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(Affiliated to JNTU-K, Kakinada),**VISAKHAPATNAM**
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DEEPFAKE VIDEO DETECTION
USING
NEURAL NETWORKS

Batch No:04

By

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ABSTRACT

In recent months, free deep learning-based software tools has facilitated the creation of credible face exchanges in videos that leave few traces of manipulation, in what they are known as "DeepFake"(DF) videos. Manipulations of digital videos have been demonstrated for several decades through the good use of visual effects, recent advances in deep learning have led to a drastic increase in the realism of fake content and the accessibility in which it can be created. These so-called AI synthesized media (popularly referred to as DF).Creating the DF using the Artificially intelligent tools are simple task. But, when it comes to detection of these DF, it is major challenge. Because training the algorithm to spot the DF is not simple. We have taken a step forward in detecting the DF using ResNext Convolutional Neural Network(CNN) and Long short term memory(LSTM)

Problem Statement

To Design and Develop a Deep Learning algorithm to classify the video as deepfake or pristine.

❑ Introduction

- Deep fake is a technique for human image synthesis based on artificial intelligence.
- Deep fakes are created by combing and superimposing existing images and videos onto source images or videos using a deep learning technique known as Generative Adversarial Network(GAN).

❑**Can we detect Deep fakes with naked eyes?**

Real or Fake?

Real
Fake

Fake
Fake

Fake
Real

[Rössler et al. 2019]

Source

إسرائيل تفرج عن الناشط صدقي المقت بعد 27   الحالات الإنسانية 14:01   غربية
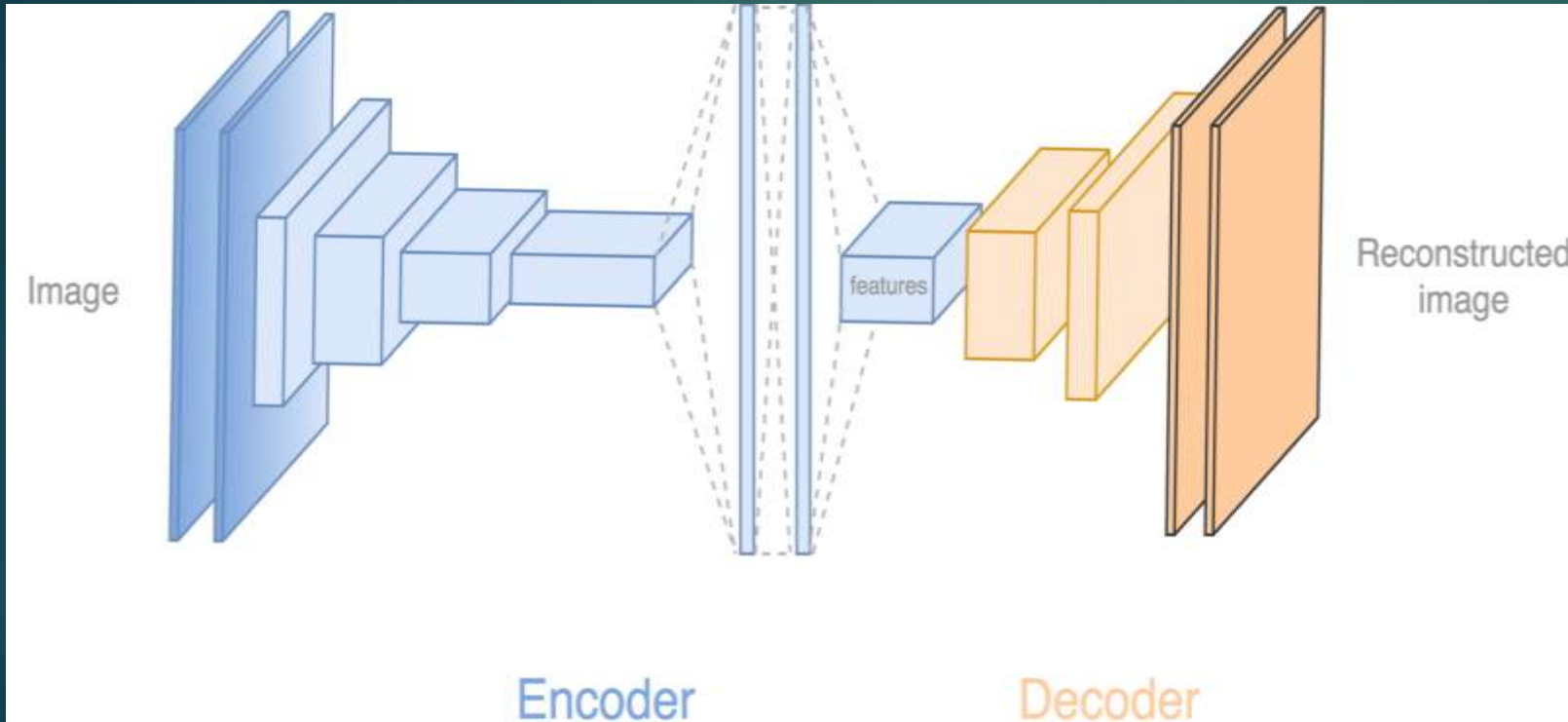
عربية

