

# Efficient Training of Convolution Neural Network Using Batch Normalization

(Acceleration of Autonomous Vehicle)

(Ayushi Garg)

TEQIP\_INTERN

## **ABOUTS:**

### **EDUCATION:**

Ayushi Garg is an undergraduate in Electrical Engineering with specialization in Computer science.

DayalBagh Educational Institute, Agra, India.

### **Working under Faculty Supervisor:**

Dr. Sparsh Mittal.

Assistant Professor, Department of Computer Science and Engineering, IIT Hyderabad

#### **Research Interests:**

Processor architectures for machine learning, neural network accelerators, computer architecture (CPUs and GPUs), VLSI, high-performance computing, approximate computing.

### **Guided by:**

Nandan Kumar Jha

MTech in Computer Science and Engineering, IIT Hyderabad

### **Internship Provided by:**

Technical Education Quality Improvement Programme (TEQIP) Cell, IIT Hyderabad.

### **Internship Duration:**

One Month (1st June'19 - 30th June'19)

## **Abstract:**

As the field of Artificial Intelligence is growing rapidly, the role of convolution neural network (CNN) is also becoming more prominent. the convolution neural network which is a class of ANN (artificial neural network) provides its one of its best use of feature extraction, with different functions that help in designing a model architecture. this model architecture defines how complex and accurate your model is.

The main challenge which DL (Deep Learning) models are facing today is to have low complexity (high speed of computation) with high Accuracy predicting probability. We have designed a architecture with CNN by using batch normalization function to make our model as efficient as possible.

## **Acknowledgments:**

I am very thankful to the TEQIP team and also to the MHRD, Govt. of India for such an excellent internship program.

I would like to thank my guide Mr.Sparsh Mittal and my mentor Mr. Nandan Kumar Jha at IIT Hyderabad.

## **My contribution:**

There are various DL models available (like ResNet (152), VGG Net (16), GoogLeNet)which have used a large number of CNN layers.

we have found out that not only CNN layer enhances the accuracy there are other factors also which helps in designing the architecture to slows down the complexity level. In which batch Normalization function also plays a major role. It allows the increasing the speed at which the model trains and solve various problems like gradient explosion and helps in feeding the normalized input in the layers. Which enhances the accuracy.

## **Conclusion:**

For solving the major problem of all DL models, the choice of model architecture does matters. There are other factors that can also play a major role in increasing the speed of computation of the model like ReLU an activation function, padding, pooling, batch normalization, number of weights and even choice of optimizer and criterion also does matters.

## **Learning Accomplishments:**

I started my internship with not having any background from the ML and DL. and from that day to now I have learned a lot. for developing purposes, I learned python programming language and Linux. I also learned some tools which Pytorch provides. for doing all these things, my mentor, Nandan Kumar Jha had guided me. He gave me the right way to learn. also have done some hands-on experience with Pytorch, Numpy and pandas which I learned from the teaching session taken by Mr. Ritesh Gupta and Mr. Sharath R. I have learned writing research and survey papers from seminars taken by Mr. Sparsh Mittal. He also gave the knowledge of some software for writing such papers. I have also learnt about Convolution Neural Network and Autonomous Driving Systems.