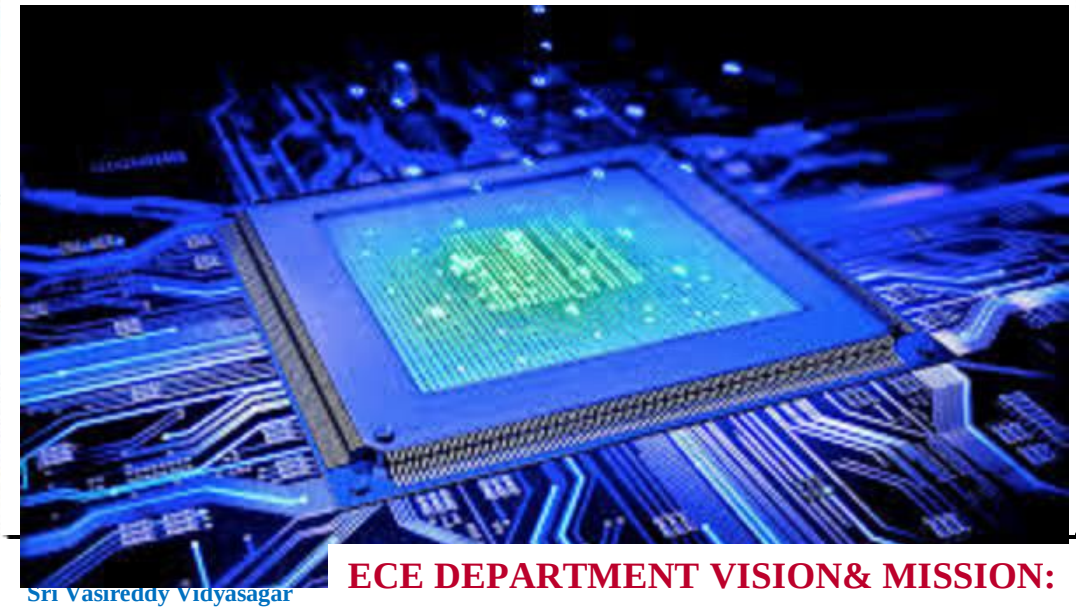
VVITRONICS

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

ELECTRONICS & COMMUNICATION ENGINEERING

JANUARY-JULY 2021



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ECE DEPARTMENT VISION& MISSION:

VISION:

To produce globally competitive engineering graduates through high quality education, to instil high standards of ethics and professionalism, and to bring out quality research in the frontier

Areas of Electronics & Communication Engineering.

MISSION:

To impart high quality technical education to all students:

- **To become active life-long learners with the necessary skills, competencies, and ethical values.**
- **To develop human resources with skills of creativity and research.**
- **To inculcate value-based, socially committed professionalism to the cause of overall development of students and society.**

NEWS&EVENTS

- Dr. M.Y. Bhanu Murthy, Professor, HoD ECE has been selected as Evaluator for 'Toycathon' by MHRD Innovation Cell, Govt. of India.
- A promotional video showcasing activities and achievements of VVIT has been published in YouTube https://youtu.be/OwEAWr6enaM.
- VVIT heartily welcomes I B.Tech students and parents for Orientation Programme on 08th Jan.
- Two teams from ECE have submitted their projects for 'TechBharat Hackathon' under the category EduTech.
- The students of VVIT, conducted a National Integrity Walk.