Why Deep Fake Detection ?

- Fake News
- Malicious hoaxes
- Financial fraud
- Celebrity unusual video
- Revenge porn
- Politician videos

❏ **How Deep Fakes Are Created ?**

Tools for deep fake creation.
- Faceswap
- Faceit
- DeepFaceLab
- DeepfakeCapsuleGAN
- Large resolution facemasked

❑ Existing System & It's drawbacks

EXISTING SYSTEM	DRAWBACKS OF EXISTING SYSTEM
Capsule Networks (CapsNets)[1]	Capsule Networks may require more data for training and may be computationally intensive.
Generative Adversarial Networks (GANs) for Counter-Deepfakes[2]	The arms race between deepfake generators and detectors can lead to continuous improvements on both sides.
Face X-Ray for Deepfake Detection[3]	It may not be as robust to variations in deepfake generation techniques.
Other DeepFake detection Models	Some early approaches analyzed individual frames independently, overlooking temporal inconsistencies that LSTM later addressed effectively.
	Few detectors can not accept long length videos.

❑ **Proposed Work**

A frame-by-frame analysis of deepfake videos reveals the inconsistencies between consecutive frames in deepfake videos, which are absent in pristine videos.
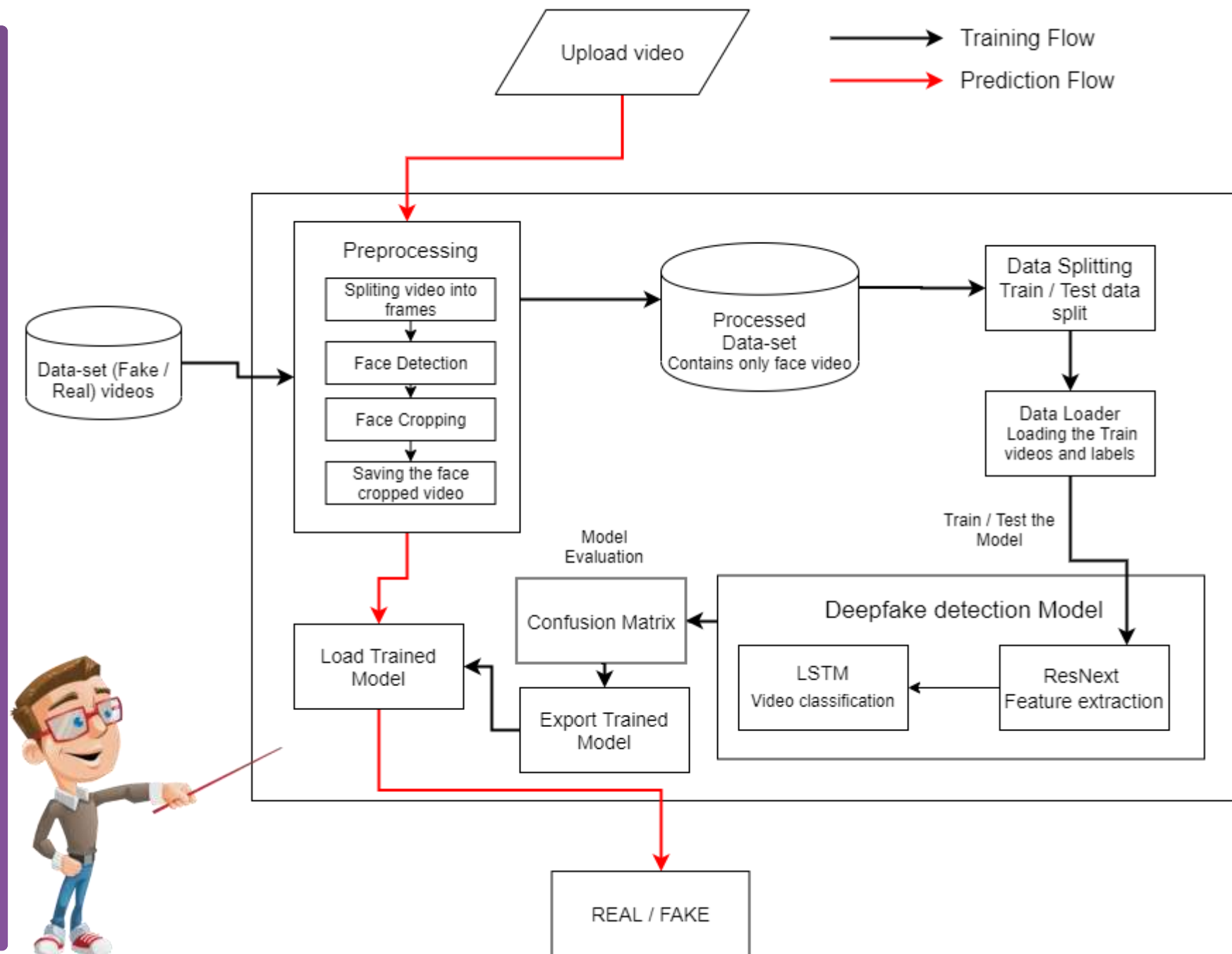
These inconsistencies include:

1. A sudden change in brightness and contrast on a small region of the face.

2. The size of some facial parts such as eyes, lips, and eyebrows changes between frames. Also finding artifacts.
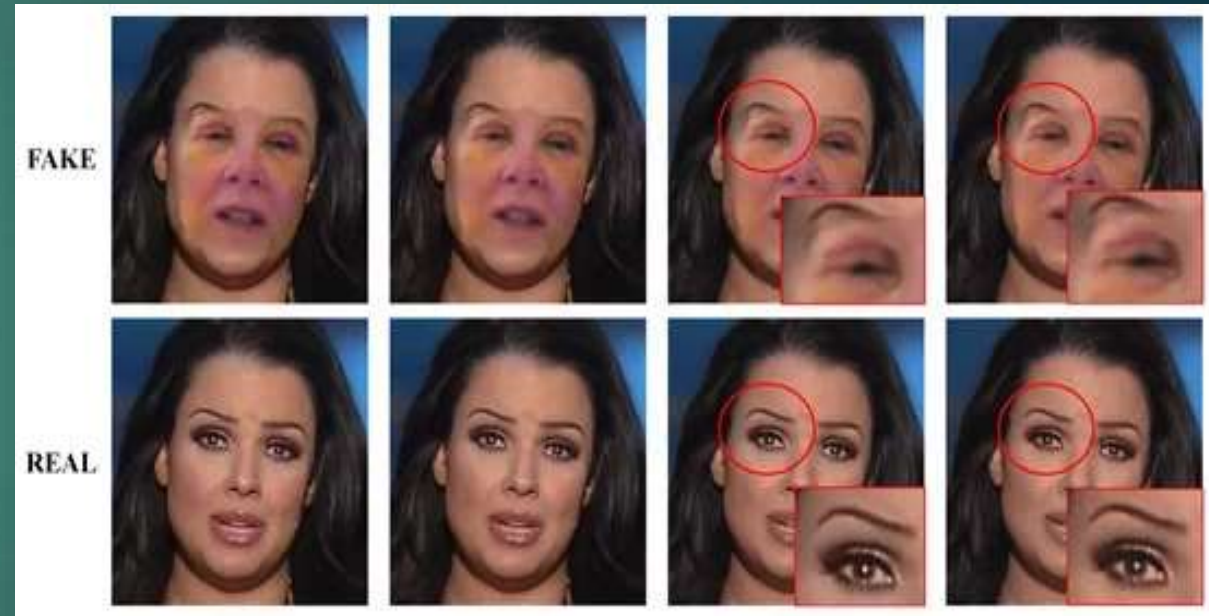
we developed a new deepfake detection method, ResNext CNN for Feature Extraction and LSTM for Sequence Processing , that can account for these inconsistencies for the identification of real and fake videos.

