

EEG Emotion Recognition - Unified Framework

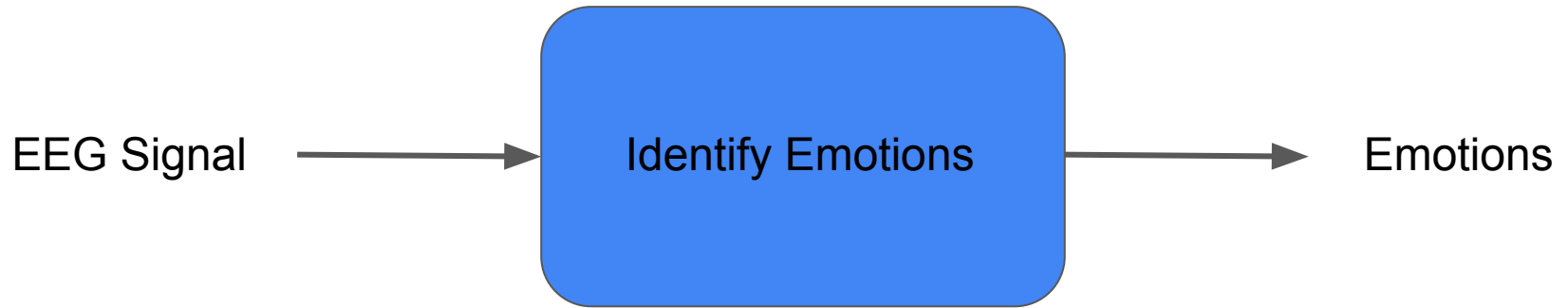
Natia Kukhilava
Tatia Tsmindashvili
Raphael Kalandadze
Sofi Katamadze

Philipp Müller
Benedikt Emanuel Wirth
Laura Ferrari

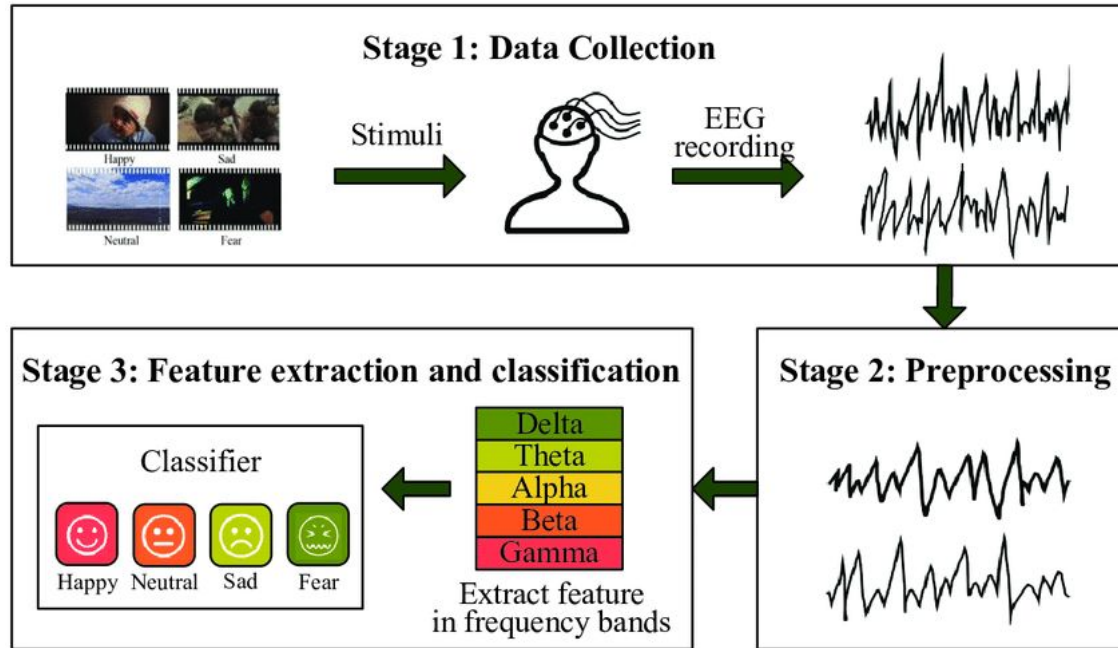


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Problem - Emotion Recognition



