Lie Detection via Micro Expression

2025.05.23

ISOO

Contents

1. Background

1. Background

- What is micro-expression?

  : A micro-expression is a facial expression that only lasts for a short moment.

Human emotions are an unconscious biopsychosocial reaction that derives from the amygdala and they typically last 0.5–4.0 seconds, although a micro-expression will typically last less than 1 second.[1]

*amygdala: 편도체

[1] https://en.wikipedia.org/wiki/Microexpression

1. Background

- What is micro-expression?

  : A micro-expression is a facial expression that only lasts for a short moment.

[1] https://en.wikipedia.org/wiki/Microexpression

1. Background

- What is AU(Action Unit)?

  : 얼굴 근육을 기반으로 얼굴 표정을 분석하기 위해 사용되는 얼굴 근육 동작 단위

AU 9	AU 10	AU 11	AU 12	AU 13	AU 14
Nose Wrinkler	Upper Lip Raiser	Nasolabial Deepener	Lip Corner Puller	Cheek Puffer	Dimpler
AU 15	AU 16	AU 17	AU 18	AU 20	AU 22
Lip Corner Depressor	Lower Lip Depressor	Chin Raiser	Lip Puckerer	Lip Stretcher	Lip Funneler
AU 23	AU 24	*AU 25	*AU 26	*AU 27	AU 28
Lip Tightener	Lip Pressor	Lips Part	Jaw Drop	Mouth Stretch	Lip Suck

AU 1	AU 2	AU 4	AU 5	AU 6	AU 7
Inner Brow Raiser	Outer Brow Raiser	Brow Lowerer	Upper Lid Raiser	Cheek Raiser	Lid Tightener
*AU 41	*AU 42	*AU 43	AU 44	AU 45	AU 46
Lid Droop	Slit	Eyes Closed	Squint	Blink	Wink
AU 1+2	**AU 1+4**	**AU 4+5**	**AU 1+2+4**	**AU 1+6**	**AU 6+7**

[Action Unit 정의 예시]

