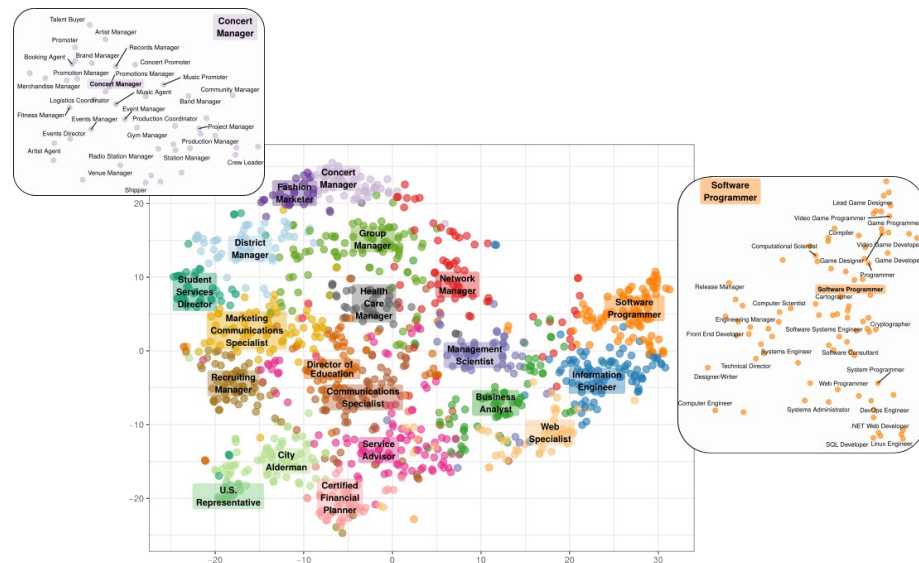




Behavioral
Data Science

UTS Data
Science



VocationCompass: Linking Social Media-Predicted Personality Traits and Ideal Jobs

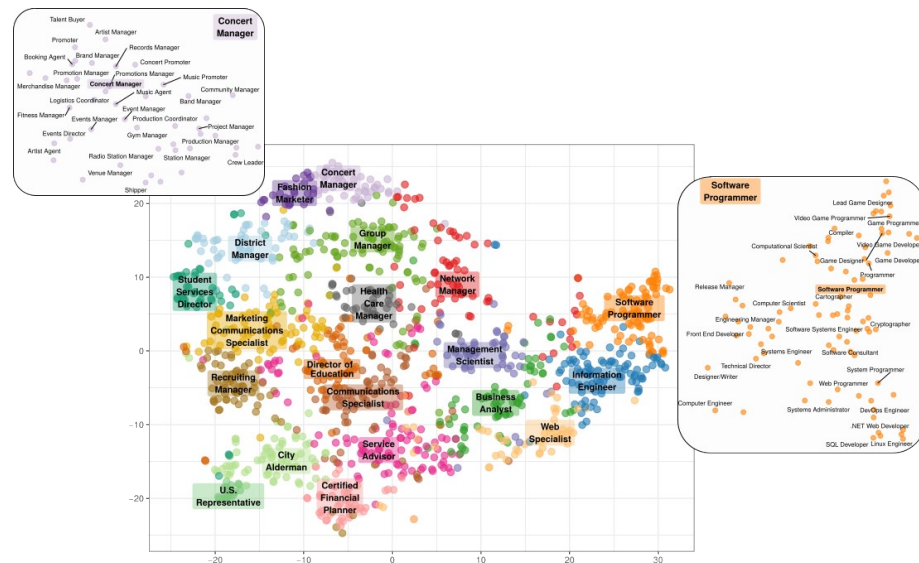
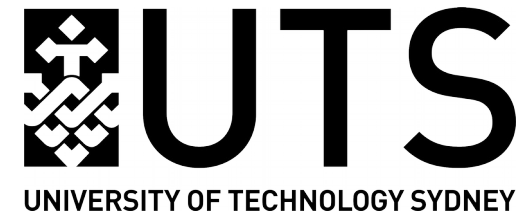
Marian-Andrei RizoIU





Behavioral
Data Science

UTS Data
Science



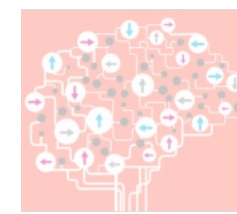
VocationCompass: Linking Social Media-Predicted Personality Traits and Ideal Jobs

