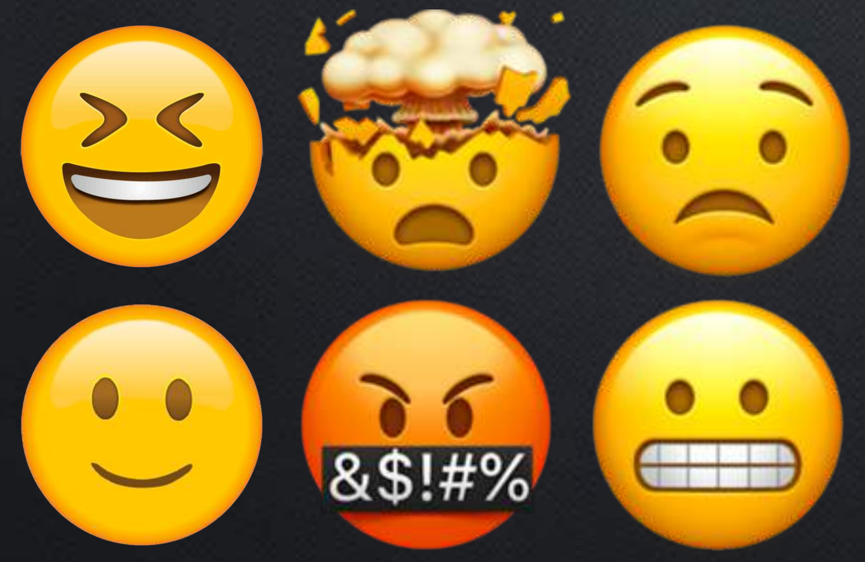
SECR

Software Engineering Conference Russia 2018

October 12-13
Moscow

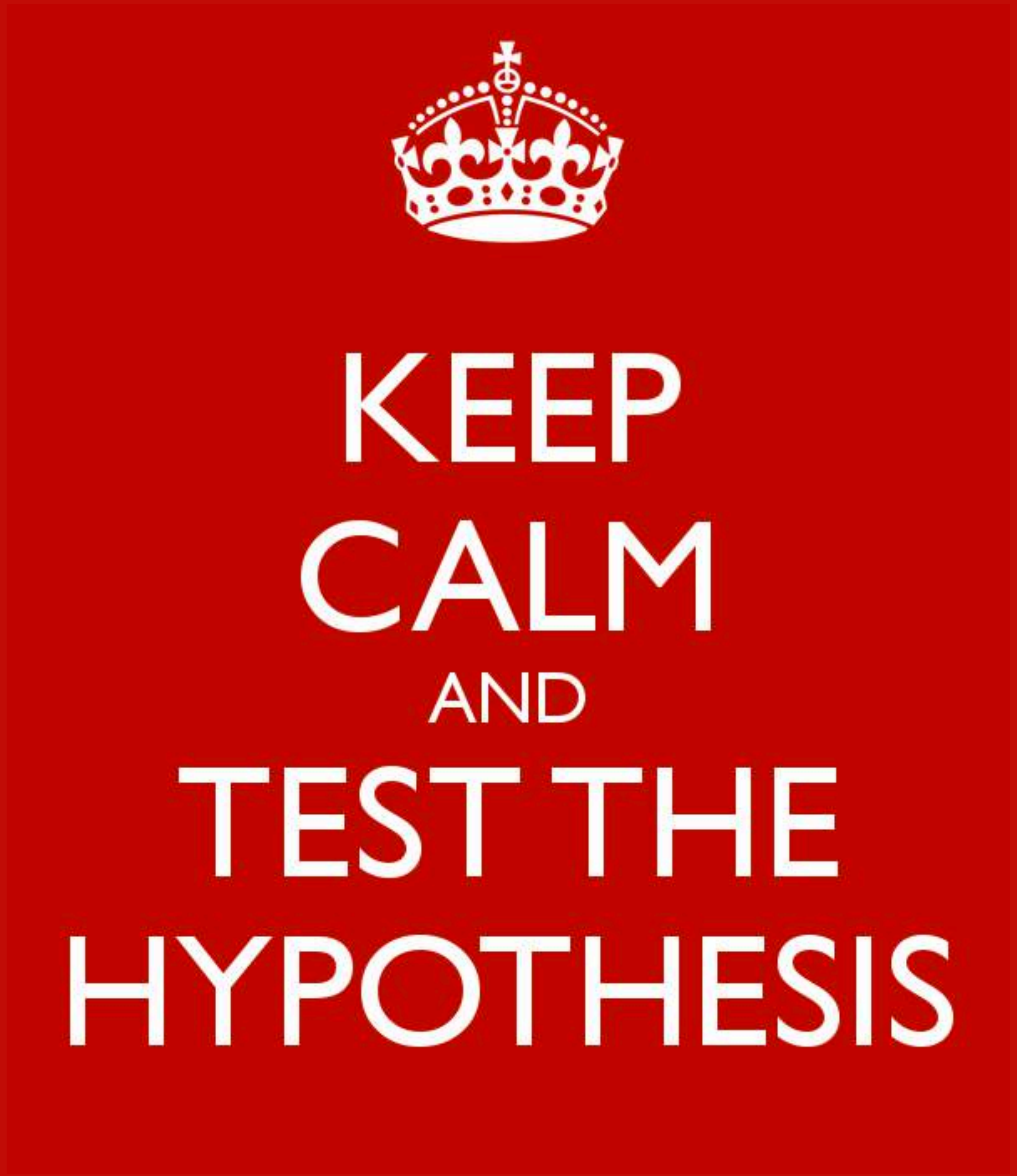


Исследование эмоциональных откликов при чтении

Кирилл Улитин

Новые Облачные Технологии

joy: 0.00
sadness: 0.02
disgust: 0.44
contempt: 0.19
anger: 0.00
fear: 0.00
surprise: 0.20
valence: 0.00
engagement: 0.12

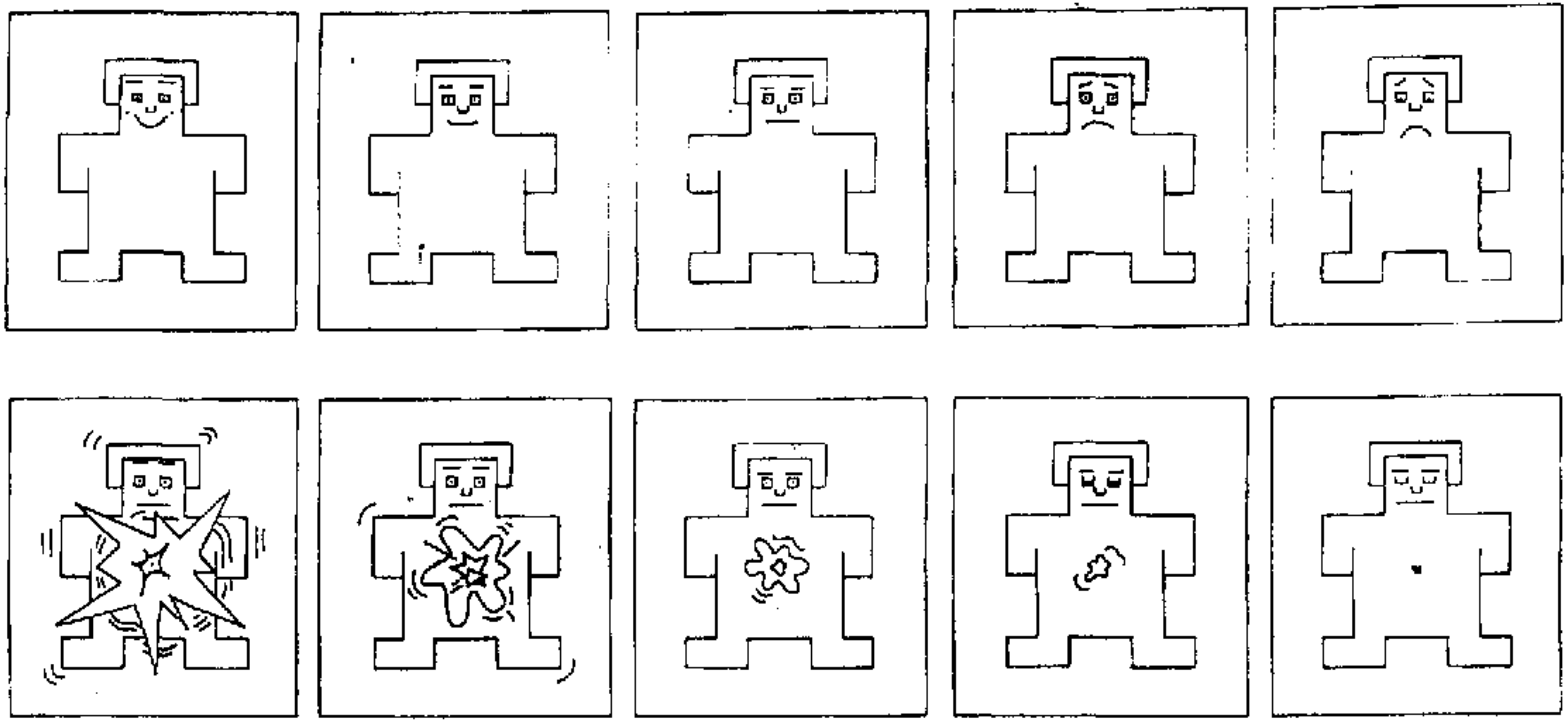


Можно ли применить алгоритм для распознания эмоций по видео при чтении документов

