

Comparison of deep neural network approach in text and image classification using CPU and GPU systems

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Motivation:

- Huge amount of data generated by computing devices.
- Hardware and software improvement.
- GPU computing.
- Framework for computation.
- New techniques in AI.

Aims and Objectives:

- Investigate the performance of DL on CPU and GPU.
- Use TensorFlow framework to build and train deep learning models.
- Evaluate these systems in typical data classification and identification tasks.
 - Text classification using IMDB (Internet Movie Database) dataset
 - Image recognition using Fashion MNIST dataset

Relation between AI, ML & DL:

- Artificial Intelligence
- Machine Learning
- Deep Learning

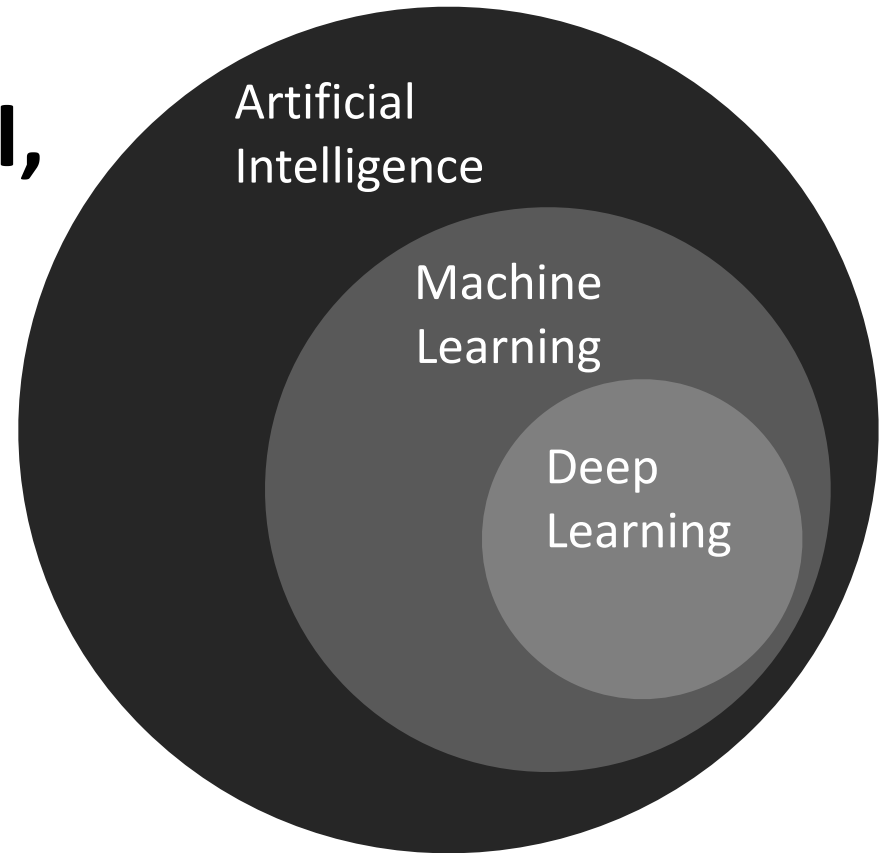


Figure 1: Relation between AI, ML & DL

Convolution Neural Networks:

- Convolution Neural Networks is key type of Artificial Neural Network.
- Key concepts are Local Receptive Fields, Activation and Pooling and Fully Connected Layer.