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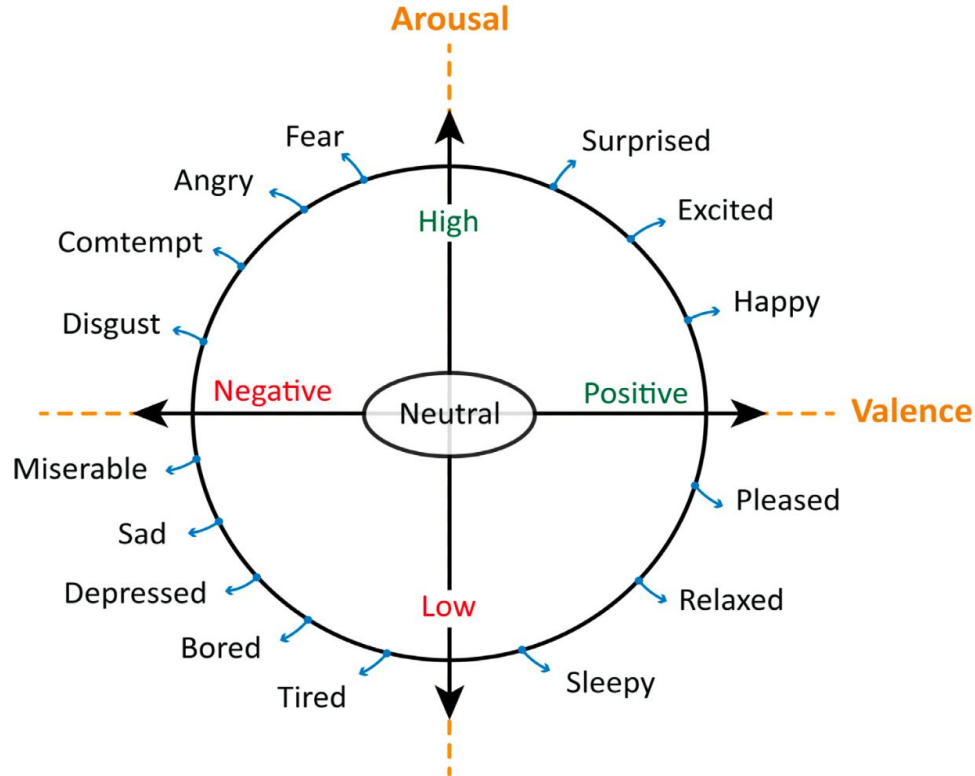
How it all started

1. Introduce the field and find SOA
2. Problem - Almost impossible to find SOA
3. Chose top models and top datasets and run pipeline for them
4. Problem - Hard to run baseline
5. Decided to write paper about problems and try to solve them

Key characteristics

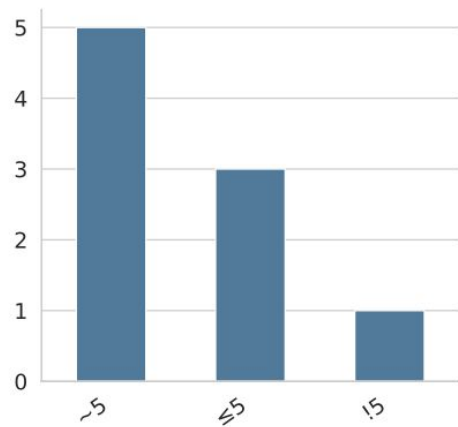
1. Dataset
2. Data splitting
3. Ground truth
4. Evaluation metrics

Valence-Arousal Scale



Dataset

1. Imbalance datasets



Dataset

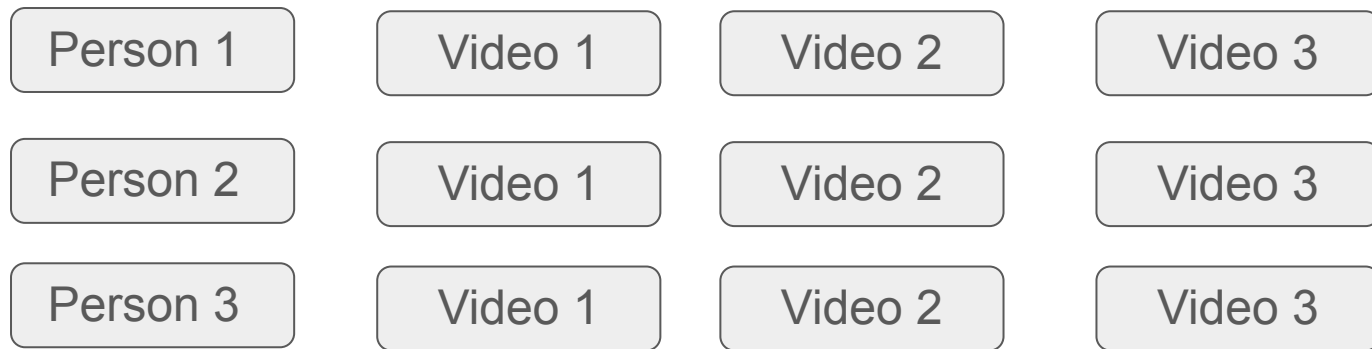
1. Imbalance datasets
2. Session duration: 1-4 min