Block Diagram

Upload video

Training Flow
Prediction Flow

Data-set (Fake / Real) videos

Preprocessing
- Spliting video into frames
- Face Detection
- Face Cropping
- Saving the face cropped video

Processed Data-set
Contains only face video

Data Splitting
Train / Test data split

Data Loader
Loading the Train videos and labels

Train / Test the Model

Model Evaluation

Confusion Matrix

Load Trained Model

Export Trained Model

Deepfake detection Model

LSTM
Video classification

ResNext
Feature extraction

REAL / FAKE

Software & Hardware Requirements

Programming Languages
- Python3
- JavaScript

Programming Frameworks
- PyTorch
- Django

IDE
- Google colab
- Jupyter Notebook
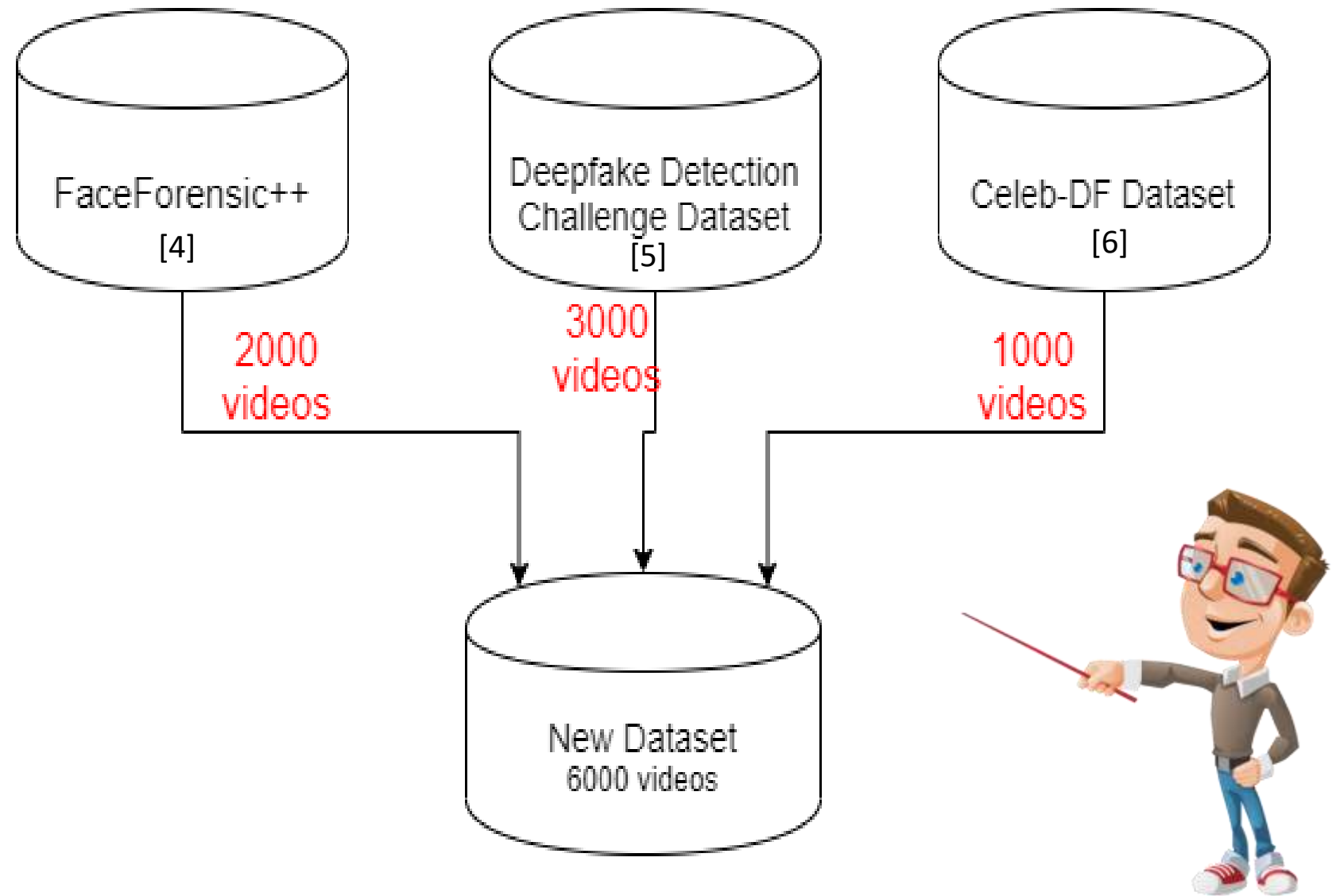- Visual Studio Code