[1] https://en.wikipedia.org/wiki/Microexpression

2. Motivation & Goal

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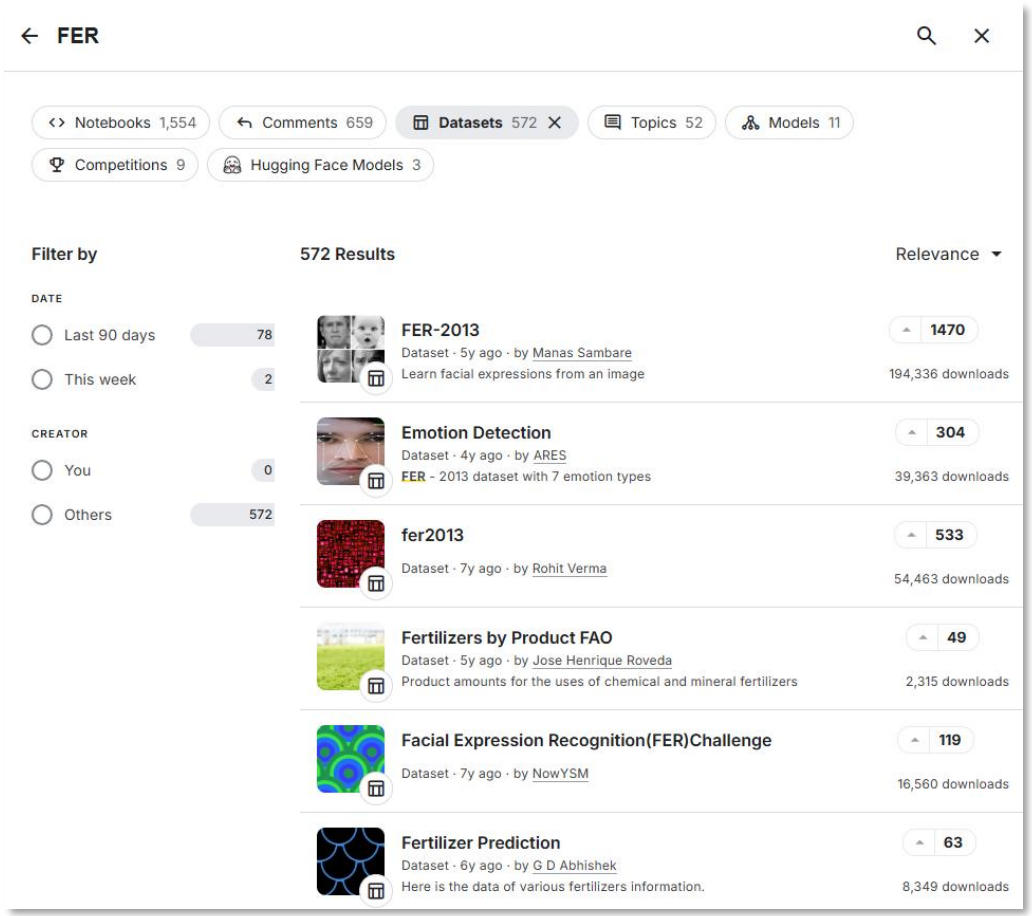
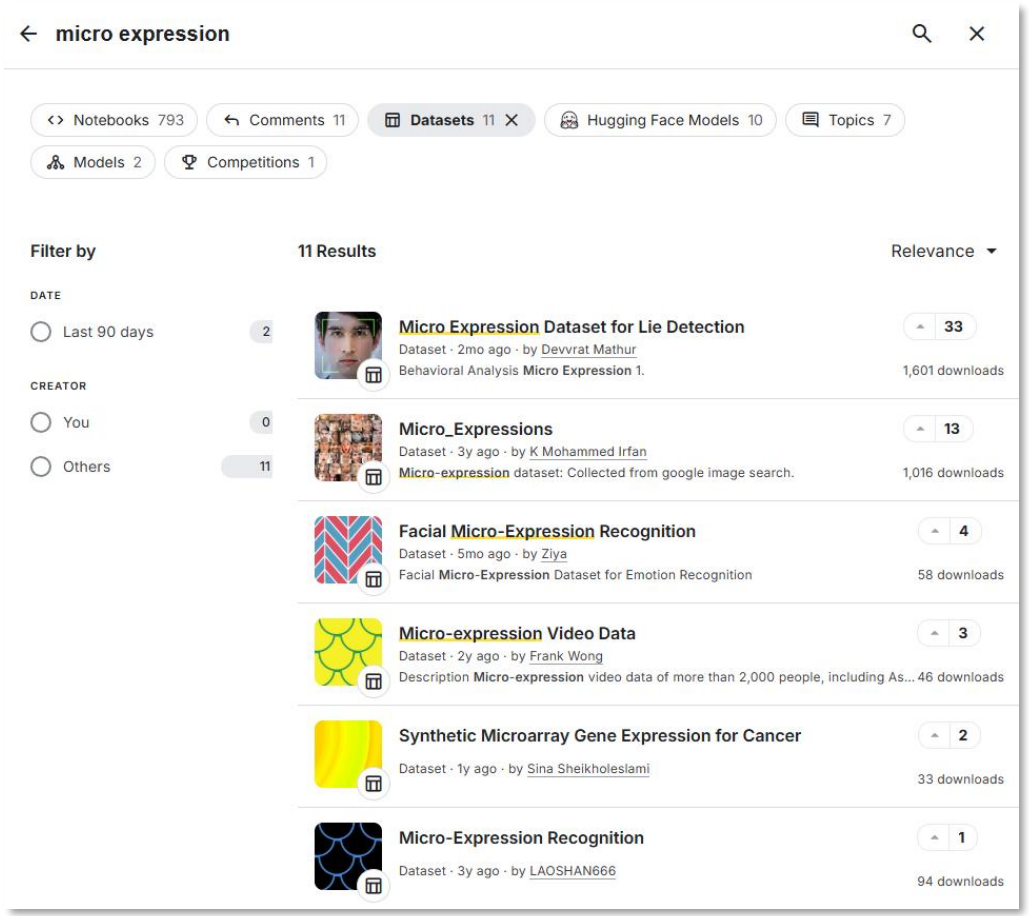


