Facial Action Coding System (FACS) – A Visual Guidebook

December 6th, 2016

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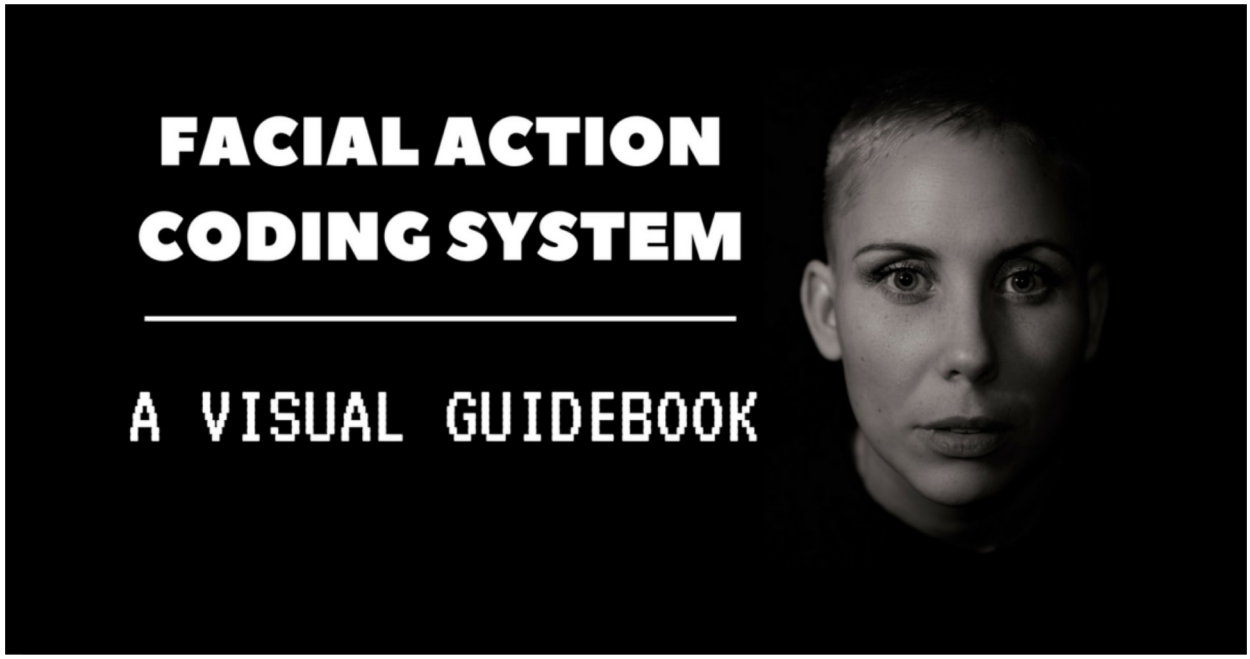


The Facial Action Coding System (FACS) refers to a set of facial muscle movements that correspond to a displayed emotion. Originally created by Carl-Herman Hjortsjö with 23 facial motion units in 1970, it was subsequently developed further by Paul Ekman, and Wallace Friesen. The FACS as we know it today was first published in 1978, but was substantially updated in 2002.

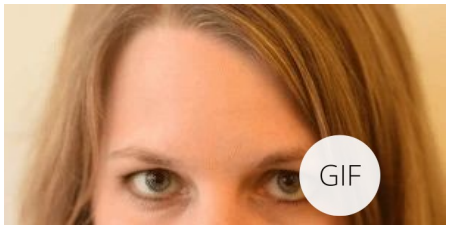
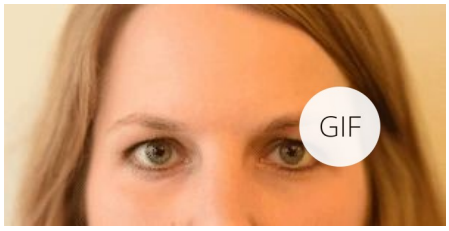
Using FACS, we are able to determine the displayed emotion of a participant.