Cloud Services
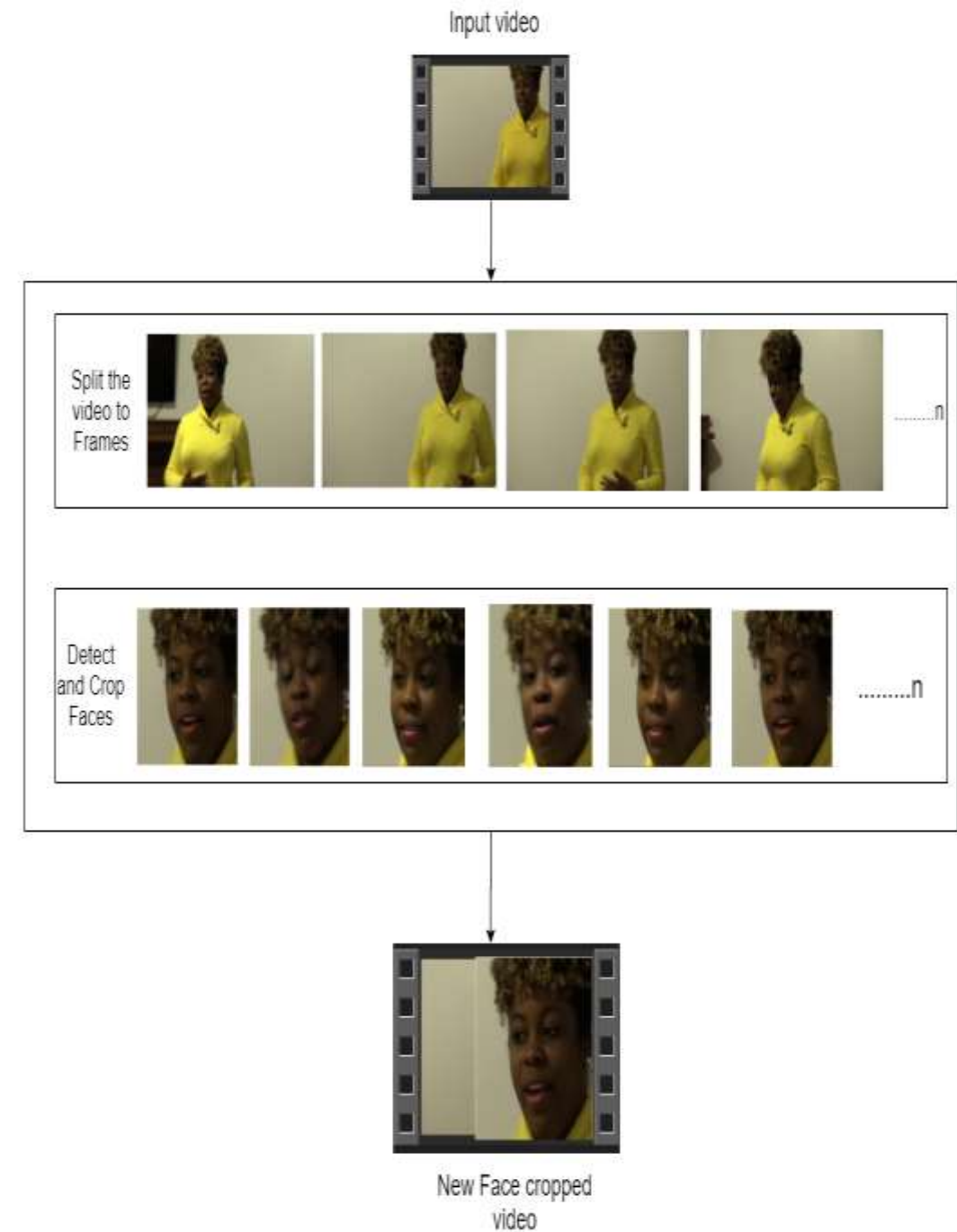