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LAMPIRAN

LAMPIRAN

Lampiran 1 *Dataset* video dalam bentuk *file* .mp4

Lampiran 2 *Splitting* video

1. *Split* 10 *frames*

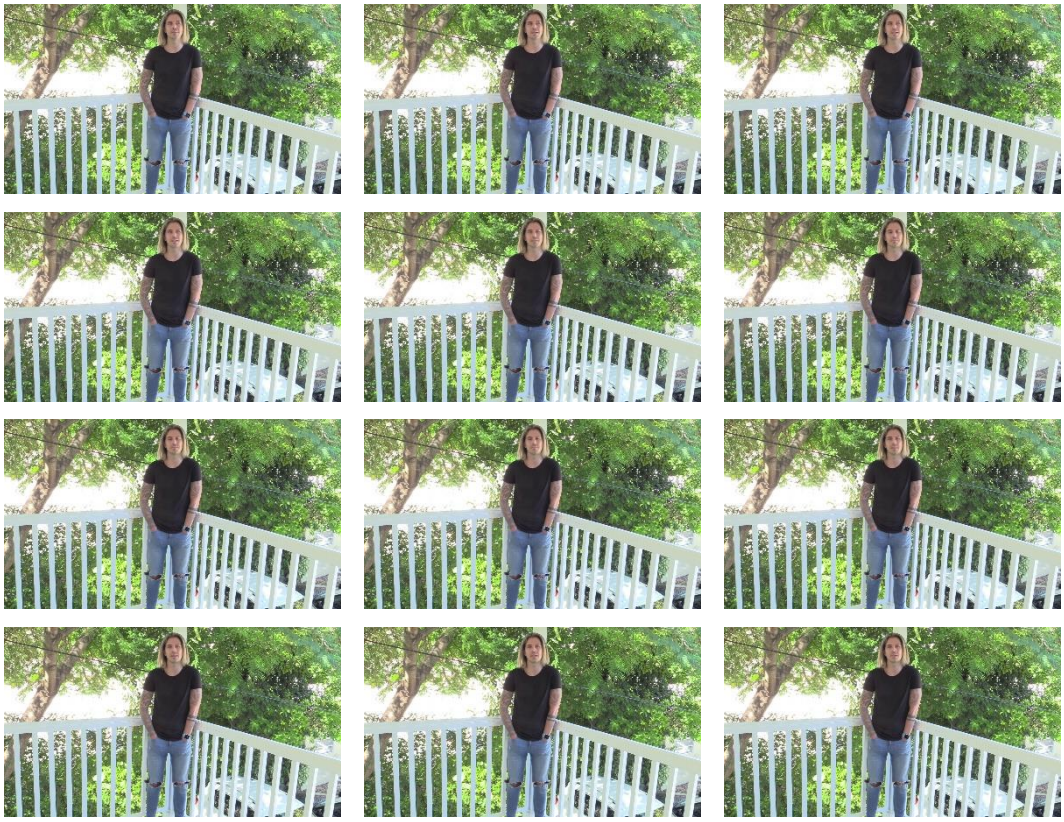
*Preprossed*_1 *Preprossed*_2 *Preprossed*_3