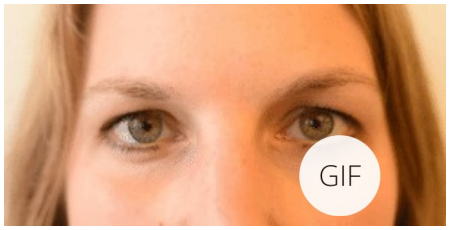
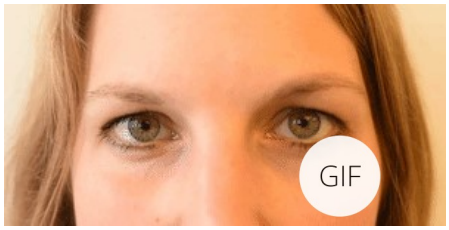
This is currently the only available technique for assessing emotions in real-time. Other measures, such as interviews and psychometric tests, must be completed after a stimulus has been presented. This delay ultimately adds another barrier to measuring how a participant truly feels in direct response to a stimulus.

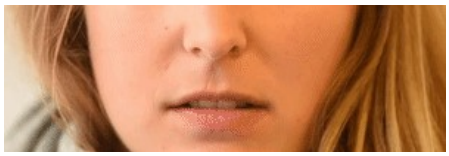
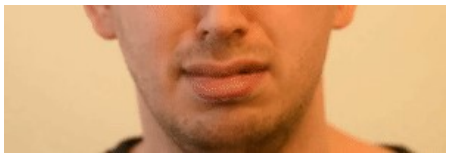
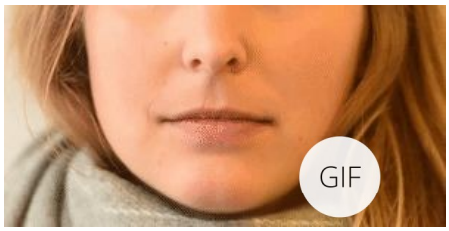
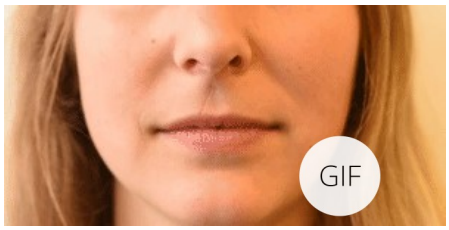
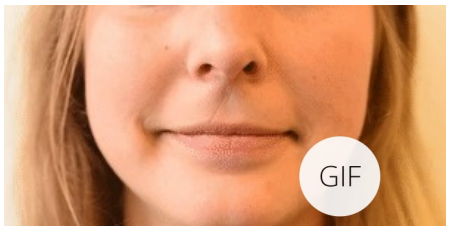
For a long time, and still in some cases today, researchers have been limited to manually coding video recordings of participants according to the action units described by the FACS. This is now much more likely to be carried out automatically, using software such as iMotions. This saves vast amounts of time and money, as scoring no longer requires analysis of each frame by a trained researcher – the software simply does the work for you.

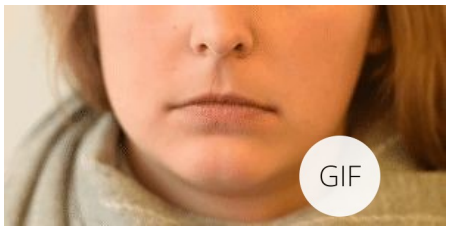
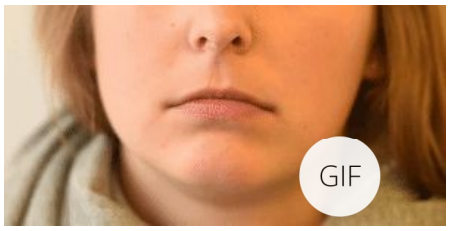
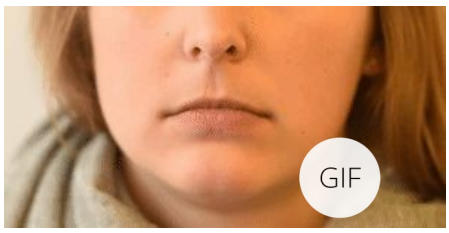
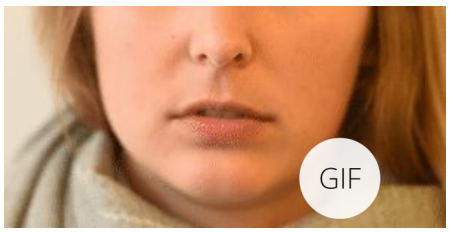
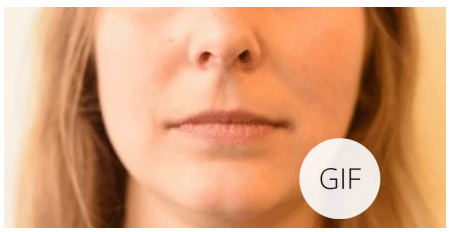
Below we have listed the major action units that are used to determine emotions. Roll your mouse over the image to start the movement! Below the action units we have also listed the combinations of action units that are determined as a specific emotion.

