# Image to Image Retrieval

## Image to Image retrieval

A NN model for image-to-image retrieval, which involves finding similar images in a gallery when given a specific image as a query.

Best fit model is implemented using Resnet50. Below are the details of systematic approach taken to come up on end result.

## Baseline Model Implementation

- **Simple CNN**:

  - **Architecture**: Start with a basic Convolutional Neural Network (CNN).

  - **Training**: Train the CNN on the dataset to classify images based on their actions.

  - **Evaluation**:

    - Accuracy: 61%

    - Mean Average Precision (mAP@10): 47%

    - Mean Rank: 341

## Improving the Model with Transfer Learning

- **ResNet50 [Best mAP]**:

  - **Architecture**: Use ResNet50, a more advanced and pre-trained CNN architecture.

  - **Custom Classifier**: Add a custom classifier on top of ResNet50 to fine-tune the model for the specific action classification task.

  - **Training**: Fine-tune the model on the dataset.

  - **Evaluation**:

    - Accuracy: 73%

    - mAP@1: 1.0

- mAP@10: 0.650003847526665

- mAP@50: 0.4817864112498961

- Mean Rank: 261.11333333333334

- Some sample image similarities

- Positive Pair
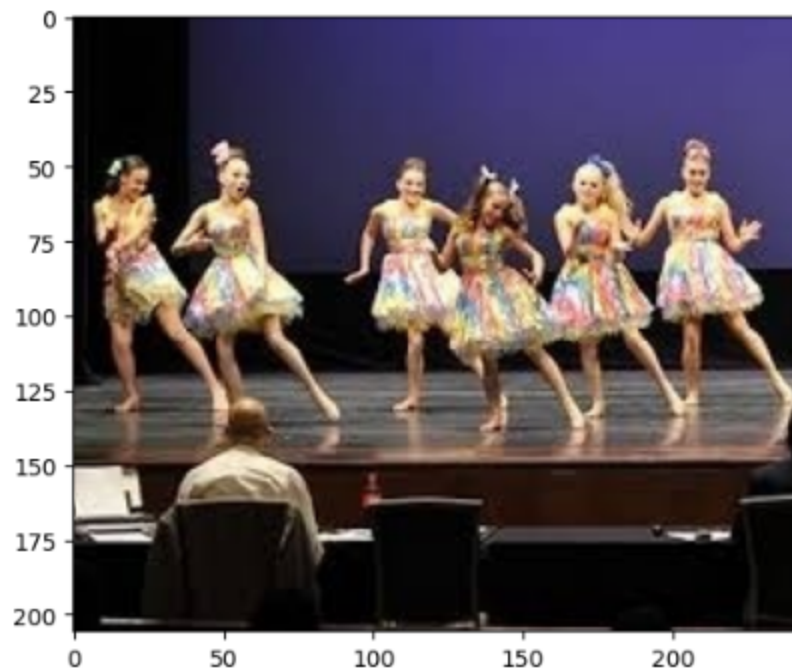
Similarity for given two images is:0.7357389330863953

- Negative Pair
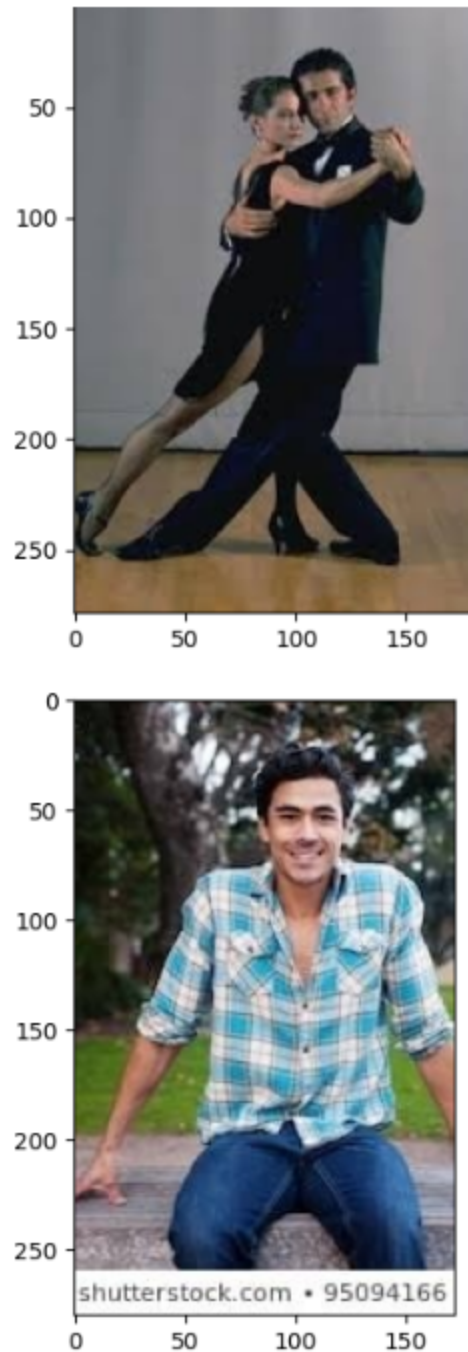
Similarity for given two images is:0.2076469361782074

+ Code    + Markdown

## Implementing a Siamese Network for Similarity Learning [Partially done due to high resource usage for more pairs creation]

- **Siamese Network**:

- **Architecture**: Design a Siamese Network with two identical subnetworks that share weights.

- **Loss Function**: Use a contrastive loss function to train the model to distinguish between similar and dissimilar image pairs.

- **Distance Metric**: Employ Euclidean distance to measure the similarity between image embeddings.

- **Training**:

  - Create positive pairs (similar images) and negative pairs (dissimilar images) from the dataset.

  - Experiment with different ratios of positive to negative pairs to find the optimal balance for training.

## Steps to run

- The final submitted code is for ResNet Approach. The file name is "resnet.ipynb".

- To run the model online we can take help of a tool like Google Colab or Kaggle's notebook.

  - To do so, upload the file

  - Upload the dataset (Can also mount google drive)

  - Click Run All