Dataset

1. Imbalance datasets
2. Session duration: 1-4 min
3. Different devices

Data splitting - Subject Independent

Train



Test

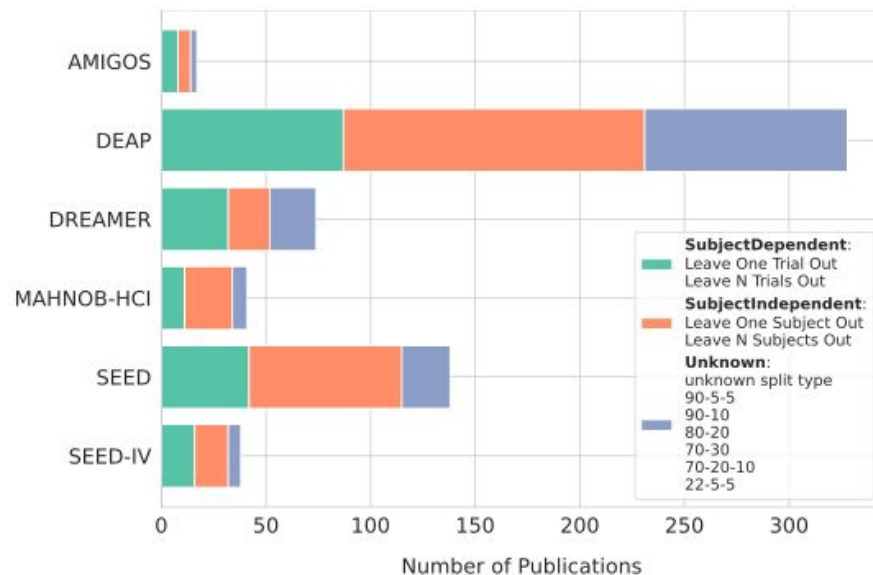


Data splitting - Subject Dependent

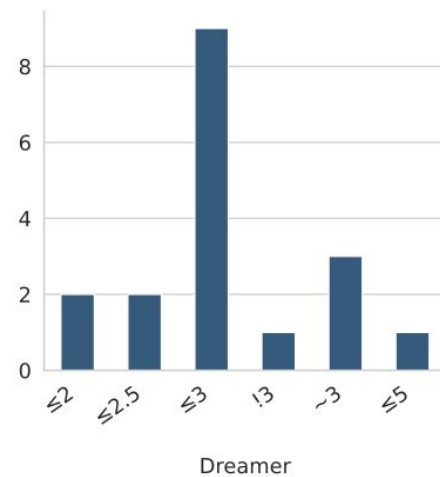
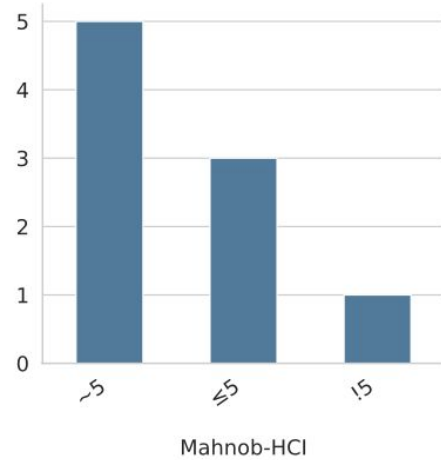
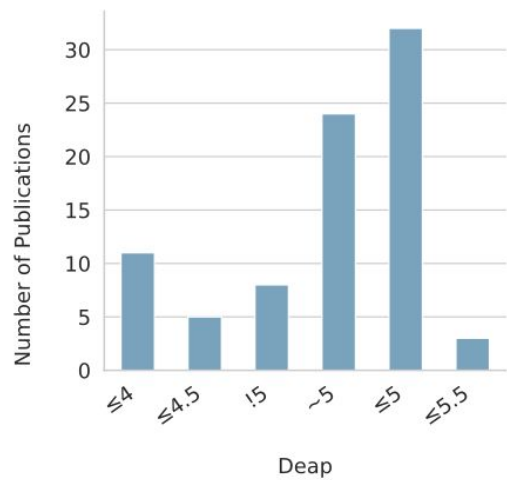