*Preprossed*_4 *Preprossed*_5 *Preprossed*_6

*Preprossed*_7 *Preprossed*_8 *Preprossed*_9

*Preprossed*_10

2. *Split* 60 *frames*



Lampiran 3 *Face detection*

Lampiran 4 *Cropped face*

1. 10 *frames*

*Cropped_face_*1 *Cropped_face_*2 *Cropped_face_*3 *Cropped_face_*4


*Cropped_face*_5


*Cropped_face*_6

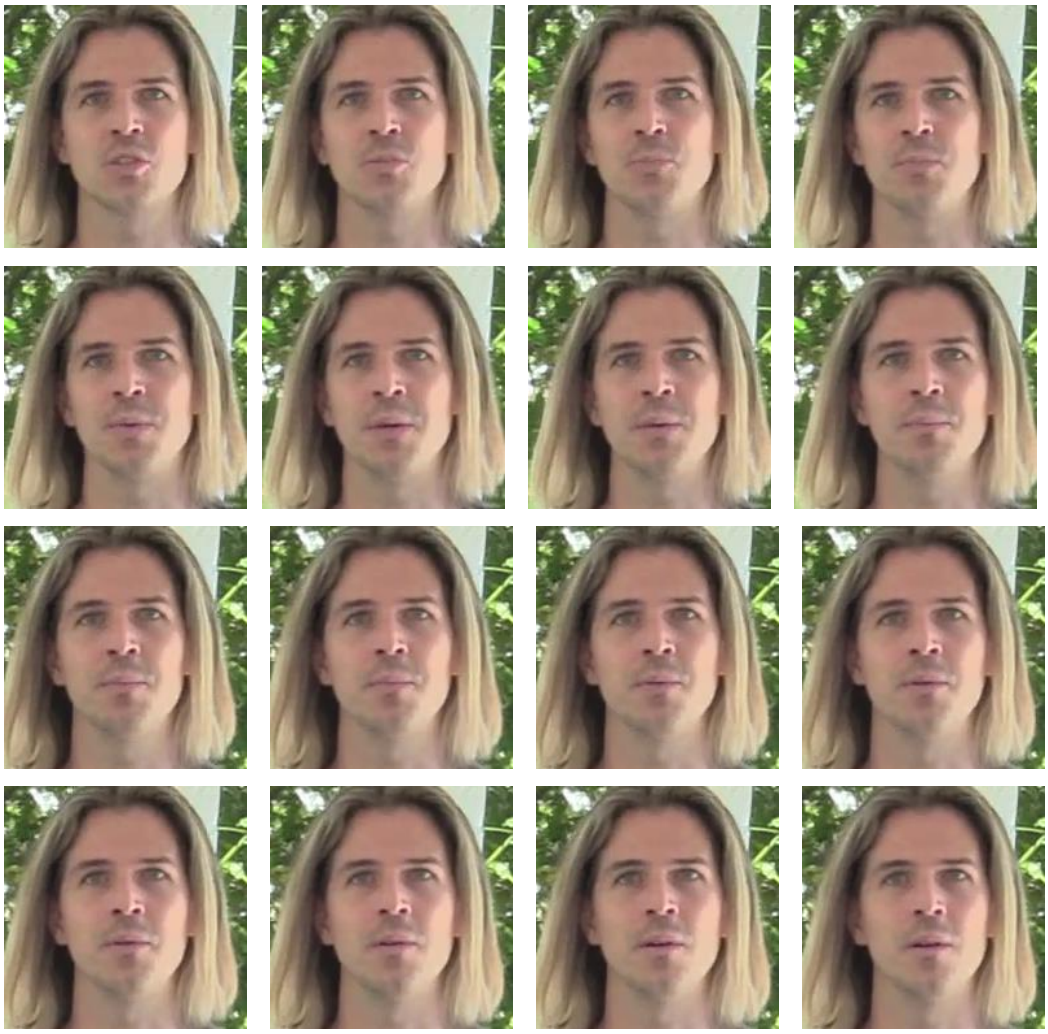

*Cropped_face*_7

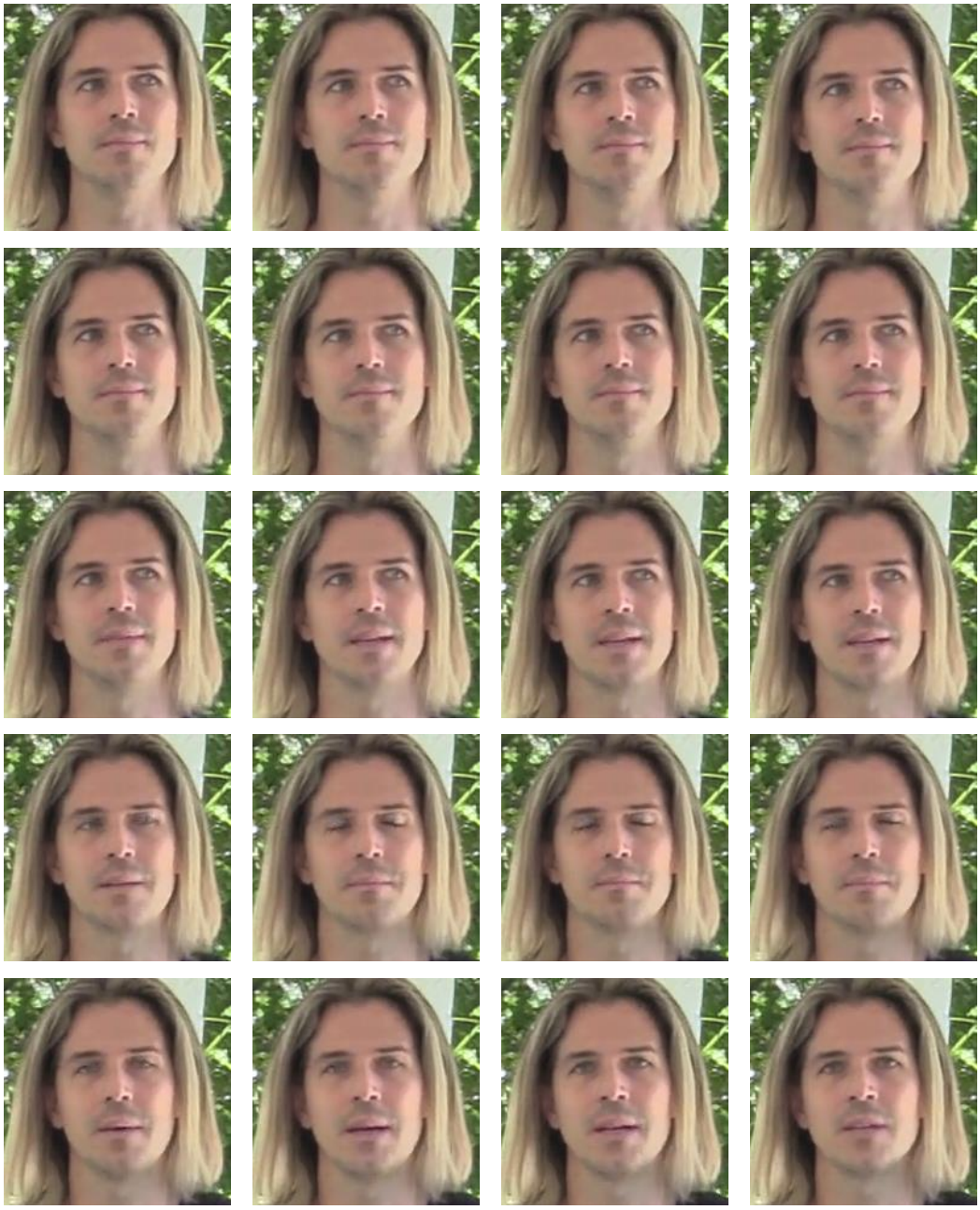

*Cropped_face*_8


*Cropped_face*_9

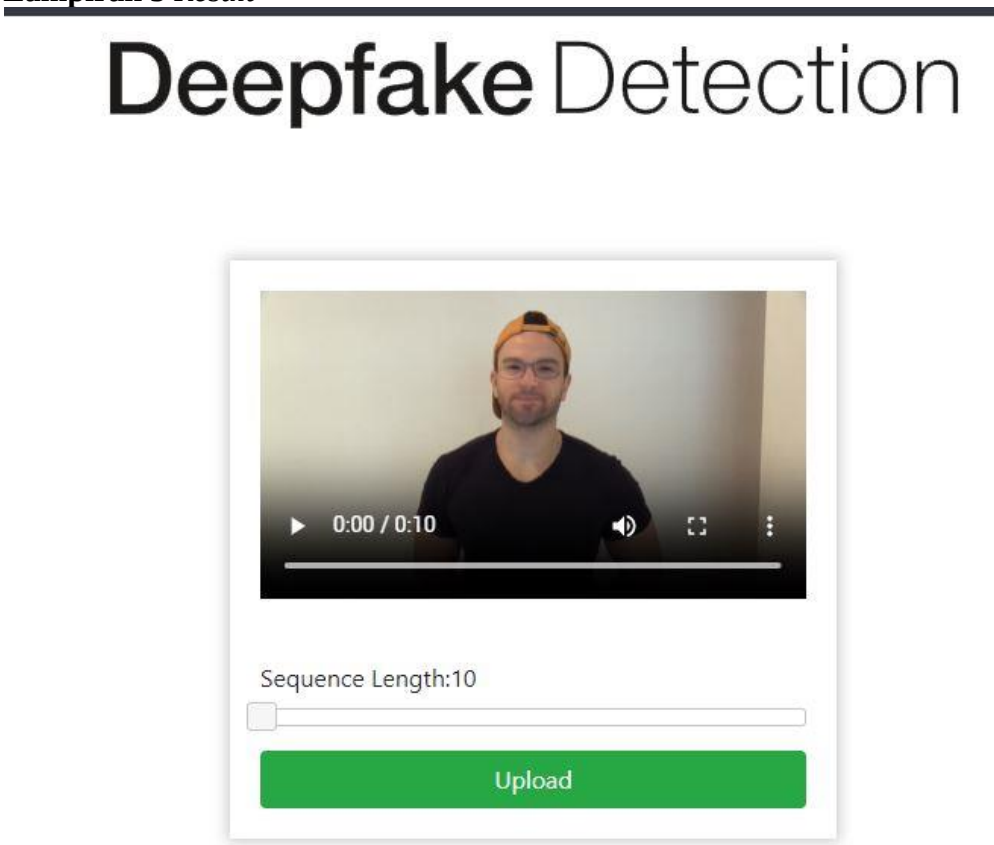

*Cropped_face*_10

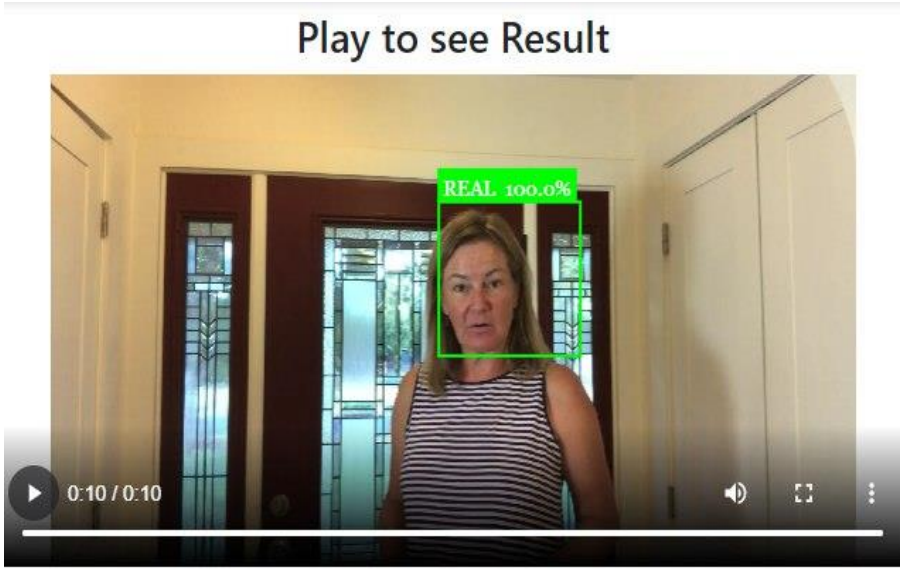
2. 60 *frames*

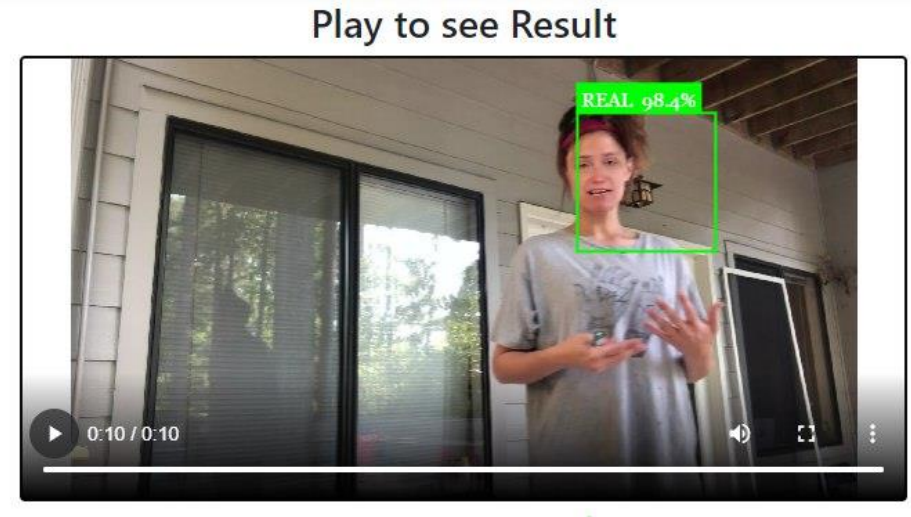




Lampiran 5 *Result*




Play to see Result
REAL 100.0%
0:10 / 0:10


Play to see Result
REAL 98.4%
0:10 / 0:10


Play to see Result
FAKE 100.0%
0:02 / 0:10

Lampiran 6 *Source code*

```
from django.shortcuts import render, redirect
import torch
import torchvision
from torchvision import transforms, models
from torch.utils.data import DataLoader
from torch.utils.data.dataset import Dataset
import os
import numpy as np
import cv2
import matplotlib.pyplot as plt
import face_recognition
from torch.autograd import Variable
import time
import sys
from torch import nn
import json
import glob
import copy
from torchvision import models
import shutil
from PIL import Image as pImage
import time
from django.conf import settings
from .forms import VideoUploadForm

index_template_name = 'index.html'
predict_template_name = 'predict.html'

im_size = 112
mean=[0.485, 0.456, 0.406]
std=[0.229, 0.224, 0.225]
sm = nn.Softmax()
inv_normalize =  transforms.Normalize(mean=-
1*np.divide(mean,std),std=np.divide([1,1,1],std))
```

```
train_transforms = transforms.Compose([
                                        transforms.ToPILImage(),
                                        transforms.Resize((im_si
ze,im_size)),
                                        transforms.ToTensor(),
                                        transforms.Normalize(mea
n,std)])

class Model(nn.Module):

    def __init__(self, num_classes,latent_dim= 2048,
lstm_layers=1 , hidden_dim = 2048, bidirectional = False):
        super(Model, self).__init__()
        model = models.resnext50_32x4d(pretrained = True)
