Recognition, feature space representation, tracking and performance in DCNN driven safety system

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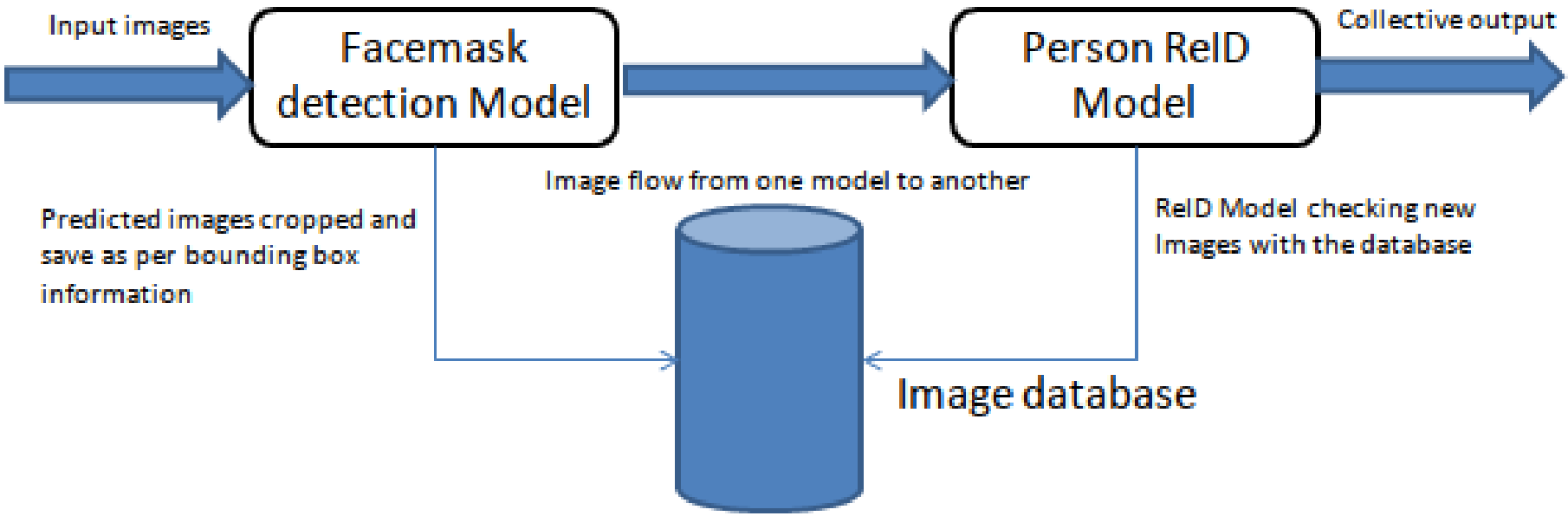
Problem Statement

COVID-19 pandemic changed our life. It is deadly and cost's more than 1.2 million of lives to date. On the other hand, following some simple rules can help to control the infection.
The goal of this work is to create a model and train neural network to discriminate peoples who follow the sanitary rules from those who are violating them and tracking all individuals in non-overlapping cameras...

Architecture of the project



What is Face mask detection

- An object detection problem to distinguish between images of people who are wearing/not wearing or incorrectly wearing the face mask.
- MMdetection is an open source object detection toolbox based on PyTorch.
- It is faster in computation.
- Different detection framework's can be customize our model.
- It support multiple Datasets like XML style, COCO, PASCAL.

Metric	IoU	MMdetection	Detectron2
mAP	@[IoU= 0.50:0.95]	**0.158**	0.139
mAP	@[IoU= 0.50]	0.238	0.277
mAP	@[IoU= 0.75]	0.181	0.109

