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# Independent Study in AI/ML
## (Image super-resolution/denoising)

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## Overview

During the course of the independent study, I plan to explore the domain of artificial intelligence and machine learning, particularly image super-resolution/denoising using Generative Adversarial Networks (GANs). I have had prior experience on working with GANs as my SMAI Project (undertaken in the last semester) was based on GANs. With the proposed independent study, I expect to learn more about Generative Adversarial Networks and well as understand the technique of super-resolution as well as denoising of images. At the end of the semester, I expect to have learnt about the aforementioned techniques/applications and also have a simple web application as one of the tentative final deliverables.

## Goals

1. **To learn more about GANs and how they can be used for image enhancement:**

   The primary goal is to study Generative Adversarial Networks (GANs) better and explore their application in the enhancement of images, particularly super-resolution (and/or) denoising of images.

2. **To develop a simple web-application that can be used to enhance images of a particular type:**

   The secondary goal is to develop a simple web-application that can allow a user to input an image of a particular category (since the AI model would be trained on image of a particular type) and obtain an enhanced image as output. A local deployment of this basic application is planned to be done.

## Specifications

a) **Learning about the area:**

I plan to explore the various architectures and techniques that are used to achieve image enhancement in the form of image super-resolution / image denoising. For this various online resources as well as video lectures will be consulted.

b) **Implementation and deployment:**

I plan to create the Machine Learning model in python using the fast.ai and Pytorch modules as backend. For the web-application, I plan to use python with Flask as the backend. If time permits, the web-application implementation might be upscaled using Django backend. I target local deployment of the application and Docker may be used for the same.

## Deliverables

The tentative list of deliverables at the end of the independent study are as follows:

1. Report

A detailed report will be created which will include information about all the research undertaken to complete the independent study as well as the detailed information about the implementation.

2. Presentations

A final concise presentation will be created which would give an overview of the work done during the entire semester. Additionally brief presentations will be created during the course of the semester at regular intervals to provide information about the progress.

3. A basic web-application

A basic web-application will be created and deployed locally that would allow users to test as well as use the ML model created to enhance low quality images.