Modern Hopfield Networks and the CIFAR10 Dataset

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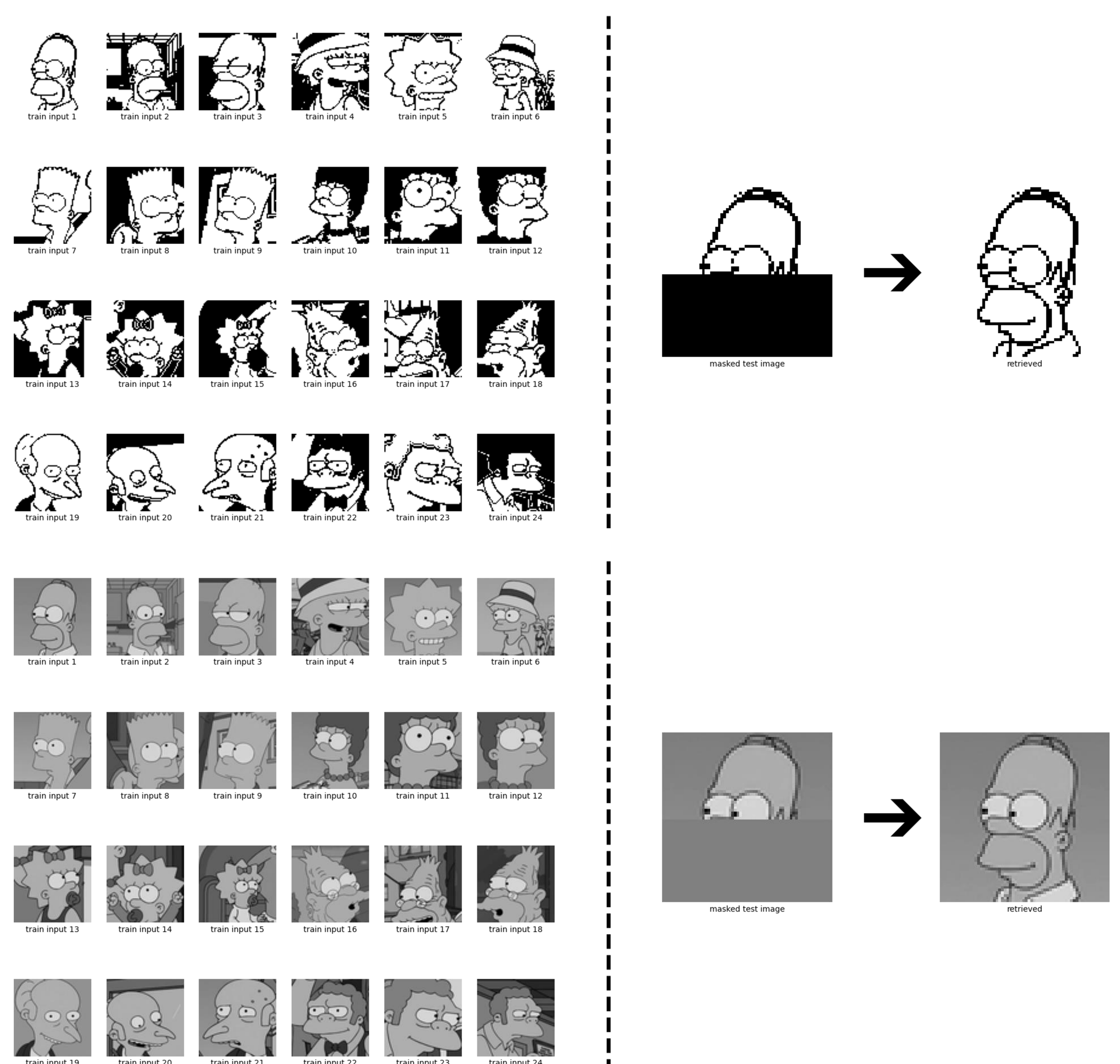
Introduction

Hopfield Networks are associative memory networks whose purpose is to connect the input with its most similar pattern. This is performed by calculating an energy function but is limited to binary inputs (black and white images). Modern Hopfield networks update such function so its able to work on grayscale images.



