Project Plan Submission

1. Please enter the current planned title for the project.

   Self-Supervised Interest Point Detection and Description (SuperPoint) and Visual SLAM Integration

2. Please list the names of the supervisors and their affiliations if not UCL.

   - Francisco Vasconcelos (Department of Computer Science UCL)
   - Simon Julier (Department of Computer Science UCL)
   - Ziwen Lu (Department of Computer Science UCL)

3. Please specify whether the project will be carried out remotely or on-campus (in London area).

   On-campus for part and remote for part

4. A one paragraph summary of what the project is about.

   This project presents a self-supervised interest point detection and description (SuperPoint) integration into a visual SLAM software (ORB-SLAM). The SuperPoint operates on a full-size image and produces interest point detections accompanied by fixed-length descriptors in a single forward pass. It learns the descriptors by generating image pairs with known homography transformation after pre-training an interest point detector on synthetic data. By using this machine learning method, this project will experiment with how interest point detection can outperform available hand-crafted algorithms (such as FAST, SIFT, and ORB). Subsequently, we will optimise the performance in domain-specific environments and develop appropriate metrics for evaluation.

5. Write down the sequence of actions you expect to take when working on your project.

   1) Literature Review
   2) Define Project Plan
   3) Learn Machine Learning
   4) Learn Visual SLAM
   5) PyTorch Implementation of SuperPoint

6) ORB-SLAM tutorial
7) Learn Other Self-Supervised Interest Point Detection Algorithms
8) SuperPoint Implementation Coding
9) Optimise the performance of SuperPoint
10) Develop appropriate metrics for evaluation
11) Integrate SuperPoint into Visual SLAM
12) Experiment with the implementation
13) Optimise the performance of the integration
14) Finalise the code implementation
15) Submit dissertation report and paper in conferences

6. Please describe how often and how you and your supervisor expect to meet to discuss your project. Please also mention if you've had any opportunity to meet with your supervisor so far.

   We discuss the project once in two weeks, starting on the 23rd of February. We have held meetings four times until the 13th of April. In the meeting, we discuss about the project timeline, progress, and things to do for the next few weeks. I meet directly with my supervisor in the university for the first meeting, and the remaining is conducted online (Microsoft Teams).

7. Ethics/datasets: Please confirm whether you have discussed with your supervisor about (1) whether your project has potential ethics issues, such as requiring the collection of personal data from people, (2) whether your project requires datasets, and (3) whether those datasets are ready to use or still need to be collected. If you are having any issues, let us know here.
   - This project use dataset that is ready to use from online resources (such as the MS-COCO dataset, KITTI dataset, TUM RGB-D dataset, Mono dataset, etc.).
   - This project does not have potential ethics issues.

8. Please feel free to add any other comments.

   The next meeting with the supervisor will be mixed either on-campus or online.