FER datasets in kaggle



Micro-expression datasets in kaggle

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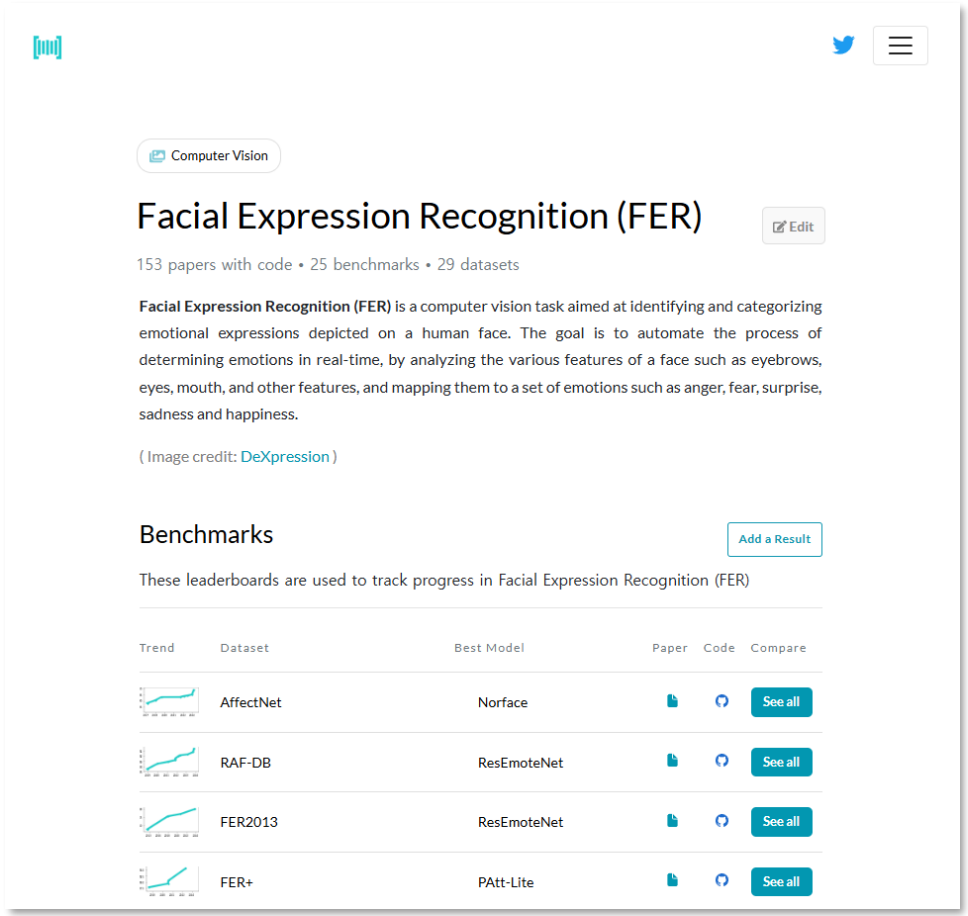
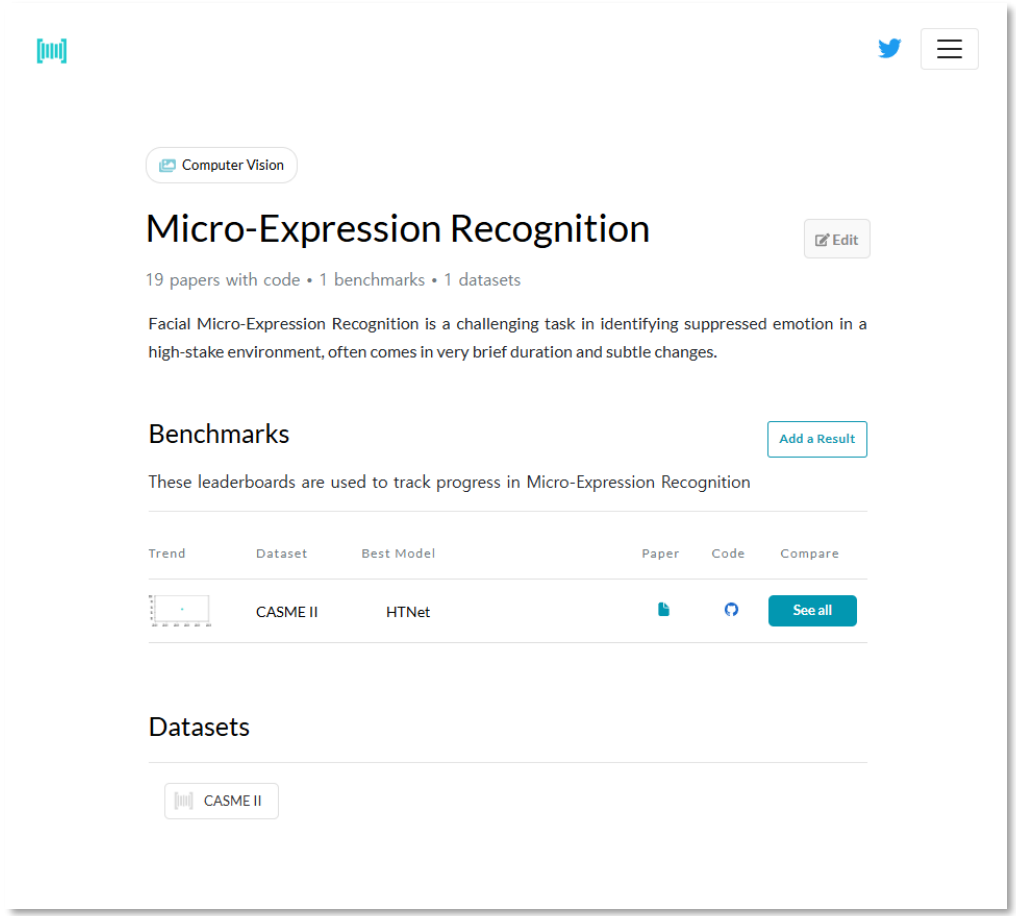