        self.model = nn.Sequential(*list(model.children())[:-2])
        self.lstm = nn.LSTM(latent_dim,hidden_dim,
lstm_layers,  bidirectional)
        self.relu = nn.LeakyReLU()
        self.dp = nn.Dropout(0.4)
        self.linear1 = nn.Linear(2048,num_classes)
        self.avgpool = nn.AdaptiveAvgPool2d(1)

    def forward(self, x):
        batch_size,seq_length, c, h, w = x.shape
        x = x.view(batch_size * seq_length, c, h, w)
        fmap = self.model(x)
        x = self.avgpool(fmap)
        x = x.view(batch_size,seq_length,2048)
        x_lstm,_ = self.lstm(x,None)
        return fmap,self.dp(self.linear1(x_lstm[:,-1,:]))

class validation_dataset(Dataset):
    def __init__(self,video_names,sequence_length=60,transform =
None):
        self.video_names = video_names
        self.transform = transform
```

```
        self.count = sequence_length

    def __len__(self):
        return len(self.video_names)

    def __getitem__(self,idx):
        video_path = self.video_names[idx]
        frames = []
        a = int(100/self.count)
        first_frame = np.random.randint(0,a)
        for i,frame in
enumerate(self.frame_extract(video_path)):
            #if(i % a == first_frame):
            faces = face_recognition.face_locations(frame)
            try:
              top,right,bottom,left = faces[0]
              frame = frame[top:bottom,left:right,:]
            except:
              pass
            frames.append(self.transform(frame))
            if(len(frames) == self.count):
                break
        """
        for i,frame in
enumerate(self.frame_extract(video_path)):
            if(i % a == first_frame):
                frames.append(self.transform(frame))
        """
        # if(len(frames)<self.count):
        #   for i in range(self.count-len(frames)):
        #         frames.append(self.transform(frame))
        #print("no of frames", self.count)
        frames = torch.stack(frames)
        frames = frames[:self.count]
        return frames.unsqueeze(0)
```

```
    def frame_extract(self,path):
      vidObj = cv2.VideoCapture(path)
      success = 1
      while success:
          success, image = vidObj.read()