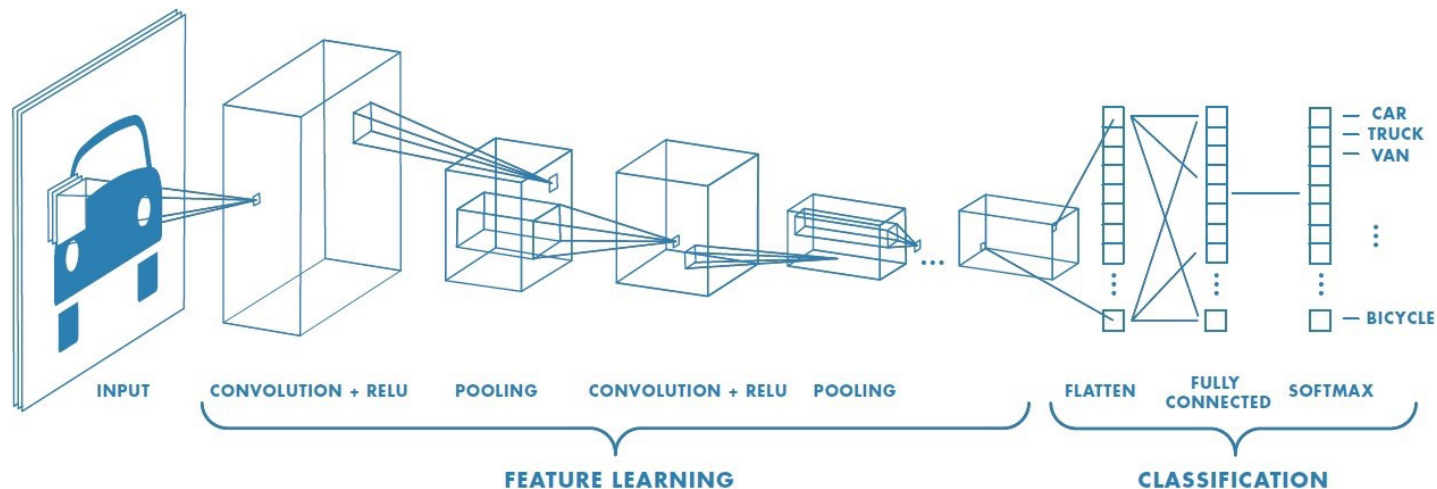


Figure 2: CNN architecture (Source: <https://towardsdatascience.com/a-comprehensive-guide-to-convolutional-neural-networks-the-eli5-way-3bd2b1164a53>)

Framework and Toolkits:

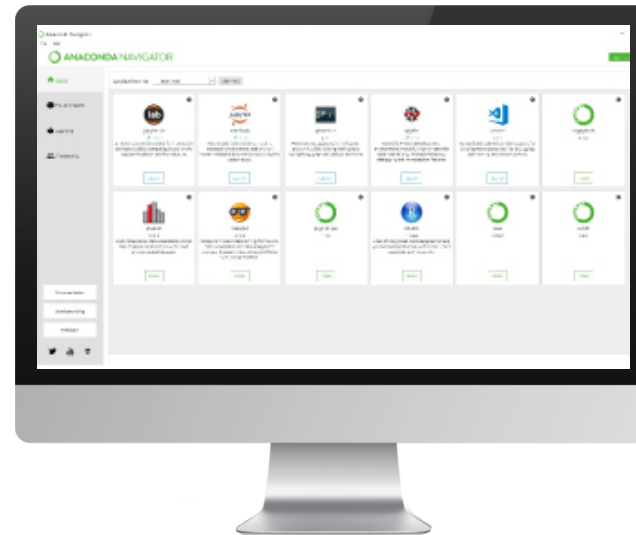
- **TensorFlow**
 - Python, and easy configuration.
 - Excellent tutorials.
- **Anaconda Navigator**
 - Graphical interface.
 - Supports CPU/GPU without using terminal window.
- **Jupyter Notebook**
 - Web-based interactive development environment.
 - Supports multiple languages.

Hardware for Deep Learning:

- **Stand-alone machine**
 - Laptop core i7.
 - 12 GB RAM.
 - NVIDIA graphic card 940M.
 - 250 GB SSD hard drive.

Setting environment for DL on a stand-alone machine:

- **CUDA 9.0**
- **CuDNN 7.0**
- **Setting environment**
- **Python 3.6**
- **TensorFlow CPU/GPU**
- **Anaconda**
- **Validation**



Text classification using IMDB dataset:

- IMDB dataset of 50,000.
- 2 part of dataset positive and negative reviews.
- Sentimental analysis.
- Accuracy of 86%.

Image recognition using Fashion MINST dataset:

- Dataset of 70,000.
- 60,000 of training dataset.
- 10,000 of test dataset.
- Grayscale images of size 28*28.
- Accuracy of 88%

Results and Analysis:

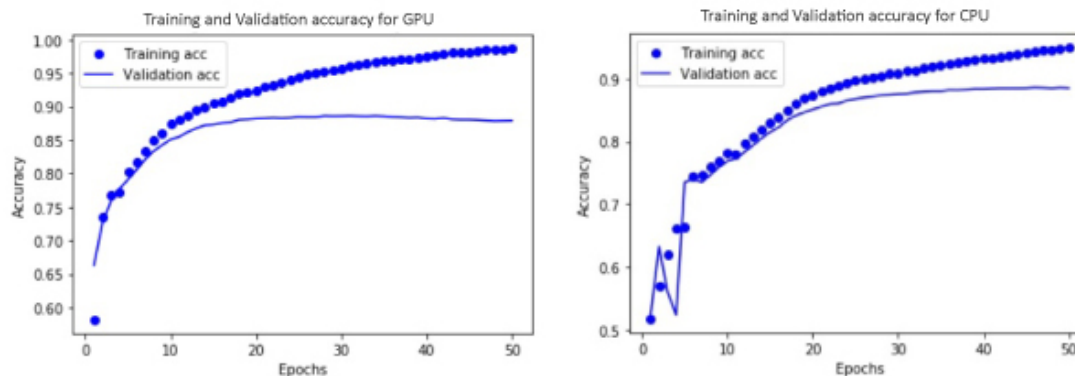


Figure 3: Accuracy vs Epoch on GPU-CPU training and validation of dataset in text classification