FER researches in paperswithcode

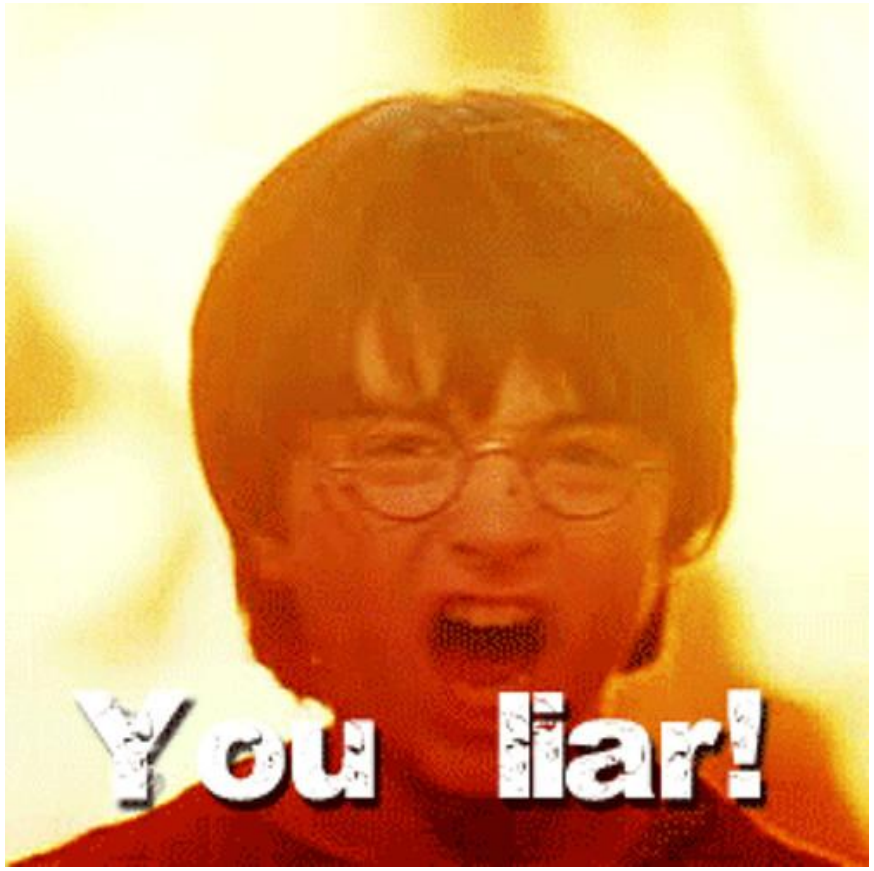


Micro-Expression researches in paperswithcode

2. Motivation & Goal

Goal

- Detect a liar by using micro expression



3. Ongoing Efforts & Plans

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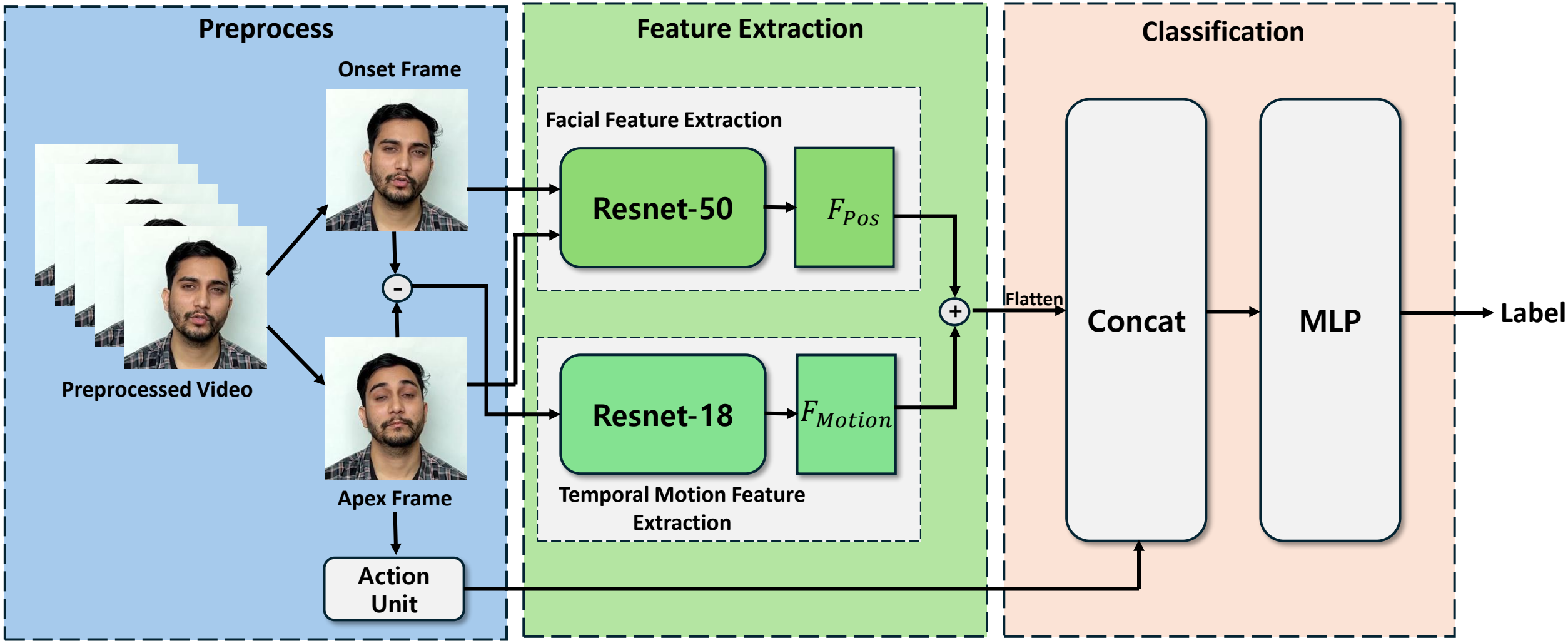
Ongoing Efforts

- Step: Preprocessing → Feature Extraction → Binary Classification → Evaluation
- Preprocessing: Choose dataset and make source code for preprocessing.
- Feature Extraction : Construct Resnet structure for FPF and TMFE.
- Binary Classification: Make source code for binary classification with logistic regression & Find other classification methods.