          if success:
              yield image

def im_convert(tensor, video_file_name):
    """ Display a tensor as an image. """
    image = tensor.to("cpu").clone().detach()
    image = image.squeeze()
    image = inv_normalize(image)
    image = image.numpy()
    image = image.transpose(1,2,0)
    image = image.clip(0, 1)
    # This image is not used
    # cv2.imwrite(os.path.join(settings.PROJECT_DIR,
'uploaded_images', video_file_name+'_convert_2.png'),image*255)
    return image

def im_plot(tensor):
    image = tensor.cpu().numpy().transpose(1,2,0)
    b,g,r = cv2.split(image)
    image = cv2.merge((r,g,b))
    image = image*[0.22803, 0.22145, 0.216989] +  [0.43216,
0.394666, 0.37645]
    image = image*255.0
    plt.imshow(image.astype(int))
    plt.show()

def predict(model,img,path = './', video_file_name=""):
  fmap,logits = model(img.to('cuda'))
  img = im_convert(img[:,-1,:,:,:], video_file_name)
  params = list(model.parameters())
  weight_softmax = model.linear1.weight.detach().cpu().numpy()
```

```
  logits = sm(logits)
  _,prediction = torch.max(logits,1)
  confidence = logits[:,int(prediction.item())].item()*100
  print('confidence of
prediction:',logits[:,int(prediction.item())].item()*100)
  return [int(prediction.item()),confidence]

def plot_heat_map(i, model, img, path = './',
video_file_name=''):
  fmap,logits = model(img.to('cuda'))
  params = list(model.parameters())
  weight_softmax = model.linear1.weight.detach().cpu().numpy()
  logits = sm(logits)
  _,prediction = torch.max(logits,1)
  idx = np.argmax(logits.detach().cpu().numpy())
  bz, nc, h, w = fmap.shape
  #out = np.dot(fmap[-1].detach().cpu().numpy().reshape((nc,
h*w)).T,weight_softmax[idx,:].T)
  out = np.dot(fmap[i].detach().cpu().numpy().reshape((nc,
h*w)).T,weight_softmax[idx,:].T)
  predict = out.reshape(h,w)
  predict = predict - np.min(predict)
  predict_img = predict / np.max(predict)
  predict_img = np.uint8(255*predict_img)
  out = cv2.resize(predict_img, (im_size,im_size))
  heatmap = cv2.applyColorMap(out, cv2.COLORMAP_JET)
  img = im_convert(img[:,-1,:,:,:], video_file_name)
  result = heatmap * 0.5 + img*0.8*255
