

**CSC 450 – Honors Research Project**

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**Deep Learning Image Recognition and Detection: Architectures, Learning and Applications**

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**Introduction to Deep Learning:**

With machine learning being an ever-growing, popular field within the artificial intelligence world, a subset of machine learning is **Deep Learning.** This specific subset is a learning technique for computers involving algorithms, and neural networks inspired by the human brain to learn from huge amounts of data. Deep learning is widely used in real life applications, such as image classification, aerospace and defense, medical research, self-driving cars, robots, etc. As time progresses, the applications of deep learning will scale, but the process of creating a model could grow quite extensive as there are many facets to account for. A simple definition for a deep learning model can be described as an algorithm repeatedly performing a task, and each time have certain tweaks in order to improve the outcome. The “*deep*” within deep learning is a reference to the number of successive layers of representations, which could also he described as the *depth* of the model. A model could range from one to hundreds of successive layers, all learned during the exposure to training data. Deep learning has only come to surface as one of the most useful AI techniques in the last few decades, as we now have access to large amounts of labeled data for training (over 2 quintillion bytes of data is generated daily), and substantial computing power to train our models. Overall, deep learning allows modern machines to solve complex problems, by learning from experience.

**Neural Networks:**

Deep learning got its name for another reason, more specifically due to the neural networks it is comprised of have various deep layers that enable learning. A neural network is a set of algorithms, which as stated earlier are based off the human brain, which we design in order to recognize patterns, whether it be in images, text, etc. Neural networks assist us in clustering and classifying data. These neural networks are a set of layers that are stacked on top one-another that adjust to the properties of the training data.