What is Person Re-identification model

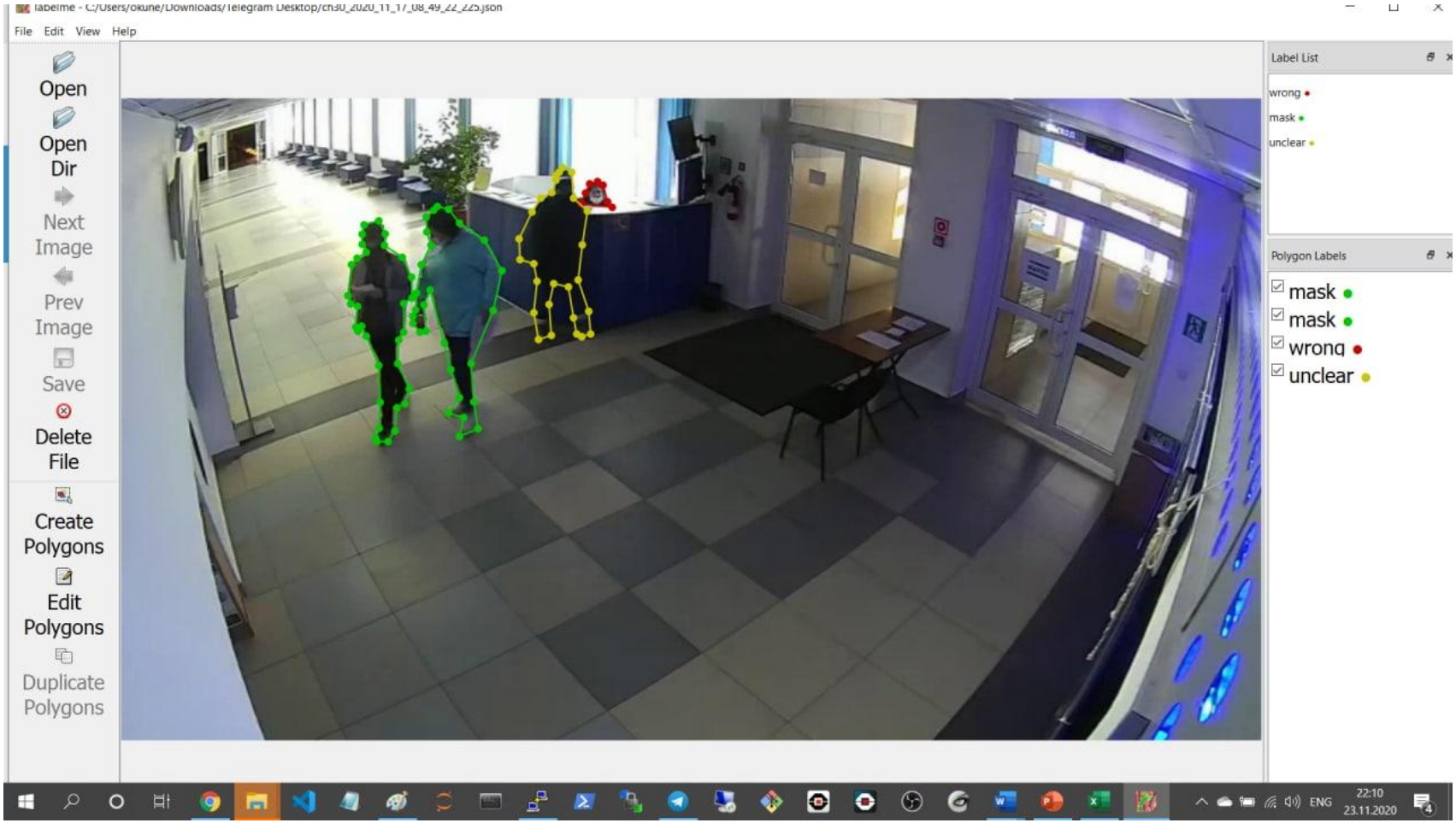
- Person re-identification is the process of associating images or videos of the same person taken from different angles and cameras.
- Torch ReID written in PyTorch.

ReID Model

torchreid /
data / data loaders , data augmentation methods , data samplers
losses / loss functions
metrics / distance metrics , evaluation metrics(Acc, Rank)
models / CNN architectures
optim / optimiser and learning rate schedulers
engine / training and evaluation pipelines
utils / useful tools (also suitable for other PyTorch projects)

Annotation

- In this model ImageMe tool was used for the Image annotation.



