
DeepVision: Deepfakes Detection Using Human Eye Blinking Pattern

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Introduction

- Detect fake videos generated by GANs
 - Detect unnatural visual artifacts in skin tone or face contour
 - Instead track eye blinking pattern: an unconscious behaviour
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Heuristics To Track Eye Blinking Pattern

- Blinking frequency fluctuates depending on person's activity
e.g., reading out loud/ silently reading
 - Time of the day
e.g., highest number of eye blinks at nighttime
→ number and range of eye blinks can be predicted
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Eye Blink Database

- Gender: Male/Female
 - Activity: Static/Dynamic
 - Time: AM/PM
 - Age: <20, 20-30, 30-40, 40-50, 65+
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Object Detection + Eye Tracker

- Fast HyperFace Algorithm → face/non-face, face landmark points, head pose, gender
- EAR (Eye Aspect Ratio) Algorithm =>
$$EAR = \frac{||p2 - p6|| + ||p3 - p5||}{2||p1 - p4||}$$

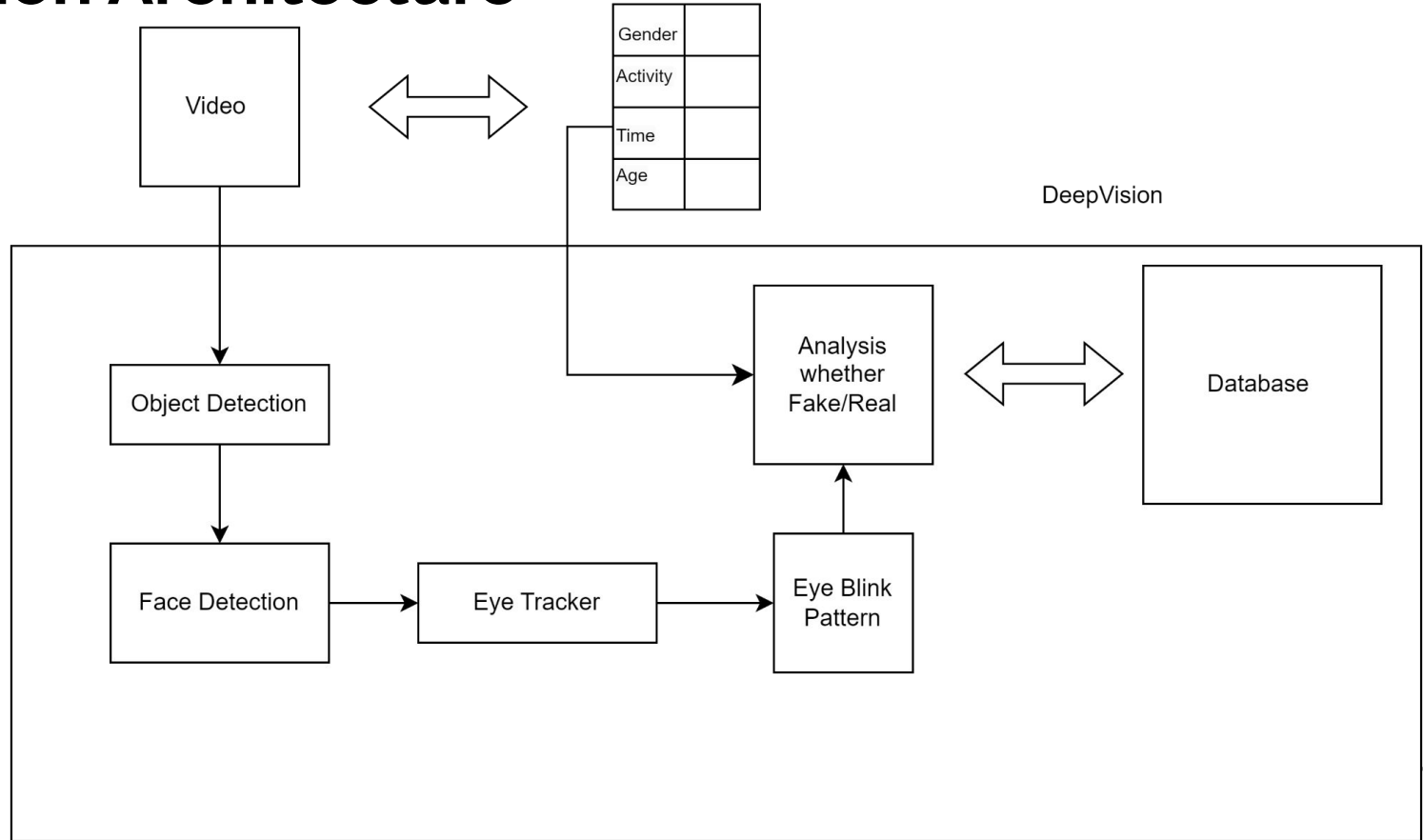


Tracking Eye Blinking

$$EAR_i = \frac{EAR_{left-eye} + EAR_{right-eye}}{2}$$

- If $EAR_i < \text{threshold}$ → eye blinking detected
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DeepVision Architecture

