

Analyzing Personality through Social Media Profile Picture Choice

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Personality Guess

Can we predict personality using only Twitter profile pictures?



Personality

Five factor model common in psychology – ‘Big Five’

Each person varies in five traits, represented by a real value

This is usually assessed by completing a questionnaire

Personality Guess

Which personality trait are users with these real Twitter Profile pictures high in?



Personality Guess

Which personality trait are users with these real Twitter Profile pictures high in?



+ Extraversion



+ Conscientiousness

Personality Guess

Twitter profile pictures – an image the user considers representative for their online persona.

Personality prediction from standard photos is a relatively well studied problem in psychology (*Penton-Voak et al. 2006, Naumann et al. 2009*).

Humans are good at predicting some personality traits from a single photo (e.g., extraversion).

Research Questions

- 1. Can we automatically predict personality from profile picture choice?**

- 2. What are the distinctive features of profile photos for each personality trait?**

Research Questions

1. Can we automatically predict personality from profile picture choice?

Yes! (*Celli et al. 2014*), (*Al Moubayed et al. 2014*)

2. What are the distinctive features of profile photos for each personality trait?

Bag-of-Visual-Words or Deep learning are hardly interpretable

Use facial and attractiveness features

Data Set

- 66,502 Twitter users
- self-reported gender
- 104,500,740 tweets
- text predicted age
- text predicted personality

Survey personality is expensive to collect !

All results are controlled for age and gender.

Results are validated using a smaller data set that uses survey personality – see paper for details.

Types of Features

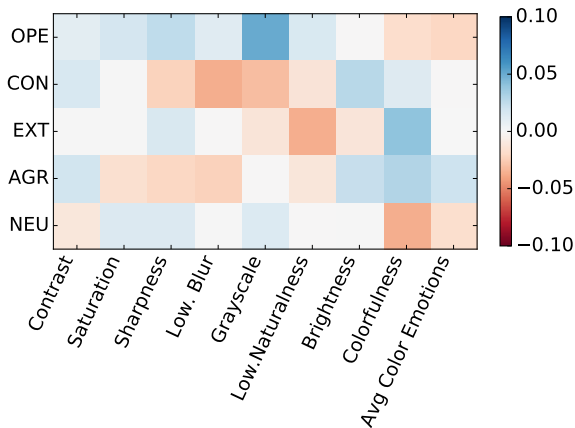
1. **Color**
2. Image Composition
3. **Type – Content**
4. Facial Demographics
5. Facial Presentation
6. **Facial Expression**

We will detail part of them – see paper for others.

Image Features - Color

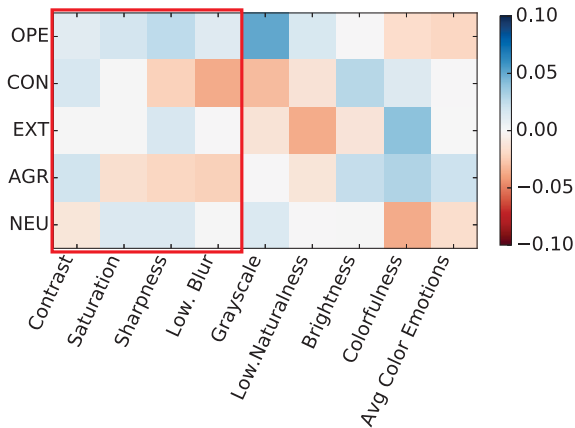
Contrast	
Saturation	High indicates vividness and chromatic purity – more appealing to the human eye
Sharpness	Measures coarseness or the degree of detail contained in an image, a proxy for the quality of the photographing gear
Blur	Low blur for higher quality images
Grayscale	If the image is in grayscale – Black/White photos are more artistic
Naturalness	The degree of correspondence between images and human perception
Brightness	
Colorfulness	The difference against gray
Color Emotions	Affective tone of colors, represented by 17 color histogram features
RGB Colors	
Hue	