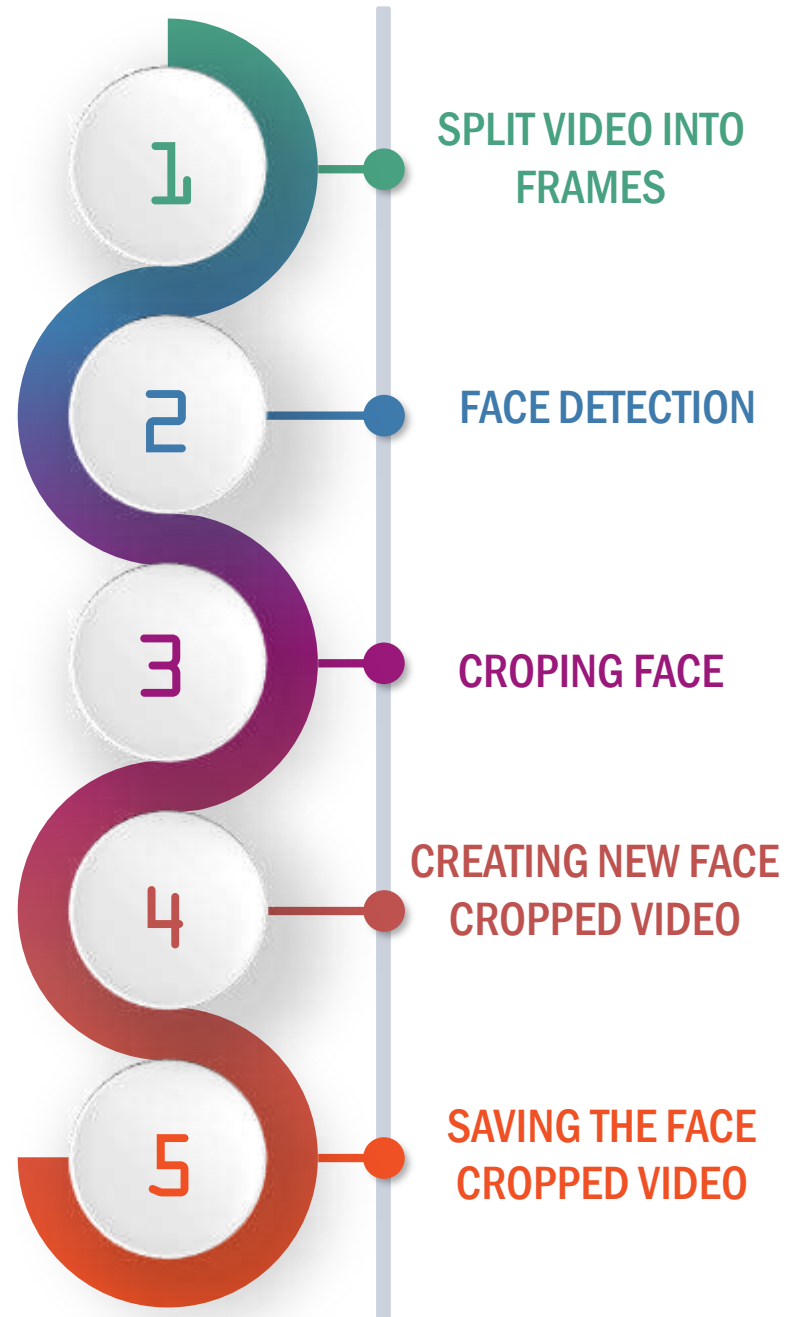- Google Cloud Platform