Old result VS new result Face mask model

- Change in annotation and updated result helped us to crop the data.
- Easy to send the images to ReID model.
- better feature extraction.

Person Re-Identification Dataset

- We created a custom dataset of 21127 images colleted from Facemask detection model.

Experiment and result

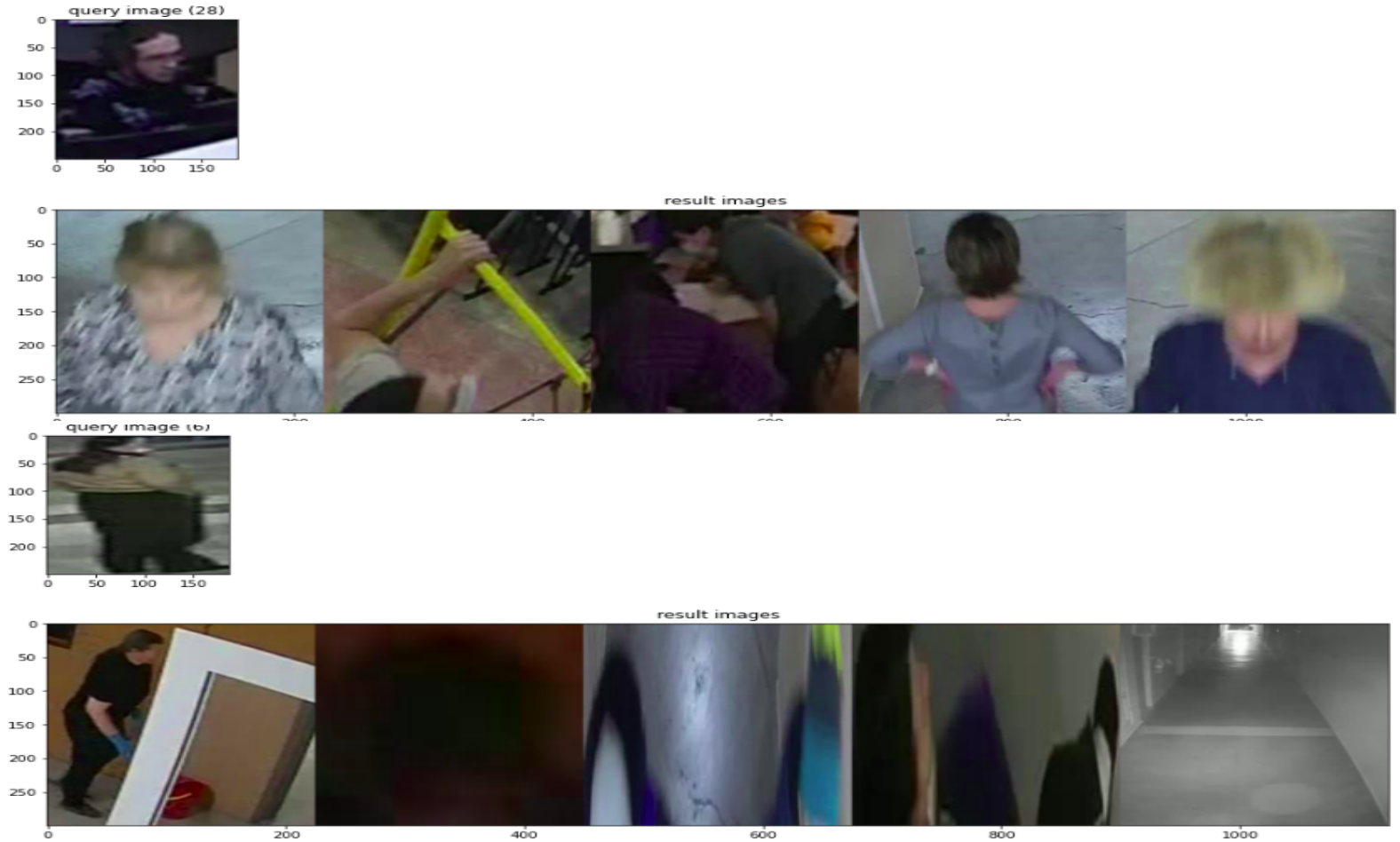
- Different feature extraction and distance metric used to get matching images.