Насколько хорошо работает один из таких алгоритмов

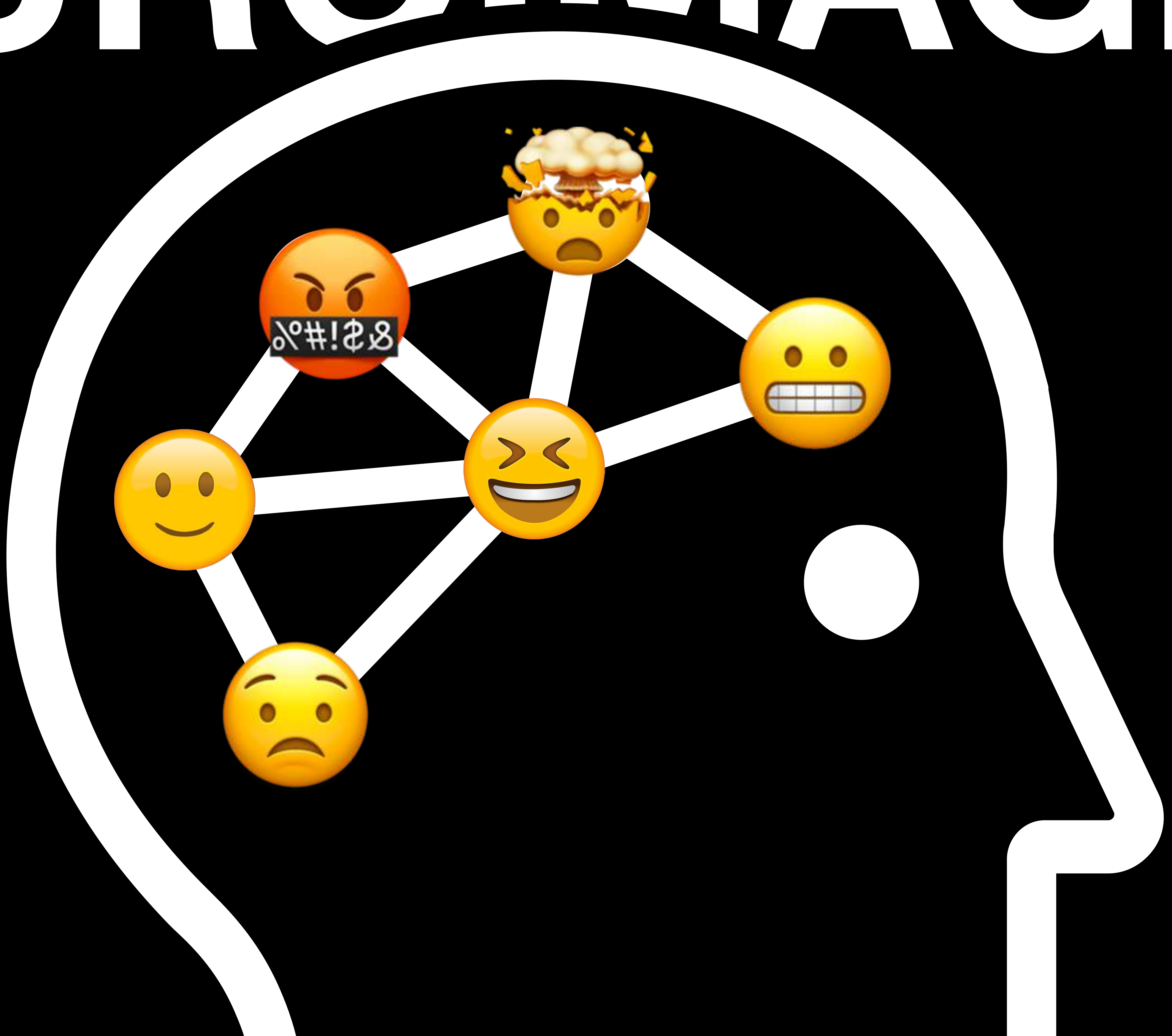
Испытывает ли человек при чтении эмоции, которые нельзя считать с лица

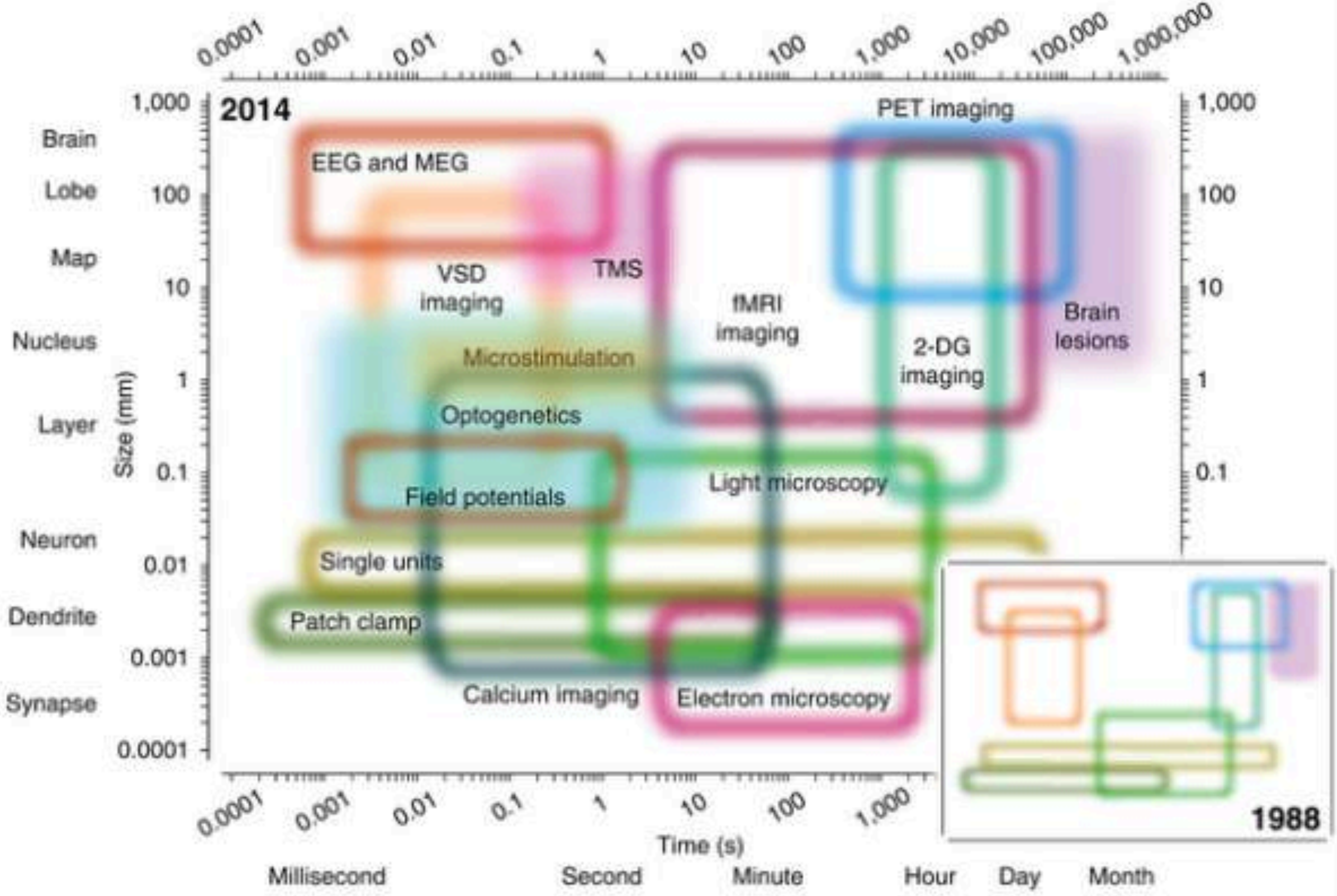
Можно ли использовать нейроинтерфейс для оценки эмоций