A computer scientist's tale
about occupational psychology

Marian-Andrei RizoIU

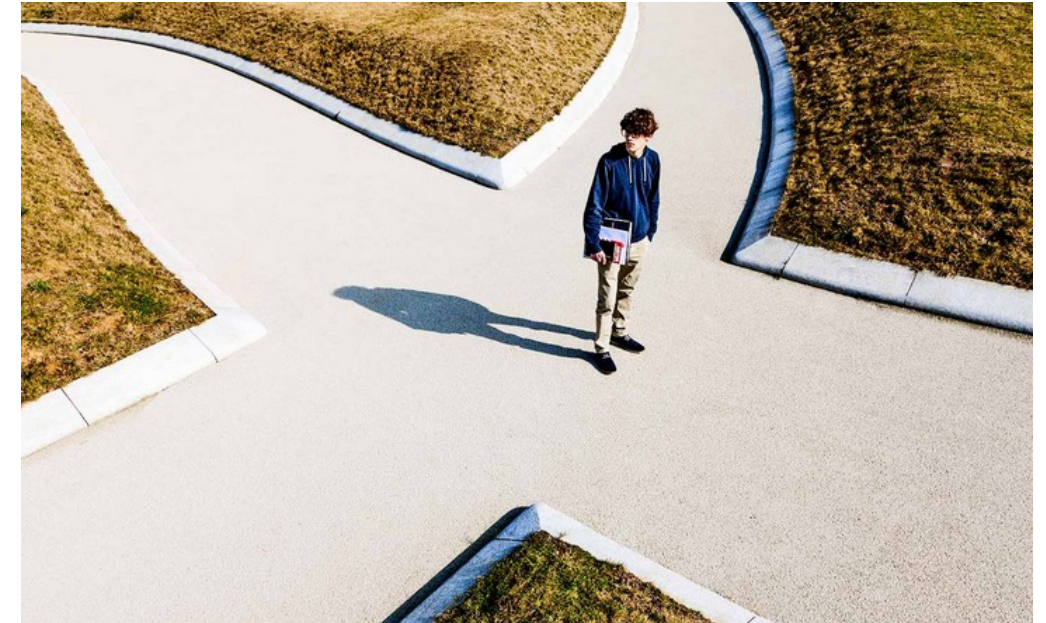


Motivation

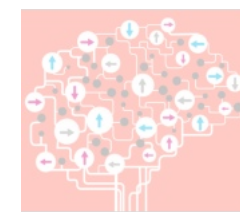


Behavioral
Data Science

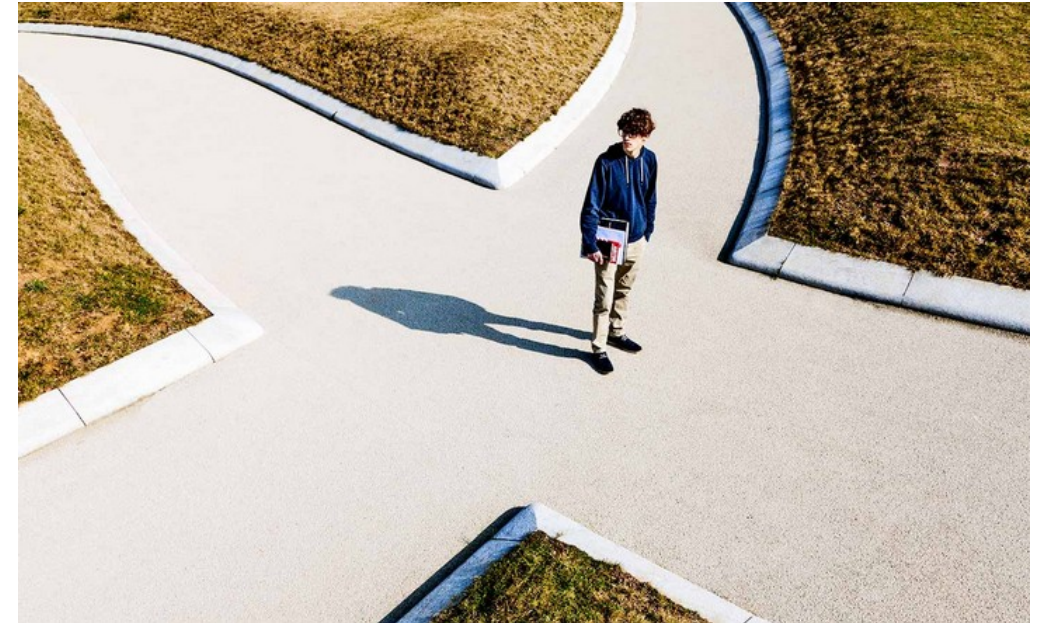
What do you want to be
when you grow up?



Motivation



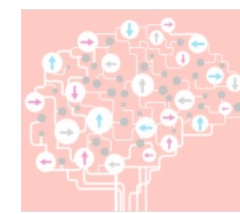
What do you want to be
when you grow up?



Quick employment facts:

- *the average person holds about 12 jobs in their lifetime*
- *one in three employees are underqualified*
- *one in four are overqualified.*
- *70%-80% of people feel disengaged at work*

Motivation



Research questions:

- Can we guide people towards “ideal” professions?
- Is there a connection between psychological traits and professions?
- Can this be achieved without lengthy surveys or aptitude tests?

Social media-predicted personality traits and values can help match people to their ideal jobs

Margaret L. Kern^{a,1}, Paul X. McCarthy^{b,c}, Deepanjan Chakrabarty^{b,c}, and Marian-Andrei Rizoiu^d

^aMelbourne Graduate School of Education, The University of Melbourne, Parkville, VIC 3010, Australia; ^bRibit.net, Data61, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Eveleigh, NSW 2015, Australia; ^cComputer Science and Engineering, University of New South Wales, Kensington, NSW 2052, Australia; and ^dFaculty of Engineering and Information Technology, The University of Technology Sydney, Ultimo NSW 2007, Australia

Edited by Susan T. Fiske, Princeton University, Princeton, NJ, and approved November 11, 2019 (received for review October 15, 2019)

Work is thought to be more enjoyable and beneficial to individuals and society when there is congruence between one's personality and one's occupation. We provide large-scale evidence that occupations have distinctive psychological profiles, which can successfully be predicted from linguistic information unobtrusively collected through social media. Based on 128,279 Twitter users representing 3,513 occupations, we automatically assess user personalities and visually map the personality profiles of different professions. Similar occupations cluster together, pointing to specific sets of jobs that one might be well suited for. Observations that contradict existing classifications may point to emerging occupations relevant to the 21st century workplace. Findings illustrate how social media can be used to match people to their ideal occupation.

personality | employment | linguistic analysis | social media | 21st century workplace

Imagine that you are a young adult looking for work. You want a job that not only pays the bills, but also one that you will succeed at and enjoy—after all, it will consume most of your waking hours. How do you find the right profession?