- Evaluation: Null


Preprocess
Onset Frame
Preprocessed Video
Apex Frame
Action Unit
Feature Extraction
Facial Feature Extraction
Resnet-50
F_{Pos}
Resnet-18
F_{Motion}
Temporal Motion Feature Extraction
Classification
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Concat
MLP
Label

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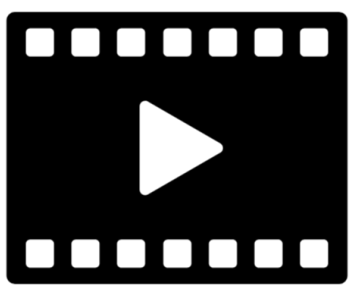
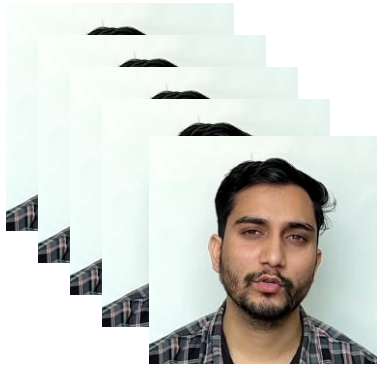
Ongoing Efforts

- Step: Preprocessing → Feature Extraction → Binary Classification → Evaluation

- Preprocessing: Choose dataset and make source code for preprocessing.