Version Control
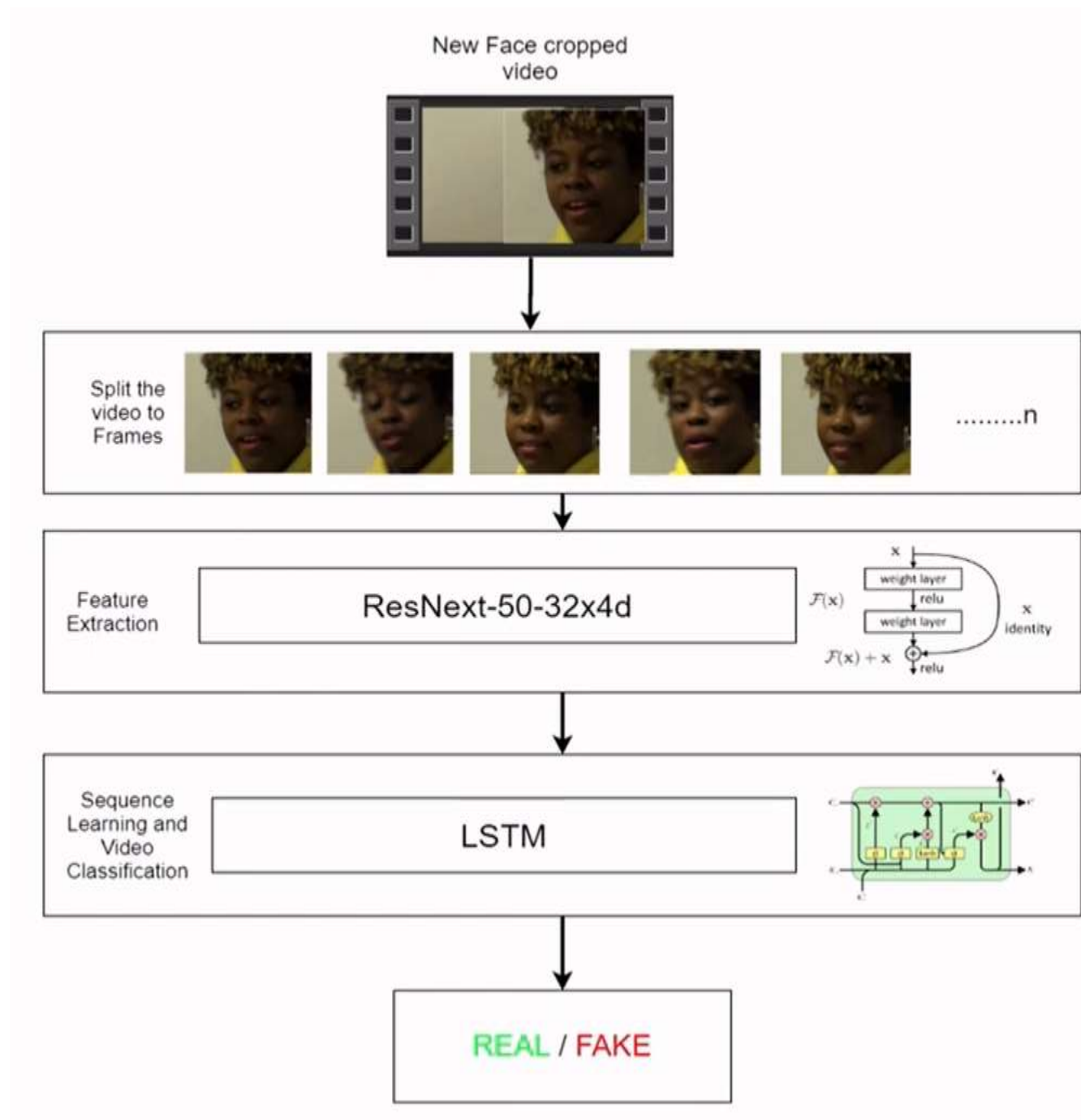- Git

Implementation

Data Set Exploration

Implementation

Pre-processing

1. SPLIT VIDEO INTO FRAMES
2. FACE DETECTION
3. CROPING FACE
4. CREATING NEW FACE CROPPED VIDEO
5. SAVING THE FACE CROPPED VIDEO

Input video

Split the video to Frames

Detect and Crop Faces

New Face cropped video

Implementation

Model Architecture

Results Discussion

Model Name	Dataset	No of Videos	Sequence Length	Accuracy
model_84_acc_10_frames_final_data			10	84. 662519
model_87_acc_20_frames_final_data			20	87.79160186
model_89_acc_40_frames_final_data	Our Dataset	6000	40	89.3468118195956
model_91_acc_60_frames_final_data			60	91.5909797822706
model_93_acc_100_frames_final_data			100	92.4981855883877

Conclusion

- We presented a neural network-based approach to classify the video as deep fake or real, along with the confidence of proposed model.

- Our method is capable of predicting the output by processing 1 second of video (10 frames per second)with a good accuracy.

- We implemented the model by using pre-trained ResNext CNN model to extract the frame level features and LSTM for temporal sequence processing to spot the changes between the t and t-1 frame.

