Contactless Checking

Contacless checking repository works as client-server connection within microservices running on Kubernetes environment. This repository based on the YOLO-v8, FaceNet, ArcFace serves as checking the people registered and recognize by the system.

The repository using socket connection with Spring Boot web as main hosting APIs to ensure the security connection in each API request. The MYSQL database serves as a relational-database to perform query and storage datasets.

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Development Environment

The recommend standard development environment is Ubuntu 18.04 LTS or later. You must install Docker, K8s Cluster Resource or minikube, Helm.

How to use

1. Install docker: docker installation

```
sudo apt-get update
sudo apt-get install ca-certificates curl
sudo install -m 0755 -d /etc/apt/keyrings
sudo curl -fsSL https://download.docker.com/linux/ubuntu/gpg -o
/etc/apt/keyrings/docker.asc
sudo chmod a+r /etc/apt/keyrings/docker.asc

# Add the repository to Apt sources:
echo \
"deb [arch=$(dpkg --print-architecture) signed-
by=/etc/apt/keyrings/docker.asc] https://download.docker.com/linux/ubuntu \
```

```
$(. /etc/os-release && echo "$VERSION_CODENAME") stable" | \
sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
sudo apt-get update

sudo apt-get install docker-ce docker-ce-cli containerd.io docker-buildx-
plugin docker-compose-plugin
sudo groupadd docker
sudo usermod -aG docker $USER
newgrp docker
```

2. Install kubectl and helm in `test/install_3pp.sh`:

```
./install_3pp.sh
```

This will automatic install kubectl and helm mount it to /usr/bin/local and make it global use.

3. Install make

```
sudo apt install make
```

4. Building steps are done via make, the builders:

    - If you don't want to clean the build artifacts, run the following command

```
make build image push
```

    - If you wan't to clean the build and re-run all the building steps

```
make clean init train build image push
```

The training process will take default hyper-parameters used for YOLOv8, more information, please check: YOLOv8 ultralystics. The hyperparameters can be found in `vas.sh`.

```
# Hyper parameters
test -n "$TASK_TYPE" || export TASK_TYPE=detect #DEFAULT task=detect is one
of [detect, segment, classify]
test -n "$MODE_TYPE" || export MODE_TYPE=train #DEFAULT mode=train is one of
[train, val, predict, export, track]
test -n "$EPOCHS" || export EPOCHS=50 #DEFAULT EPOCHS=50
test -n "$DEFAULT_MODEL" || export DEFAULT_MODEL="yolov8n.pt" #DEFAULT we
get the pretrained model for training process
test -n "$IMAGE_SIZE" || export IMAGE_SIZE=640
```

5. Using `testcon` image which integrate the environment for run requirement `face_model`. Check at `test/testcon`. In case you don't want to rebuild all necessary library with pip which takes a lot of efforts and time.

In order to using your docker registry. Update `DOCKER_REGISTRY` in ./vas.sh. Or simply export DOCKER_REGISTRY in your enviroment.

```
$ export DOCKER_REGISTRY=<your docker-registry>
```

6. Config AWS_ACCESS_KEY_ID and AWS_SECRET_ACCESS_KEY in your env to retrieve all dataset in S3 bucket. Found in IAM roles in AWS.

```
export AWS_ACCESS_KEY_ID=<your-AWS_ACCESS_KEY_ID>
export AWS_SECRET_ACCESS_KEY=<your-AWS_SECRET_ACCESS_KEY>
export AWS_DEFAULT_REGION=<your-AWS_DEFAULT_REGION> | <DEFAULT us-east-1>
```

7. To install helm chart, must build-image-push image to registry before running helm. If could not retrieve the image to pull.

```
$ EXPORT RELEASE=true
$ EXPORT NAME="-n zrdtuan-ns"
$ make package-helm
$ helm $NAME install ck-app build/helm-build/ck-application/ck-application-1.0.0-
5.tgz --set aws.key=$AWS_ACCESS_KEY_ID --set aws.secret=$AWS_SECRET_ACCESS_KEY
```