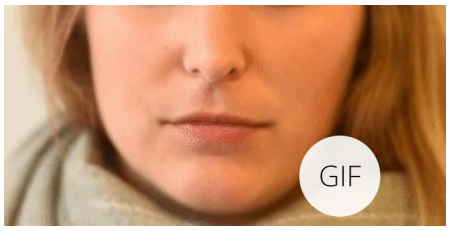
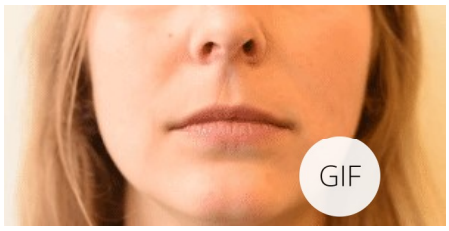
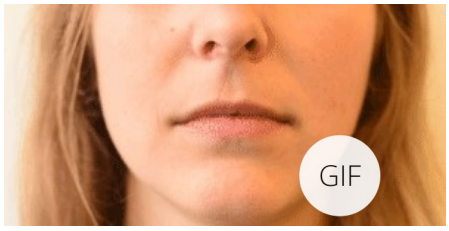
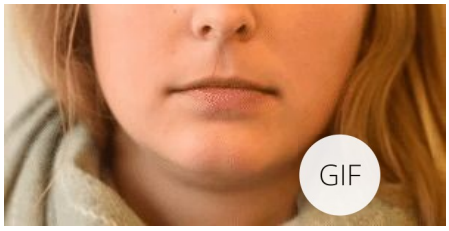
Main Action Units

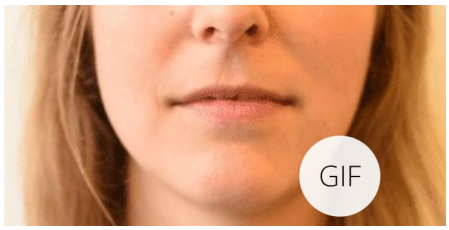
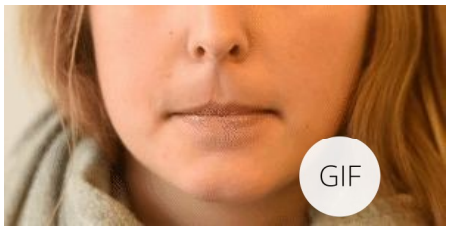
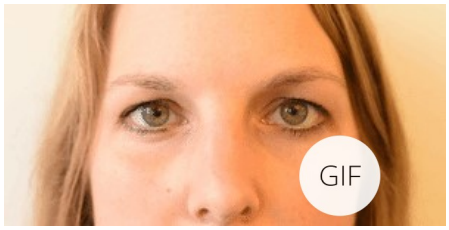
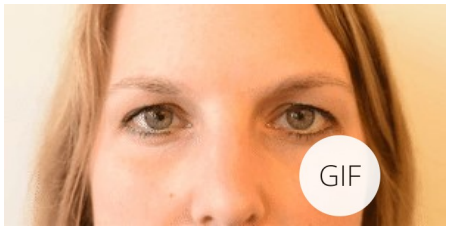
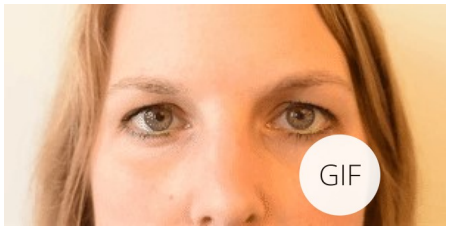
Action Unit	Description	Facial Muscle	Example (Hover to Play)
1	Inner Brow Raiser	*Frontalis, pars medialis*	
2	Outer Brow Raiser (unilateral, right side)	*Frontalis, pars lateralis*	