FacultyAchievements

1. Dr. K. Giri Babu (Professor & Dean of Studies, ECE) "MR Brain Image Segmentation to detect White Matter, Gray Matter, and Cerebro Spinal Fluid using TLBO algorithm" in International Journal of Image and Graphics(Scopus Indexed), ISSN 1793-6756, January 2021.
2. Dr. K. Giri Babu (Professor & Dean of Studies, ECE) "Rotational invariant fractional derivative filters for lung tissue classification" in Journal of Computer and Communications (SCI & Scopus Indexed), Vol.15, Issue 6, ISSN 1751-9667, March 2021.
3. Dr. K. Giri Babu (Professor & Dean of Studies, ECE) "Attention Based Multi-Patched 3D-CNNs with Hybrid Fusion Architecture for Reducing False Positives during Lung Nodule Detection" in Journal of Computer and Communications (Web of Science), Vol.9, Issue 4, ISSN 2327-5219, April 2021.
4. Dr. K.Vasu Babu (Associate Professor, ECE) published a Journal paper "Design of UWB MIMO Antenna to reduce the mutual coupling using defected grounded structure" in Wireless Personal Communications, Springer, Issue 4, ISSN 0929-6212, April 2021.
5. Mr G V S Satya Kumar (Associate Professor, ECE) published a Journal paper "Enhanced content based Image Retrival using Informationoriented angle based local tridirectional weber patterns" in International Journal of Images and Graphics (Web of Science, Scopus), Vol.21, Issue 4, ISSN 0219-4678/1793-6756, March 2021.
6. Mr M Pardha Saradhi (Associate Professor, ECE) published a Journal paper "Multiscale CNN with compound fusions for false positive reduction in lung nodule detection" in Artificial Intelligence in Medicine, ELSIEVER (SCI, Scopus), Vol.113, DOI: 10.1016/j.artmed.2021.102017, March 2021.

Student Achievements

1. A.V.Pavan Kalyan, Ch.Bhargavi, N.Clement Rufus, P.Sri Lekha, T.G.Jyothi of ECE got Highest percentage in Semester exams.
2. K. Alekhya, Y. Siva Charan, K. Sai Sandeep of II ECE secured Highest SGPA in end exams.
3. Anantha Mounika, Mannam Rama Krishna, Tallam Jyothi Sai Abhijith of III ECE secured Highest SGPA in end exams.
4. Goparaju Srikar of IV ECE is working on a project titled 'Smart Traffic Controlling System' being developed by National Informatics Centre (NIC), Govt.

- 3 students of ECE selected for Internships by 'iVIS, Mangalagiri.'
- 6 VVITians for nominated for University Innovation Fellows (UIF) programme for the year 2021-22.
- Mr.B.V.Sathish Kumar, Assistant Prof, ECE, published a patent in the field of Biomedical Engineering.
- A Seminar on Engineering Students Psychology by Dr.Nagesh, Renowned Psychologist & Inspirational Speaker.
- Dr. K.Giri Babu, Professor of ECE & Dean of Studies conferred with State Best Teacher Award by ISTE.
- Dr.K.Vasu Babu, Associate Professor of ECE appointed as 'Proctor Coordinators' for Online FDP jointly organized by IIT Guwahati & NIT Patna from Feb 15-26, 2021.

Student Contribution

1. NSS student Co-ordinators of VVIT conducted COVID testing camp from 25th to 26th February 2021 for students and staff.
2. IIC student Co-ordinators of VVIT organizes 1-Day design thinking workshop for second Year students.

Faculty Articles

DEEPFAKE DETECTION

The rise of AI in the recent decade has given way for deep fakes. In particular, deep fake, manipulated images/voice snippets/video, can now be produced with high precision using deep generative models. These fakes can be extremely damaging to individuals and society by artificially engineering people into compromising situations. It is critical that we find methods to defend against the proliferation of deep fakes by identifying them with high accuracy. We investigate several approaches towards detecting deepfake videos. Misinformation is rampant in today's world, and one method of spreading misinformation gaining in popularity is deepfakes, or facial manipulation in images and videos. We experiment with the usage of combining a CNN to generate an embedding from facial features with an RNN for temporal structure between frames within a video. This work addresses a deepfake video and audio recognition task using a variety of Deep Learning techniques. In this study we investigated several architectures featuring CNNs, LSTMs, Xception networks and compared their performance. AI-synthesized face-swapping videos, commonly known as DeepFakes, is an emerging problem threatening the trustworthiness of online information. The need to develop and evaluate DeepFake detection algorithms calls for large-scale datasets. However, current DeepFake datasets suffer from low visual quality and do not resemble DeepFake videos circulated on the Internet. We present a new large-scale challenging DeepFake video dataset, CelebDF, which contains 5, 639 high-quality DeepFake videos of celebrities generated using improved synthesis process. We conduct a comprehensive evaluation of DeepFake detection methods and datasets to demonstrate the escalated level of challenges posed by Celeb-DF.

Deepfake detection is becoming a much more popular topic among today's computer vision world. Deepfakes refer to when a performance by an actor is superimposed onto a photo or video of a target person to make it appear like the targetis performing the actions that the actor is doing. The creation of deepfakes has been enabled by recent AI/ML advances, and modern deepfakes are virtually imperceptible from real people to human eyes.