For TLS, in this lab I config K8s resource in Docker Desktop => Running on WSL. To check the kubernetes IP.

```
$ kubectl get nodes -o wide
```

8. After install helm chart, the container will pull from docker registry to initial the pod running in k8s. Check out the deploy is up and health state.

```
$ kubectl $NAME get all
```

```
NAME                                                READY   STATUS    RESTARTS
AGE
pod/ck-application-authentication-6d76dd99b7-c4xkr   1/1     Running   0
14m
pod/ck-application-client-56cd64698c-4phls           1/1     Running   0
14m
pod/ck-application-mysql-0                           2/2     Running   0
```

```
14m
pod/ck-application-server-84c4f67c6-ttn72            1/1     Running   0
14m

NAME                              TYPE           CLUSTER-IP       EXTERNAL-IP
PORT(S)    AGE
ck-application-authentication   LoadBalancer   10.106.76.107    localhost
8443/TCP   5s
ck-application-client-http      LoadBalancer   10.97.223.70     localhost
80/TCP     5s
ck-application-client-https     LoadBalancer   10.108.149.254   localhost
443/TCP    5s
ck-application-mysql            ClusterIP      None             <none>
3306/TCP   5s
ck-application-mysql-read       ClusterIP      10.110.144.98    <none>
3306/TCP   5s
ck-application-server           LoadBalancer   10.111.255.161   localhost
5000/TCP   5s

NAME                                          READY   UP-TO-DATE   AVAILABLE
AGE
deployment.apps/ck-application-authentication   1/1     1            1
14m
deployment.apps/ck-application-client           1/1     1            1
14m
deployment.apps/ck-application-server           1/1     1            1
14m

NAME                                                     DESIRED   CURRENT
READY   AGE
replicaset.apps/ck-application-authentication-6d76dd99b7   1         1         1
14m
replicaset.apps/ck-application-client-56cd64698c           1         1         1
14m
replicaset.apps/ck-application-server-84c4f67c6            1         1         1
14m

NAME                                       READY   AGE
statefulset.apps/ck-application-mysql   1/1     14m
```

The service data will be manage and stored inside Persistent Volume Claim (PVC), in case we need to reploy the service if crashed, all the data will be preserved, and automatically mounted into pod.

9. Wait a bit untill all pods are running

```
NAME                                          READY   STATUS    RESTARTS   AGE
ck-application-authentication-6d76dd99b7-c4xkr   1/1     Running   0          11s
ck-application-client-56cd64698c-4phls           1/1     Running   0          11s
ck-application-mysql-0                           2/2     Running   0          11s
ck-application-server-84c4f67c6-ttn72            1/1     Running   0          11s
```

In the contactless checking system, two server are deploying alongwith one MySQL database for back up and one for primary database, and Web Client. To access into the web for user interface. We need to access into the service.