Correlations



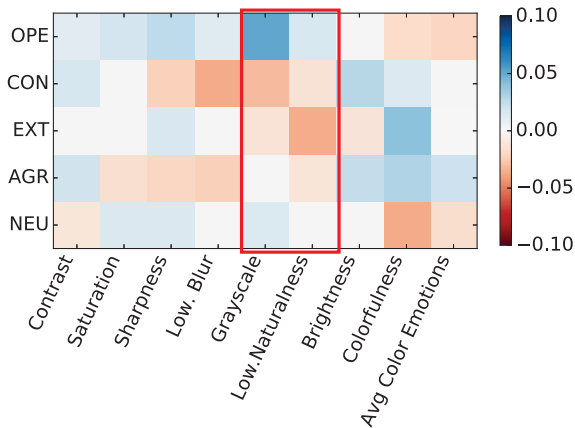
Pearson correlations between profile image and Big Five personality controlled for age and gender. Positive correlation is highlighted with blue and negative correlation with red.

Aesthetically Pleasing Images



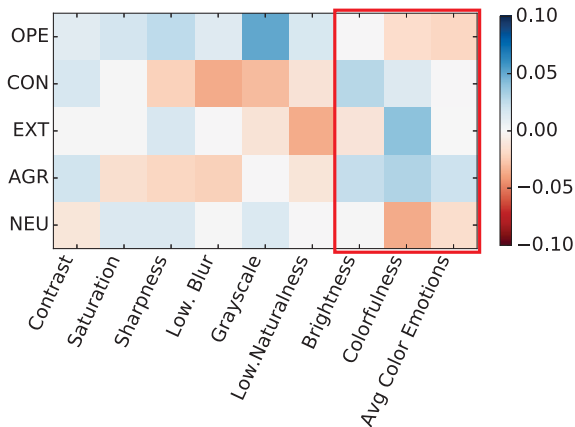
All correlated with **Ope**, anti-correlated with **Agr**, no clear patterns for others.

Artistic Images



Correlated with **Ope**, anti-correlated with **Con**, **Ext**, no pattern for **Neu**, **Agr**

Colors



Correlated with **Agr**, anti-correlated with **Ope** and **Neu**

Image Features - Type

Default Image the Twitter 'Egg'

Is Not Face

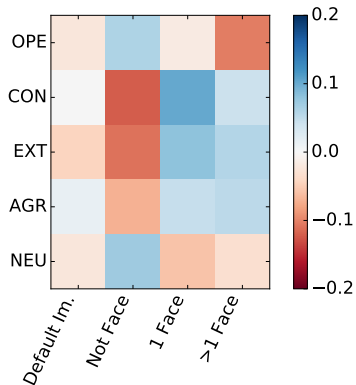
One Face

Detected using Face++ API

Multiple Faces

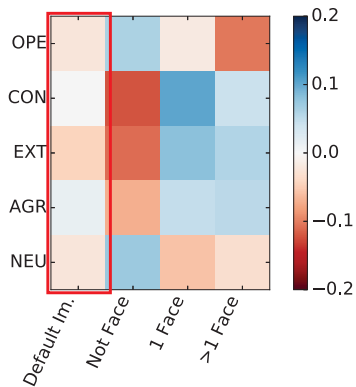
No. Faces

Correlations



Pearson correlations between profile image and Big Five personality controlled for age and gender. Positive correlation is highlighted with blue and negative correlation with red.

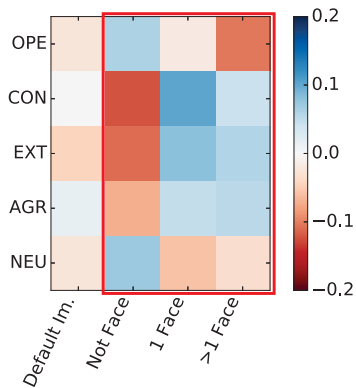
Default Image



Ope, Ext & Neu – not default picture

Con & Agr – no preference

Faces in Image



Ope & **Neu** – do not prefer faces.