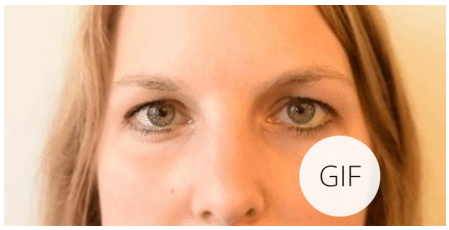
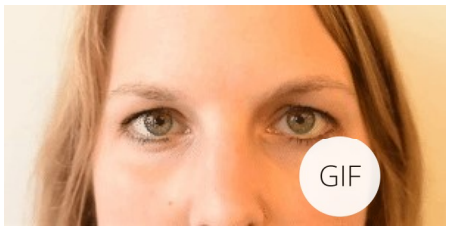
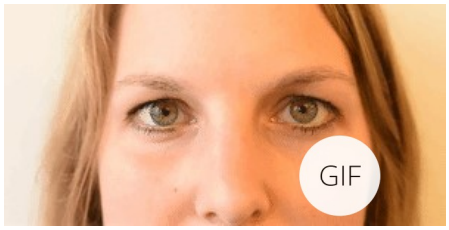
4	Brow Lowerer	*Depressor Glabellae, Depressor Supercilli, Currugator*	
5	Upper Lid Raiser	*Levator palpebrae superioris*	
6	Cheek Raiser	*Orbicularis oculi, pars orbitalis*	
7	Lid Tightener	*Orbicularis oculi, pars palpebralis*	
9 (also shows slight AU4	Nose Wrinkler	*Levator labii superioris alaquae nasi*	

and AU10)			
10 (also shows slight AU25)	Upper Lip Raiser	*Levator Labii Superioris, Caput infraorbitalis*	
11	Nasolabial Deepener	*Zygomatic Minor*	
12	Lip Corner Puller	*Zygomatic Major*	
13	Cheek Puffer	*Levator anguli oris (Caninus)*	
14	Dimpler	*Buccinator*	

15	Lip Corner Depressor	*Depressor anguli oris (Triangularis)*	
16 (with AU25)	Lower Lip Depressor	*Depressor labii inferioris*	
17	Chin Raiser	*Mentalis*	
18 (with slight AU22 and AU25)	Lip Puckerer	*Incisivii labii superioris* and *Incisivii labii inferioris*	
20	Lip stretcher	*Risorius*	

22 (with AU25)	Lip Funneler	*Orbicularis oris*	
23	Lip Tightener	*Orbicularis oris*	
24	Lip Pressor	*Orbicularis oris*	
25	Lips part	*Depressor Labii, Relaxation of Mentalis (AU17), Orbicularis Oris*	
26 (with AU25)	Jaw Drop	*Masetter; Temporal and Internal Pterygoid* relaxed	

27	Mouth Stretch	*Pterygoids, Digastric*	
28 (with AU26)	Lip Suck	*Orbicularis oris*	
41	Lid droop	Relaxation of *Levator Palpebrae Superioris*	
42	Slit	*Orbicularis oculi*	
43	Eyes Closed	Relaxation of *Levator Palpebrae Superioris*	

44	Squint	*Orbicularis oculi, pars palpebralis*	
45	Blink	Relaxation of *Levator Palpebrae and Contraction of Orbicularis Oculi, Pars Palpebralis.*	
46	Wink	*Levator palpebrae superioris; Orbicularis oculi, pars palpebralis*	

Head Movement Action Units

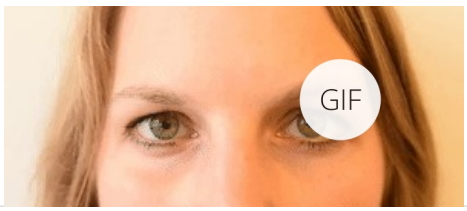
Action Unit	Description	Example (Hover to Play)
51	Head Turn Left	

