

# Artificial Intelligence Course Project

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## I. INTRODUCTION

Artificial Intelligence Course Project is to create a search algorithm which search in Neural Architecture Space for best performing CNN architect on Fashion mnist data-set.

## II. CONVOLUTIONAL NEURAL NETWORK

A Convolutional Neural Network (CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The pre-processing required in a ConvNet is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, ConvNets have the ability to learn these filters/characteristics.

## III. NEURAL ARCHITECTURE SEARCH

Neural Architecture Search (NAS) automates network architecture engineering. It aims to learn a network topology that can achieve best performance on a certain task. By dissecting the methods for NAS into three components: search space, search algorithm and child model evolution strategy, this post reviews many interesting ideas for better, faster and more cost-efficient automatic neural architecture search.

## IV. DATA-SET

Fashion-MNIST is a dataset of Zalando's article images—consisting of a training set of 60,000 examples and a test set of 10,000 examples. Each example is a 28x28 grayscale image, associated with a label from 10 classes. Zalando intends Fashion-MNIST to serve as a direct drop-in replacement for the original MNIST dataset for benchmarking machine learning algorithms. It shares the same image size and structure of training and testing splits. Each image is 28 pixels in height and 28 pixels in width, for a total of 784 pixels in total. Each pixel has a single pixel-value associated with it, indicating the lightness or darkness of that pixel, with higher numbers meaning darker. This pixel-value

is an integer between 0 and 255. The training and test data sets have 785 columns. The first column consists of the class labels (see above), and represents the article of clothing. The rest of the columns contain the pixel-values of the associated image.

## V. METHODOLOGY

### A. Genetic Search Algorithm

- We use Genetic Search Algorithm to find best performing CNN from NAS.
- First we create a dictionary where we define keys by different activation function like relu, sigmoid, tanh, swish, gelu.
- Then with the help of dictionary we aplay random function to find different 10 Genome.
- Then We find the best five accuracis from 10 accuracy then again we craete 10 genome and find best 5 accuracy and then we craete a list of 10 best accuracy and find 5 best accuracy. These process continue till we find best NAS

### B. Result

We find this best result in our project Best test accuracy: 0.8885999917984009 Training genome: NC 30 5 relu; RC 3 4 sigmoid; RC 23 6 sigmoid; FL swish; Model params: 6916