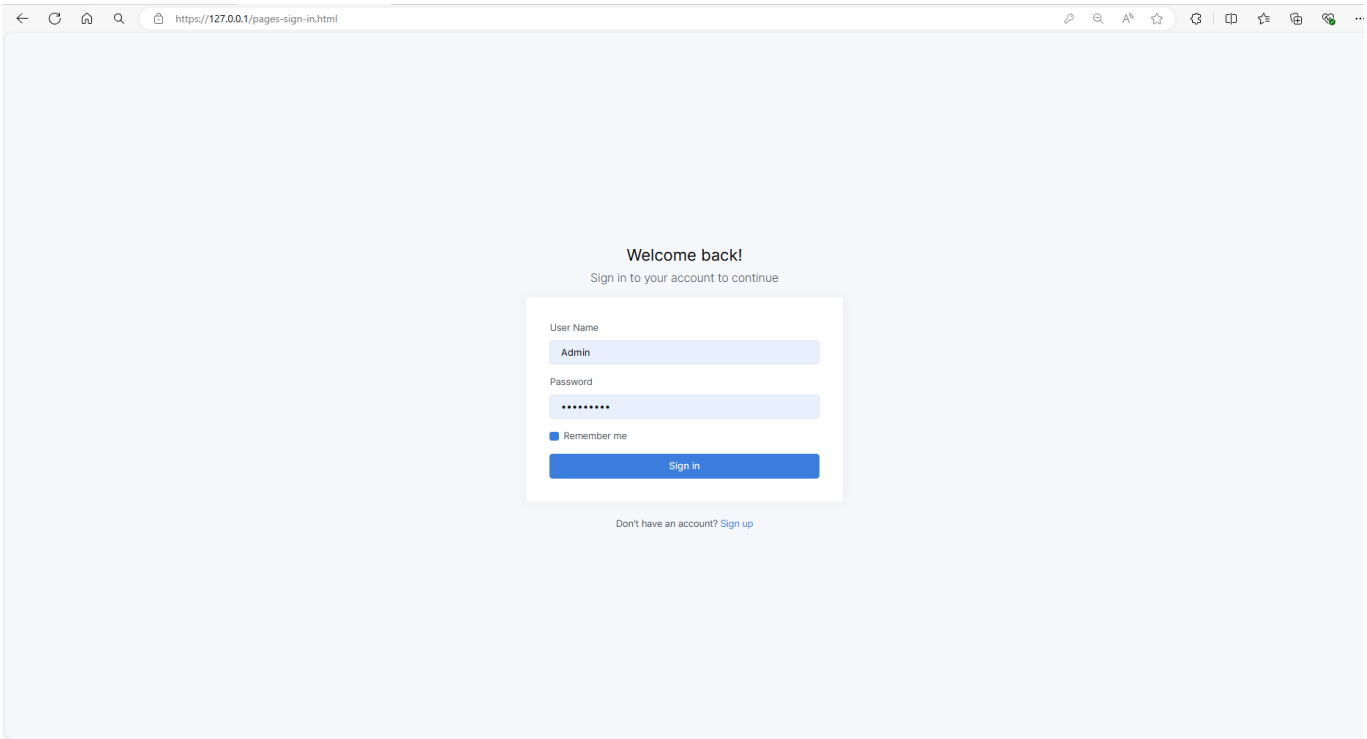
10. Get the service.

```
$ kubectl $NAME get svc
```

This will show all the service to access. Select the Web Client service.

```
NAME                              TYPE           CLUSTER-IP       EXTERNAL-IP
PORT(S)    AGE
ck-application-authentication     LoadBalancer   10.106.76.107    localhost
8443/TCP   5s
ck-application-client-http        LoadBalancer   10.97.223.70     localhost
80/TCP     5s
ck-application-client-https       LoadBalancer   10.108.149.254   localhost
443/TCP    5s
ck-application-mysql              ClusterIP      None             <none>
3306/TCP   5s
ck-application-mysql-read         ClusterIP      10.110.144.98    <none>
3306/TCP   5s
ck-application-server             LoadBalancer   10.111.255.161   localhost
5000/TCP   5s
```