52	Head Turn Right	
53	Head Up	
54	Head Down	

55	Head Tilt Left	
56	Head Tilt Right	
57	Head Forward	

58	Head Back	

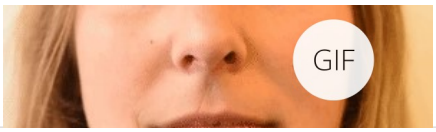
Eye Movement Action Units

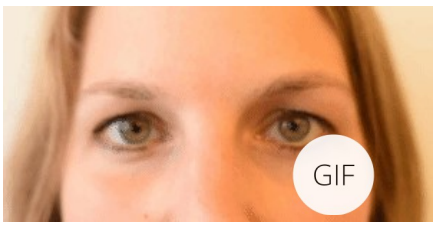
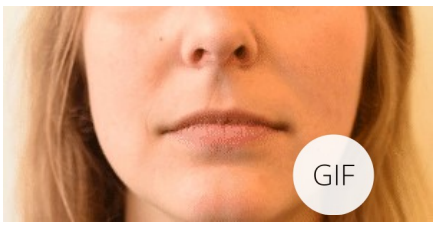
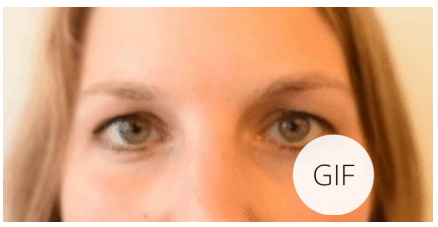
Action Unit	Description	Example (Hover to Play)
51	Eyes Turn Left	
51	Eyes Turn Right	
51	Eyes Up	

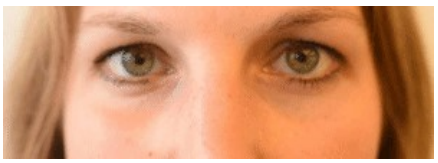
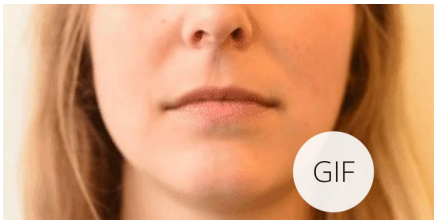
51	Eyes Down	

Emotions and Action Units

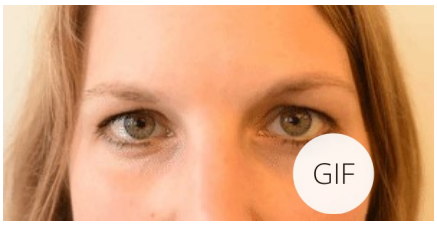
The Action Units described above show the different movements of facial muscles. Certain combined movements of these facial muscles pertain to a displayed emotion. Emotion recognition is completed in iMotions using Affectiva or Emotient, which uses the collection of certain action units to provide information about which emotion is being displayed. For example, happiness is calculated from the combination of action unit 6 (cheek raiser) and 12 (lip corner puller). A complete list of these combinations and the emotion that they relate to is shown below. The gifs on the right are shown in the same order that the action units listed.

Emotion	Action Units	Description	Examples (Hover to Play)
Happiness / Joy	6 + 12	Cheek Raiser, Lip Corner Puller	

Sadness	1 + 4 + 15	Inner Brow Raiser, Brow Lowerer, Lip Corner Depressor	 
Surprise	1 + 2 + 5 + 26	Inner Brow Raiser, Outer Brow Raiser, Upper Lid Raiser, Jaw Drop	

			 
Fear	1 + 2 + 4 + 5 + 7 + 20 + 26	Inner Brow Raiser, Outer Brow Raiser, Brow Lowerer, Upper Lid Raiser, Lid Tightener, Lip Stretcher, Jaw Drop	