https://www.ncbi.nlm.nih.gov/pubmed/7962581

NEUROIMAGING





2014
EEG and MEG
PET imaging
VSD imaging
TMS
fMRI imaging
2-DG imaging
Brain lesions
Microstimulation
Optogenetics
Light microscopy
Field potentials
Single units
Patch clamp
Calcium imaging
Electron microscopy
1988
Brain
Lobe
Map
Nucleus
Layer
Neuron
Dendrite
Synapse
Size (mm)
1,000
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0.1
0.01
0.001
0.0001
0.0001
0.001
0.01
0.1
1
10
100
1,000
10,000
100,000
1,000,000
Time (s)
Millisecond
Second
Minute
Hour
Day
Month

http://neuro.chat/


EPOC


muse


OpenBCI
Ganglion


System Control Panel
30 fps
OpenBCI
Shop
Issues
Help
Start Data Stream
Notch 50Hz
BP Filt 5-50 Hz
Layout
Time Series
Vert Scale
Window
200 uV
5 sec
7.17 uVrms
9.61 uVrms
23.6 uVrms
6.26 uVrms
Time (s)
Focus Widget
Theme
KeyPress
Serial
Green
OFF
OFF
focused!
alpha
beta
Head Plot
Polarity
Contours
Smooth
1x
+/-
ON
0.9
FFT Plot
Max Freq
Max uV
Log/Lin
Smooth
Filters?
60 Hz
100 uV
Log
0.9
Filtered
Amplitude (uV)
Frequency (Hz)
Band Power
(uV)^2 / Hz per channel
DELTA
THETA
ALPHA
BETA
GAMMA
Accelerometer
X = 0.000 g
Y = 0.000 g
Z = 0.000 g
+2g
0g
-2g
Data stream stopped.

IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE, VOL. 15, NO. 5, SEPTEMBER 2011 737

A Novel Emotion Elicitation Index Using Frontal Brain Asymmetry for Enhanced EEG-Based Emotion Recognition

Panagiotis C. Petrantonakis, *Student Member, IEEE*, and Leontios J. Hadjileontiadis, *Senior Member, IEEE*

***Abstract*—This paper aims at providin**
uating the emotion elicitation procedure
gram (EEG)-based emotion recognition
frontal brain asymmetry theory, an in
Index (AsI), is introduced, in order to
This is accomplished by a multidimensio
analysis between different EEG sites fro
hemispheres. The proposed approach wa
(Fp1, Fp2, and F3/F4 10/20 sites) EEG r
healthy right-handed subjects. For the e
of the AsI, an extensive classification pro
two feature-vector extraction techniques
six different classification scenarios in t
This resulted in classification results up t
dependent case and 94.40% for the user-d
the efficacy of AsI as an index for the emot

***Index Terms*—Emotion elicitation,**
electroencephalogram, frontal brain asym
directed information.

I. INTRODUCTIO

HUMAN machine interaction (H
attention in the last decade as ma
influenced our lives in many aspects, s
profession, and entertainment. It has bee
machines could understand a person's
become more intuitive, smoother, and
a new approach in the HMI area know
(AC). AC is the research field that d
systems and devices that can recogniz
human emotions and would serve as
machines with the ability of acting em
Emotion recognition is the first step
tioned ultimate endeavor of AC. In o
tions many approaches have been pr
facial expressions [2], [3], speech [4
the autonomous nervous system (AN
vanic skin response) [6], [7] or eve

Psychophysiology, 40 (2003), 838–848. Blackwell Publishing Inc. Printed in the USA.

DOI: 10.1111/1469-8986.00121

EARLY CAREER AWARD

Clarifying the emotive functions of asymmetrical frontal cortical activity

EDDIE HARMON-JONES
Department of Psychology, Universi

Abstract

Asymmetrical activity over the fr
motivations. Explanations of the
positive affect and/or approach m
affect and/or withdrawal motivat
as only positive (negative) affec
Consequently, this research is u
valence, motivational direction,
the emotion of anger, a negative
frontal cortical activity is due to
implications for the study of the
discussed.

Descriptors: Emotion, Motivatio

frontiers in Neuroscience

METHODS
published: 02 October 2015
doi: 10.3389/fnins.2015.00354

CrossMark

Musical neurofeedback for treating depression in elderly people

Rafael Ramirez [1], Manel Palencia-Lefler [2], Sergio Giraldo [1] and Zacharias Vamvakousis [1]*

[1] Department of Information and Communication Technologies, Universitat Pompeu Fabra, Barcelona, Spain, [2] Department of Communication, Universitat Pompeu Fabra, Barcelona, Spain

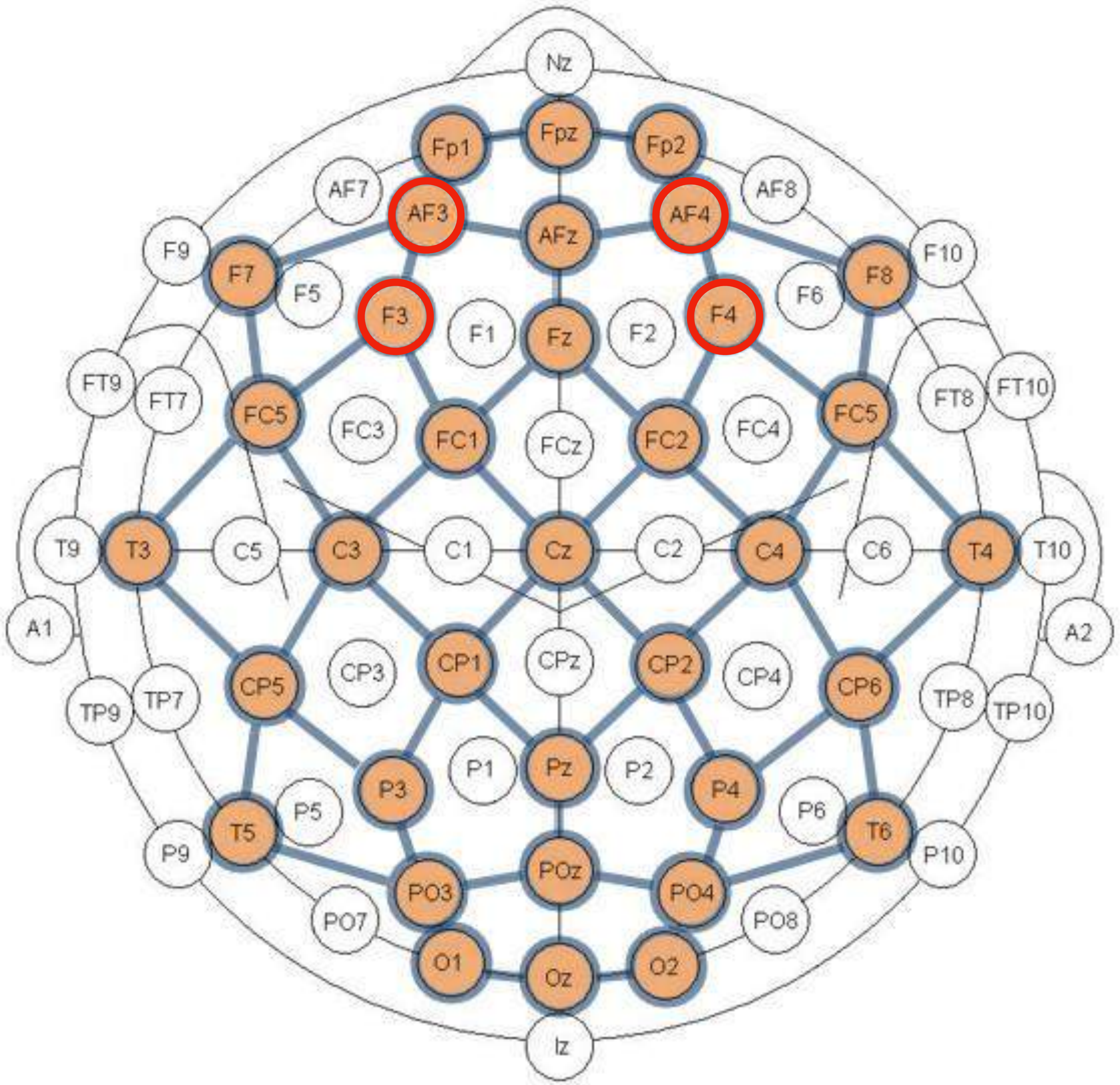
$$\text{Arousal} = (\beta F3 + \beta F4 + \beta AF3 + \beta AF4)/(\alpha F3 + \alpha F4 + \alpha AF3 + \alpha\ AF4)$$

