# CprE 535 - Course project description

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## 1 Classification of images as CGI vs real images with CNNs.

### 1.1 Introduction and prior work

Classification models for detecting Computer generated images (CGI) and real or natural images (NI), typically involve extracting appropriate features of the images, which is followed by a two-class classification using Support Vector Machines (SVMs) which are linear classifiers [4].

Recently, there has been increasing interest in Convolutional Neural Network (CNN) based approaches for classifying NI and CGI images [1]. In [1], the authors develop a five layer network, with the first three layers being convolutional in nature, to extra key features of the images and the last two layers being fully connected ones, representing a multi-layer perceptron (MLP).

The authors minimize the cross entropy loss of the effective network, and use an $\ell_1$ regularization on the loss function. The dataset used in [1] is the Columbia Photographic Images and PRCG Dataset [2], which is open source.

A similar approach is adopted in [3]; they use 2 convolutional layers for feature extraction followed by a MLP and dropout for classification. The authors minimize the cross entropy of the effective network.

### 1.2 Project proposal

The application of CNNs to classification of CGI vs NI images is relatively new. There have been several advances in the formulation of Convolutional Neural Networks, which may be used to improve classification accuracy.

Residual networks, or ResNets [5] were introduced for classification tasks, which utilized skipped connections to improve classification performance of CNNs. Hence, structuring a network with 3 or more convolutional layers, along with skipped connections, is a potential direction that can be pursued.

The dataset that I will use for this project will be the same as that used in [1] for the purpose of comparison.

## 2 References

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[3] N. Rahmouni, V. Nozick, J. Yamagishi and I. Echizen, December 2017. "Distinguishing computer graphics from natural images using convolution neural networks." In 2017 IEEE Workshop on Information Forensics and Security (WIFS) (pp. 1-6).

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