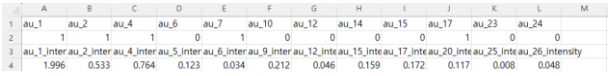




Preprocessed video

Apex Frame

Onset Frame



au_1	au_2	au_4	au_6	au_7	au_10	au_12	au_14	au_15	au_17	au_23	au_24
1	1	1	0	1	0	0	0	0	1	0	0

au_1_Inter	au_2_Inter	au_4_Inter	au_5_Inter	au_6_Inter	au_9_Inter	au_12_Inte	au_15_Inte	au_17_Inte	au_20_Inte	au_25_Inte	au_26_Intensity
1.996	0.533	0.764	0.123	0.034	0.212	0.046	0.159	0.172	0.117	0.008	0.048

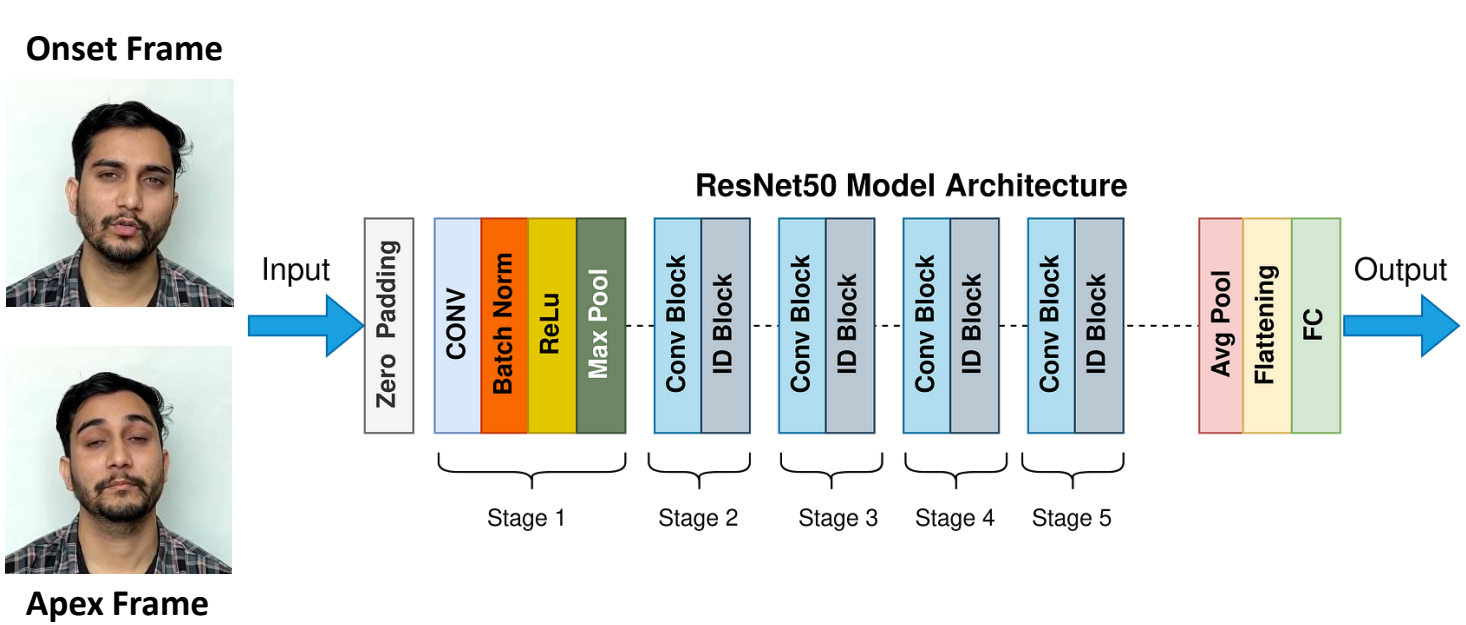
Action Unit

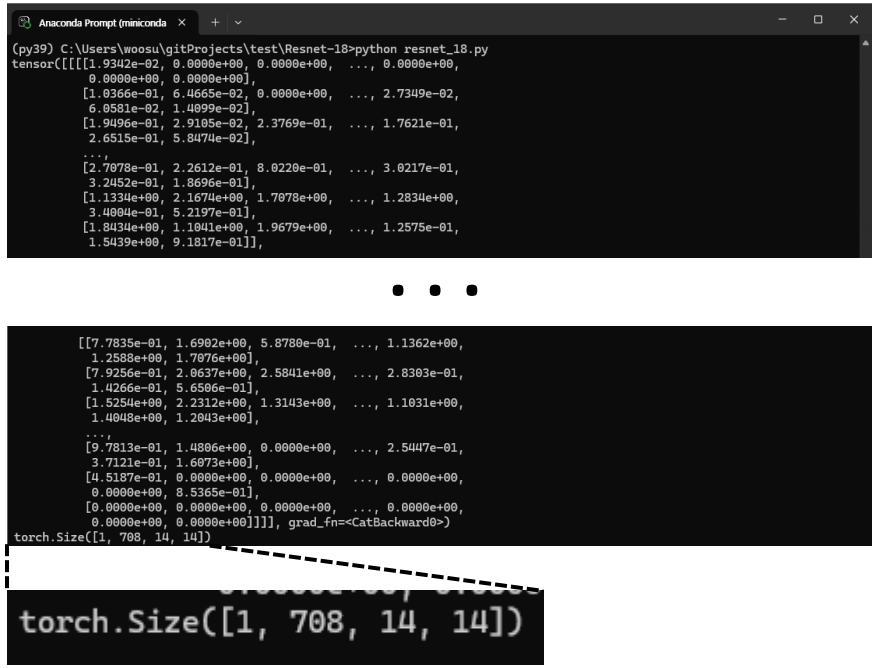
3. Ongoing Efforts & Plans

Ongoing Efforts