- Dept. of ECE secured a grant of Rs 1,00,000/- under AICTESPICES for the dept. 'IETE Student Forum'
- 100 girl students of VVIT selected to ICT Academy DXC Women Empowerment Program.
- An Awareness Program on "Disha" by R.N.Ammi Reddy , SP Guntur Urban on 17-4-2021.
- 3 students of ECE placed in EFFECTRONICS.
- Mr.S.Krishna Prasad and Mr.Sk.Riyazuddien, Associate Professors of ECE publishied a patent with title of invention "Speech Enhancement Methodology using Sign Regressor based Acoustic Noise Canceler."
- 20 students of VVIT selected to CTS through Salesforce placement drive.
- 113 students of II ECE pursuing Minor Degree in Computer Science and Engineering.
- EWB student chapter of VVIT received "Outstanding presentation award" in IUCEE annual Student Forum (IASF 2021).

This technology is devastating to people targeted by them, as politicians can be made to give speeches they never would have, archive footage can be doctored, or celebrities can be superimposed onto pornographicfootage. It is therefore important that there exist robust algorithms to distinguish real photos or footage from deepfakes. Detecting deepfakes is interesting, as they are rapidly becoming more prevalent in today's world, have serious potential for harm, and is an extremely difficult task for humans to perform unaided.

Fig 1: Example of Real and Deep Fake image

PREVIOUS METHODS

These are few detection methods used earlier to predict a given video whether it is a fake or real video. In all these detection methods we used techniques like geometry of face and the dynamics of the mouth shape according to the speaking word

1. Deepfake Detection Using Biological Signals: based on the facial expressions and using a method called the Photoplethysmography (PPG) cells.
2. Deepfake Detection Using Phoneme-Viseme Mismatches: based on the fact that the dynamics of the mouth shape, are sometimes different or inconsistent with the spoken phoneme
3. Forensic Technique Using Facial Movements: This model tracks facial expression and movements of a single video provided as input. This detection uses support vector model (SVM)
4. Recurrent Convolutional Strategy: The Recurrent Convolutional Strategy uses recurrent convolutional models (RCM) for detecting face manipulation in videos.

Detection based on Learned Features

For detection , we have used five network architectures known from the literature to solve the classification task.

1. Cozzolino cast the hand-crafted Steganalysis features from the previous section to a CNN-based network.
2. We use our dataset to train the convolutional neural network proposed by Bayar and Stamm that uses a constrained convolutional layer followed by two convolutional, two max-pooling and three fully-connected layers. The constrained convolutional layer is specifically designed to suppress the high-level content of the image. Similar to the previous methods, we use a centered 128 × 128 crop as input.

3. Rahmouni adopt different CNN architectures with a global pooling layer that computes four statistics (mean, variance, maximum and minimum).
4. MesoInception is a CNN-based network inspired by InceptionNet to detect face tampering in videos.
5. XceptionNet is a traditional CNN trained on ImageNet based on separable convolutions with residual connections.

Implementation:

DATA SET:

The data is gathered from different datasets available like face Forensic++, deepfakes detection challenge dataset from Kaggle, celebrity deepfakes videos. This data is pre-processed as face cropped videos by detecting a face in an image.

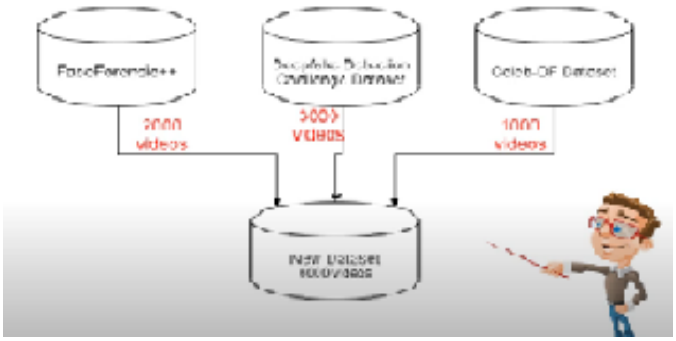

Fig 2: Data set collection

PRE-PROCESSING THE DATA

There are 6 CNNs out of them 3 CNNs are used for facial binary classification and 3 CNNs for calibration, this is formulated as multiclass classification of discretized displacement pattern. In these CNNs, without specific explanation, we follow AlexNet to apply the ReLU nonlinearity function after the pooling layer and fully connected layer.