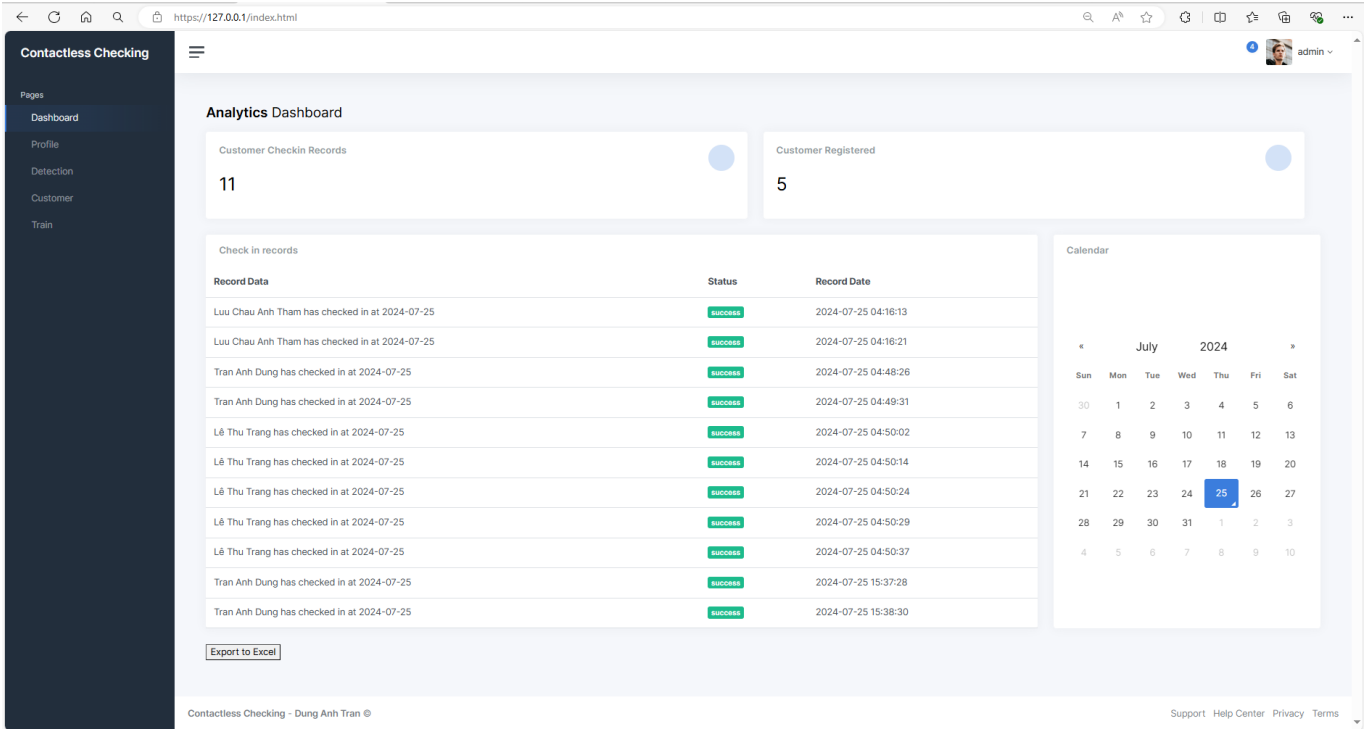
Access https://127.0.0.1 or https://localhost to navigate the Web Client. If access, it will navigate to login page. All the cluster using TLS certificates to authenticate all resources.



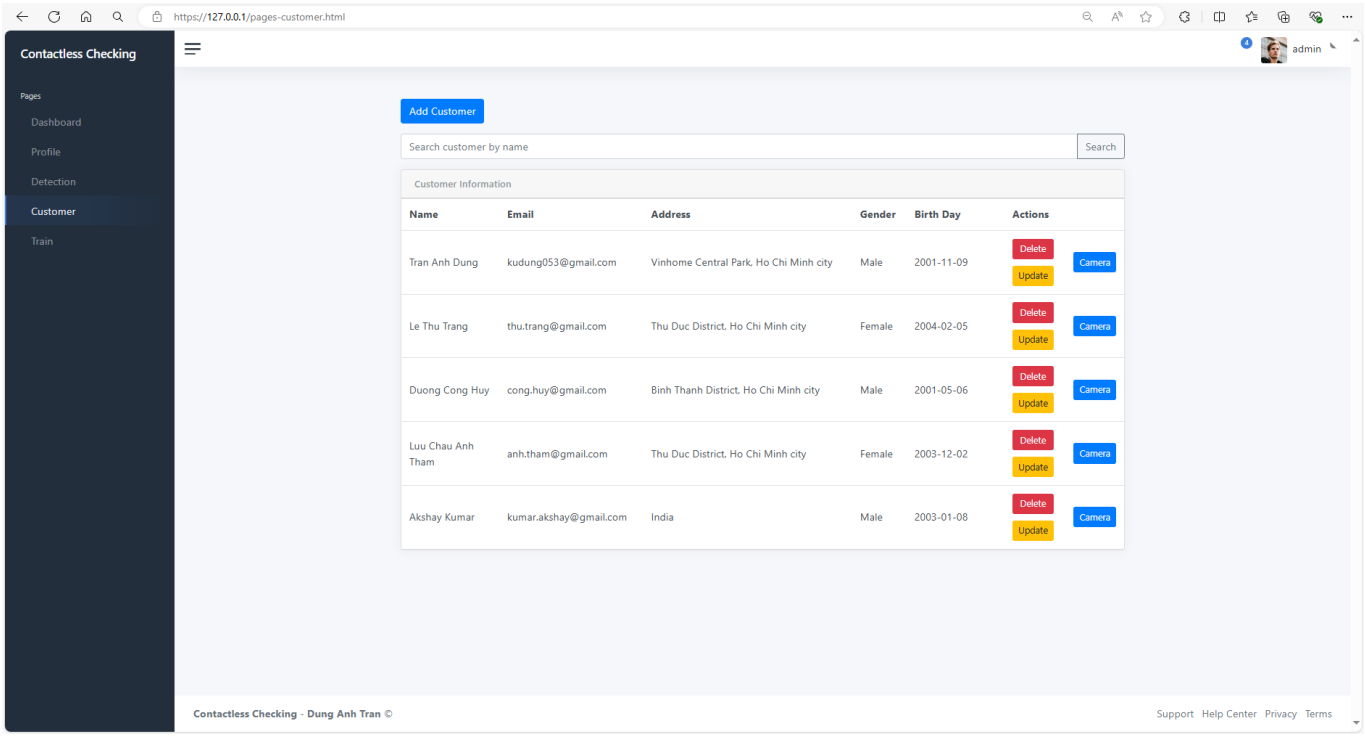
Enter the Username/Password. By default the API Server created default Admin account. Use the credentials to login into pages.

