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# Industry Project Proposal

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| Name of the Organization | Samsung SDS Research America |
| Project location (city) | San Jose, California |

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### Project Description

**Problem definition**

*[50-100 word description of the problem which the candidates need to solve]*

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| Retinal OCT image analysis for eye disease diagnosis: The OCT (Optical Coherence Tomography) is an imaging method used to capture cross sections of the retinas of patients. The captured images are used to diagnose the patient’s retinal health into four categories: Normal, CNV, DME, and DRUSEN. The goal of the first part of the project is to reproduce the state of art classification accuracy by training Deep Convolution Networks following the standard Supervised Learning paradigm. The second part of the project is about learning features from images without labels (Unsupervised Learning) based on the recent ‘Self-Supervised Learning’ method, with the goal of improving the classification accuracy over the baseline established from the first part of the project. |

**Key Research Questions/ Technological constraints that the Project will Answer**

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| 1. Reproduce the SoTA accuracy to establish the baseline following the Supervised Learning based on the provided labels 2. Learn the Unsupervised Features based on the Self-Supervision technique 3. Train a classification head on top of the learned Unsupervised Features to further improve the accuracy upon the established baseline from #1 |

**Final deliverables at the end of the project**

*[Please list the desired technical deliverables from the project team in as much detail as possible]*

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| 1. Supervised Training script (including data augmentation) and model parameters 2. Unsupervised Training script (including data augmentation) and model parameters 3. Classification head training script (including data augmentation) and model parameters |

**Key activities/ technologies the project team may be expected to undertake/ work with**

*[E.g. What kind of technology stack they will work with, the datasets they may need to work on, what kind of analysis they may be expected to undertake, etc.]*

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| Download and learn the data / use case from the Kaggle link: <https://www.kaggle.com/paultimothymooney/kermany2018> (1/2 week)  Identify and learn a few promising approaches from the published kernels from the same link (1/2 week)  Gain hands-on experience by replicating the supervised training steps in the selected kernels (1 week)  Study the Self-Supervised Feature Learning techniques from the Github repo: <https://github.com/google-research/simclr> (1/2 week)  Reproduce the results from the link above by replicating the training / testing steps  (1 ½ weeks)  Apply the same training / testing steps to the Retinal OCT data (2 weeks) |

**Expected learning outcomes**

*[What do you expect the candidates to learn from the project. Please mention the technical skills they will imbibe over the project.]*

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| 1. Hands-on experience with prepping new dataset and feeding to a Supervised Learning pipeline 2. Understanding the concept and the practical benefit of Unsupervised Learning technique 3. Hands-on experience with Unsupervised Feature Learning based on Self-Supervision |

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| Desired Team Size (if any): | 3 |

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### B. Mentor Details

*Details of a mentor from the organization who will guide the candidate(s) on the project*

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| **Mentor name** | Hankyu Moon |
| **Position in the organization** | AI Science Manager |
| **Mentor email ID** | hankyu.m@samsung.com |
| **Mentor contact number** | 408-963-7828 |

**Brief profile of mentor** *[Can also be a link]*

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| https://www.linkedin.com/in/hankyu-moon-b678b910/ |

### C. Selection process

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| **Minimum eligibility criteria to apply** (if any):  Hands on experience in (1) building image data pipeline (2) building Deep CNN models (3) using popular DL platforms such as TensorFlow.  Basic technical knowledge and skills to read and digest academic literature in AI and Computer Vision |
| **Desired selection process** (if any) |

**About FourthBrain**

FourthBrain trains aspiring Machine Learning engineers in the technical and practical skills necessary to contribute immediately to an AI team. Our remote, online program is designed to be flexible and accessible for anyone with software experience. We infuse values of collaboration, communication, empathy, and equity throughout the program.

We are part of the AI Fund, founded by Andrew Ng.