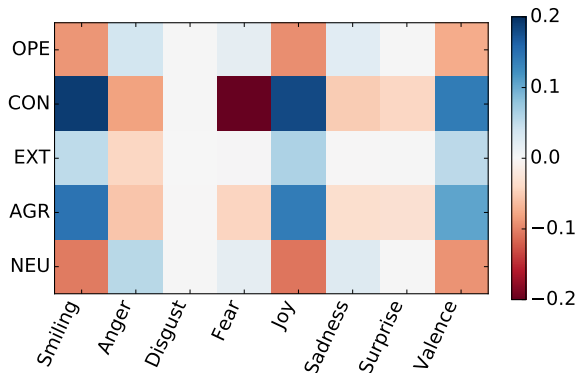
Con – prefers faces, especially a single one.

Ext & **Agr** – prefer faces, usually more than one.

Image Features - Facial Expression

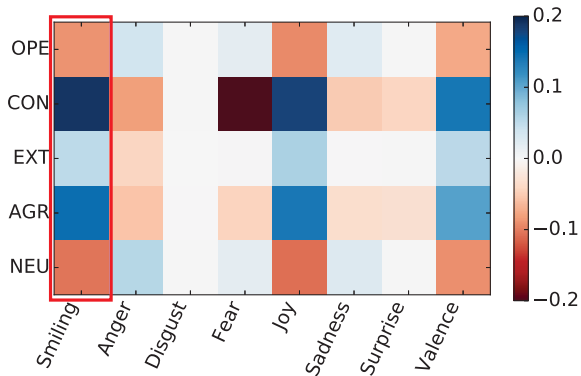
Smiling	Degree of smiling (Face++ API)
Anger	Ekman's model of six discrete emotions (EmoVu API)
Disgust	
Fear	
Joy	
Sadness	
Surprise	
Left Eye Openness	
Right Eye Openness	
Attention	
Expressiveness	
Neutral Expression	
Positive Mood	Maximum value of the positive emotions (joy, surprise)
Negative Mood	Maximum value of the negative emotions (anger, disgust, fear, sadness)
Valence	
The average of positive and negative mood	

Correlations



Pearson correlations between profile image and Big Five personality controlled for age and gender. Positive correlation is highlighted with blue and negative correlation with red.

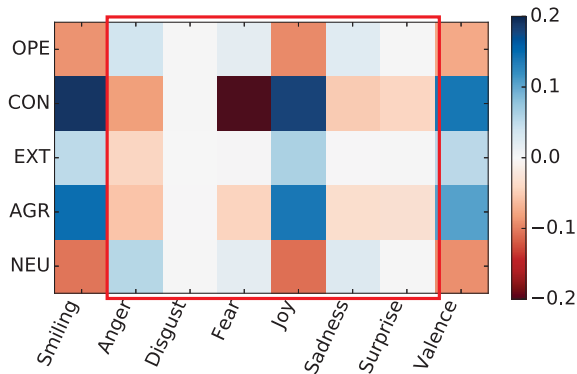
Smiling



Correlated with **Con & Ext & Agr**

Anti-correlated with **Ope & Neu**

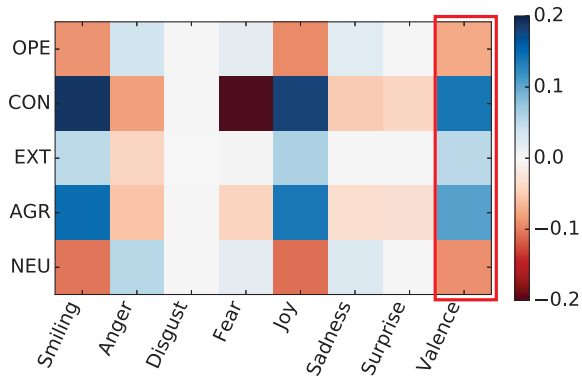
Emotions



Joy strongly correlated with **Con**, then with **Agr & Ext**.