GIF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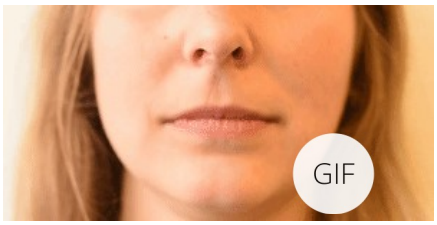
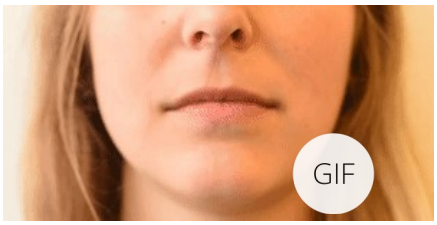
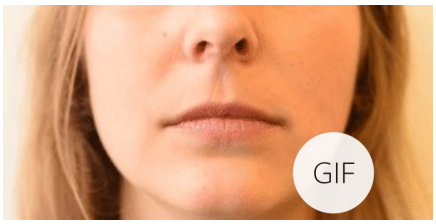
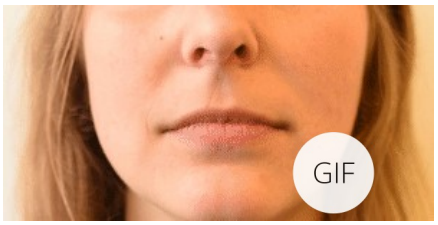
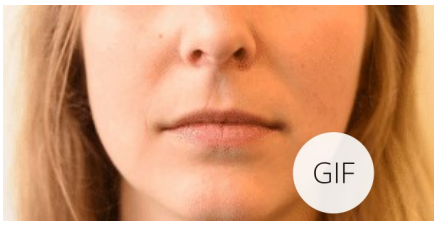
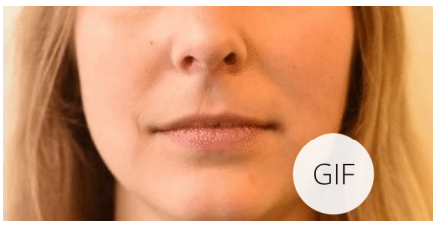
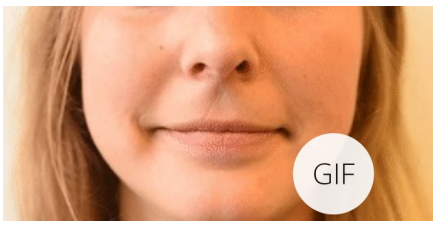

GIF


GIF

Anger	4 + 5 + 7 + 23	Brow Lowerer, Upper Lid Raiser, Lid Tightener, Lip Tightener	
Disgust	9 + 15 + 16	Nose Wrinkler, Lip Corner Depressor, Lower Lip Depressor	

