Review Protocol for Quality Attribute Impact of Design Patterns in ML-Enabled Systems

Version 2.3

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May 20, 2024

This document specifies the review protocol for the study Quality Attribute Impact of Design Patterns in ML-Enabled Systems and includes the following sections:

- Research question
- Search strategy
- Study selection criteria
- Study selection procedures
- Data extraction strategy

1 Research Question

RQ1: What common patterns can be derived from existing component models of ML-enabled software systems in literature?

2 Search Strategy

The search will be preformed in the following databases:

White literature: IEEE Xplore, Wiley's, ACM DL, SpringerLink

Grey literature: Google Image Search, Google Patents

The grey literature will be searched using an incognito mode in the browser to avoid search results tailored to our profiles.

The search string will be the following:

```
("component model*" OR "architectural description language*"
OR "component diagram*" OR "class responsibility collaborator*" OR
"structure chart*" OR "component based design*")
AND
("ml-system" OR "ml-enabled system" OR "machine learning" OR
"deep learning" OR "reinforcement learning" OR
"unsupervised learning" OR "supervised learning" OR "neural network")
AND
NOT "artificial intelligence"
```

For the search on grey literature we will use modified search strings. When searching Google Images, we will use the following string:

```
"machine learning" AND ("component model" OR "component diagram")
```

For Google Patents, since a pattern will most likely include an architectural diagram anyway we do not need to search for it explicitly. Therefore the search string will instead be:

```
"ml-system" OR "ml-enabled system" OR "machine learning" OR
"deep learning" OR "reinforcement learning" OR "unsupervised learning"
OR "supervised learning" OR "neural network"
```

3 Study Selection Criteria

Inclusion criteria:

- The system the source mentions is a software system.
- The system the source mentions is a machine learning system.
- The focus of the source is on the system itself.
- The source contains one or more figures showing the relationship between architectural components.

White literature exclusion criteria:

- The source was not written in English.
- The source was a duplicate.
- The source was published before 2014.
- The source was not available in full text.
- The source was not a single chapter or paper.

Grey literature exclusion criteria:

- The source was not written in English.
- The source was a duplicate.
- The source was published before 2014.
- The source was video or audio.
- The source contained component models or equivalent only as an example of what they are or how they are used.

Stopping criteria for grey literature:

- First 100 images of Google Image Search.
- First 100 patents.

4 Study Selection Procedures

We will strive for only using sources written in English. However, if it turns out that the amount of component models we can retrieve from English sources is limited, we will relieve this exclusion criteria. In this case, we will prioritise languages that works well with translating.

Each study will be assessed by one person. If some disagreement arises on whether or not a source contains a component model, we will ask Vladislav or Daniel for a third opinion.

5 Data Extraction Strategy

When a component model has been identified, we will copy and store it. Additional info on the type of system, as well as what type of ML is used, will also

be stored. If there are any disagreements on the extracted models we will ask Vladislav or Daniel for a third opinion.