

CIFAR-10 Classifier Break Down

• What is CIFAR-10?

Canadian Institute For Advanced Research, it's a collection of 60k images in 10 classes (32×32 colored)

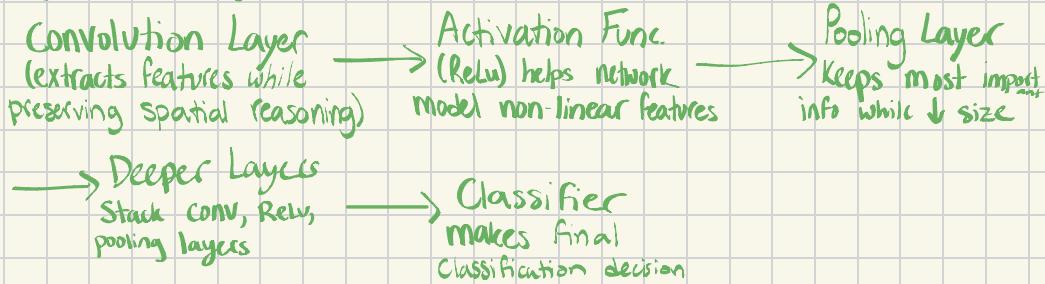
• Project Idea:

A CNN that classifies images from CIFAR-10 dataset into 10 categories

• Explain what a CNN is and how it works

A convolutional neural network and it's used to process and understand images, it takes advantage of the spatial structure of images (edges, shapes, full objects)

It's good for image classification, face recognition, medical imaging, etc



• Purpose of Project:

- To understand and implement a CNN
 - ↳ how CNNs automatically learn visual features

• Tools I will use:

- | | | | |
|-----------|--------------|----------------|----------------|
| • Python | • numpy | • CIFAR-10 | • Scikit-learn |
| • Pytorch | • matplotlib | • Google Colab | |

• Notes

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1. Import libraries
2. Load Cifar-10 data
 - ↳ training and testing
 - ↳ transform (images → tensors), (normalize pixels)
 - ↳ data loaders with batch, shuffle
3. Define CNN model
 - ↳ class for CNN
 - ↳ Convolution layers (channels, ReLU activation)
 - ↳ pooling layer (MaxPool to kernel size, apply ReLU)
 - ↳ Deeper / Fully connected layer ($32 \times 32 \rightarrow 16 \times 16 \rightarrow 8 \times 8$)
 - ↳ Output layer (Output 10 (num of classes))
4. Define loss function (CrossEntropyLoss)
5. Define optimizer (Adam)
6. Training loop
 - ↳ For each epoch
 - ↳ for each batch in training
 - ↳ forward pass
 - ↳ compute loss
 - ↳ backward pass
 - ↳ update weights
7. Test
8. Print

• Reflection (challenges, questions, surprises, etc)?

Like my first project I tried to write detailed pseudocode so that the actual coding part was much more straightforward. As I was writing both the pseudocode and code I realized this project / code was pretty similar to the MNIST project. But there were some key differences like having to move tensors to cpu from gpu because np and plt use cpu. Another difference is the use of channels (the different layers of info in an image) (RGB image has 3 channels). When the image goes through the convolution layer each channel is processed by filters (kernels) and each filter produces a new channel as output, then those new inputs go into the next convolution layer etc.

• Did I achieve what I wanted to?

Yes, I now have a CIFAR-10 CNN and have a better understanding of CNNs and how to make one.