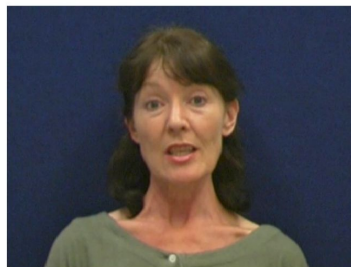


Results

Dataset



(a) Original Donor



(b) Original Target



(c) Face Swapped

- DeepfakeTIMIT:

database of videos where faces swapped using the open source GAN-based approach

(<https://github.com/shaoanlu/faceswap-GAN>)

Source:

<https://www.idiap.ch/en/scientific-research/data/deepfaketimit>

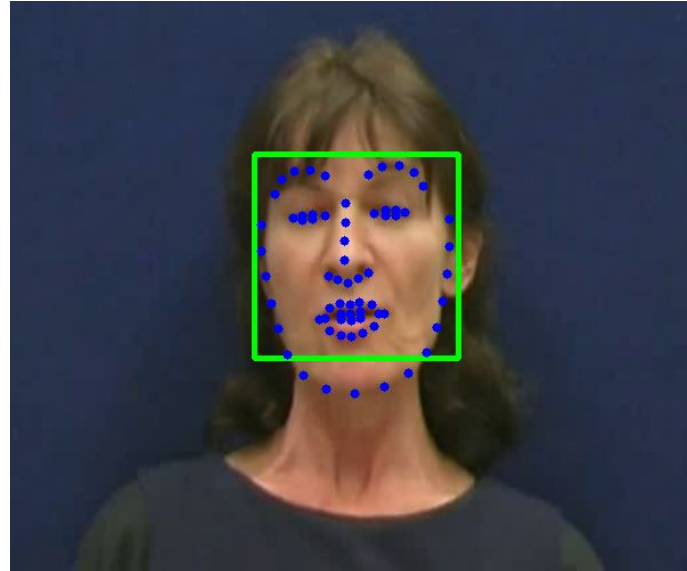
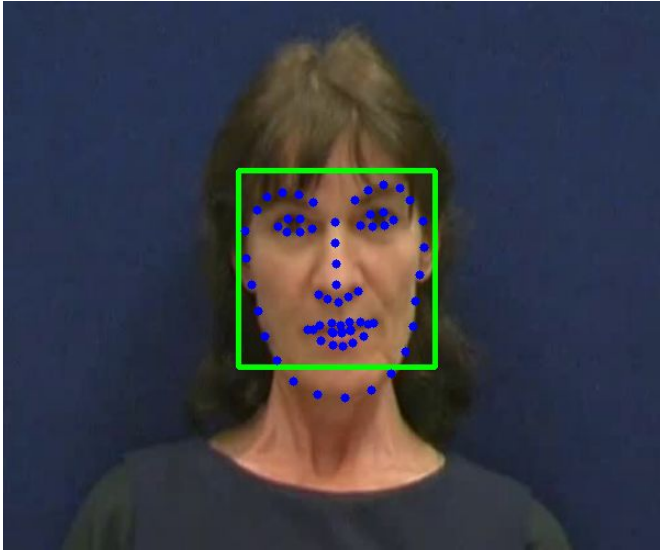
DeepFake Video