The US Bureau of Labor Statistics (1) classifies occupations into 867 categories, which encompass tens of thousands of specific job titles. Yet many occupations that will be needed in the coming decades do not yet exist, and many existing categories are becoming obsolete (2, 3). Organizations are increasingly concerned that employee skills are mismatched with industry requirements, with 1 in 3 people being underqualified and 1 in 4 overqualified for their current positions (4). Many employees also desire meaningful careers, such that their work contributes not only to their financial wellbeing but also to their psychological wellbeing (5). Yet only 20% to 30% of workers globally report feeling engaged in their work, and 18% of workers are actively disengaged (6).

Scholars and practitioners have long suggested that work is more likely to be enjoyable and beneficial to the individual and society when there is congruence between the person and the occupation (7, 8). Since the 1960s, psychologists have suggested that one's personality provides an important clue toward the occupations that one will succeed at (8). "Personality" refers to the biopsychosocial characteristics that distinguish a person

Distinctive personality profiles appear across a range of occupations (12, 13). A study of 8,458 employed individuals found that individuals who held a job that fitted their personality were more likely to earn up to 10% greater income (14). Studies also find that the Big 5 predict meaningful life outcomes, including physical and mental health, longevity, social relationships, health-related behaviors, antisocial behavior, and social contribution, at levels on par with intelligence and socioeconomic status (15–17). Values are closely tied to the self, express motivational goals, and distally impact behavior (18).

As people engage with social media, they leave behind digital fingerprints—behavioral traces of their personality—which can be detected at a large scale (19–22). Linguistic analyses of social media information have been used to predict an array of outcomes, including age, gender, political orientation, physical and mental illness, and unemployment (22–25). However, associations between these factors and career success across a broad range of occupations are unknown.

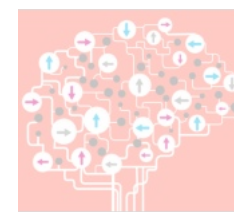
Here, we present a 21st century approach for matching one's personality with congruent occupations by applying machine-learning approaches to linguistic information publicly available through online social media (i.e., Twitter), based on 128,279 users representing 3,513 occupations.

Matching Personality Digital Fingerprints with Occupations

As a proof of concept, we first used a select set of occupations among a small number of users to test whether different personality digital fingerprints—based on Big 5 scores derived from linguistic information available from Twitter—could be linked

Significance

Employment is thought to be more enjoyable and beneficial to individuals and society when there is alignment between the person and the occupation, but a key question is how to best match people with the right profession. The information that people broadcast online through social media provides insights into who they are, which we show can be used to match people and occupations. Findings have implications for career guidance for new graduates, disengaged employees, career changers, and the unemployed.



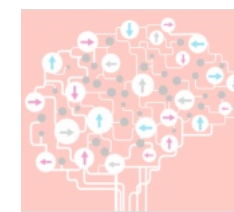
**Bloomberg
Businessweek**

Strategies

The Best Way to Change Your Job Is to Focus on Your Personality

Skills and experience aren't the only things that matter.

12 februarie 2020, 22:00 GMT+11



Behavioral Data Science

**nature
index**

Scientists are curious and passionate and ready to argue

12 February 2020

Catherine Armitage

**BUSINESS
INSIDER**

No need to take a career quiz — a new study suggests social media can help find the best job match for your personality

Business Insider, 28 Jan 2020

BBC NEWS

How your Twitter feed could help find your dream job

BBC News, 27 Jan 2020

THE CONVERSATION

Robot career advisor: AI may soon be able to analyse your tweets to match you to a job

The Conversation, 17 Dec 2019

GIZMODO

News story from Gizmodo Australia on Wednesday 18 December 2019

Gizmodo Australia, 18 Dec 2019

ScienceDaily
Your source for the latest research news

Unveiling a new map that reveals the hidden personalities of jobs

Science Daily, 16 Dec 2019

It's been long been believed that different personalities align better with different jobs.

ForeignAffairs
global open source intelligence

MIL-Evening Report: Robot career advisor: AI may soon be able to analyse your tweets...

Foreign Affairs New Zealand, 18 Dec 2019

MailOnline

News story from Daily Mail on Monday 16 December 2019

Daily Mail, 16 Dec 2019



? About this Attention Score

In the top 5% of all research outputs scored by Altmetric

High Attention Score compared to outputs of the same age (99th percentile)

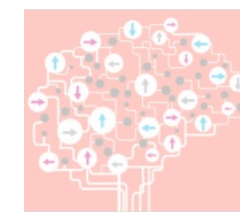
High Attention Score compared to outputs of the same age and source (94th percentile)

LESS...