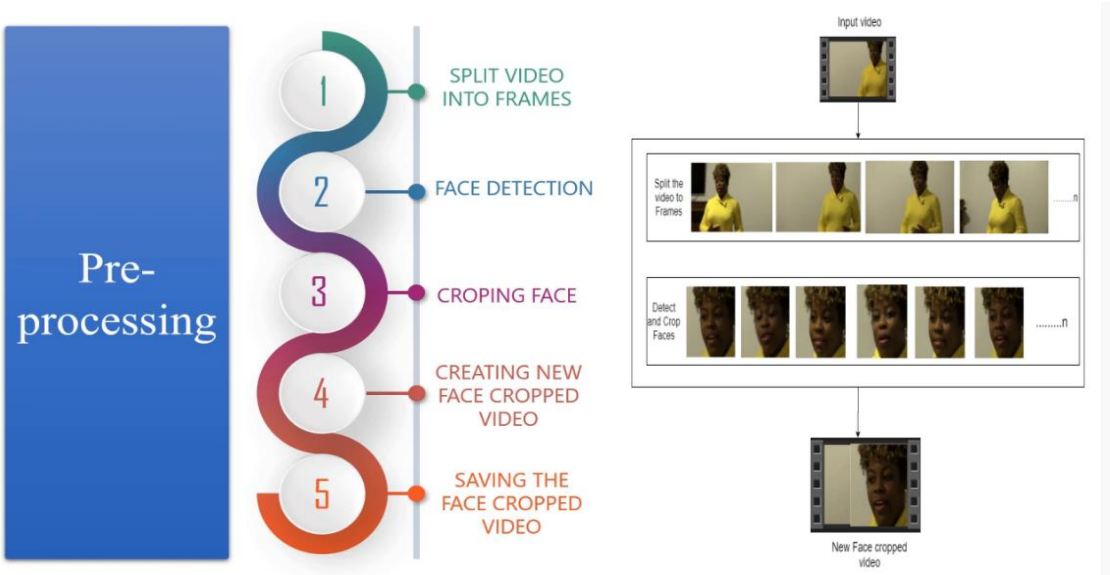

Fig 3: PRE-PROCESSING THE DATA

Using this network, we can detect the person's face and crop the frame accordingly. This will process the data to have only face-cropped videos. Using various tools to extract face from an image like OpenCV, PILLOW library.

• CNN FOR FEATURE EXTRACTION In reference with IEEE Signal Processing Society Camera Model Identification Challenge, using the ImageNet pre-trained model we output a deep representation of every frame by the InceptionV3 with fully connected layer. The final feature vectors after the final pooling layer is been used as the input for sequential LSTM.

• LSTM FOR SEQUENCE PROCESSING. Let us take an image frames' sequence of CNN feature vector as input and a 2-node neural network having the probabilities of the sequences which is a part of a given deepfake video. we'd like to handle a significant challenge that is the design of a model in a consequential manner which can recursively process a sequence. To resolve this issue, By the usage of a 2048 wide LSTM unit, which is the expected result. Especially, in the period of training, a sequence of ImageNet feature vectors is given to out LSTM model which is succeed by a 512 fully connected layer. Lastly, we compute the probabilities of each frame using a softmax layer which gives the result of sequence being either pristine or deepfake.

Using processed data, we can train the model for deepfake detection in the detection model, we use ImageNet and LSTM networks for Feature extraction and video classification respectively. The trained model which is XceptionNet can be loaded using tools such as Torch and Network models to predict the given video as Real/Fake. We use XceptionNet as our trained model to predict the deepfakes.