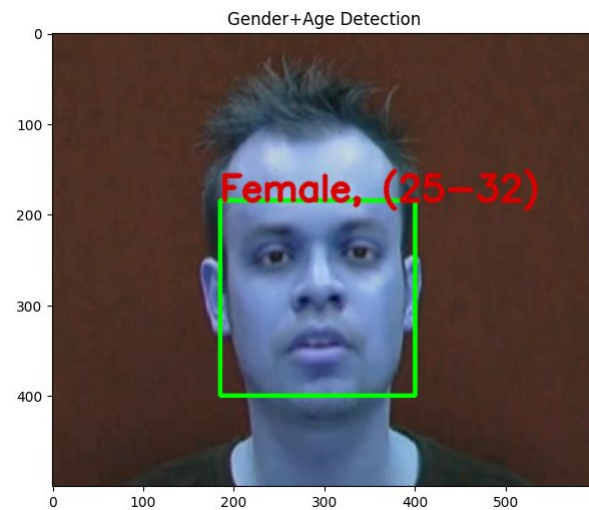
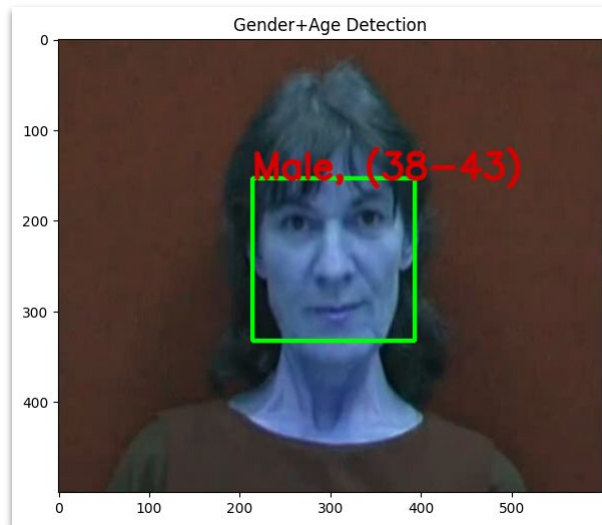
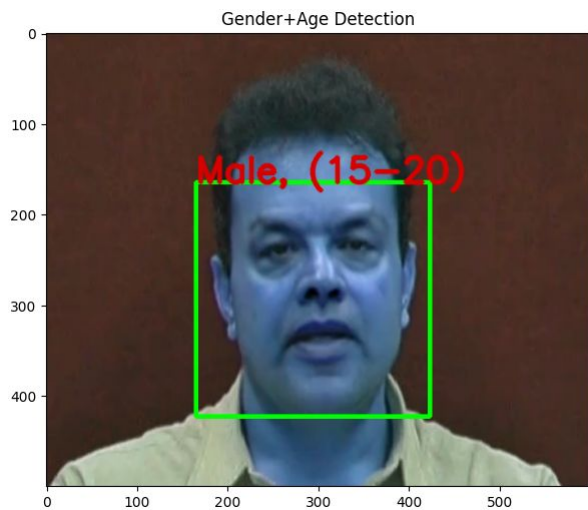
Face Detection

- dlib python package
 - Pre-trained Face Landmarks Predictor:
https://github.com/JeffTrain/selfie/raw/master/shape_predictor_68_face_landmarks.dat
 - Pre-trained Gender and Age Predictor:
[https://drive.google.com/drive/folders/1Lb0bRQj-Tdrn5LFy9UjNMfd8r4Tp6UIb?usp=drive link](https://drive.google.com/drive/folders/1Lb0bRQj-Tdrn5LFy9UjNMfd8r4Tp6UIb?usp=drive_link)
 - dnn package of python cv
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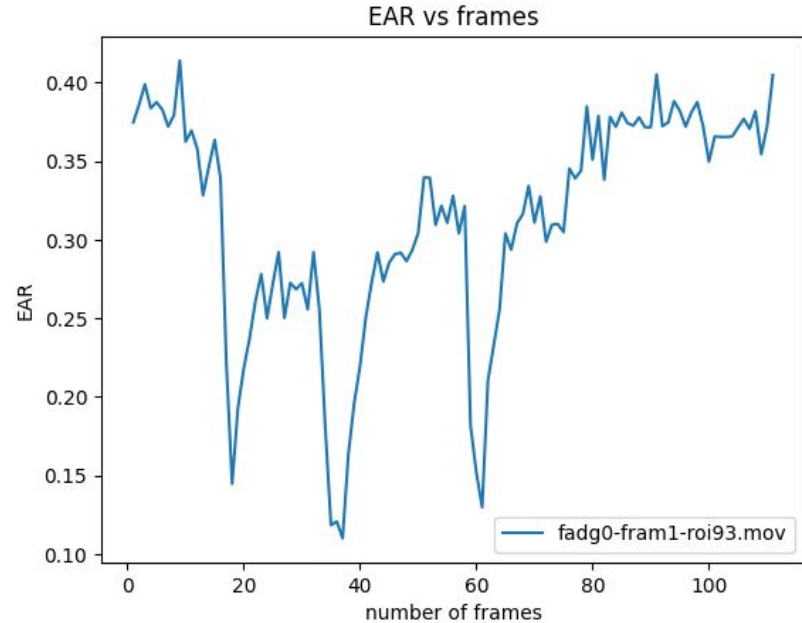
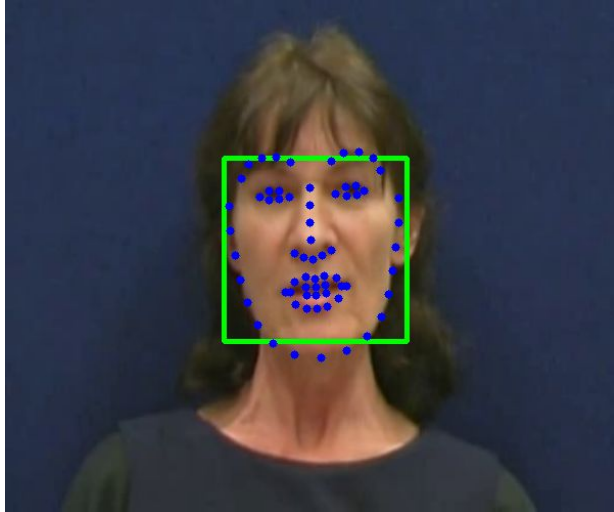
Face Detection Results

