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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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| Smart Annotation Platform using Deep Learning  Data annotation, specifically for image data sets is a challenging task since it requires a rigorous manual training process that is time and cost intensive to ensure standardized outcomes. The global data collection and labelling market has been estimated as a 1.3B$ market in 2020 with a compound growth rate of 25.6% from 2021 to 2026. This necessitates the use of Deep Learning/Machine Learning algorithms to standardize the annotation process and make it more cost efficient.  Recent works on automated semantic segmentation platforms such as Curve-GCN (Source: <https://arxiv.org/pdf/1903.06874.pdf>) demonstrate that once a region of interest is manually selected by a user, there are automated algorithms that can detect the exact boundaries of objects as shown here. This is just an example annotation frontend. You may use any of the examples of Image annotation tools in <https://github.com/jsbroks/awesome-dataset-tools>  **[Image Source]:** <https://arxiv.org/pdf/1903.06874.pdf>  This process significantly reduces the annotation time to separate exact object boundaries. In this project we further streamline the manual annotation process by combining the Curve GCN or SIMILAR METHODS with automated bounding box detection algorithms (such as YOLOv3 or alike). The intention is to automate the semantic segmentation process as much as possible to minimize manual labelling effort. The overall system can then be tested on public data sets of outdoor and indoor images. |

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

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| 1. Is it possible to standardize and minimize manual annotation errors for outdoor and indoor images? 2. How much improvement in time can an automated detection and segmentation system provide? 3. What key metrics should be considered for designing such an automated image labelling systems. 4. When will such an automated annotation system fail? |

**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. A working demo of the overall annotation system with the ML/DL modules. 2. A deployed ML webapp that enables annotation of indoor and outdoor images. 3. Written technical report about the Data, Process and Outcomes. |

**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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| 1. Data used for this task will be the publicly available ADE20K data set (<https://groups.csail.mit.edu/vision/datasets/ADE20K/>) that contains indoor and outdoor images. 2. The annotation platform that will be improved in this project can be CurveGCN (<https://github.com/fidler-lab/curve-gcn>), or PolyRNN++ (<https://github.com/fidler-lab/polyrnn-pp>), or any other annotation system of choice form the team. 3. The object detectors that will be used to train bounding boxes can vary (YOLOv3, FasterRCNN etc.) 4. The final deployable ML system will contain an annotation front end to receive user-inputs and a backend that will detect the exact object edges. The backend can be deployed on AWS or GCP. 5. The communication between front and back end must be streamlined to reduce latency. |

**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 replicating an annotation platform and deploying it on cloud services. 2. Understanding the concept of object detection coupled with semantic segmentation for fast annotation. 3. Hands-on experience with ML Pipelines and Reporting outcomes. |

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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/Pytorch.  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.