

ECE 532 Project Proposal  
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Github Repository link: [lubyant/ECE532\\_CourseProject](https://github.com/lubyant/ECE532_CourseProject)

The project of this machine learning course is proposed to investigate the pattern of large numbers of picture images by applying several basic to advance level algorithm. The purpose of the project is to utilize the idea of the machine learning process and strengthen the understanding of the machine learning principle in a practical manner.

Above all, a public and prepossessed database will be attained and imported as the training and validation dataset. The data source is from the Fashion-MNIST(<https://www.kaggle.com/zalando-research/fashionmnist>), an online public database produced by Zalando's article images. The number of the training set is 60000, while the number test set is 10000. In each element, it is given with a 28-pixel \* 28-pixel greyscale image which was categorized as one of ten items as the label of the object. From label 0 to label 9, they represent the T-shirt, trouser, pullover, dress, coat, sandal, shirt, sneaker, bag, and ankle boot respectively. For each element or sample image, there are 28\*28 features which are 784 entities in total. Each entity is assigned a single integer value between 0 to 255 representing the degree of the greyscale. Therefore, the shape of the object in the picture can be transcribed and presented as a certain combination of the pixel greyscale-value. By applying a specific algorithm of the classifier to these 784\*60000 features matrix, we can find out the weight vector for representing the pattern of image classes, such as what is T-shirt shape image like, how does trouser look.

The applicable algorithms in the project are Linear Classifier, K-Nearest-Neighbors of Euclidean Distance, and a tree layer artificial Neuron Network. The linear classifier is the most basic and simplest method in this project so that each input pixel value contributes to a weighted sum for each output unit or label by the least square and regularization process (Lecun et al., 1998). The KNN method is another

method of setting a classifier as it computes the Euclidean distance between the sample of training and sampling data. For a k-nearest neighbor, we apply a range of value k to find out the shortest distance between a test set with number k of the training set(Keller & Gray, 1985). This k value can be iterated to investigate the pattern. The artificial neural network mimics the biological idea that it builds up with several layers of data neuron: one inputting layer of training data, one output layer of target pattern, and several unseen hidden layers with neurons that computing from the previous layer(Cireşan et al., 2010). For three algorithms, the error rates will be computed by cross-validation that training sets and test sets are switched by times to compare the functionality of three different methods.

The timeline of the project is scheduled as following:

- Oct/22 to Nov/17: work on the linear classifier and kNN classifier
- Nov/18 to Dec/1: establish the aNN classifier
- Dec/2 to Dec/12: compute the error rate by cross validation. Manuscript revision and finalized
- Dec/12 to Dec/17: peer review

## Reference:

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