ACCELERATED IMAGE-BASED PRODUCT RECOMMENDATION SYSTEM

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INTRODUCTION

Recommendation System is a software system widely used in E-commerce websites such as Amazon, Walmart, etc., allowing users to find suitable products based on their current choice.

A slower recommendation system can adversely impact the ranking of an application. Accelerating the core algorithm of the system makes sure that users receive similar recommendations with a faster response time, improving the user experience. Additionally, it increases the company's revenue, raising its market value.

Our project aims to build a basic parallelized image-based product recommendation system that accepts images as input and returns a set of similar products. We also plan to extend our project to accept both text and images as input.

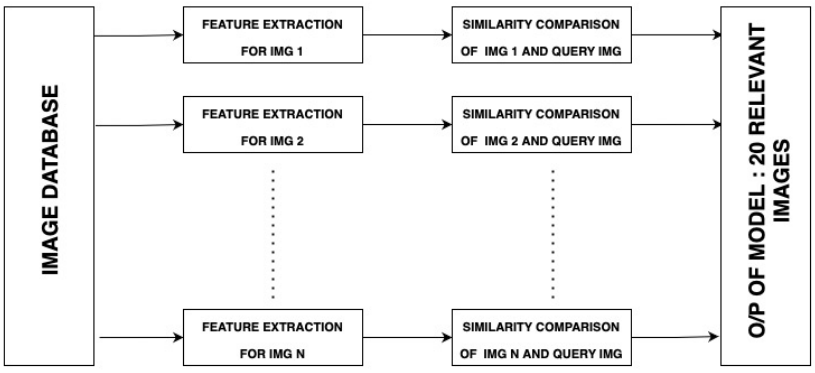
DESCRIPTION OF IMPLEMENTATION

The design of our application consists of three major tasks which can be leveraged for parallelization.

Task 1: Parallelize the text-based image retrieval from the large image database.

Task 2: Parallelizing the feature vector extraction to get meaningful features of all the images in the large database. We plan to experiment with various feature extraction techniques such as Deep Neural network models, Color Histogram Refinement Techniques, Scale Invariant Feature Transform, etc.

Task 3: Parallelizing the comparison of the extracted feature vectors of input images with the feature vectors of the query image based on chi-squared or cosine similarity.



Parallelizing technique: The underlying parallelization technique for Tasks 1, 2, and 3 is Data Parallelism.

EVALUATION

We will use Python's threading module for implementing multithreading. Pytorch and Cuda will be used to train the Deep Neural Network model in parallel for feature extraction.

For the implementation of the parallelized version of our application, we will use NVIDIA Tesla T4 GPU provided by Google Collab.

We will also implement the sequential code of the recommendation system and compare the performance with the parallel version.

The goal of our project is to build a recommendation system for products. The existing open datasets for e-commerce products do not adequately cover all the requirements, and we noticed an inconsistency in most of the datasets. To address this issue, we are planning to create a customized dataset that consists of 35-40 products like accessories, clothes, electronics, furniture, etc. summing up to ~ 70,000 images.

We also perform data pre-processing which involves noise removal using filters and resizing the image to the required dimensions.

To evaluate the performance of the parallelized program we will be comparing the execution time with the serial version. We will also calculate the overall speedup of our algorithm that is given by:

$$Speedup = \frac{Serial\ Time}{Parallel\ Time}$$

In the case of training a deep neural network for feature extraction, the evaluation mechanism is measuring the throughput that is calculated by:

$$Throughput = \frac{Number\ of\ Batches \times Batch\ Size}{Total\ training\ time}$$

REFERENCES

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[3] Sample dataset link: https://amazon-berkeley-objects.s3.amazonaws.com/index.html

[4] https://medium.com/@prabhnoor0212/siamese-network-keras-31a3a8f37d04

[5] https://github.com/lbrejon/Compute-similarity-between-images-using-CNN