- Our model can process the video in the frame sequence of 10,20,40,60,80,100.

References

[1] "Capsule-Forensics Networks for Deepfake Detection" ,Huy H. Nguyen, Junichi Yamagishi & Isao Echizen, https://link.springer.com/chapter/10.1007/978-3-030-87664-7_13

[2] A GAN-Based Model of Deepfake Detection in Social Media, Preeti a*, Manoj Kumar b*, HiteshKumarSharmaa,b, A GAN-Based Model of Deepfake Detection in Social Media – ScienceDirect

[3] Face X-ray for More General Face Forgery Detection Lingzhi Li1*† Jianmin Bao Ting Zhang2 Hao Yang2 Dong Chen2 Fang Wen2 Baining Guo2 1Peking University 2Microsoft ResearchAsia,https://openaccess.thecvf.com/content_CVPR_2020/papers/Li_Face_X-Ray_for_More_General_Face_Forgery_Detection_CVPR_2020_paper.pdf

[4] FaceForensics++: Learning to Detect Manipulated Facial Images
https://github.com/ondyari/FaceForensics

[5] Deep Fake Detection Challenge DataSet. https://www.kaggle.com/c/deepfake-detection-challenge/data

[6] Celeb-DF: A Large-scale Challenging Dataset for DeepFake Forensics,
https://github.com/yuezunli/celeb-deepfakeforensics

LIVE DEMO