  # Saving heatmap - Start
  heatmap_name = video_file_name+"_heatmap_"+str(i)+".png"
  image_name = os.path.join(settings.PROJECT_DIR,
'uploaded_images', heatmap_name)
  cv2.imwrite(image_name,result)
  # Saving heatmap - End
  result1 = heatmap * 0.5/255 + img*0.8
  r,g,b = cv2.split(result1)
```

```
  result1 = cv2.merge((r,g,b))
  return image_name

# Model Selection
def get_accurate_model(sequence_length):
    model_name = []
    sequence_model = []
    final_model = ""
    list_models = glob.glob(os.path.join(settings.PROJECT_DIR,
"models", "*.pt"))
    for i in list_models:
        model_name.append(i.split("\\")[-1])
    for i in model_name:
        try:
            seq = i.split("_")[3]
            if (int(seq) == sequence_length):
                sequence_model.append(i)
        except:
            pass

    if len(sequence_model) > 1:
        accuracy = []
        for i in sequence_model:
            acc = i.split("_")[1]
            accuracy.append(acc)
        max_index = accuracy.index(max(accuracy))
        final_model = sequence_model[max_index]
    else:
        final_model = sequence_model[0]
    return final_model

ALLOWED_VIDEO_EXTENSIONS =
set(['mp4','gif','webm','avi','3gp','wmv','flv','mkv'])

def allowed_video_file(filename):
    #print("filename" ,filename.rsplit('.',1)[1].lower())
```

```
    if (filename.rsplit('.',1)[1].lower() in
ALLOWED_VIDEO_EXTENSIONS):
        return True
    else:
        return False
def index(request):
    if request.method == 'GET':
        video_upload_form = VideoUploadForm()
        if 'file_name' in request.session:
            del request.session['file_name']
        if 'preprocessed_images' in request.session:
            del request.session['preprocessed_images']
        if 'faces_cropped_images' in request.session:
            del request.session['faces_cropped_images']
        return render(request, index_template_name, {"form":
video_upload_form})
    else:
        video_upload_form = VideoUploadForm(request.POST,
request.FILES)
        if video_upload_form.is_valid():
            video_file =
video_upload_form.cleaned_data['upload_video_file']
            video_file_ext = video_file.name.split('.')[-1]