Data splitting

1. Subject Independent (LOSO)
2. Subject Dependent (LOTO)



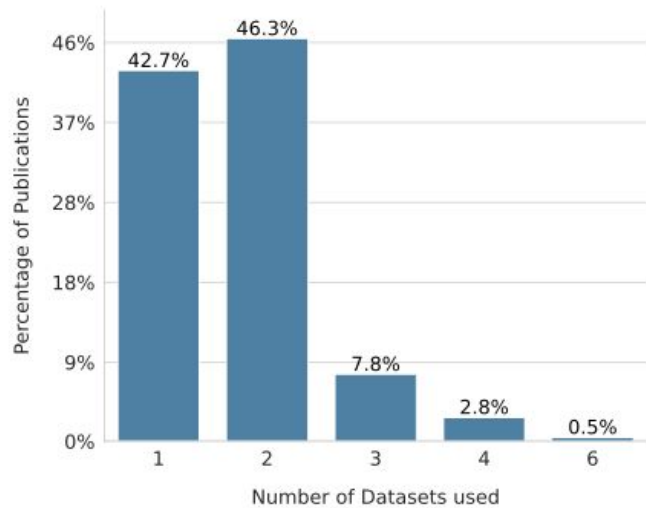
Ground Truth



Ground Truth

	Ground Truth	Accuracy	F1 Weighted	F1
Arousal	4.5	0.63 ± 0.24	0.57 ± 0.26	0.73 ± 0.24
	5	0.47 ± 0.16	0.44 ± 0.16	0.53 ± 0.22
	4.5	0.53 ± 0.20	0.53 ± 0.21	0.56 ± 0.26
	5	0.49 ± 0.15	0.47 ± 0.15	0.45 ± 0.23
Valence	4.5	0.52 ± 0.10	0.49 ± 0.10	0.48 ± 0.20
	5	0.53 ± 0.10	0.48 ± 0.12	0.43 ± 0.18
	4.5	0.55 ± 0.09	0.51 ± 0.12	0.56 ± 0.18
	5	0.52 ± 0.09	0.48 ± 0.12	0.48 ± 0.15

Evaluation



EEGain

- 6 widely-used datasets
- 4 models
- Transformations
- Split types
- Metrics

```
!python3 run_cli.py \  
--model_name=TSception \  
--data_name=MAHNOB \  
--data_path="..." \  
--log_dir="logs/" \  
--overall_log_file="logs_mahnob_loto.txt" \  
--label_type="V" \  
--num_epochs=2 \  
--batch_size=32 \  
--lr=0.001 \  
--sampling_r=128 \  
--window=4 \  
--weight_decay=0 \  
--label_smoothing=0.01 \  
--dropout_rate=0.5 \  
--num_classes=2 \  
--channels=32 \  
--split_type="L0T0"
```


EEGain - Validation

	Arousal/Valence	Model	Accuracy	F1 Weighted	F1
Mahnob	Arousal	Tsception	0.61 ± 0.13	0.34 ± 0.22	0.60 ± 0.13
	Arousal	EEGNet	0.58 ± 0.15	0.31 ± 0.20	0.57 ± 0.15
	Arousal	DeepConvNet	0.59 ± 0.14	0.37 ± 0.21	0.58 ± 0.14
	Arousal	ShallowConvNet	0.61 ± 0.15	0.30 ± 0.22	0.59 ± 0.14
	Arousal	Random	0.57 ± 0.13	0.32 ± 0.09	0.53 ± 0.05
	Valence	Tsception	0.62 ± 0.10	0.43 ± 0.14	0.61 ± 0.10
	Valence	EEGNet	0.59 ± 0.11	0.40 ± 0.14	0.58 ± 0.11
	Valence	DeepConvNet	0.61 ± 0.11	0.43 ± 0.15	0.60 ± 0.11
	Valence	ShallowConvNet	0.61 ± 0.10	0.38 ± 0.15	0.59 ± 0.10
	Valence	Random	0.53 ± 0.13	0.33 ± 0.09	0.53 ± 0.05
Deap	Arousal	Tsception	0.60 ± 0.09	0.63 ± 0.09	0.60 ± 0.09
	Arousal	EEGNet	0.59 ± 0.12	0.64 ± 0.17	0.58 ± 0.12
	Arousal	DeepConvNet	0.62 ± 0.1	0.68 ± 0.16	0.60 ± 0.10
	Arousal	ShallowConvNet	0.62 ± 0.11	0.67 ± 0.16	0.60 ± 0.09
	Arousal	Random	0.53 ± 0.10	0.54 ± 0.18	0.53 ± 0.10
	Valence	Tsception	0.60 ± 0.11	0.60 ± 0.17	0.59 ± 0.11
	Valence	EEGNet	0.57 ± 0.10	0.64 ± 0.13	0.56 ± 0.10
	Valence	DeepConvNet	0.56 ± 0.09	0.63 ± 0.11	0.56 ± 0.09
	Valence	ShallowConvNet	0.58 ± 0.09	0.66 ± 0.11	0.56 ± 0.08
	Valence	Random	0.50 ± 0.07	0.54 ± 0.10	0.50 ± 0.07

Q & A



Scan for EEGain