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CNN\_1 Chihuahua or Muffin.ipynb

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CNN\_1 Chihuahua or Muffin.ipnb - Reflective Journal

Convolutional Neural Networks (CNNs) and Traditional Neural Networks (NNs) are fundamentally different in how they process images. While traditional NNs see images as a flat list of pixels, ignoring their spatial arrangement, CNNs take advantage of the image's structure. CNNs use special layers called convolutional layers to examine different parts of the image and identify patterns like edges or corners. This ability to understand the relationships between pixels helps CNNs learn more meaningful features (OpenAI, 2023).

One key difference is that CNNs can recognize objects regardless of their position in the image, this is a skill the traditional NNs often struggle with. CNNs also share information between different parts of the image, this reduces the number of calculations needed. This makes CNN more efficient. CNNs can learn features at different levels of detail, from simple lines to complex shapes, while traditional NNs often learn features in a single step. This makes CNNs better suited for many image processing tasks due to their ability to understand the spatial structure of images and learn features in a more efficient and effective way (OpenAI, 2023).

The purpose of this assignment was to experiment with CNN. This option is better suited for image classification tasks because it can learn spatial hierarchies of features directly from the image data. The first step was for me to clone the entire repository in Colab. I did this by adjusting the code in the first cell. I was able to continue to run the additional cells successfully, until I ran the third cell. I received a few additional errors as I was trying to run the additional cells. I used the Fix Error/Explain Error option at the bottom of the code error for suggestions and explanations of the error. If I couldn’t get Gemini to help, I would use chat.gpt to give me an explanation to help me correct the error.

The first step required to setup and import the necessary libraries, cloning the project code, and navigating to the project directory. The second step also required me to set up the environment for training deep learning model using PyTorch. I then prepared the tools and checked the hardware to train the model, to process images.

I then ran a cell so that the output consisted of images of chihuahuas and muffins, dividing it into training and validation sets. The training set has a larger number of images compared to the validation set, which is common in machine learning to ensure the model is trained on a diverse dataset and can generalize well to unseen data.

I then ran a cell for the training set and one for the validation set. The training set transformations can include additional augmentations like random flips and rotations to increase the diversity of the training data and prevent overfitting. The validation set transformations should be simpler to avoid introducing additional variability during evaluation. The chihuahua and muffin classes are then defined. I then ran a cell to use the image(s) and extract features from it using the convolutional layers and then classify the image as either a chihuahua or muffin. A summary table provided details about the architecture and memory requirements of the network. The function Cross Entropy Loss is used for classification and the Adam optimizer as the default settings for training. I ran a cell that shows the training progress of the machine learning model with10 epochs. Each epoch represents one complete pass through the entire training dataset. The final cell has functions that work together to evaluate the performance of the trained image classification model. It calculates the overall accuracy on the validation set and the plot results allows one to visually inspect the images and how they classified.

CNNs are like supercomputers for pictures. They can help doctors find diseases in X-rays, help cars drive themselves, and even recognize people's faces. They can also be used to find things in stores or track natural disasters from space. CNNs are getting better all the time, so we can expect to see them used in even more amazing ways in the future Google. (2024).

References

OpenAI. (2023). *ChatGPT* (October 2023 version) [Large language model]. <https://chat.openai.com/>

Google. (2024). *Gemini 1.5* (Pro) [Large language model]. Google. [https://gemini.google.com](https://gemini.google.com/)