            sequence_length =
video_upload_form.cleaned_data['sequence_length']
            video_content_type =
video_file.content_type.split('/')[0]
            if video_content_type in settings.CONTENT_TYPES:
                if video_file.size >
int(settings.MAX_UPLOAD_SIZE):
                    video_upload_form.add_error("upload_video_fi
le", "Maximum file size 100 MB")
                    return render(request, index_template_name,
{"form": video_upload_form})

            if sequence_length <= 0:
```

```
                video_upload_form.add_error("sequence_length",
"Sequence Length must be greater than 0")
                return render(request, index_template_name,
{"form": video_upload_form})

            if allowed_video_file(video_file.name) == False:
                video_upload_form.add_error("upload_video_file",
"Only video files are allowed ")
                return render(request, index_template_name,
{"form": video_upload_form})

            saved_video_file =
'uploaded_file_'+str(int(time.time()))+"."+video_file_ext
            with open(os.path.join(settings.PROJECT_DIR,
'uploaded_videos', saved_video_file), 'wb') as vFile:
                shutil.copyfileobj(video_file, vFile)

            request.session['file_name'] =
os.path.join(settings.PROJECT_DIR, 'uploaded_videos',
saved_video_file)
            request.session['sequence_length'] = sequence_length
            return redirect('ml_app:predict')
        else:
            return render(request, index_template_name, {"form":
video_upload_form})

def predict_page(request):
    if request.method == "GET":
        if 'file_name' not in request.session:
            return redirect("ml_app:home")
        if 'file_name' in request.session:
            video_file = request.session['file_name']
        if 'sequence_length' in request.session:
            sequence_length = request.session['sequence_length']
        path_to_videos = [video_file]
        video_file_name = video_file.split('\\')[-1]
```

```
        video_file_name_only = video_file_name.split('.')[0]
        video_dataset = validation_dataset(path_to_videos,
sequence_length=sequence_length,transform= train_transforms)