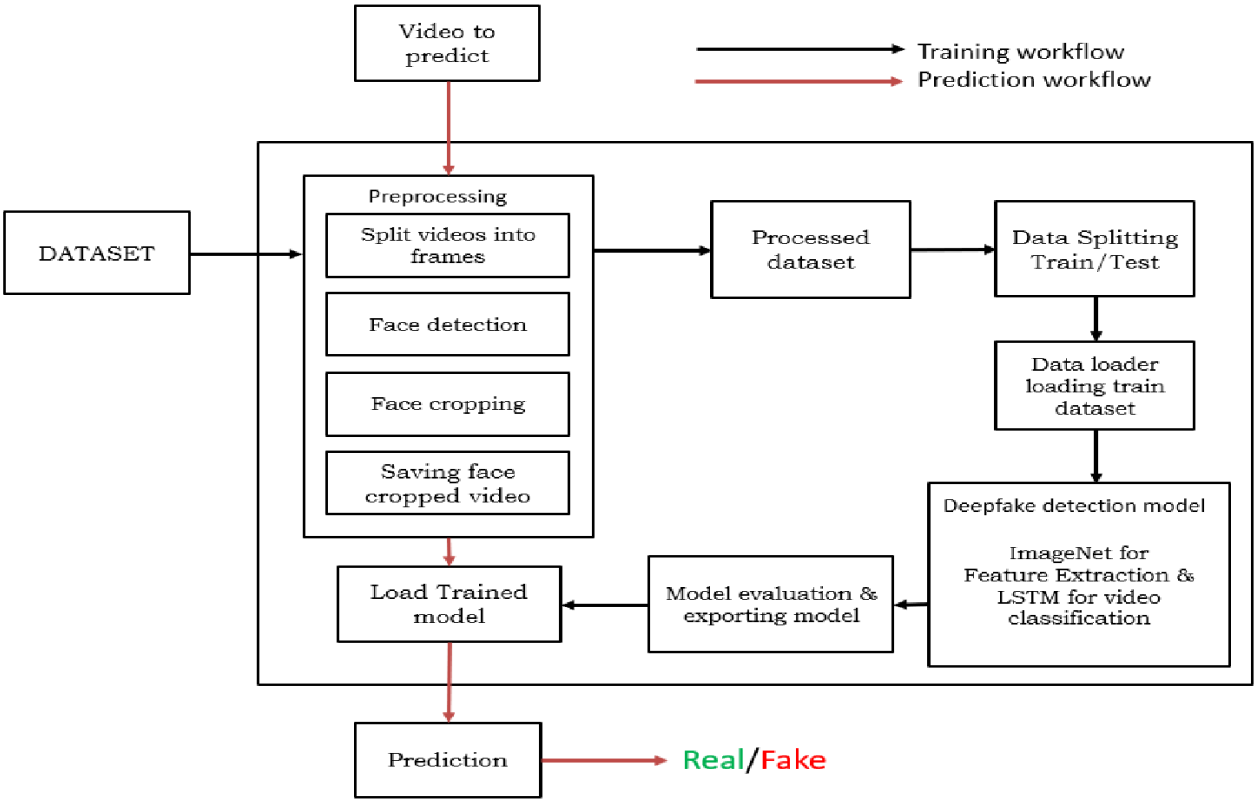

Fig 4: Prediction work flow

Before training the model, we need to preprocess the data accordingly, preprocessing the data has four steps splitting the video into frames, face detection, face cropping and finally saving face cropped video.

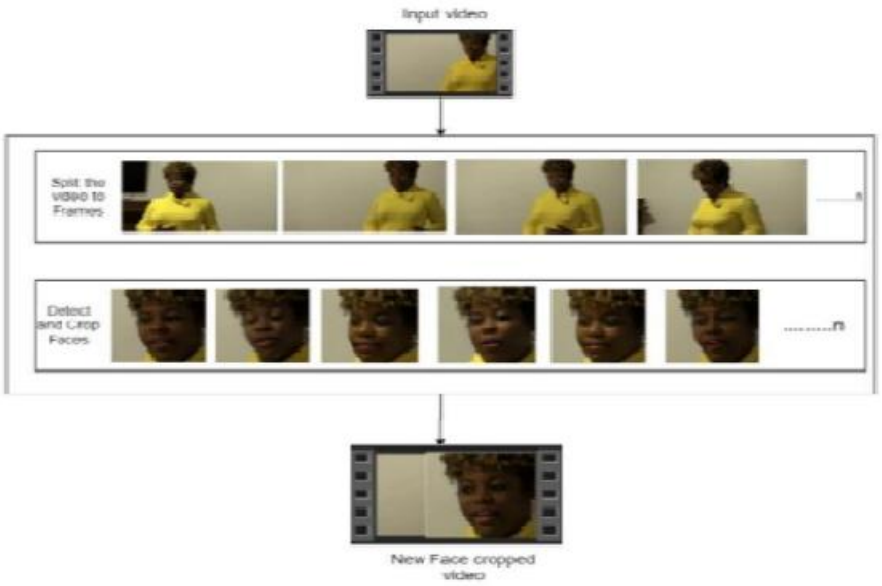

Fig 5: Video Splitting

RESULTS:

Our work attempts to give the advanced tool for the defence of spotting fake media created using advance deep learning algorithms. We show how our system can achieve competitive results in this task while using simple architecture. These are few deepfakes videos taken from YouTube given along with their link, we have taken these videos, processed them, and tested them to predict the deepfake along with probability. Our model predicts the output for every frame and combines them to get resultant videos as follows.

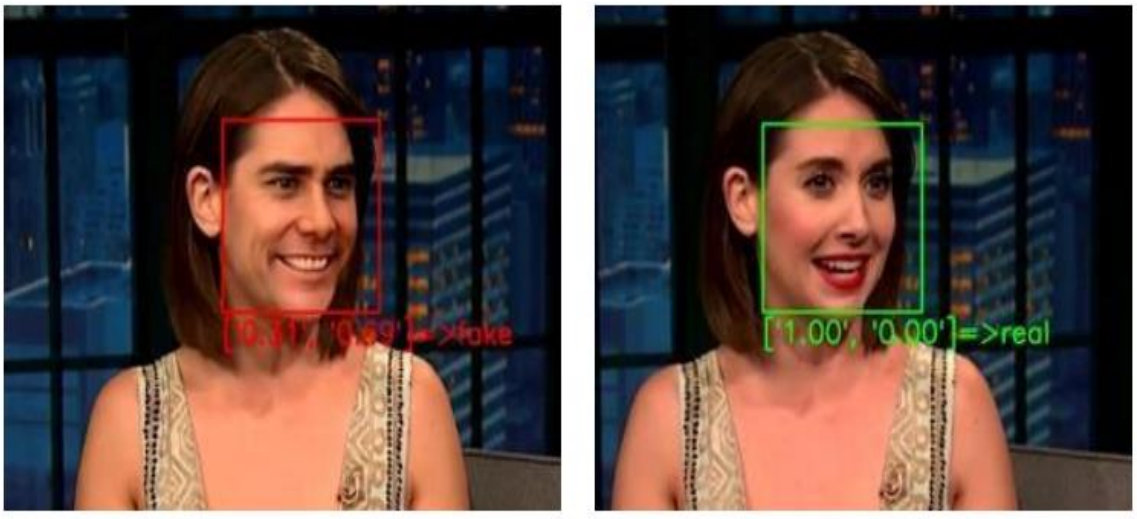

Fig 6: Detection of Fake Image

These are the results generated by taking video inputs from internet. Here the original is on the right-side featuring Elon musk, whereas on left side is the deepfake video of the original video, these videos are given to our network model and has predicted the real/fake videos having probabilities of Pr = 0.00 and Pf = 1.00 fake video and probabilities of Pr = 0.92 and Pf = 0.08 real video. Where the terms are: $Pr = probability\ of\ real\ Pf = probability\ of\ fak$e.

Fig 7: Detection of Original Image

These are the random video taken form internet which are original videos and these are real videos. In the example we can clearly see that the results predicted by our network model is real which is accurate.

Conclusion

While the present advanced facial image manipulation methods such as Deep Fakes, Face2Face, Face Swap, etc; exhibit visually impressive results, we show that these fake videos can be detected by the properly trained forgery detectors. By a few different learning-based approaches, we can solve the issue of detection in low-quality video. In this paper we focus on the influence of compression on the detectability of state of-the-art manipulation methods, proposing a standardized benchmark for follow-up work. All image data, trained models, as well as our benchmark, are publicly available and are already used by other researchers. In particular, transfer learning is of high interest in the forensic community. By the increase in various new manipulation techniques, there is a need to develop certain methods which can detect deepfakes with little to no training data. We hope that the dataset and benchmark become a stepping stone for future research in the field of digital media forensics, and in particular with a focus on facial forgeries.

There are several ways to improve on the proposed model, some of which have already been mentioned. Training the feature extraction network along with some polishing of hyper parameters would most likely increase the accuracy of the model drastically.