$$\text{Valence} = \alpha F4 - \alpha F3$$

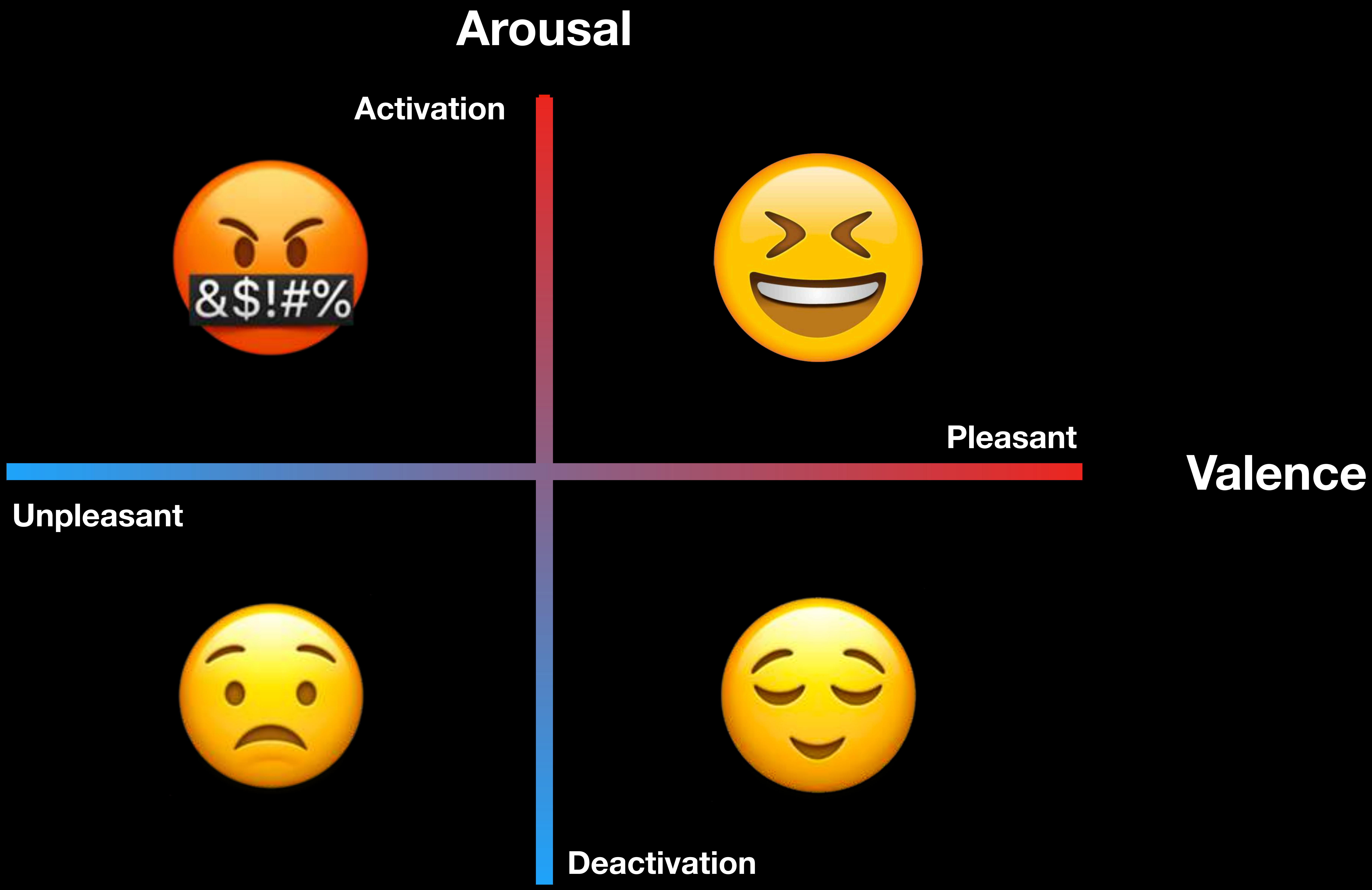
https://doi.org/10.3389/fnins.2015.00354

Ultracortex Mark IV

Node Locations (35 total)



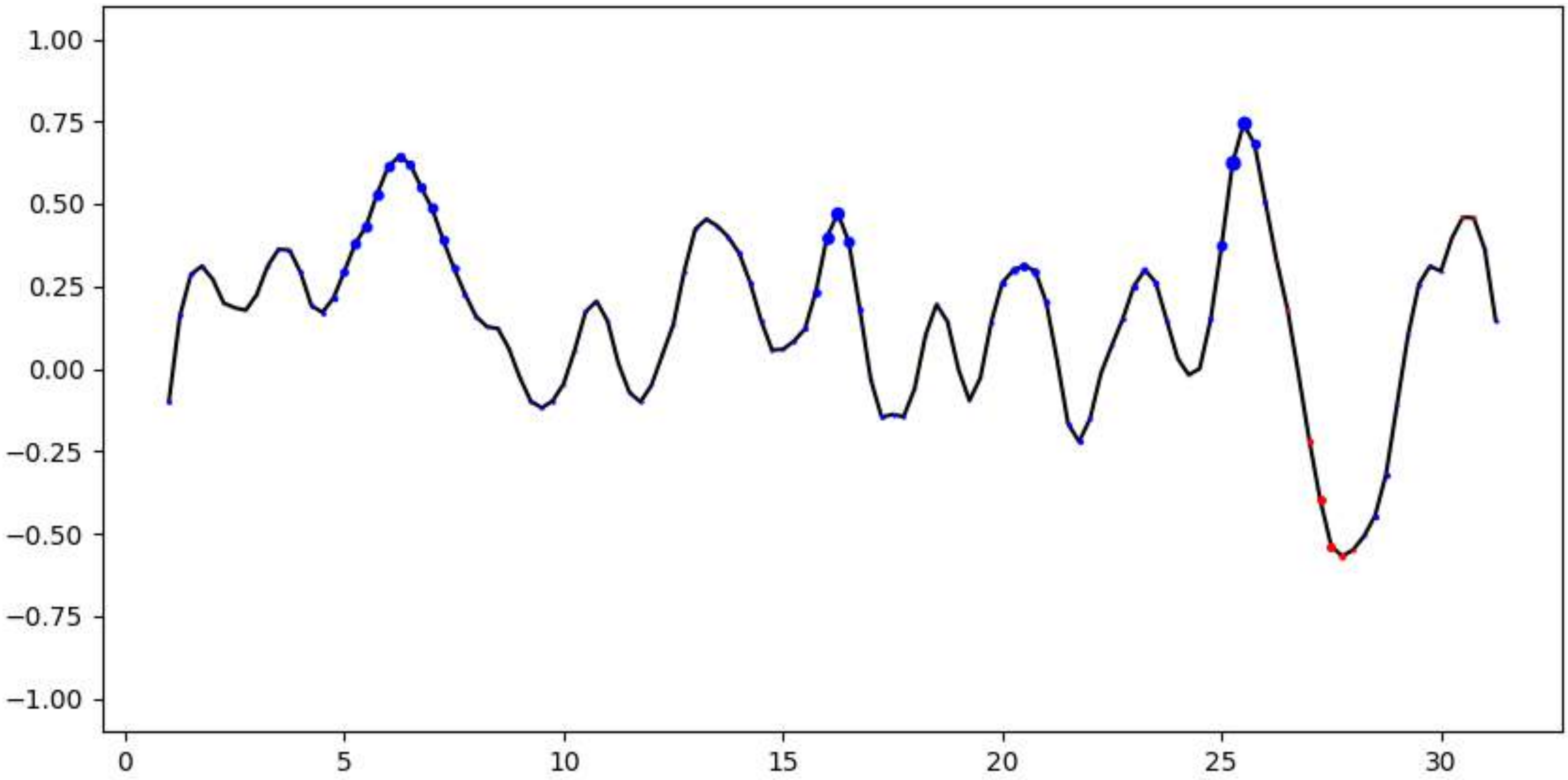
Based on the internationally accepted **10-20 System**
for electrode placement in the context of EEG research