Sadness and fear correlated with **Ope & Neu**, anti-correlated with **Con & Agr**

Valence



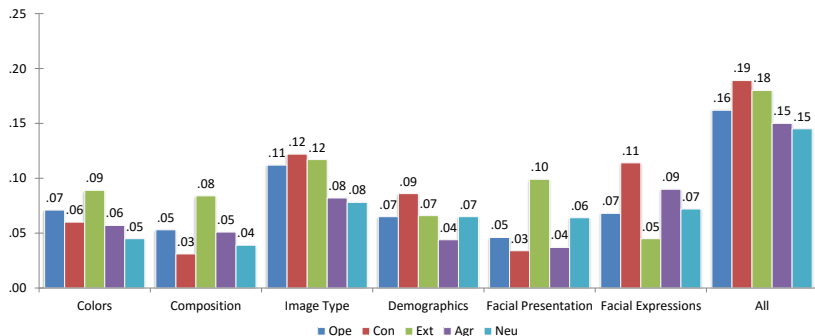
Con, then **Agr** and **Ext** – positive valence

Neu, then **Ope** – negative valence

Overview

Feature Group	Ope	Con	Ext	Agr	Neu
Aesthetically Pleasing	++			--	
Artistic	++		--	--	
Color Emotions	--	+	+	++	--
Faces	0	1	>1	>=1	0
Facial Emotions	--	+++	+	++	---

Predictive Performance



Predictive performance using Linear Regression, measured in Pearson correlation over 10-fold cross-validation. All correlations are significant ($p < .05$, two-tailed t-test).

Take Aways

1. Profile picture choice is influenced by personality
2. Interpretable computer vision features lead to significant prediction accuracy
3. Text predicted personality is a good stand-in for survey assessed personality and offers orders of magnitude statistical power

Thank You!

Thank you!
Questions?

Image Features - Composition

- Rule of Thirds
- Edge Distribution
- Hue Count
- Visual Weight
- Static Lines
- Dynamic Lines

Edge Distribution = Spatial distribution of the high frequency edges of an image

In good quality photos, the edges are focused on the subject

The number of unique hues of a photo is another measure of simplicity

Good compositions have fewer objects, resulting in fewer distinct hues (*Ke, Tang, and Jing 2006*).

Visual weight measures the clarity contrast between subject region and the whole image

The presence of lines in an image induces emotional effects (*Arnheim 2004*)

Correlations

Feature	Demographics		Personality Trait				
	Gender	Age	Ope	Con	Ext	Agr	Neu
Average Rule of Thirds	.036	.052	-.029	-.022	.038	.036	-.036
Edge Distribution	-.038	.016	.046			-.051	.039
Hue Count		.026	-.016				
Visual Weight				-.017			
Static Lines	.056				.018	.019	
Dynamic Lines	.044		-.024			.033	

Pearson correlations between profile image and Big Five personality controlled for age and gender and with age and gender (coded as 1 – female, 0 – male) separately. Positive correlation is highlighted with green (paler green $p < .01$, deeper green $p < .001$, two-tailed t-test) and negative correlation with red (paler red $p < .01$, deeper red $p < .001$, two-tailed t-test).

Interpretation

Again, aesthetically pleasing features are + with **Ope** and - with **Agr**, and to a lesser extent - with **Ext**.

The number of dynamic lines (indicative of emotional content) is -**Ope** and +**Agr**.

Image Features - Demographics

- Age
- Gender
- Race
 - Asian
 - Black
 - White

Detected using Face++ API

Correlations

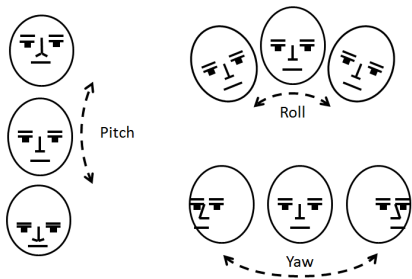
Feature	Demographics		Personality Trait				
	Gender	Age	Ope	Con	Ext	Agr	Neu
Image Demographics							
Age	-.310	.306	.050	.105	-.036		
Gender	.795	-.041			.035	.034	
Asian	.064	-.150	-.072	-.042			
Black	-.034	-.061	.047	.050	.085	-.055	-.096
White	-.033	.169	.031		-.066	.026	.071

Pearson correlations between profile image and Big Five personality controlled for age and gender and with age and gender (coded as 1 – female, 0 – male) separately. Positive correlation is highlighted with green (paler green $p < .01$, deeper green $p < .001$, two-tailed t-test) and negative correlation with red (paler red $p < .01$, deeper red $p < .001$, two-tailed t-test).