Experiment and result

- Structure similarity index

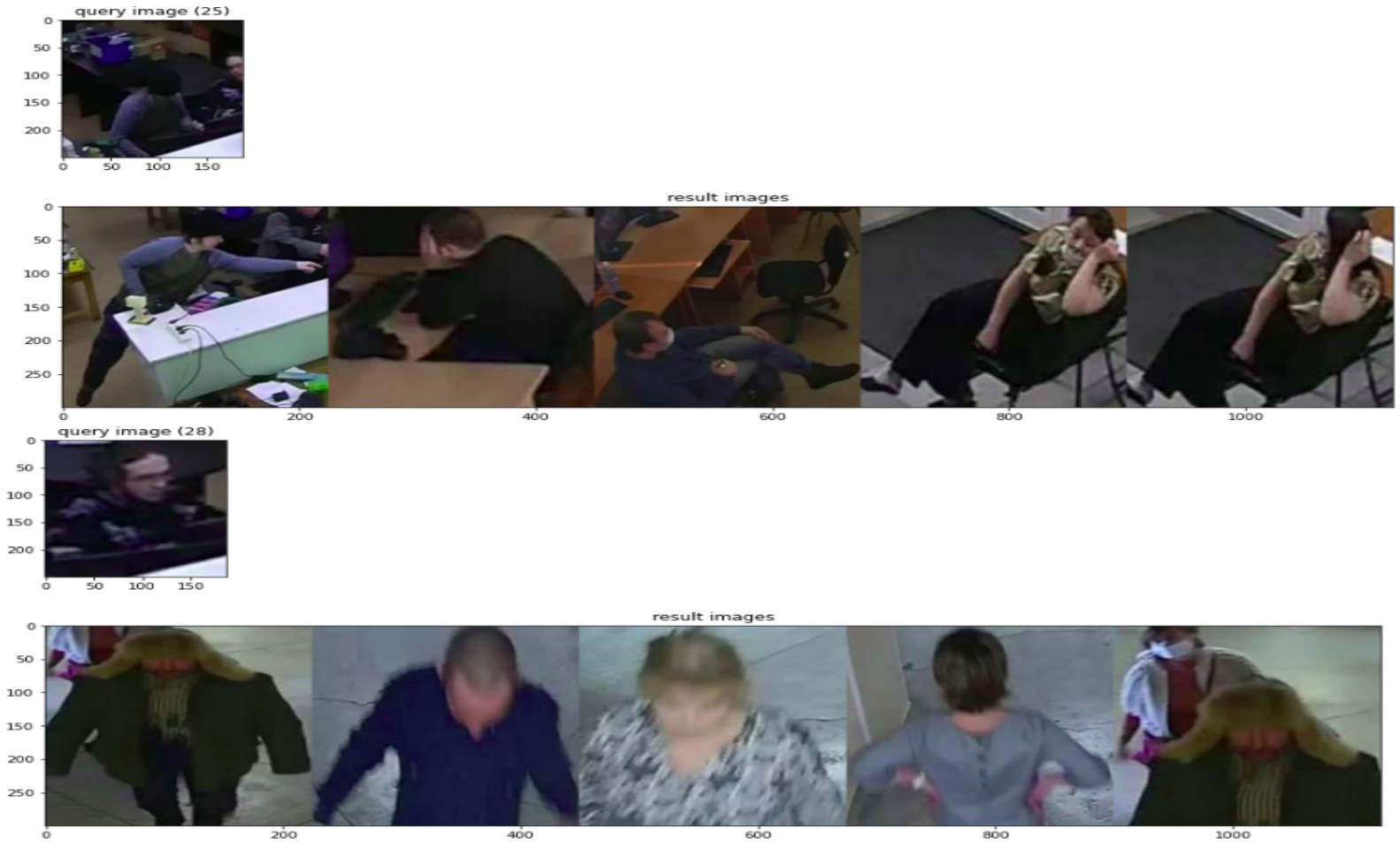
Experiment and result

- ResNet50 with cosine similarity



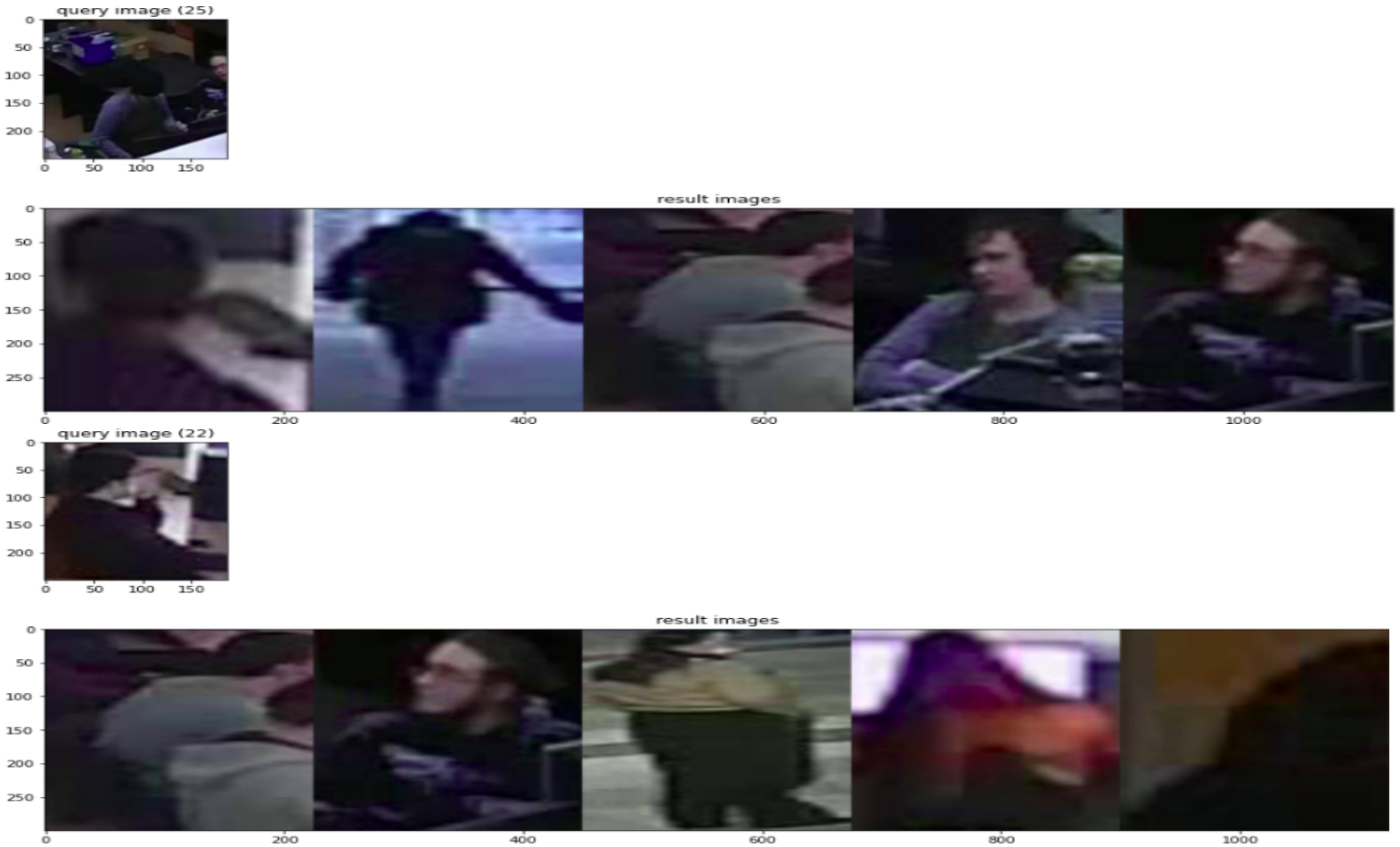
Experiment and result

- ResNet50 with pearson similarity