The homepage will display all analytics metrics and record all check-in times, with the ability to filter by date.

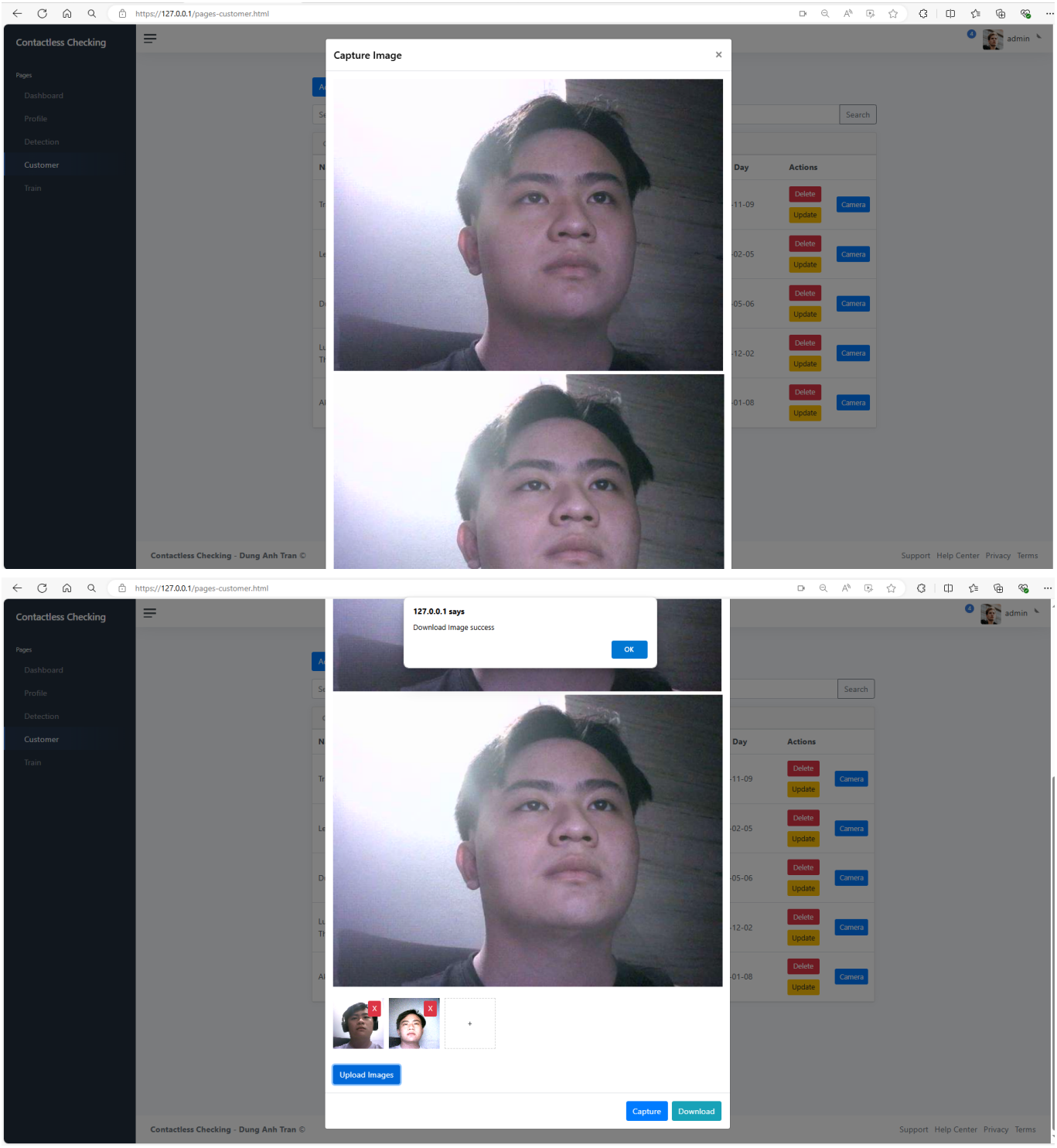
```
credentials: Admin/Admin@123
```



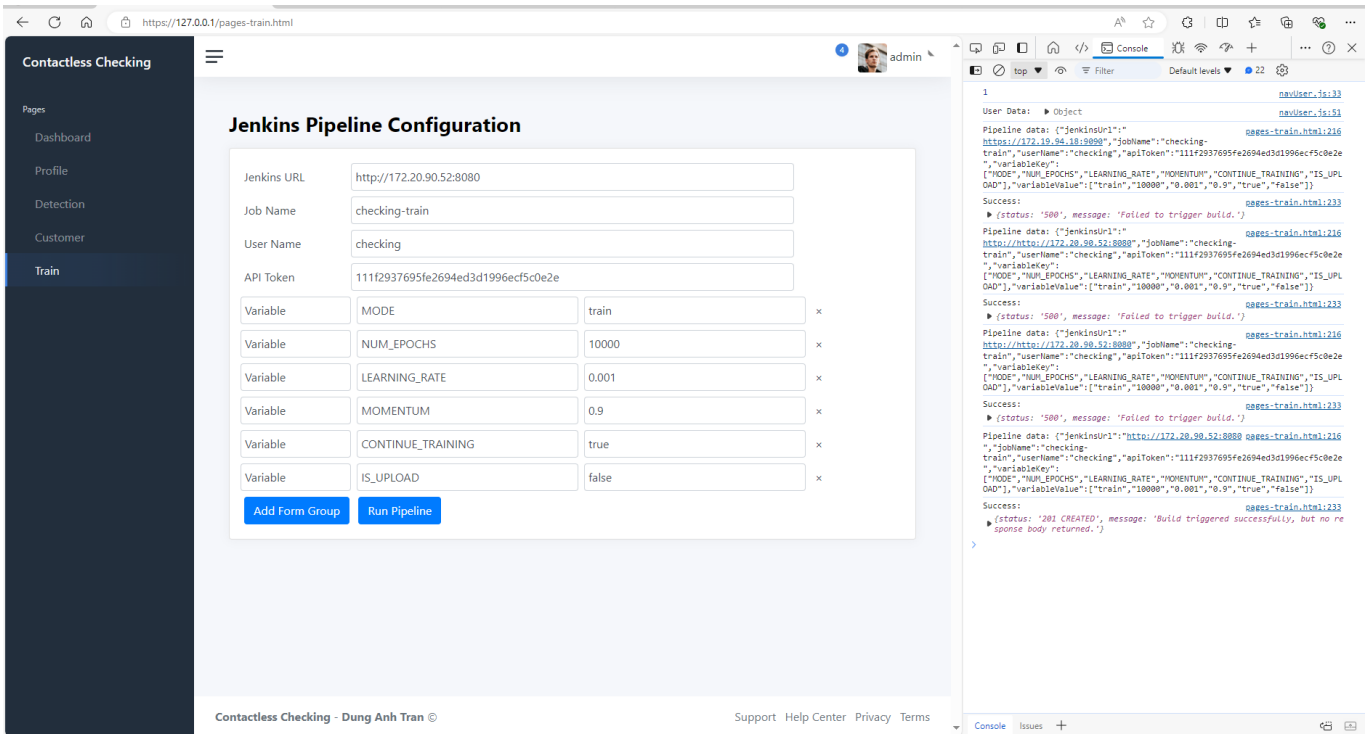
First, create a set of registered customers in the system. Capture all images and send them to the backend, where they will be stored in both a local and a remote S3 bucket to prevent data loss in case of a system crash.