Arousal
Activation
&$!#%
Pleasant
Valence
Unpleasant
Deactivation

Study	Stimuli	#Chan.	Method Description	Emotion states	Accuracy	Pattern Study
[4]	IAPS, IADS	3	Power of alpha and beta, then PCA, 5 subjects, classification with FDA	Valence and arousal	Valence: 92.3%, arousal: 92.3%	×
[5]	IAPS	2	Amplitudes of four frequency bands, 17 subjects, evaluated KNN, Bagging	Valence (12), arousal (12) and dominance (12)	Valence: 74%, arousal: 74%, and dominance: 75%	×
[6]	Video	62	Wavelet features of alpha, beta and gamma, 20 subjects, classification with KNN and LDA	disgust, happy, surprise, fear and neutral	83.26%	×
[7]	Music	24	Power spectral density and asymmetry features of five frequency bands, 26 subjects, evaluated SVM	Joy, anger, sadness, and pleasure	82.29%	√
[8]	IAPS	8	Spectral power features, 11 subjects, KNN	Positive, negative and neutral	85%	×
[9]	IAPS	4	Asymmetry index of alpha and beta power, 16 subjects, SVM	Four quadrants of the valence-arousal space	94.4% (subject-dependent), 62.58% (subject-independent)	×
[10]	Video	32	Spectral power features of five frequency bands, 32 subjects, Gaussian naive Bayes classifier	Valence (2), arousal (2) and liking (2)	Valence: 57.6%, arousal: 62% and liking: 55.4%	×
[11]	Music	14	Time-frequency (TF) analysis, 9 subjects, KNN, QDA and SVM	Like and dislike	86.52%	√
[12]	Video	32	Power spectral density features of five frequency bands, modality fusion with eye track, 24 subjects, SVM	Valence (3) and arousal (3)	Valence: 68.5%, arousal: 76.4%	×
[13]	Video	62	Power spectrum features, wavelet features, nonlinear dynamical features, 6 subjects, SVM	Positive and negative	87.53%	√
[14]	IAPS	64	Higher Order Crossings, Higher Order Spectra and Hilbert-Huang Spectrum features, 16 subjects, QDA	Happy, curious, angry, sad, quiet	36.8%	√

https://arxiv.org/pdf/1601.02197v1.pdf

Accuracy
Valence: 92.3%, arousal: 92.3%
Valence: 74%, arousal: 74%, and dominance: 75%
83.26%
82.29%
85%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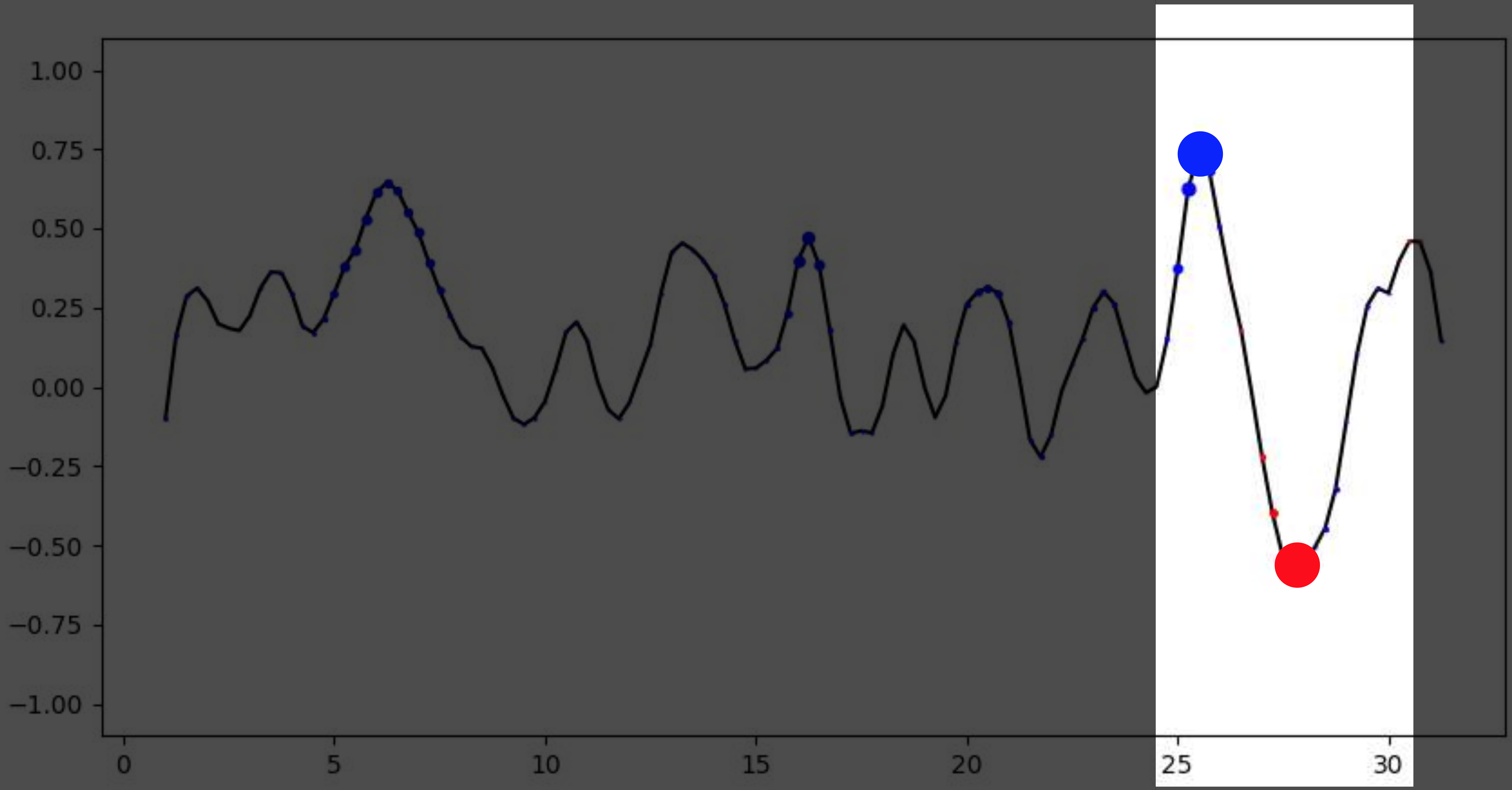

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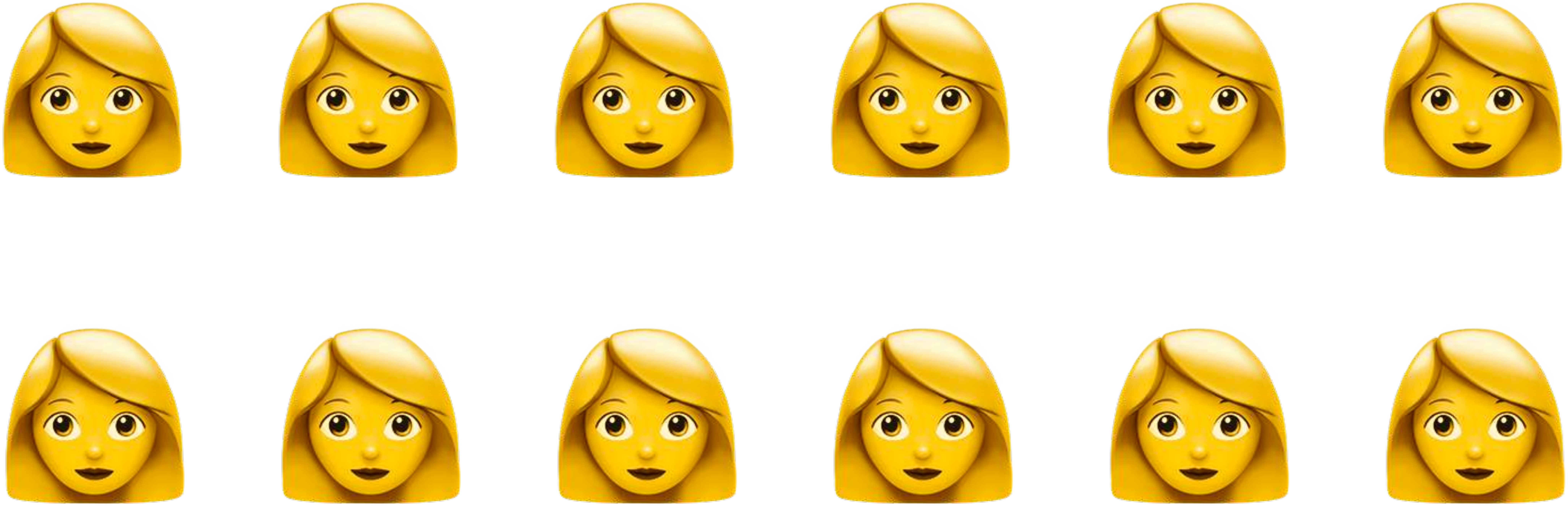