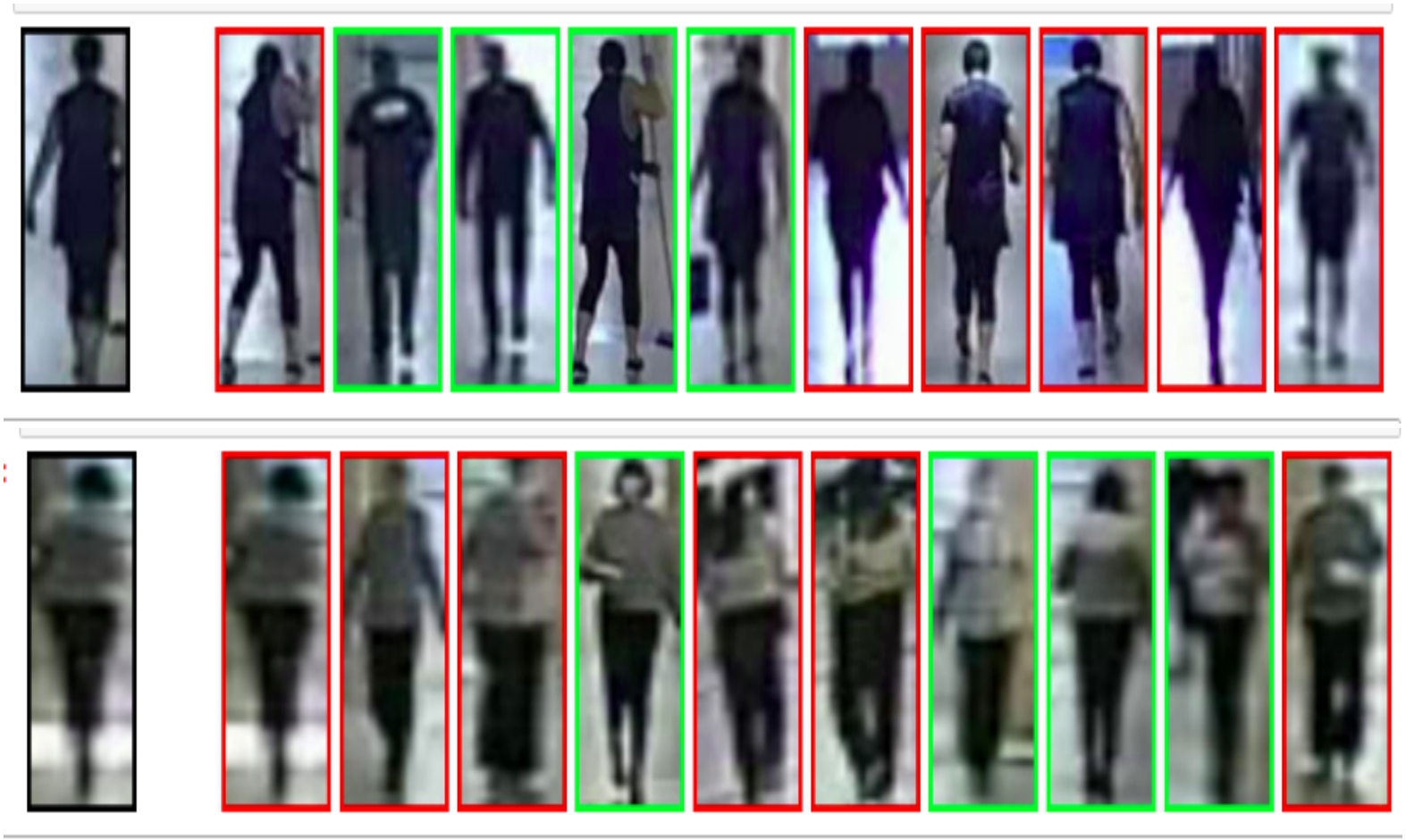
Experiment and result

- ResNet50 with Jaccard similarity



Experiment and result

- TorchreID
- With TorchreID we obtained 68% accuracy in top 10 selection.
- With random selection accuracy is only 2%



Experiment and result

- TorchreID

- Abstract published on MNSK, NSU 2021.
- Paper accepted for publication in International Journal of Innovative Science and Research Technology (IJISRT).

Thank you for your attention.