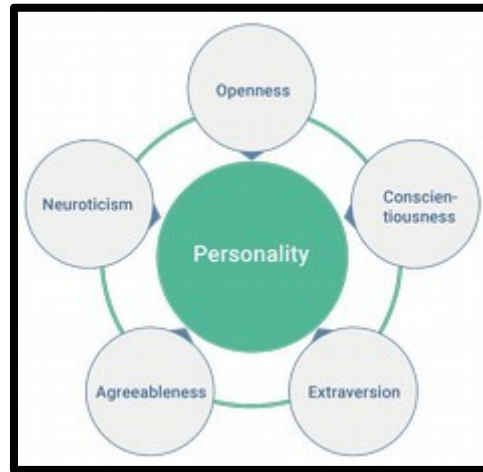
Mentioned by

- 18 news outlets
- 2 blogs
- 298 tweeters
- 1 Facebook page
- 11 Redditors

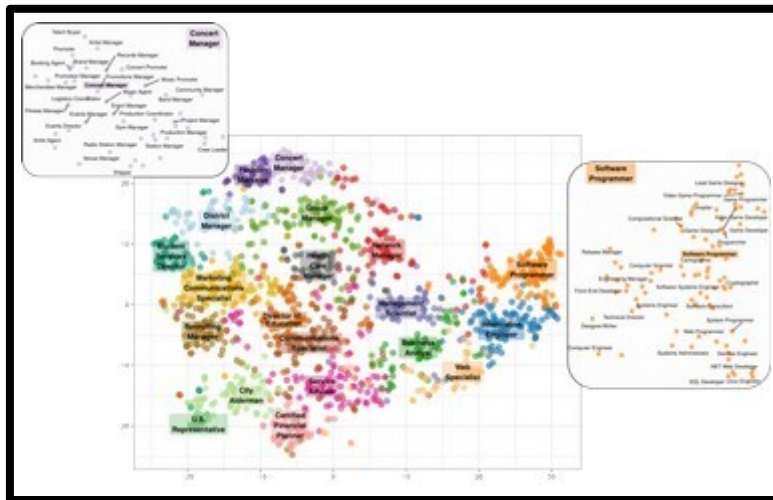
Presentation outline



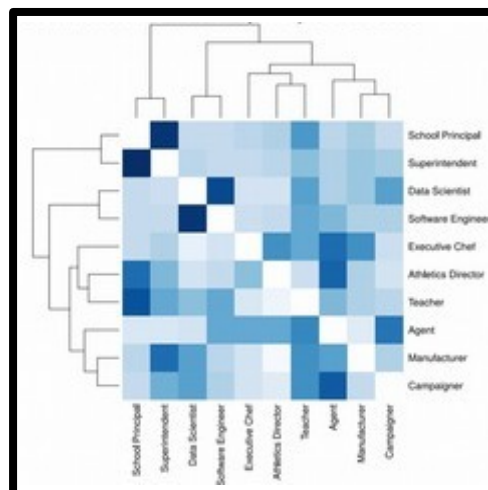
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Data Science



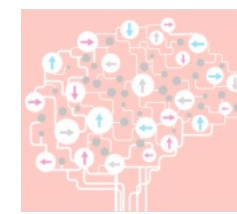
Profiling personality traits using social media data



Personality profiles for occupations



Predicting user professions based on personality traits



Yet another “Myers-Briggs” test?

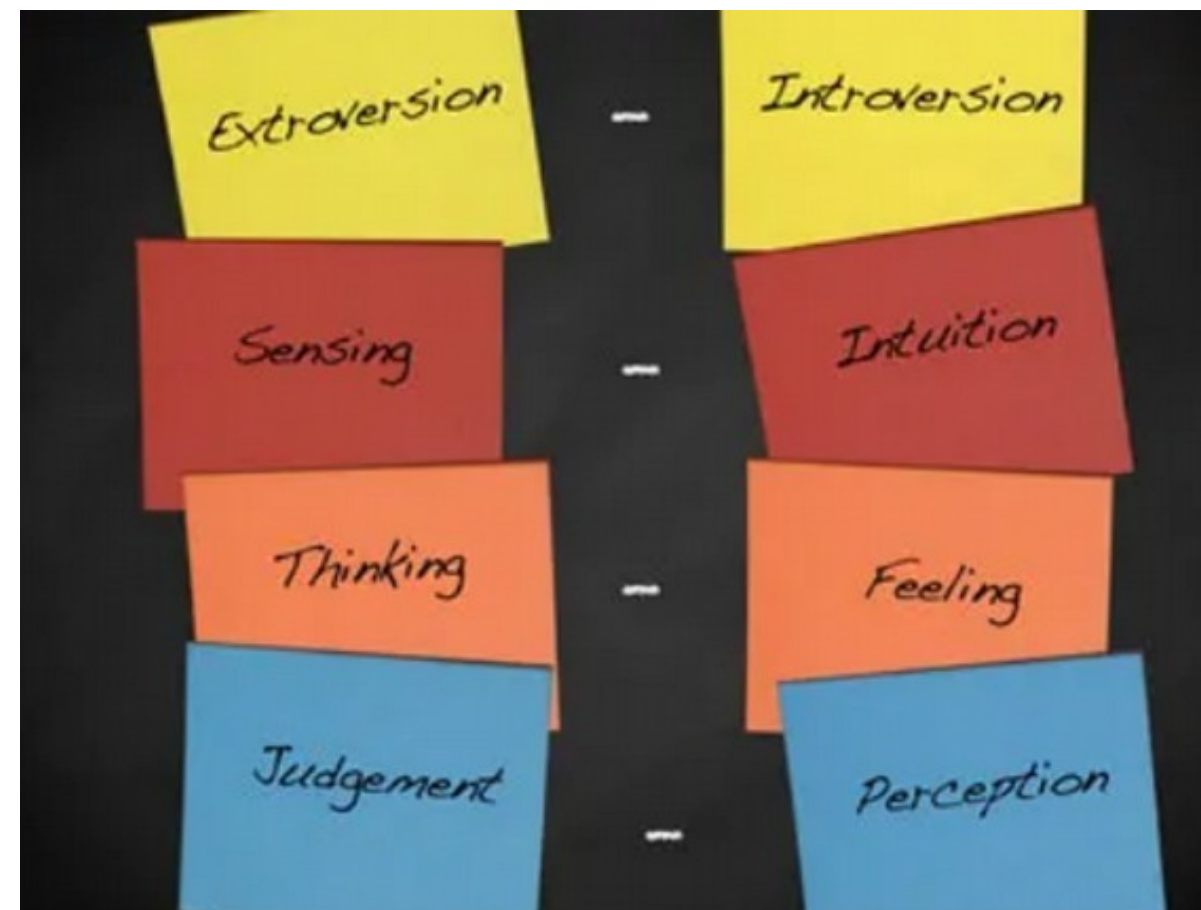
Proposed by two American women during the second world war, Katharine Briggs and Isabel Myers.