Подготовка

1

Просмотр ролика

2

Интервью

3

Video

10s

Text Video

10


12 Oct 23:19:15
Scenes
Sources
Mixer
Scene Transitions
Controls
Scene 3
Scene 2
Scene 2 2
Window Capture 2
Window Capture
Image
camera
Desktop Audio
Mic/Aux
Fade
Duration 300ms
Start Streaming
Start Recording
Studio Mode
Settings
Exit
System Control Panel
30 fps
OpenBCI
Shop
Issues
Help
Stop Data Stream
Layout
Time Series

curiositry / EEGrunt

Watch 15 | Star 96 | Fork 38

<> Code | Issues 2 | Pull requests 0 | Projects 0 | Wiki | Insights

A Collection Python EEG (+ ECG) Analysis Utilities for OpenBCI and Muse http://autodidacts.io

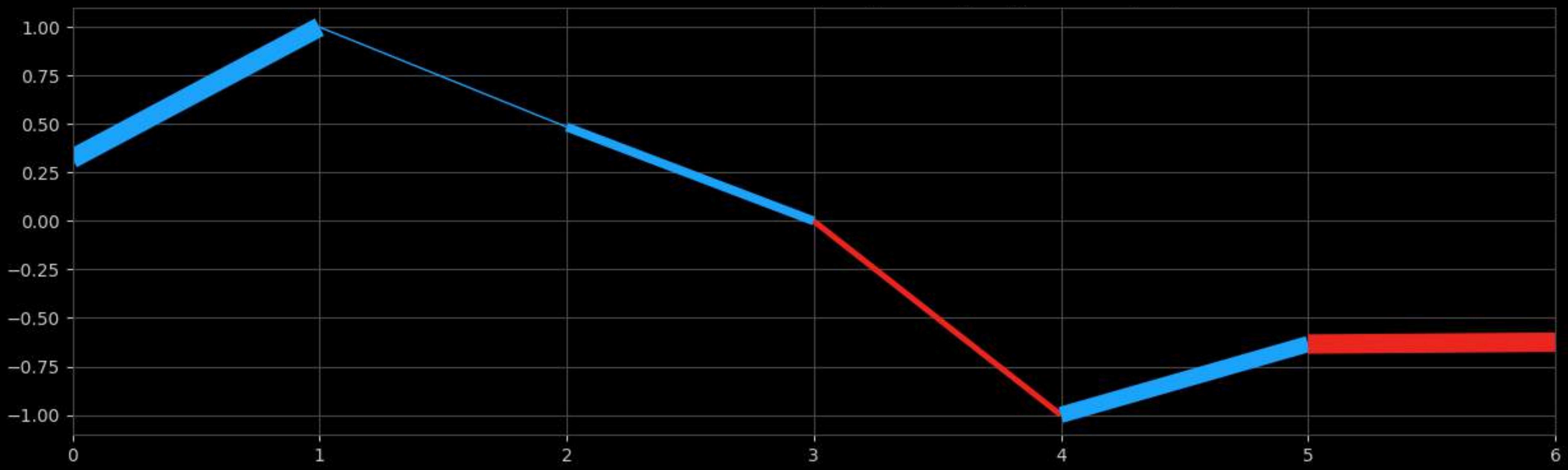
eeg openbci ecg muse python data-visualization data-analysis neuroscience

86 commits | 1 branch | 0 releases | 4 contributors

Branch: master | New pull request | Create new file | Upload files | Find file | Clone or download

curiositry Add support for Muse data recorded with LSL (Lab Streaming Layer) — Latest commit `d6b04a6` on 19 Jun 2017

data	added sample data	3 years ago
plots	Added sample plots	3 years ago
.gitignore	Update	3 years ago
EEGrunt.py	Add support for muse data recorded with Lab Streaming Layer	a year ago
README.md	Update README to mention new ECG analysis functions (and add link to …	2 years ago
analyze_channel.py	Add support for Muse data recorded with LSL (Lab Streaming Layer)	a year ago
analyze_data.py	Add support for Muse data recorded with LSL (Lab Streaming Layer)	a year ago
analyze_ecg_channel.py	deCamelCase hrv window length var	2 years ago
analyze_ecg_data.py	deCamelCase hrv window length var	2 years ago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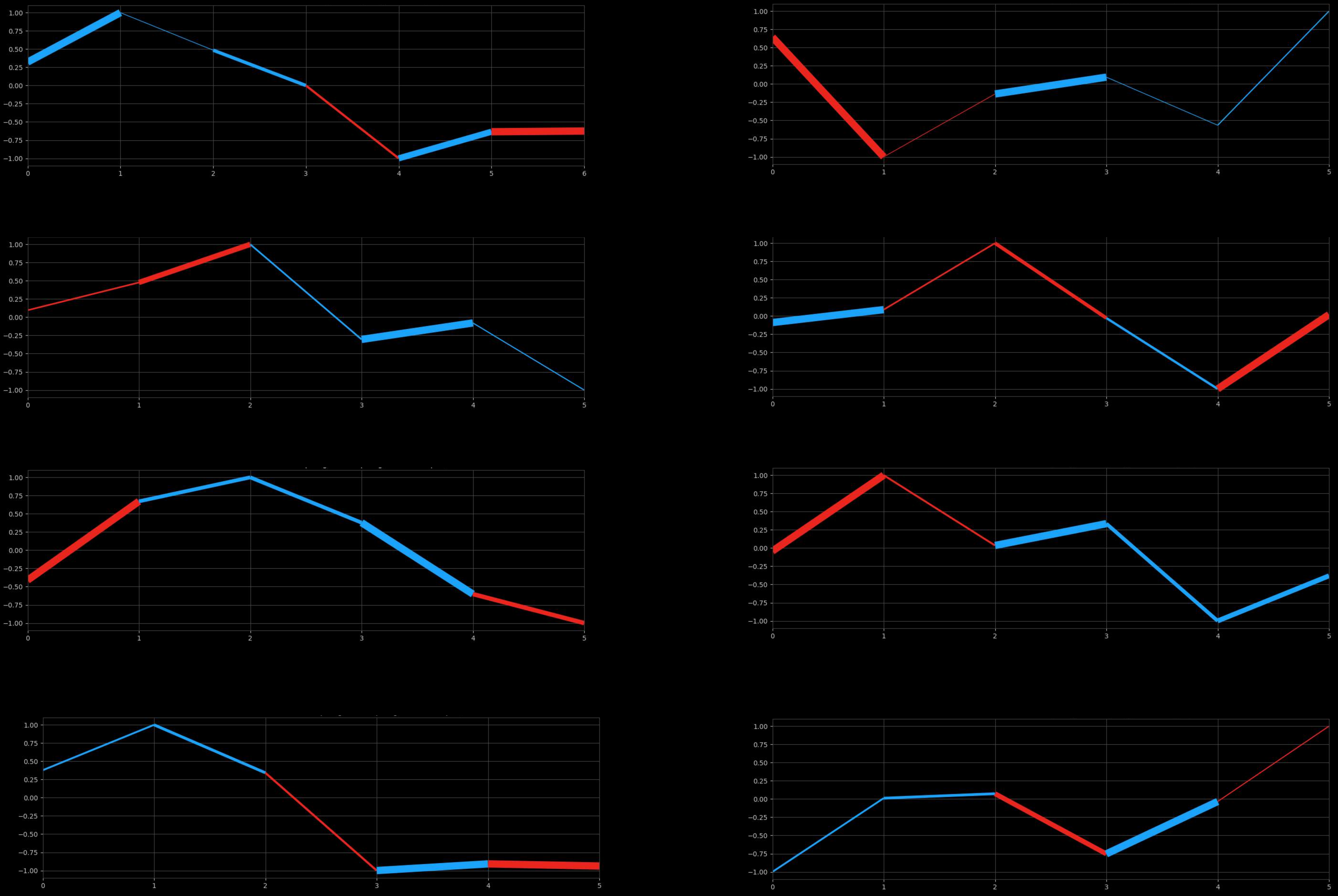
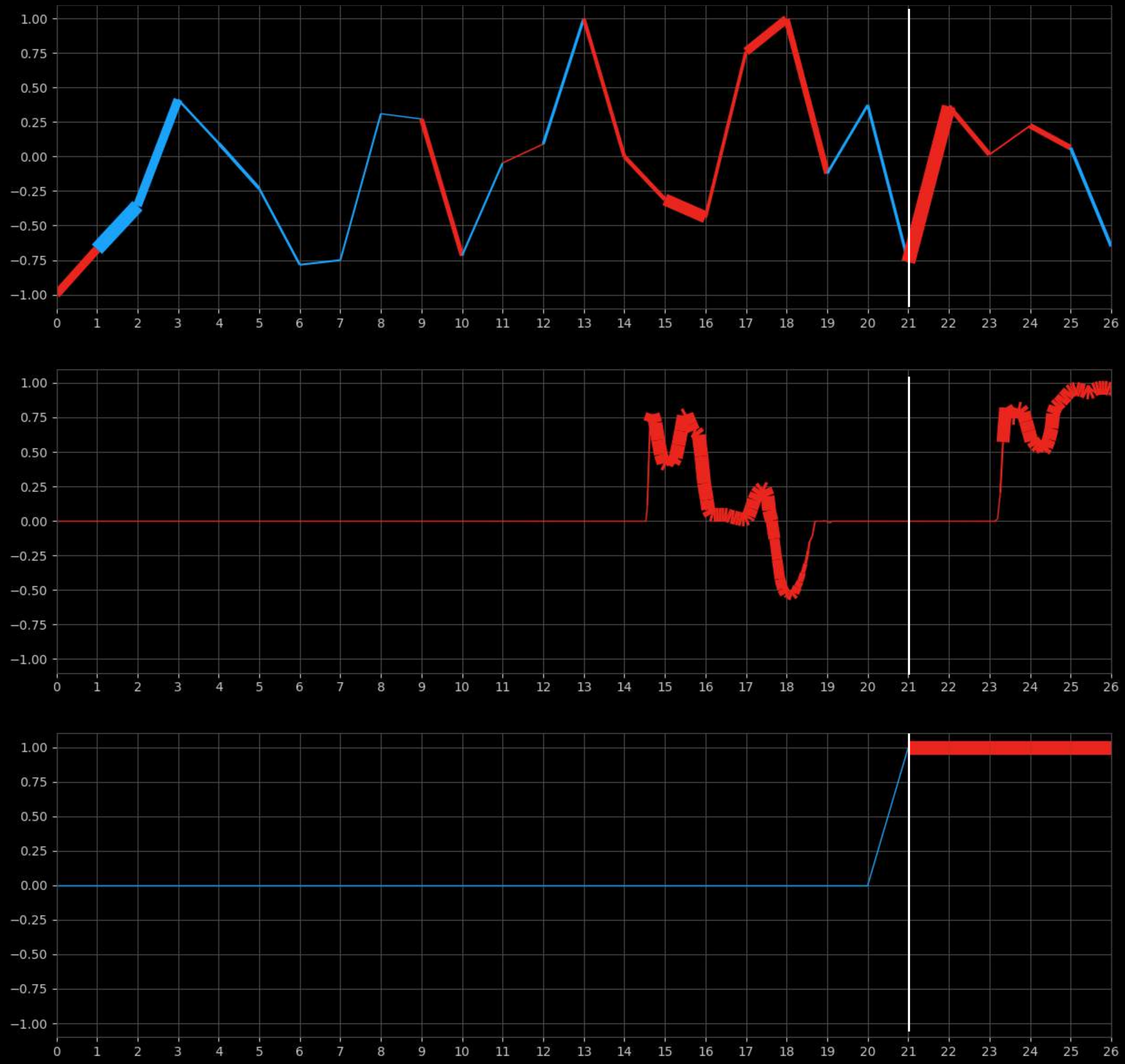