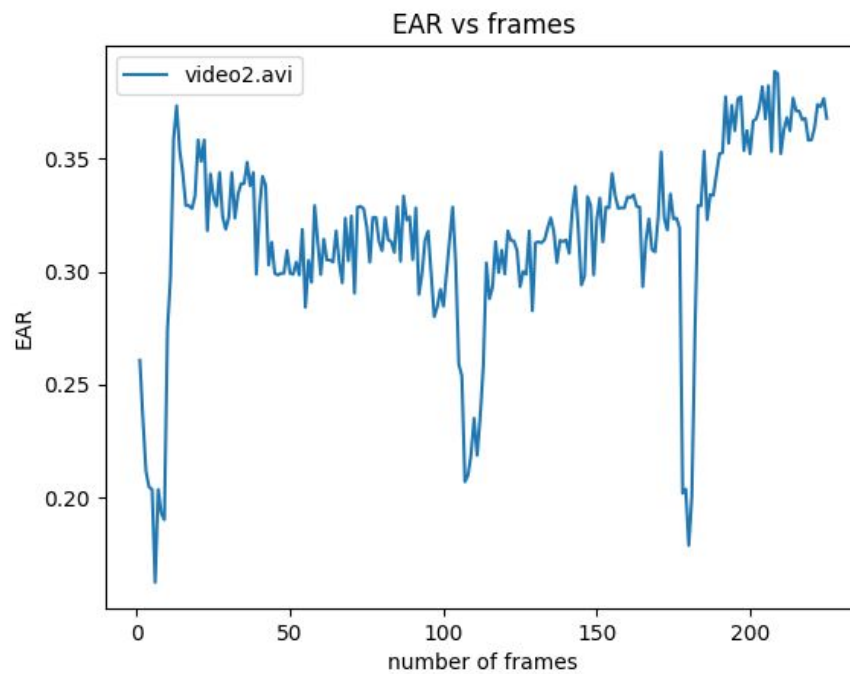
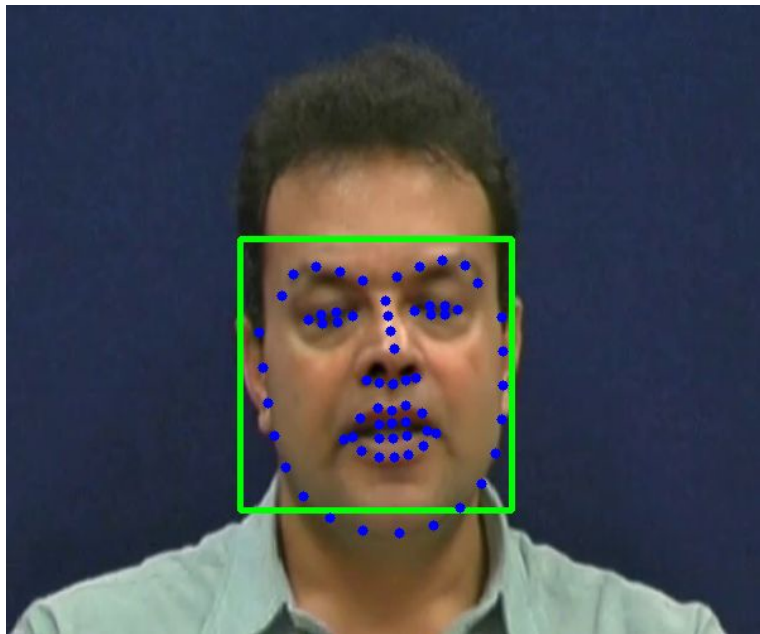


