REU Presentation 1 (Week 2)

GUSTAVO GARCIA
Self Introduction

• School: Ana G. Méndez University (Gurabo Campus).
• Highest Math Course: Differential Equations.
• What I’ve Learned
  • Current approaches of computer vision.
  • Basics of Convolutional Neural Network (CNN) and Convolution/Correlation.
  • High-level description of the math behind neural networks.
  • Using Keras and Pytorch to perform basic CNN modeling and training.
  • Using Newton Cluster and fundamental Linux commands.
Assignment 1: CIFAR-100 Image Classification with Keras Model

- **Architecture:**
  - Conv2D ➔ MaxPooling2D ➔
  - Loop layers: Conv2D ➔ Conv2D ➔ MaxPooling2D ➔ Dropout(0.25) ➔
  - Flatten ➔ Dense(1024) ➔ Dropout(0.5) ➔ Dense(100)

- **For all model sizes:**
  - Number of epochs: 20
  - Batch size: 64
  - Optimizer: Adam
  - Loss Function: categorical crossentropy
  - Activation functions: relu & softmax
Assignment 1: CIFAR-100 Image Classification with Keras

Largest dataset size

- Best performing model, 7 convolutional layers:
  - Test loss: 1.84
  - Test accuracy: 0.51
Assignment 1: CIFAR-100 Image Classification with Keras

Largest dataset size

- 17.7 million parameters: 140 s
- 4.4 million parameters: 161 s
- Less total parameters ≠ less time
Assignment 1: CIFAR-100 Image Classification with Keras

Largest network size

• Best performing model, 50k size:
  • loss: 2.1045 - accuracy: 0.4213
  • val_loss: 2.1463 - val_accuracy: 0.4247
Assignment 1: CIFAR-100 Image Classification with Keras

Largest network size

- Dataset size of 10k: 40s
- Dataset size of 50k: 140s.
- For the most part, larger dataset size = time increase.
Pytorch – CIFAR10
Model – VGG16

• Originally designed for image classification tasks.
• Total of 16 layers: 13 convolutional and 3 fully connected.
• Dropout included to combat overfitting.
Pytorch – CIFAR10

Accuracy & Loss

• Epochs increase → Accuracy increase.
• Test Accuracy: 68.59%
• Test Loss: 0.89
Pytorch – CIFAR100
Accuracy & Loss

- Test Accuracy: 39.39%
- Test Loss: 3.20
Research Project

Deep Learning Based Photovoltaic Module Segmentation from Satellite and Aerial Imagery. Andrew Ballen, Liz Trader, Mengjie Li, and Kristopher Davis

• Explore different image processing models and find out
  • What’s the best solution for a specific scenario
  • What’s the impact of image resolution
  • What are the potential improvements to existing approaches

• Focus on dataset: PV08.zip, PV03.zip, and PV01.zip

• Develop solar panel detection model

• Sizing and fault detection