Based on the theory of Carl Young

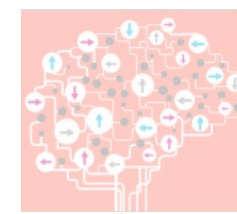
Wildly used in employment surveys and aptitude tests

Main difficulties:

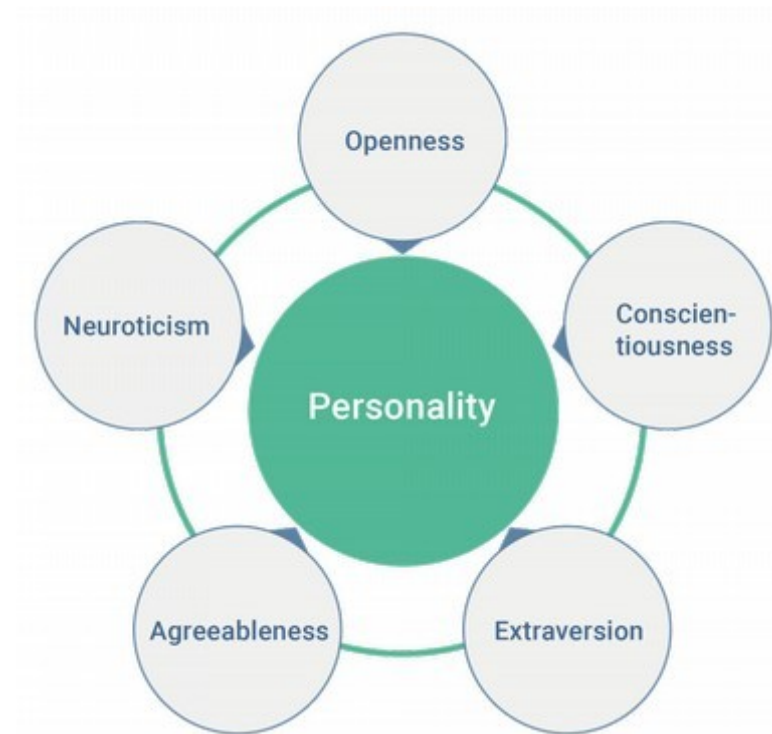
- Pseudo-science
- Unrepresentative scale
- Lengthy questionnaires



Personality scales



Behavioral
Data Science



The Big Five personality traits

[John & Srivastava, 1999]

who we are as a people

Openness

adventure, unusual ideas, imagination, curiosity, and variety of experience.

Conscientiousness

self-discipline, act dutifully, and strive for achievement against measures and expectations.

Extraversion

Breadth of activities (as opposed to depth), pronounced engagement with the external world.

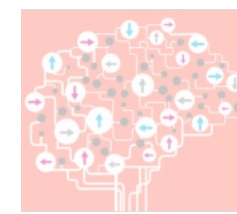
Agreeableness

Getting along with others, and are concerned with social harmony, considerate, kind, generous.

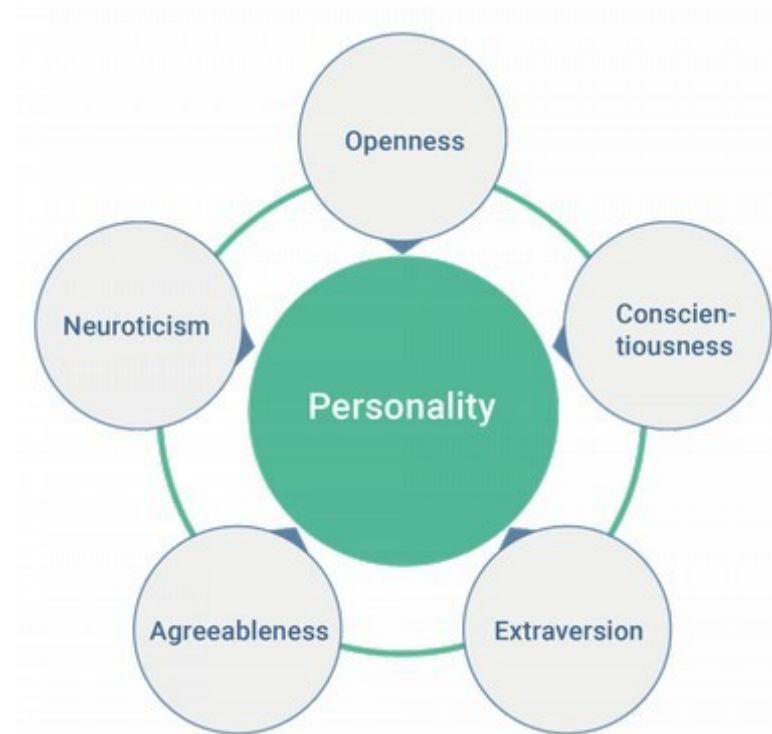
Neuroticism

Tendency to experience negative emotions, anger, anxiety, depression, low tolerance for stress or aversive stimuli.