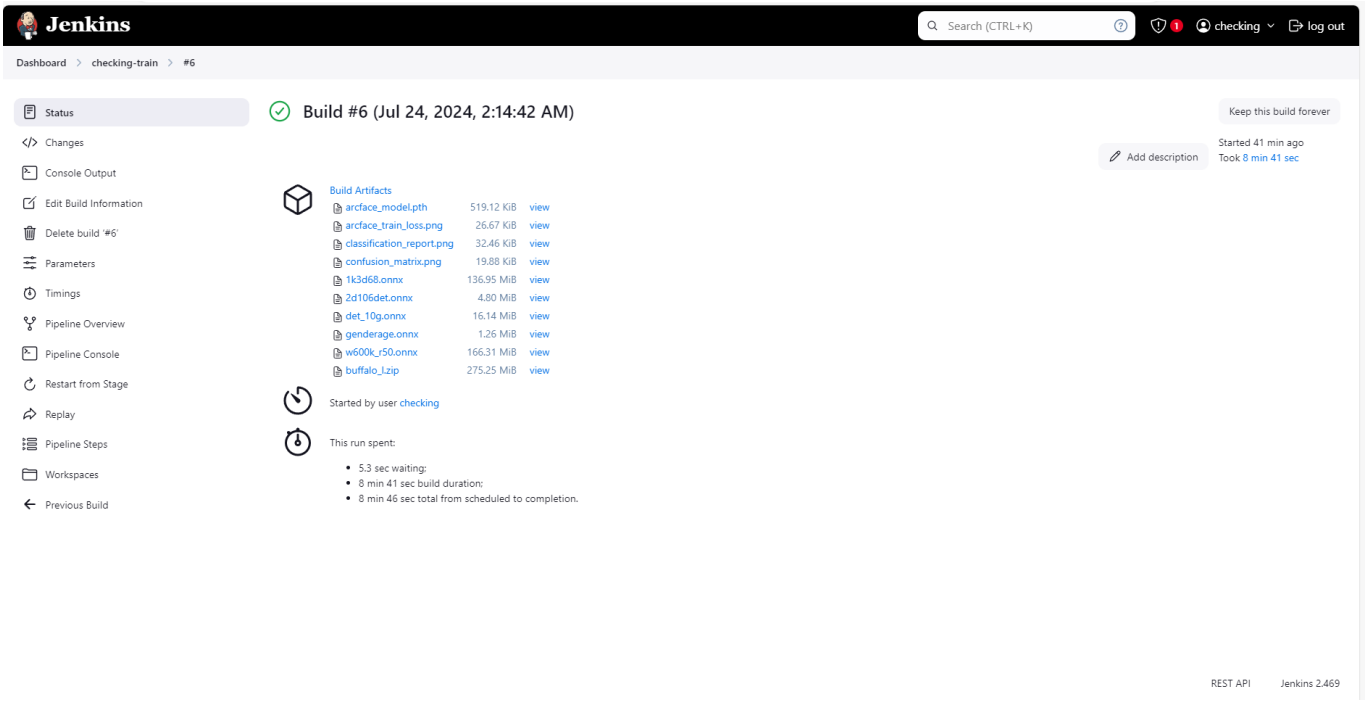


We can edit all customer information and create a new image dataset for the check-in system, which will be sent to train the ArcFaceModel. To obtain image data, we can either upload images or capture them using a camera device.

