Analyzing Personality through Social Media Profile Picture Choice

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Penn | World Well-Being Project

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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
Openness to Experience

+ Imaginative
  Creative
  Original
  Curious

- Down-to-earth
  Uncreative
  Conventional
  Uncurious
Conscientiousness

+
Conscientious
Hard-working
Well-organized
Punctual

-
Negligent
Lazy
Disorganized
Late

[Word cloud with positive and negative traits]

[Tags: Conscientiousness, Conscientious, Hard-working, Well-organized, Punctual, Negligent, Lazy, Disorganized, Late]
Extraversion

+
Joiner
Talkative
Active
Affectionate

-
Loner
Quiet
Passive
Reserved
Agreeableness

+

-+ Trusting
-+ Lenient
-+ Soft-hearted
-+ Good-natured

-

- Suspicious
- Critical
- Ruthless
- Irritable
<table>
<thead>
<tr>
<th>Neuroticism</th>
<th>Calm</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Worried</td>
<td>- Calm</td>
</tr>
<tr>
<td>+ Temperamental</td>
<td>- Even-tempered</td>
</tr>
<tr>
<td>+ Self-conscious</td>
<td>- Comfortable</td>
</tr>
<tr>
<td>+ Emotional</td>
<td>- Unemotional</td>
</tr>
</tbody>
</table>
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
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?
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

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contrast</strong></td>
<td></td>
</tr>
<tr>
<td>Saturation</td>
<td>High indicates vividness and chromatic purity – more appealing to the human eye</td>
</tr>
<tr>
<td>Sharpness</td>
<td>Measures coarseness or the degree of detail contained in an image, a proxy for the quality of the photographing gear</td>
</tr>
<tr>
<td><strong>Blur</strong></td>
<td>Low blur for higher quality images</td>
</tr>
<tr>
<td>Grayscale</td>
<td>If the image is in grayscale – Black/White photos are more artistic</td>
</tr>
<tr>
<td>Naturalness</td>
<td>The degree of correspondence between images and human perception</td>
</tr>
<tr>
<td><strong>Brightness</strong></td>
<td></td>
</tr>
<tr>
<td>Colorfulness</td>
<td>The difference against gray</td>
</tr>
<tr>
<td>Color Emotions</td>
<td>Affective tone of colors, represented by 17 color histogram features</td>
</tr>
<tr>
<td><strong>RGB Colors</strong></td>
<td></td>
</tr>
<tr>
<td>Hue</td>
<td></td>
</tr>
</tbody>
</table>
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**, largely 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**
<table>
<thead>
<tr>
<th>Default Image</th>
<th>the Twitter ‘Egg’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is Not Face</td>
<td></td>
</tr>
<tr>
<td>One Face</td>
<td>Detected using Face++ API</td>
</tr>
<tr>
<td>Multiple Faces</td>
<td></td>
</tr>
<tr>
<td>No. Faces</td>
<td></td>
</tr>
</tbody>
</table>
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**

Object, Ext & Neu – not default picture

Con & Agr – no preference
Ope & Neu – do not prefer faces.

Con & Ext – prefers faces, especially a single one.

Agr – prefer faces, usually more than one.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smiling</td>
<td>Degree of smiling (Face++ API)</td>
</tr>
<tr>
<td>Anger</td>
<td>Ekman’s model of six discrete emotions (EmoVu API)</td>
</tr>
<tr>
<td>Disgust</td>
<td></td>
</tr>
<tr>
<td>Fear</td>
<td></td>
</tr>
<tr>
<td>Joy</td>
<td></td>
</tr>
<tr>
<td>Sadness</td>
<td></td>
</tr>
<tr>
<td>Surprise</td>
<td></td>
</tr>
<tr>
<td>Left Eye Openness</td>
<td></td>
</tr>
<tr>
<td>Right Eye Openness</td>
<td></td>
</tr>
<tr>
<td>Attention</td>
<td></td>
</tr>
<tr>
<td>Expressiveness</td>
<td></td>
</tr>
<tr>
<td>Neutral Expression</td>
<td></td>
</tr>
<tr>
<td>Positive Mood</td>
<td>Maximum value of the positive emotions (joy, surprise)</td>
</tr>
<tr>
<td>Negative Mood</td>
<td>Maximum value of the negative emotions (anger, disgust, fear, sadness)</td>
</tr>
<tr>
<td>Valence</td>
<td>The average of positive and negative mood</td>
</tr>
</tbody>
</table>
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.
Correlated with \textbf{Con} \& \textbf{Ext} \& \textbf{Agr}

Anti-correlated with \textbf{Ope} \& \textbf{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

<table>
<thead>
<tr>
<th>Feature Group</th>
<th>Ope</th>
<th>Con</th>
<th>Ext</th>
<th>Agr</th>
<th>Neu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetically Pleasing</td>
<td>++</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Artistic</td>
<td>++</td>
<td>++</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Color Emotions</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>-</td>
</tr>
<tr>
<td>Faces</td>
<td>0</td>
<td>1</td>
<td>&gt;=1</td>
<td>&gt;=1</td>
<td>0</td>
</tr>
<tr>
<td>Facial Emotions</td>
<td>-</td>
<td>+++</td>
<td>+</td>
<td>++</td>
<td>-</td>
</tr>
</tbody>
</table>
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 larger datasets
Thank you!

Questions?