Personality scales



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The Big Five personality traits

[John & Srivastava, 1999]

who we are as a people

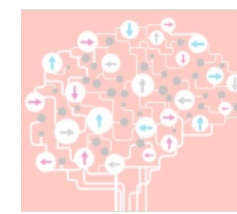


The Schwartz basic values

[S. H. Schwartz, 2012]

what we truly care about in life

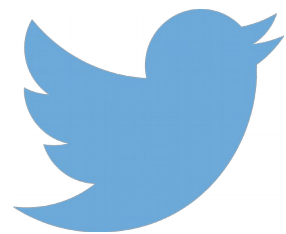
Inferring personality traits from social media (1)



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Data collection methodology

- 15,000 job titles from the US Bureau of Labor Statistics (O*Net)
- 1.5M users that self-identify the jobs title in their profile
- for each user – collect the last 200 emitted tweets

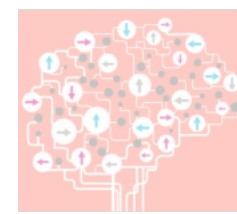


Dataset stats:

- #occupations: 3,513
- #users: 128,279



Inferring personality traits from social media (2)



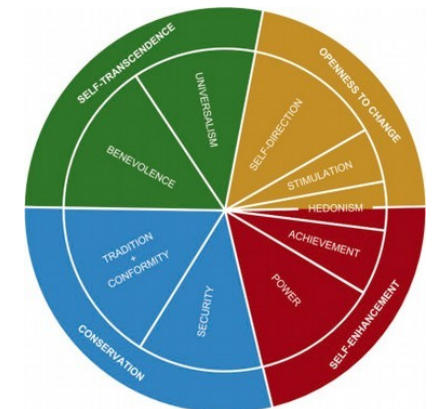
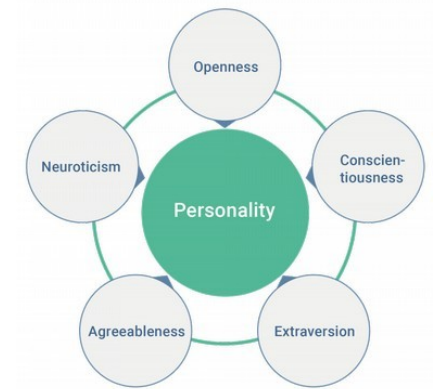
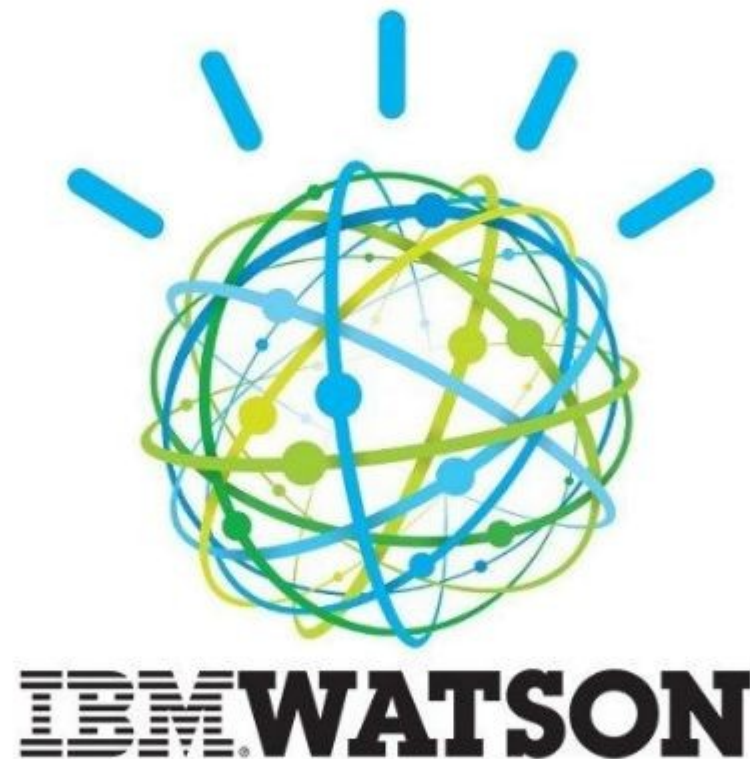
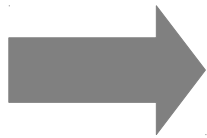
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▪
▪
▪



128k users



Commercial service

Deep Learning NLP, trained on English Tweets

Error rates (compared to surveys):