Image Features - Facial Presentation

Detected using Face++ API

- No Glasses
- Reading Glasses
- Sunglasses
- Pitch Angle
- Roll Angle
- Yaw Angle
- Face Ratio



Yaw – Usually predictive of selfies

Correlations

Feature	Demographics		Personality Trait				
	Gender	Age	Ope	Con	Ext	Agr	Neu
Facial Presentation							
No Glasses	.145	-.036		.027	.085	.026	-.065
Reading Glasses	-.141	.054	.020		-.099	-.017	.071
Sunglasses	-.034	-.020	-.017	-.028		-.019	
Pitch Angle	-.043						
Roll Angle	.017						
Yaw Angle							
Face Ratio	.034	.036	.038	-.039	-.097	-.039	.057

Pearson correlations between profile image and Big Five personality controlled for age and gender and with age and gender (coded as 1 – female, 0 – male) separately. Positive correlation is highlighted with green (paler green $p < .01$, deeper green $p < .001$, two-tailed t-test) and negative correlation with red (paler red $p < .01$, deeper red $p < .001$, two-tailed t-test).

Interpretation

Reading Glasses + **Neu** and - **Ext, Agr**

Sunglasses - **Con**

Face ratio + **Ope, Neu** and - **Con, Ext, Agr**

Combined with previous findings, **Ope & Neu** prefer no faces in picture, but when a face is present, this occupies a larger part of the photo.

Facial Expression Intercorrelation

Valence	0.61	0.05	0.1	0.04	0.69	-0.97	-0.1	0.03	-0.02	-0.02	0.06	0.97	0.15	0.7	1
Positive	0.75	-0.4	-0.31	-0.26	0.98	-0.61	-0.26	0.02	0.05	0.05	0.12	0.71	-0.6	1	0.7
Negative	-0.36	0.62	0.54	0.4	-0.59	-0.24	0.25	-0.01	-0.09	-0.09	-0.09	0.11	1	-0.6	0.15
Expressiveness	0.59	0.05	0.05	-0.02	0.7	-0.92	-0.1	-0.03	-0.02	-0.02	0.06	1	0.11	0.71	0.97
Attention	0.12	-0.08	0	-0.06	0.12	-0.05	-0.04	-0.02	-0.01	-0.01	1	0.06	-0.09	0.12	0.06
Right_Openness	-0.03	-0.01	-0.21	0.1	0.04	0.03	0	0.03	0.93	1	-0.01	-0.02	-0.09	0.05	-0.02
Left_Openness	-0.02	-0.02	-0.21	0.09	0.04	0.03	0	0.03	1	0.93	-0.01	-0.02	-0.09	0.05	-0.02
Surprise	-0.15	-0.05	-0.04	0.12	-0.17	-0.04	0	1	0.03	0.03	-0.02	-0.03	-0.01	0.02	0.03
Sadness	-0.24	0.01	-0.01	0.05	-0.25	0.02	1	0	0	0	-0.04	-0.1	0.25	-0.26	-0.1
Neutral	-0.54	-0.12	-0.17	-0.11	-0.59	1	0.02	-0.04	0.03	0.03	-0.05	-0.92	-0.24	-0.61	-0.97
Joy	0.77	-0.39	-0.3	-0.27	1	-0.59	-0.25	-0.17	0.04	0.04	0.12	0.7	-0.59	0.98	0.69
Fear	-0.18	-0.06	-0.05	1	-0.27	-0.11	0.05	0.12	0.09	0.1	-0.06	-0.02	0.4	-0.26	0.04
Disgust	-0.08	-0.02	1	-0.05	-0.3	-0.17	-0.01	-0.04	-0.21	-0.21	0	0.05	0.54	-0.31	0.1
Anger	-0.31	1	-0.02	-0.06	-0.39	-0.12	0.01	-0.05	-0.02	-0.01	-0.08	0.05	0.62	-0.4	0.05
Smiling	1	-0.31	-0.08	-0.18	0.77	-0.54	-0.24	-0.15	-0.02	-0.03	0.12	0.59	-0.36	0.75	0.61
	Smiling	Anger	Disgust	Fear	Joy	Neutral	Sadness	Surprise	Left_Openness	Right_Openness	Attention	Expressiveness	Negative	Positive	Valence

