

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