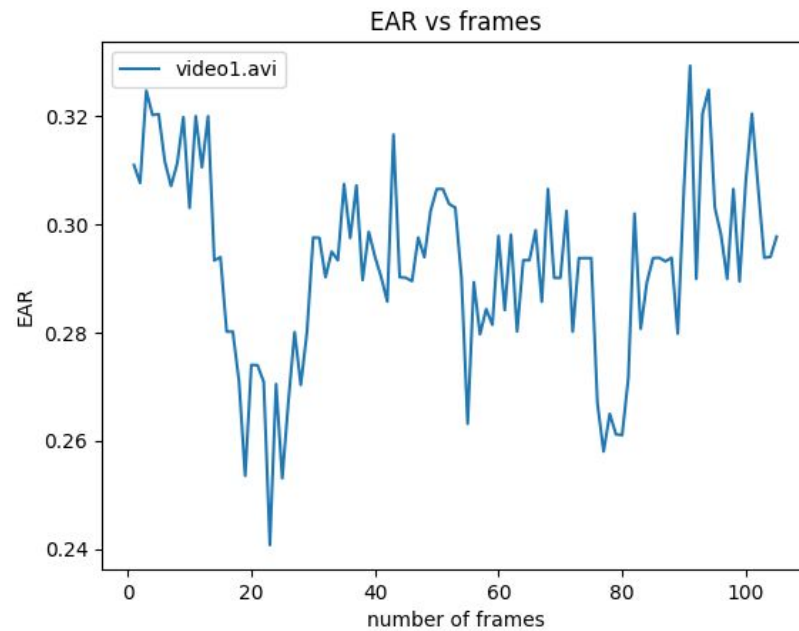
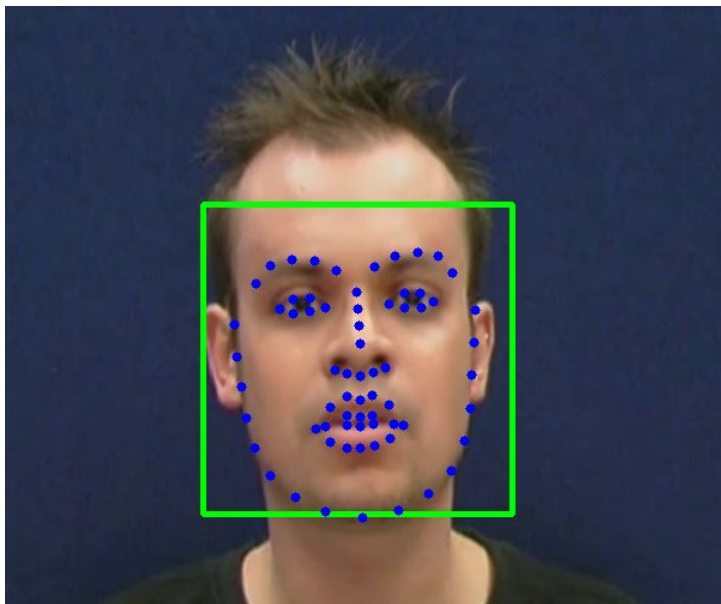
Gender + Age Detection



EAR- Eye Aspect Ratio Evaluation







Eye Blink Results

- Average blinks per minute= 17-22 blinks/minute
- Average blink period= 100-400 ms

	<code>fadg0-fram1-roi93.mov</code>	<code>video2.avi</code>	<code>video1.avi</code>
blinks per minute	40.540541	20.0	0.0
blink_period (in ms)	880.0	6840.0	0.0
age	(38-43)	(15-20)	(25-32)
gender	Male	Male	Female

References

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 - <https://dontrepeatyoursself.org/post/how-to-detect-face-landmarks-with-dlib-python-and-opencv/>
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