        model = Model(2).cuda()
        model_name = os.path.join(settings.PROJECT_DIR,'models',
get_accurate_model(sequence_length))
        models_location =
os.path.join(settings.PROJECT_DIR,'models')
        path_to_model = os.path.join(settings.PROJECT_DIR,
model_name)
        model.load_state_dict(torch.load(path_to_model))
        model.eval()
        start_time = time.time()
        # Start: Displaying preprocessing images
        print("<=== | Started Videos Splitting | ===>")
        preprocessed_images = []
        faces_cropped_images = []
        cap = cv2.VideoCapture(video_file)

        frames = []
        while(cap.isOpened()):
            ret, frame = cap.read()
            if ret==True:
                frames.append(frame)
                if cv2.waitKey(1) & 0xFF == ord('q'):
                    break
            else:
                break
        cap.release()

        for i in range(1, sequence_length+1):
            frame = frames[i]
            image = cv2.cvtColor(frame, cv2.COLOR_BGR2RGB)
            img = pImage.fromarray(image, 'RGB')
            image_name =
video_file_name_only+"_preprocessed_"+str(i)+'.png'
```

```
            image_path = os.path.join(settings.PROJECT_DIR,
'uploaded_images', image_name)
            img.save(image_path)
            preprocessed_images.append(image_name)
        print("<=== | Videos Splitting Done | ===>")
        print("--- %s seconds ---" % (time.time() - start_time))
        # End: Displaying preprocessing images

        # Start: Displaying Faces Cropped Images
        print("<=== | Started Face Cropping Each Frame | ===>")
        padding = 40
        faces_found = 0
        for i in range(1, sequence_length+1):
            frame = frames[i]
            #fig, ax = plt.subplots(1,1, figsize=(5, 5))
            face_locations =
face_recognition.face_locations(frame)
            if len(face_locations) == 0:
                continue
            top, right, bottom, left = face_locations[0]
            frame_face = frame[top-padding:bottom+padding, left-
padding:right+padding]
            image = cv2.cvtColor(frame_face, cv2.COLOR_BGR2RGB)

            img = pImage.fromarray(image, 'RGB')