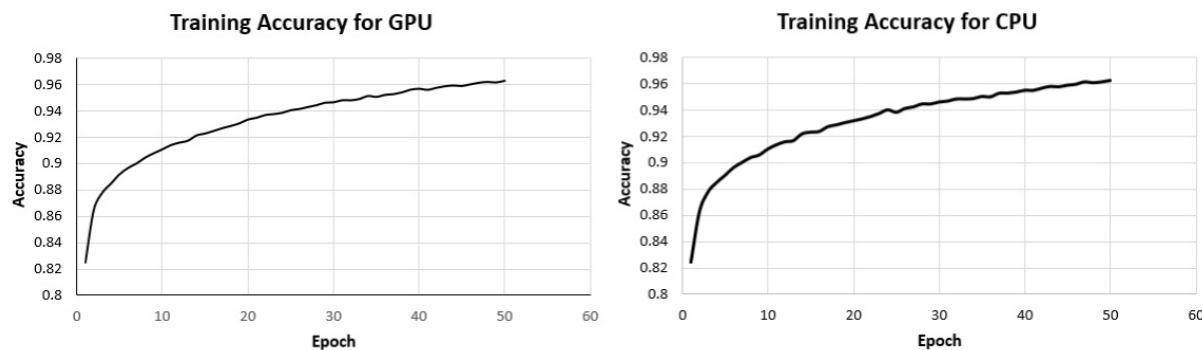


Figure 4: Accuracy vs Epoch on GPU-CPU training of dataset in Fashion MNIST dataset

Results and Analysis:

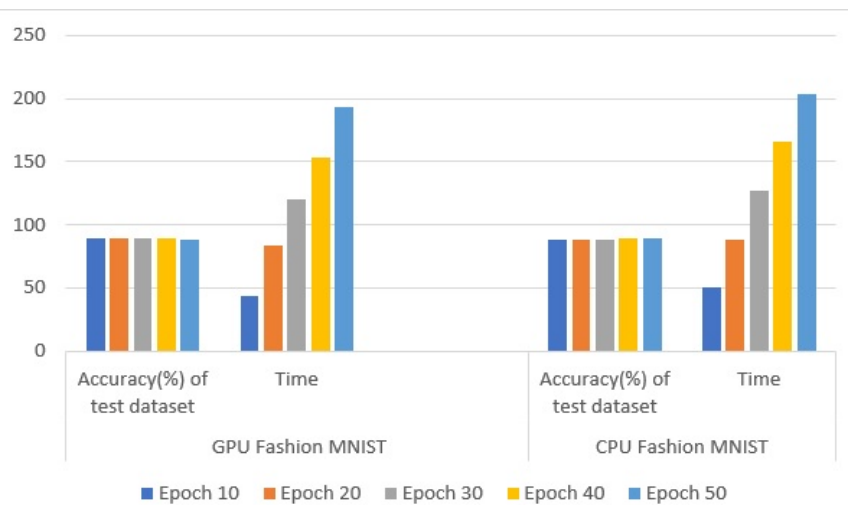


Figure 5: Time/Accuracy/Epoch graph for GPU-CPU text classification

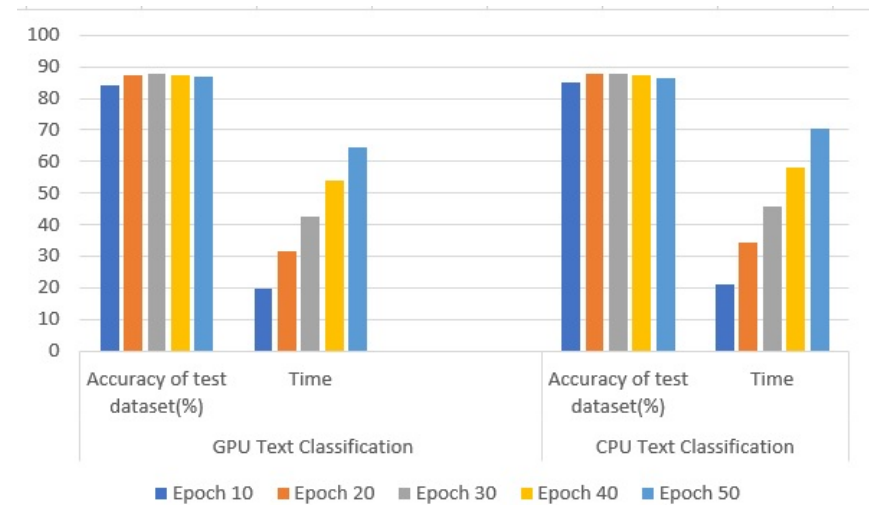


Figure 6: Time/Accuracy/Epoch graph for GPU-CPU Fashion MNIST dataset classification

Conclusion and future work:

- Setting the environment for deep learning.
- Text classification
- Image recognition.
- Compared the results of CPU/GPU by increasing epochs.
- Compared the time and accuracy CPU/GPU for both cases.
- GPU processing time is moderately better than CPU.
- Extend our investigation with powerful GPU and TPU.

Questions