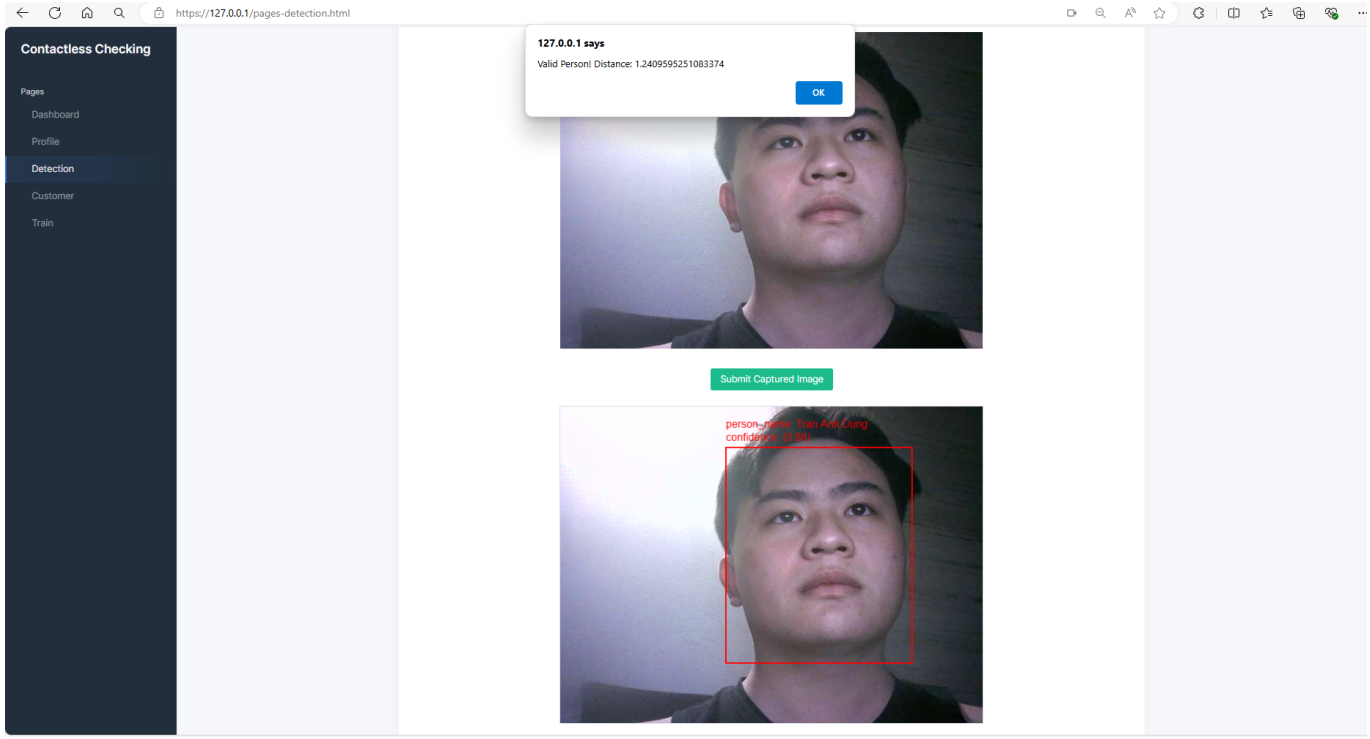


The collected images will be trained using Jenkins CI. Enter the appropriate parameters and trigger the Jenkins pipeline to train the model with the collected datasets.





The trained model will be used to detect customer images. On the detection page, a snapshot of the customer's image will be sent to the model server for analysis, and the results will be returned to the client.


https://127.0.0.1/pages-detection.html
Contactless Checking
Pages
Dashboard
Profile
Detection
Customer
Train
127.0.0.1 says
Valid Person! Distance: 1.2409595251083374
OK
Submit Captured Image
person_name: Tran Anh Dung