TwitterSurvey:

- 434 Twitter users
- survey personality
- self-reported gender
- self-reported age
- used for validation (no statistical power)

Data Set Validation

Neu	0.018	-0.318	-0.336	-0.314	1
Agr	0.024	0.26	0.088	1	-0.314
Ext	0.136	0.275	1	0.088	-0.336
Con	0.112	1	0.275	0.26	-0.318
Ope	1	0.112	0.136	0.024	0.018
	Ope	Con	Ext	Agr	Neu

TwitterSurvey Big 5 intercorrelations

Neu	0.037	-0.387	-0.273	-0.422	1
Agr	-0.016	0.353	0.151	1	-0.422
Ext	0.272	0.239	1	0.151	-0.273
Con	0.163	1	0.239	0.353	-0.387
Ope	1	0.163	0.272	-0.016	0.037
	Ope	Con	Ext	Agr	Neu

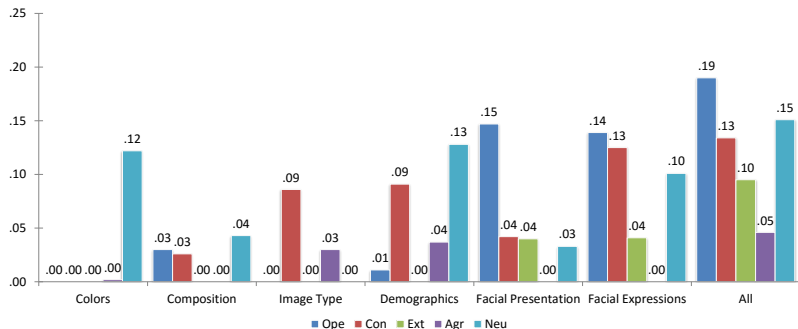
TwitterText Big 5 intercorrelations

Data Set Validation

Neu_S	0.003	-0.181	-0.098	-0.003	0.185
Agr_S	-0.014	0.115	0.034	0.147	-0.093
Ext_S	-0.067	0.045	0.187	-0.064	-0.112
Con_S	0.007	0.218	0.089	0.022	-0.111
Ope_S	0.193	-0.024	-0.036	-0.192	-0.05
	Ope_T	Con_T	Ext_T	Agr_T	Neu_T

Survey personality & Text-predicted personality correlations between on the TwitterSurvey dataset.

Predictive Performance



TwitterSurvey data set. Predictive performance using Linear Regression, measured in Pearson correlation over 10-fold cross-validation. All correlations > 0.95 are significant ($p < .05$, two-tailed t-test).

Overview - Openness

- artistic photos
- aesthetically pleasing
- low in color emotions
- less faces, especially more than one
- expressing more negative facial emotions
- less expressive, more neutral

Overview - Neuroticism

- neither artistic or not
- neither aesthetically pleasing or not
- low in color emotions
- less faces
- expressing strongest negative facial emotions
- less expressive, more neutral

Overview - Conscientiousness

- neither artistic or not
- neither aesthetically pleasing or not
- no relation with color emotions
- strongest preference for a single face
- expressing strongest positive facial emotions
- most expressive

Overview - Agreeableness

- photos are not artistic
- photos are not aesthetically pleasing
- most positive color emotions
- prefers faces
- expressing positive facial emotions

Overview - Extraversion

- photos are not artistic, but less than Agr
- photos are not aesthetically pleasing, but less than Agr
- positive color emotions
- prefers faces, especially multiple faces
- expressing positive facial emotions, less than Agr