Implementation

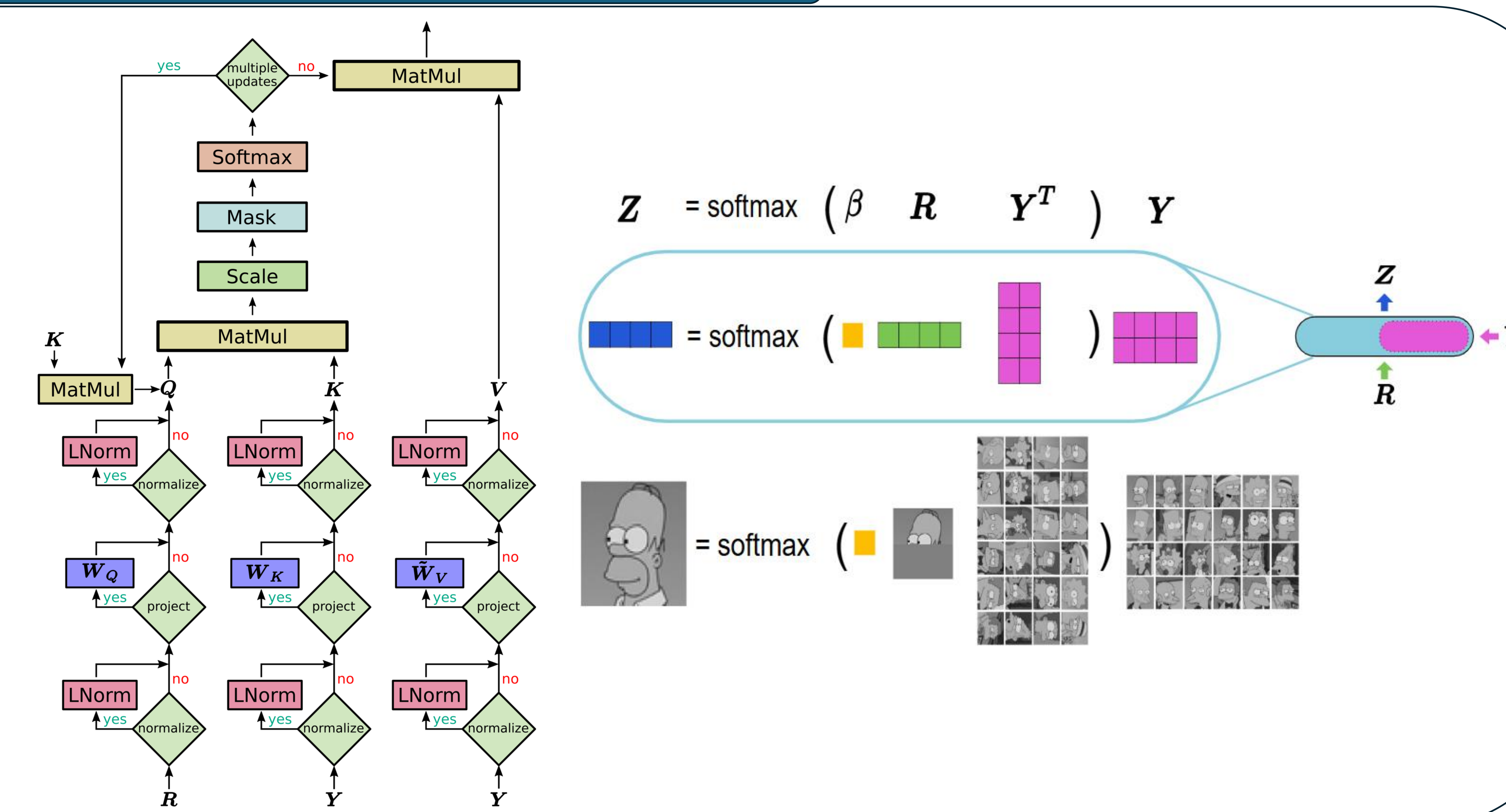
The original implementation is written using PyTorch and using a small dataset. We decided to implement it with TensorFlow and against the CIFAR10 dataset for seeing the power of the device.

Original

Our implementation

Architecture and preprocessing

- Preprocessing:
  - Rgb to gray scale
  - mask/noise for random images in the dataset
- Low memory = 20 images for training and testing



Preliminary Results

- Good implementation → Similar results
- Bad performance
  - Theoretically, a full white image would destroy our model
- Main challenges:
  - Provide "meaningful" features to compare similarity "efficiently"
- Possible future work
  - Extract features and normalize input
  - Test with a more differentiated dataset and/or more variables