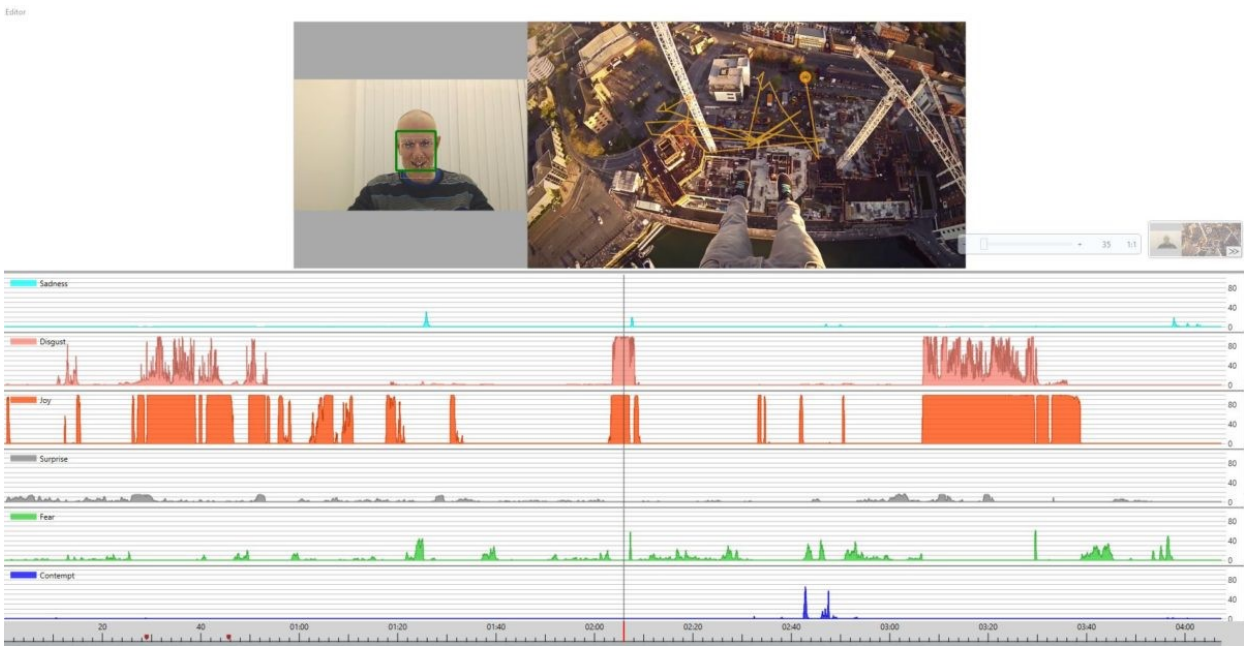
			 
Contempt	12 + 14 (on one side of the face)	Lip Corner Puller, Dimpler	 

Putting it all together

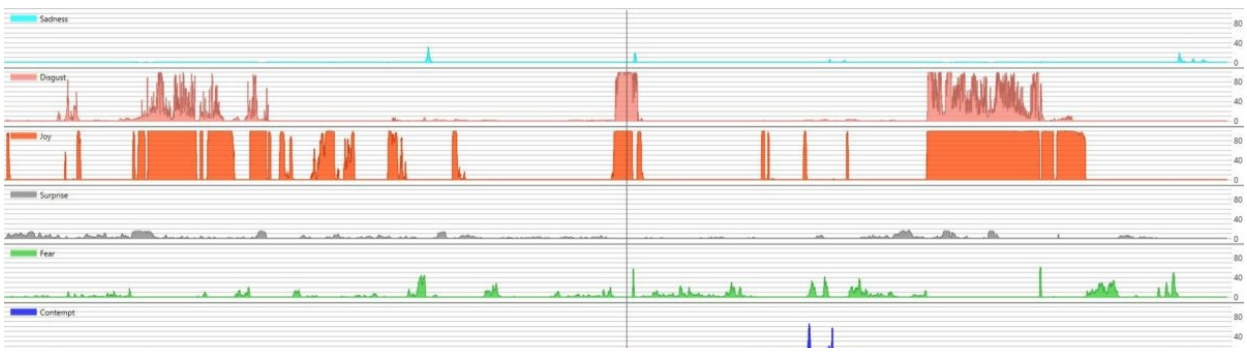
When measuring facial expressions within iMotions, the stimuli are paired automatically to the FACS analysis, allowing you to pinpoint the exact

moment that the stimulus triggered a certain emotion. The FACS is also graded on a scale of intensity, which gives a measure of how strongly the emotion is displayed. These measurements can also be synchronized with recordings of galvanic skin response, which provides a measure of arousal. With this information combined, it's possible to start drawing conclusions about how strongly an individual felt, and what those emotions consisted of, in response to a set stimulus.

The screenshot below shows how the facial expression data is displayed while a participant watches an advertisement.



If we zoom in, we can see the intensity of the displayed emotion. There are five emotions displayed in the image below, however iMotions provides a measure of the seven central emotions (shown in the table above), alongside, and in conjunction with measurements of action units.



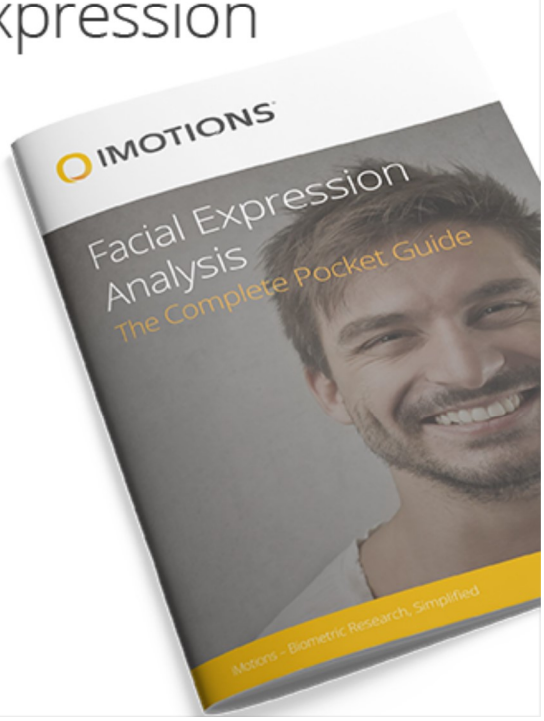
I hope this explanation of action units and FACS has been helpful, and informative. If you'd like to learn even more about facial expressions, then we also have a free pocket guide that you can download for free below!

Free 42-page Facial Expression Analysis Guide

for Beginners and Intermediates

- Get a thorough understanding of all aspects
- Valuable facial expression analysis research insights
- Learn how to take your research to the next level

DOWNLOAD FREE GUIDE



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