<div align="center">**Algorithm Design and Development Plan**</div>

1. Purpose

This document describes the plan for algorithm design and development, under its indication of use and performance evaluation plan.

2. Academic Research Strategy

This section describes your strategy to find the most promising papers. Usually, you need to select your academic search engine (i.e., resources), keywords, filters to identify the most promising ideas (i.e., papers) to build your algorithm. For example:

- Resources. e.g., PubMed, IEEE, Google-scholar, clinicaltrials.gov, FDA-510k …
- Keyword list. The keywords shall at-least cover the following domains:
    - machine learning - time-series analysis, spectrum, probability model, supervised vs unsupervised model, regression vs classification, online-training & personalized etc.
    - clinical research - guideline, disease-related keywords, endpoint-related keywords etc.
- Filter: to select paper with high citation in short period. e.g., paper will be selected if it's cited by 100+ times within 3 years.
- Filter: to select paper on top conferences or journals. e.g., JAMA, JACC, NJEM, ICML, CVPR (low acceptance rate or high impact factor) etc.
- Filter: to select paper based on level of evidence
    - machine learning:
        - less opportunity to get overfitted, +1 point. e.g., the proposed method is verified on RCT or prospective clinical trial data; the proper annotation distribution (large range, not severe imbalanced); robust performance evaluation strategy (no mixing of training and testing patient ID, no using of future data to predict past events, etc.)
        - rationale in physiology/pathology/clinical-pathway, +1 point. e.g., In physiology, K+ can cause ECG-T change. Then signal processing on ECG-T (area, sloop, spectrum, time-series-pattern) can be regarded as promising.
        - rationale in mathematics, +1 point. e.g., the paper mathematically proves it can be easily trained or adapted for personalization.
        - source code is accessible, +1 point. Need not be in Python, source code availability increases the chance of reproducibility.
    - clinical research:
        - level A: high quality evidence from 1+ RCT or meta-analysis.
        - level B: … …
        - … … please check reference [3] (2017 ACC/AHA/HFSA Focused Update …)

3. Toolbox Research Strategy

This section describes the strategy to identify good toolboxes/libraries that can be used for implementation. Toolboxes/libraries can be identified by good academic papers with source codes, GitHub, Package managers (such as Pip for Python). Things to consider when deciding to include a toolbox/library includes:

- Ease of use
- Well maintained (This is to identify whether a repository is being actively maintained. If not, there might be issues such as compatibility and unfixed bugs).

- o   Last update/commit/release date is recent
- o   Issues are resolved or responded to
- o   Issues with recent dates
- Number of stars/forks (To identify whether the library is being widely used. Wide usage usually means good maintenance and good documentation.)
  - o   Number of contributors may also need to be considered, sometimes a single-contributor library could be risky.
- Documentation (Whether documentation is adequate and up to date)
- Community
  - o   Are there recent questions on websites such as StackOverflow and are they answered to?
  - o   Are the issues resolved?
  - o   Is the library actively being used by academic papers or other tools?
- Developer
  - o   Some toolboxes are developed by large companies or big academic labs. If the tools are actively being used by themselves (such as in products or papers), the likelihood of being well-maintained and well-documented would be higher.
- Performance
  - o   Is there any benchmark associated with the library/toolbox?
  - o   Performance includes both speed and accuracy.

4. Academic Research Summary

This section describes the way to present the selected most promising papers.

Keywords	1st author	Time	Title	Why you think this paper is promising, refer to section 4	Remark
AA, BB	XXX	2020	XXX	100+ citation in 2 years, top journal, level of evidence +3.	rank 1

[note] Usually we select top 5-10 papers to implement first. Their real performance will be evaluated based on XXX Performance Evaluation Plan [2].

5. Toolbox Research Summary

This section describes the way to present the selected most promising toolbox.

Keywords	Link	Time	Title	Why you think this paper is promising, refer to section 5	Remark
AA, BB	XXX	2020	XXX	100+ citation in 2 years, top journal, level of evidence +3.	rank 1

[note] Usually we select top 5-10 toolbox to try out first. Their real performance will be evaluated based on XXX Performance Evaluation Plan [2].

[tips] Code owner shall build the Jupyter notebook develop environment, and then invite multiple data scientist for development. Make sure all of them work in the root folder (e.g., tests/), but updating independent folder (e.g., library/xxx)

6. Examples

- Template - ECG-PSVT Algorithm Design and Development Plan
- Template - Research Plan towards Comparison between Digital and Traditional MMSE.docx
- Template - Research Report towards Comparison between Digital and Traditional MMSE.xlsx

7. Revision History

Revision	DCO#	Originator	Description of Change
0.1	XXX	Chen Hao	Initial release.