Накoнец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OpenBCI- AW-20...1VA.png	OpenBCI- RAW-20...2VA.png	OpenBCI- RAW-20...3VA.png	OpenBCI- RAW-20...4VA.png	OpenBCI- RAW-20...5VA.png	OpenBCI- RAW-20...1VA.png	OpenBCI- RAW-20...2VA.png	OpenBCI- RAW-20...3VA.png	OpenBCI- RAW-20...4VA.png	OpenBCI- RAW-20...5VA.png	OpenBCI- RAW-20...6VA.png
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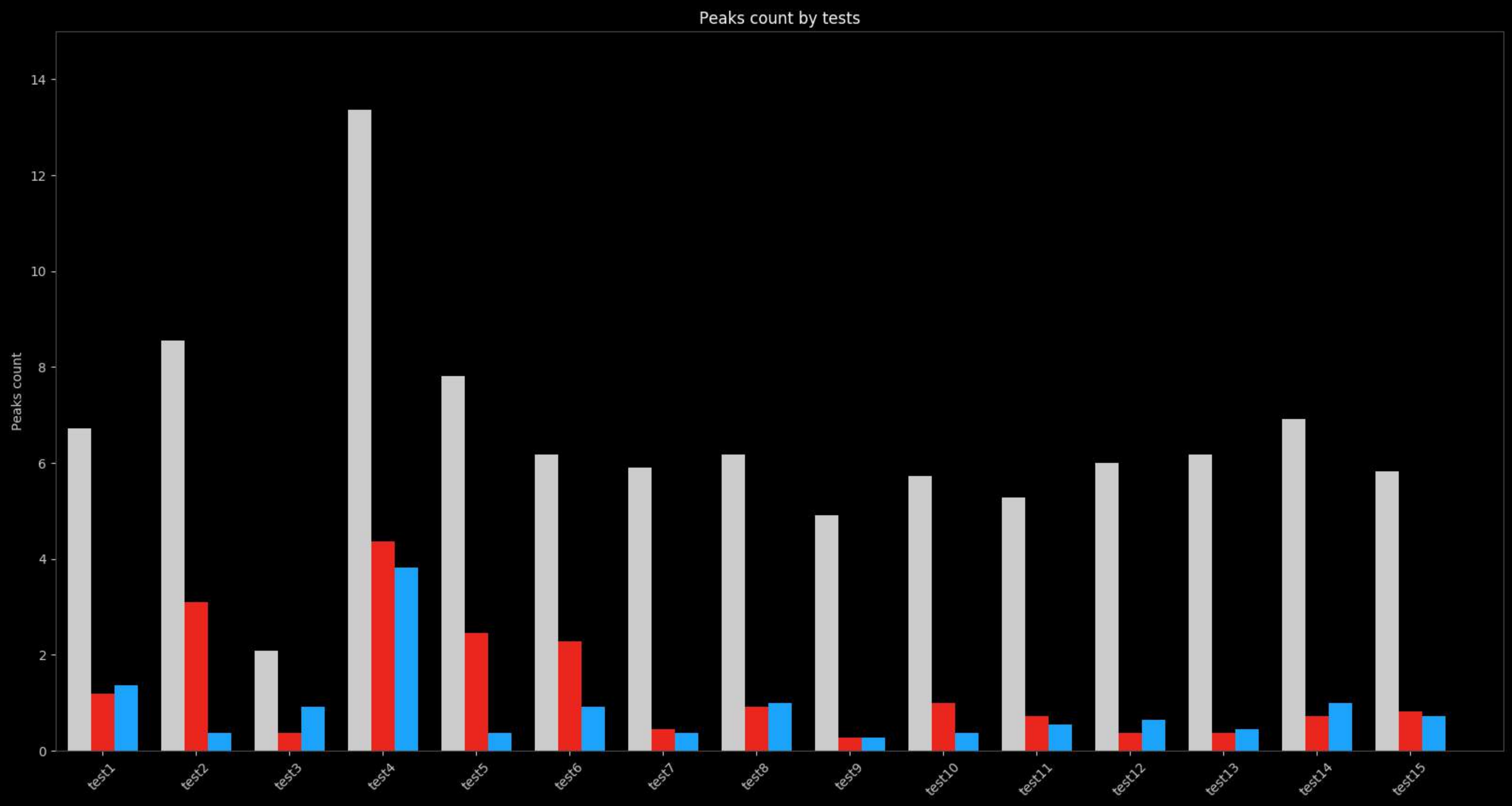

Peaks count by tests
Peaks count
0
2
4
6
8
10
12
14
test1
test2
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test4
test5
test6
test7
test8
test9
test10
test11
test12
test13
test14
test15