12% for the Big 5,

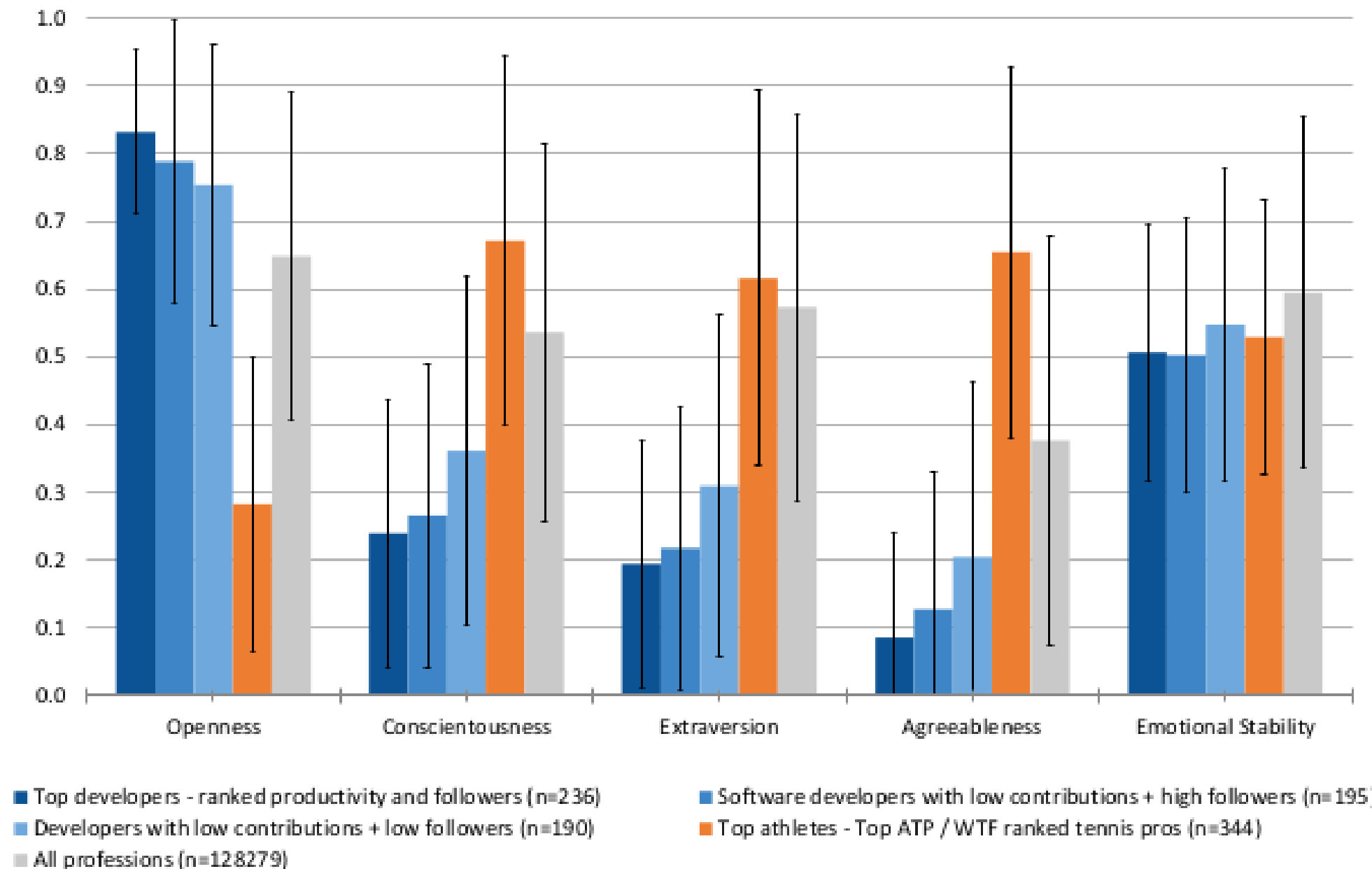
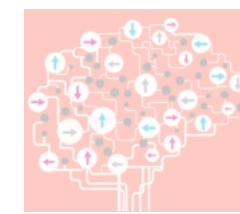
11% for the basic values.



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Detecting differences between occupations

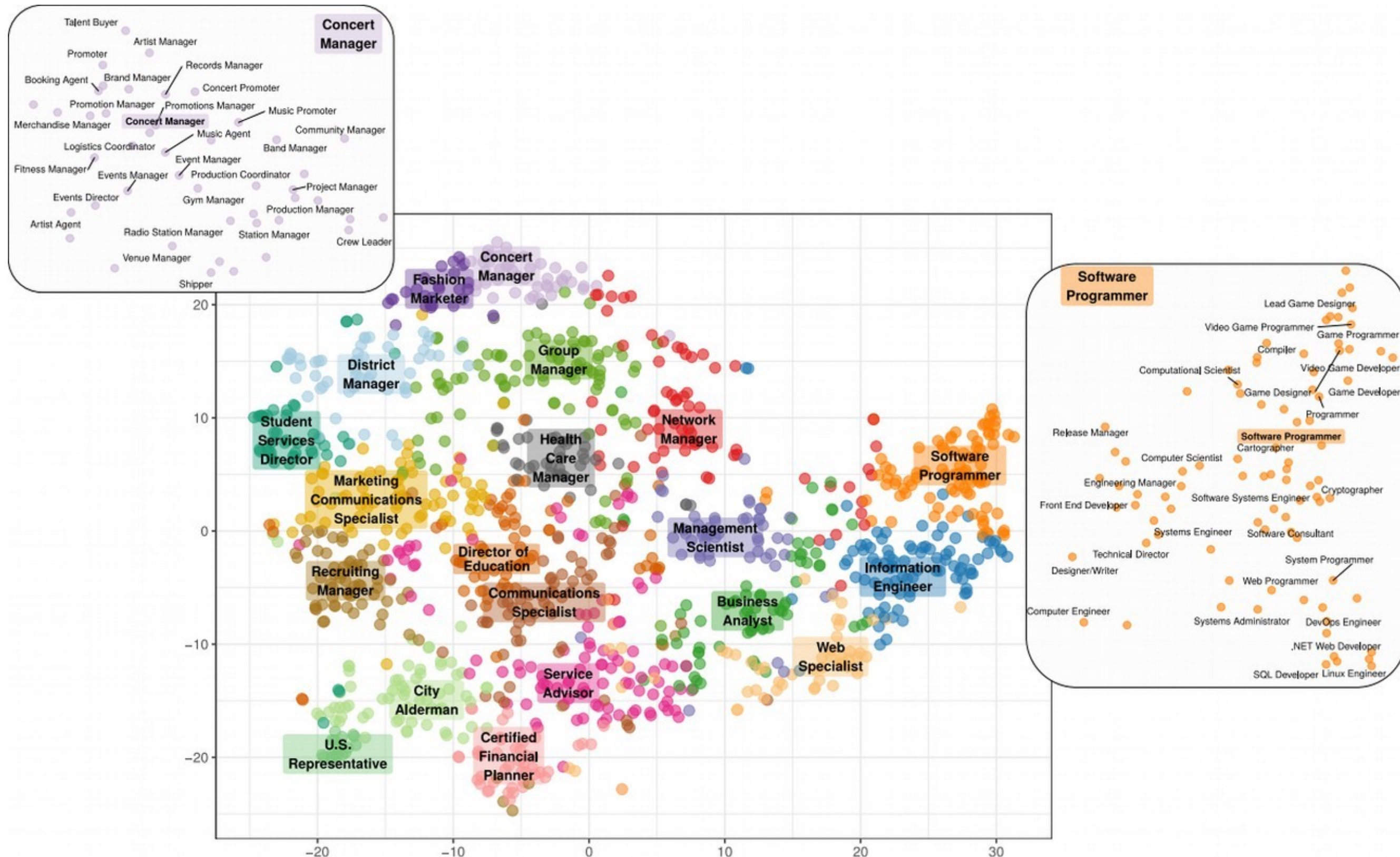


GitHub devs and ATP tennis players have opposite profiles on four dimensions. GitHub devs – more open, but less agreeable; tennis players – more conscientious and more extravert.