- Step: Preprocessing → Feature Extraction → Binary Classification → Evaluation

- Feature Extraction : Construct Resnet structure for FPF and TMFE.

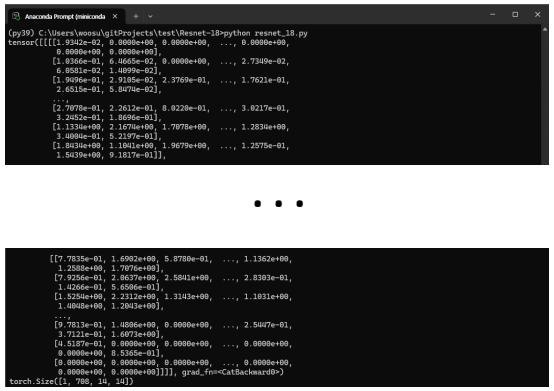


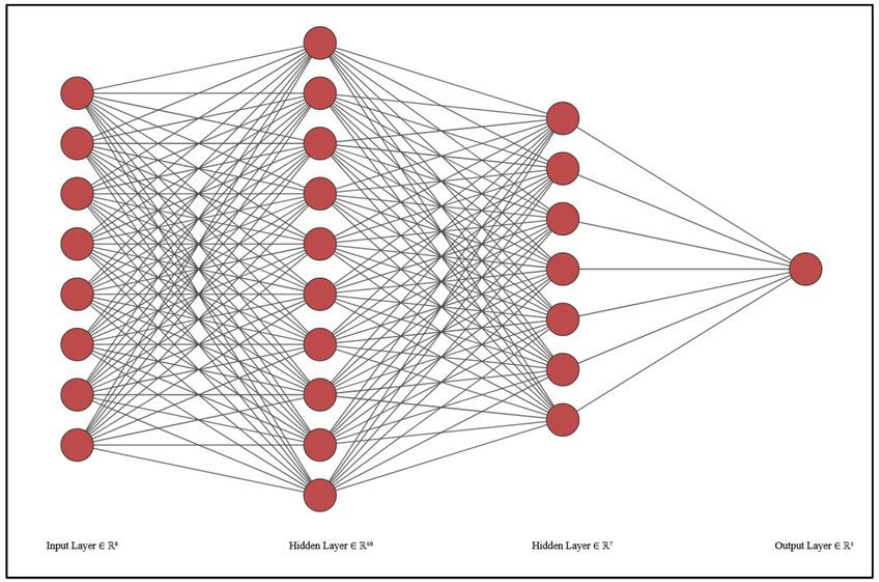


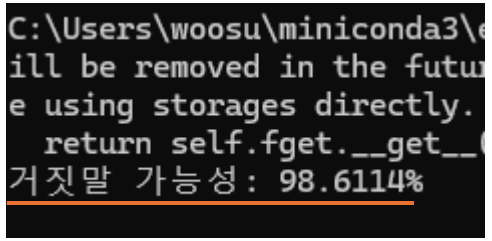
3. Ongoing Efforts & Plans

Ongoing Efforts

- Step: Preprocessing → Feature Extraction → Binary Classification → Evaluation
- Binary Classification: Make source code for binary classification with logistic regression & Find other classification methods.