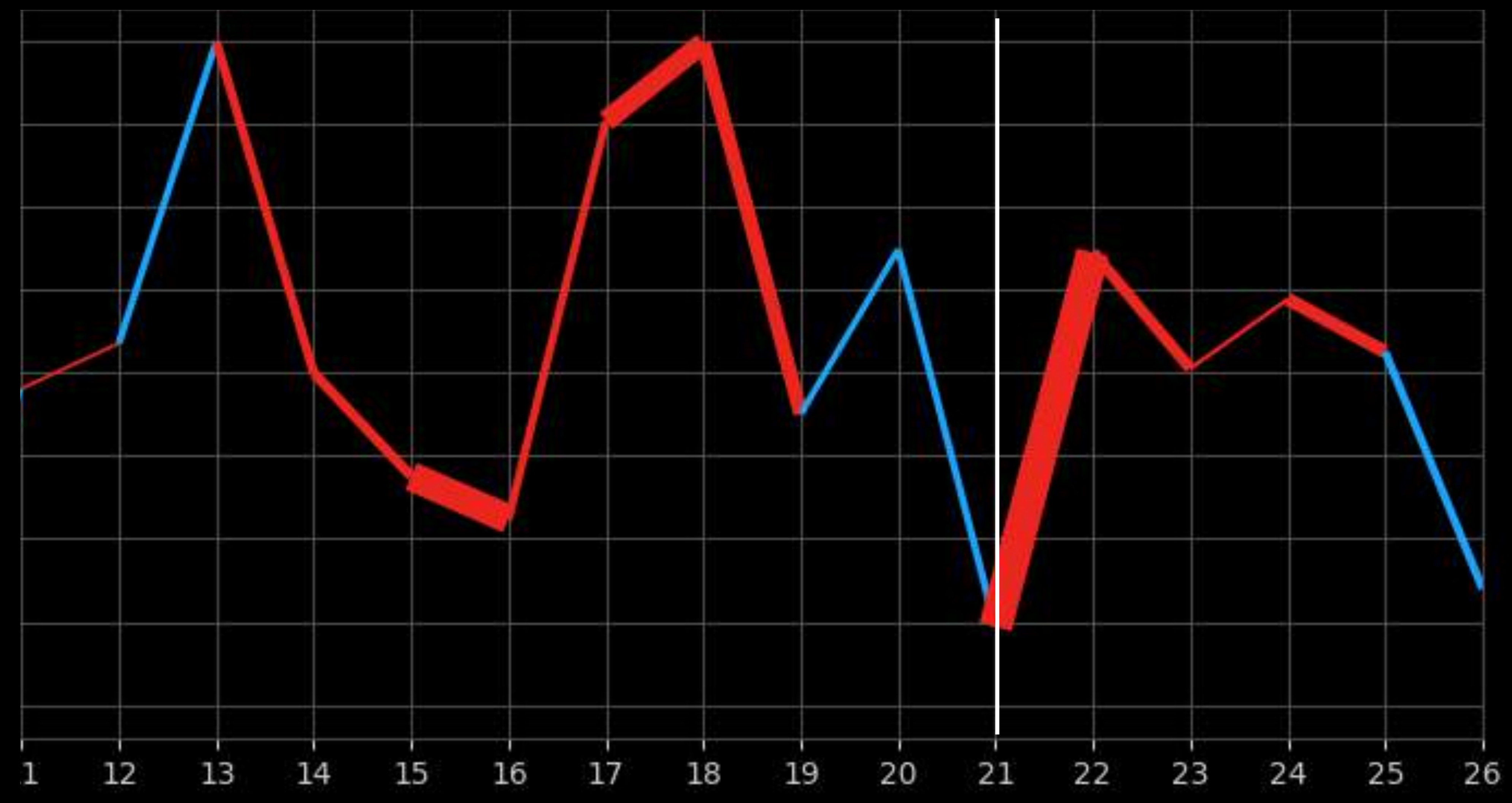
	% случаев когда эмоция верно опрделна алгоритмом по изображению	% случаев когда менялось выражение лица	% случаев когда эмоция верно опрделна экспертно по ЭЭГ	% случаев когда респондент неверно описал свои эмоции
Вместе	**28%**	**51%**	**86%**	**17%**

***12 респондентов 180 роликов**

	% случаев когда эмоция верно опрделна алгоритмом по изображению	% случаев когда менялось выражение лица	% случаев когда эмоция верно опрделна экспертно по ЭЭГ	% случаев когда респондент неверно описал свои эмоции
Вместе	28%	51%	86%	17%
Видео	45%	80%	98%	13%
Текст	20%	32%	80%	16%


30 Sep 15:05:46


30 Sep 15:06:48
1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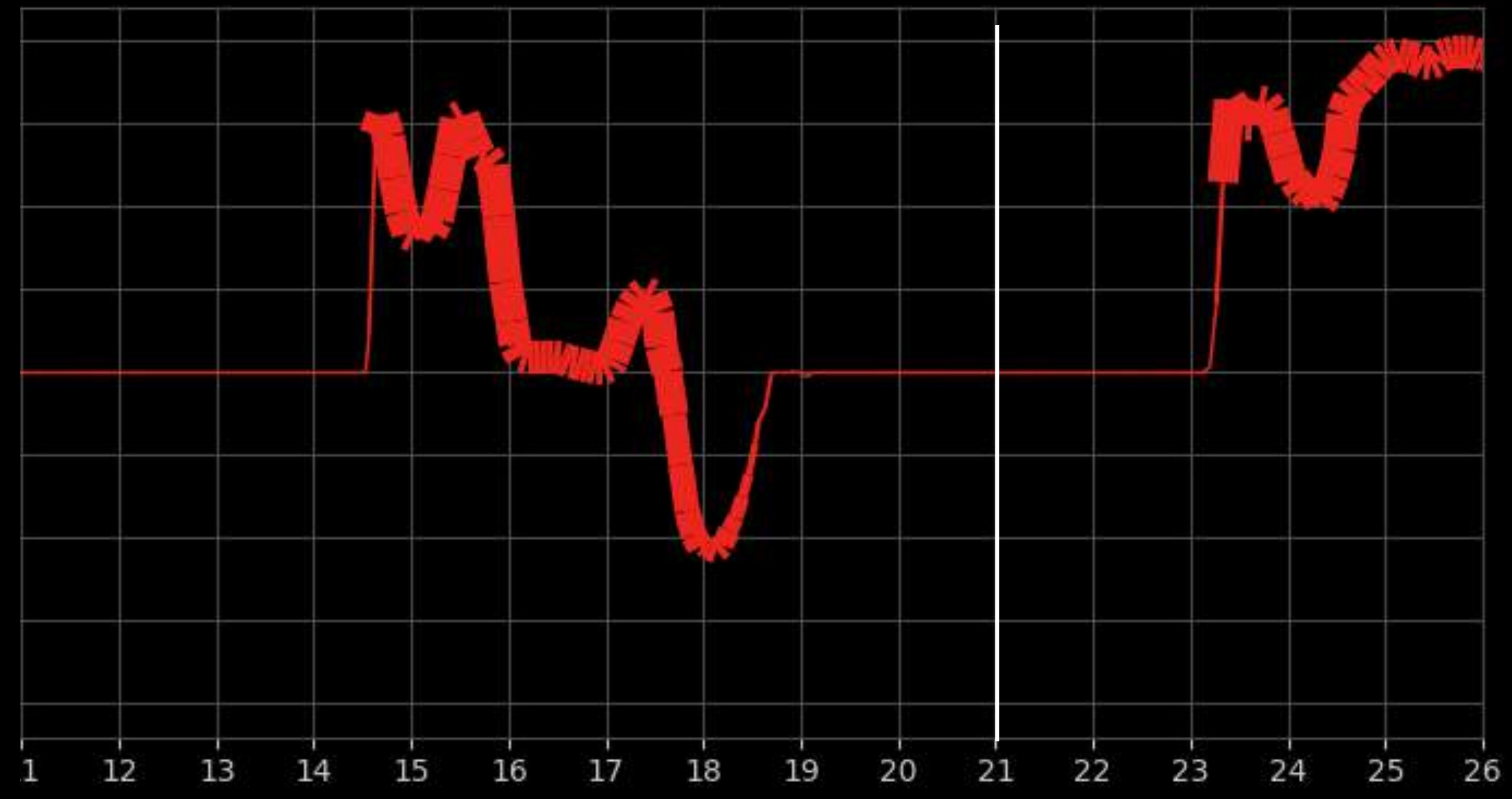
1 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Ошибки алгоритма распознавания эмоций

Затянутое наступление эмоции (больше 3-5 секунд)

Очень короткая эмоция меньше 1 секунды (смущение, испуг, подавленные эмоции)

Ошибки в определении (напряжение, удивление вместо страха, радость вместо смущения)

Насколько хорошо работает один из алгоритмов

Можно ли применить алгоритм для распознания эмоций по видео при чтении документов

Испытывает ли человек при чтении эмоции, которые нельзя считать с лица

Можно ли использовать нейроинтерфейс для оценки эмоций

45% для видео, 20% для текста (для использованной выборки)

При чтении текста эмоции на лице проявляются только в момент развязок, а в остальное время остаются нейтральными.

При просмотре роликов люди более активно выражают эмоции на лице 80%, чем при чтении текста 32%

Да

ЭЭГ дает высокую точность при оценке эмоций (98% / 80% видео/текст)

Спасибо!
Вопросы?

- Кирилл Улитин
- kirill@ulitin.ru
- ulitin.ru