            image_name =
video_file_name_only+"_cropped_faces_"+str(i)+'.png'
            image_path = os.path.join(settings.PROJECT_DIR,
'uploaded_images',
video_file_name_only+"_cropped_faces_"+str(i)+'.png')
            img.save(image_path)
            faces_found = faces_found + 1
            faces_cropped_images.append(image_name)
        print("<=== | Face Cropping Each Frame Done | ===>")
        print("--- %s seconds ---" % (time.time() - start_time))
```

```
        # No face is detected
        if faces_found == 0:
            return render(request, predict_template_name,
{"no_faces": True})

        # End: Displaying Faces Cropped Images
        try:
            heatmap_images = []
            for i in range(0, len(path_to_videos)):
                output = ""
                print("<=== | Started Predicition | ===>")
                prediction = predict(model, video_dataset[i],
'./', video_file_name_only)
                confidence = round(prediction[1], 1)
                print("<=== |  Predicition Done | ===>")
                # print("<=== | Heat map creation started |
===>")
                # for j in range(0, sequence_length):
                #     heatmap_images.append(plot_heat_map(j,
model, video_dataset[i], './', video_file_name_only))
                if prediction[0] == 1:
                    output = "REAL"
                else:
                    output = "FAKE"
                print("Prediction : " ,
prediction[0],"==",output ,"Confidence : " , confidence)
                print("--- %s seconds ---" % (time.time() -
start_time))

            return render(request, predict_template_name,
{'preprocessed_images': preprocessed_images, 'heatmap_images':
heatmap_images, "faces_cropped_images": faces_cropped_images,
"original_video": video_file_name, "models_location":
models_location, "output": output, "confidence": confidence})
        except:
            return render(request, 'cuda_full.html')
```

```
def about(request):
    return render(request, about_template_name)

def handler404(request,exception):
    return render(request, '404.html', status=404)
def cuda_full(request):
    return render(request, 'cuda_full.html')
```