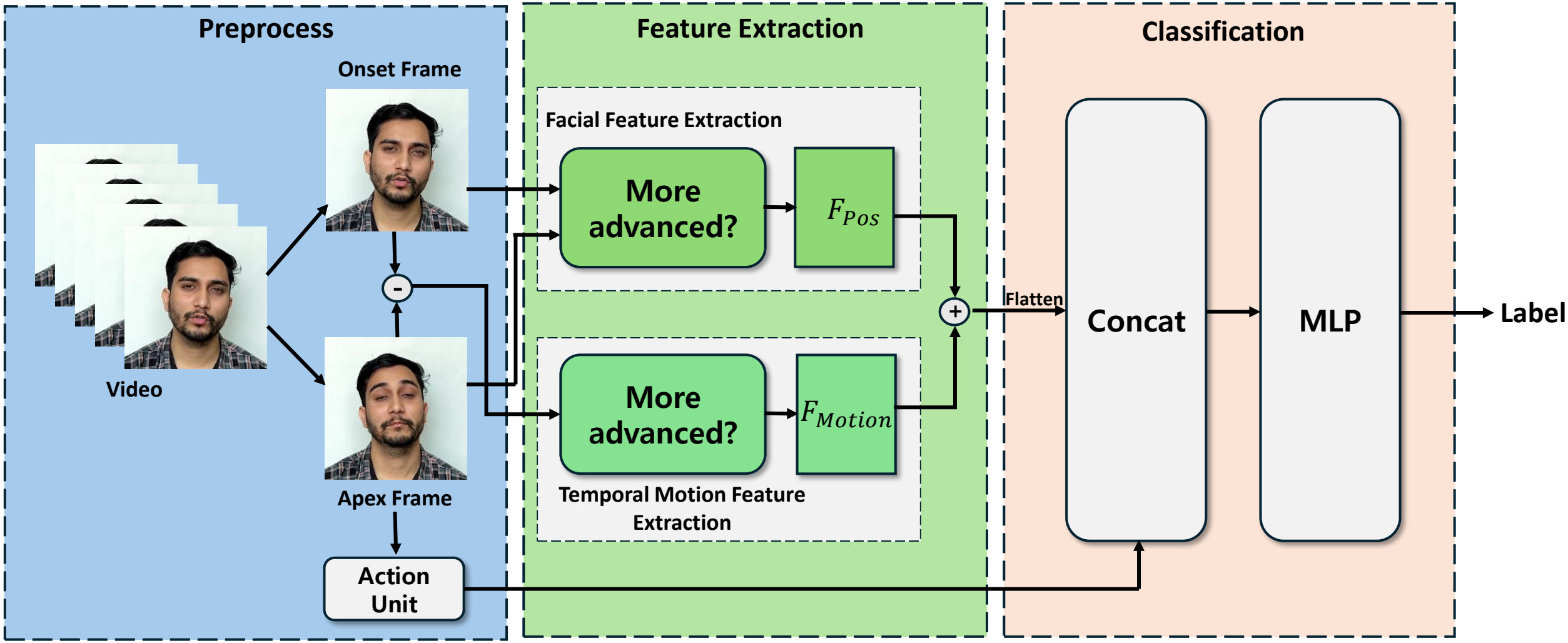




3. Ongoing Efforts & Plans

Plans

- Step: Preprocessing → Feature Extraction → Binary Classification → Evaluation
- Preprocessing: Use additional datasets to make final datasets.
- Feature Extraction : Test other methods and choose final methods.
- Binary Classification: Test other methods and choose final methods and finetuning.
- Evaluation: Choose classification evaluation method.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4. Challenges & Issues

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- Challenges 1: To advance the structural design of the FER model (transformer?).
- Challenges 2: Finetuning.
- Issue 1: Dependency.

5. Reference

- https://en.wikipedia.org/wiki/Microexpression
- https://www.kaggle.com/search?q=FER+in%3Adatasets
- https://www.kaggle.com/search?q=Micro-expression+in%3Adatasets
- https://paperswithcode.com/task/facial-expression-recognition
- https://paperswithcode.com/task/micro-expression-recognition
- https://openreview.net/pdf?id=mHYkcQzdae
- https://ai.google.dev/edge/mediapipe/solutions/vision/face_landmarker?hl=ko
- https://github.com/ihp-lab/LibreFace/tree/main/AU_Detection

Thanks for listening

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