The Vocation Map

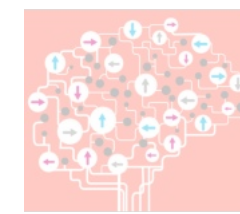


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1227 professions with at least 50 users each (101,152 users);
profession profiles – 10-dim vector, median of user values

Case study: science and technology professions



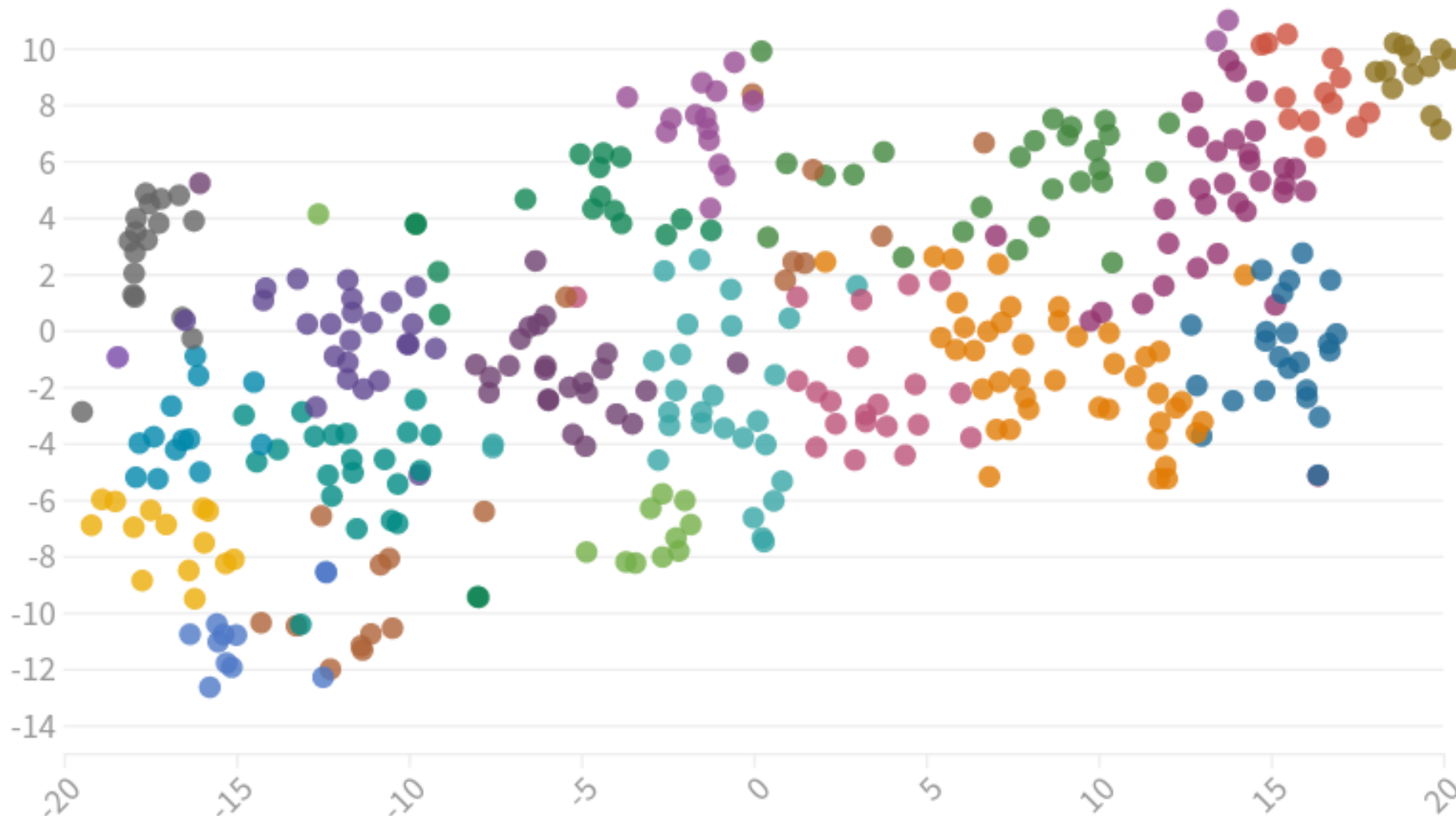
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nature
index

Scientists are curious and passionate and
ready to argue

12 February 2020

Catherine Armitage



Hand-curated scientific
and technical
occupations

+ Top Github devs
+ Science stars
+ Leading chemistry
researchers
+ Top ATP tennis
players

● PHP Developer ● Group Manager ● Intelligence Analyst ● Software Systems Engineer ● Web Specialist ● Information Engineer
● Service Director ● Research and Development Director ● Information Technology Manager ● Software Engineer ● Senior Scientist
● Internet Marketing Strategist ● Web Content Manager ● Manager of IT ● Voice Engineer ● Systems Engineer ● IT Specialist
● Marketing Communications Specialist ● Senior Game Designer ● Policy Officer

Case study: science and technology professions

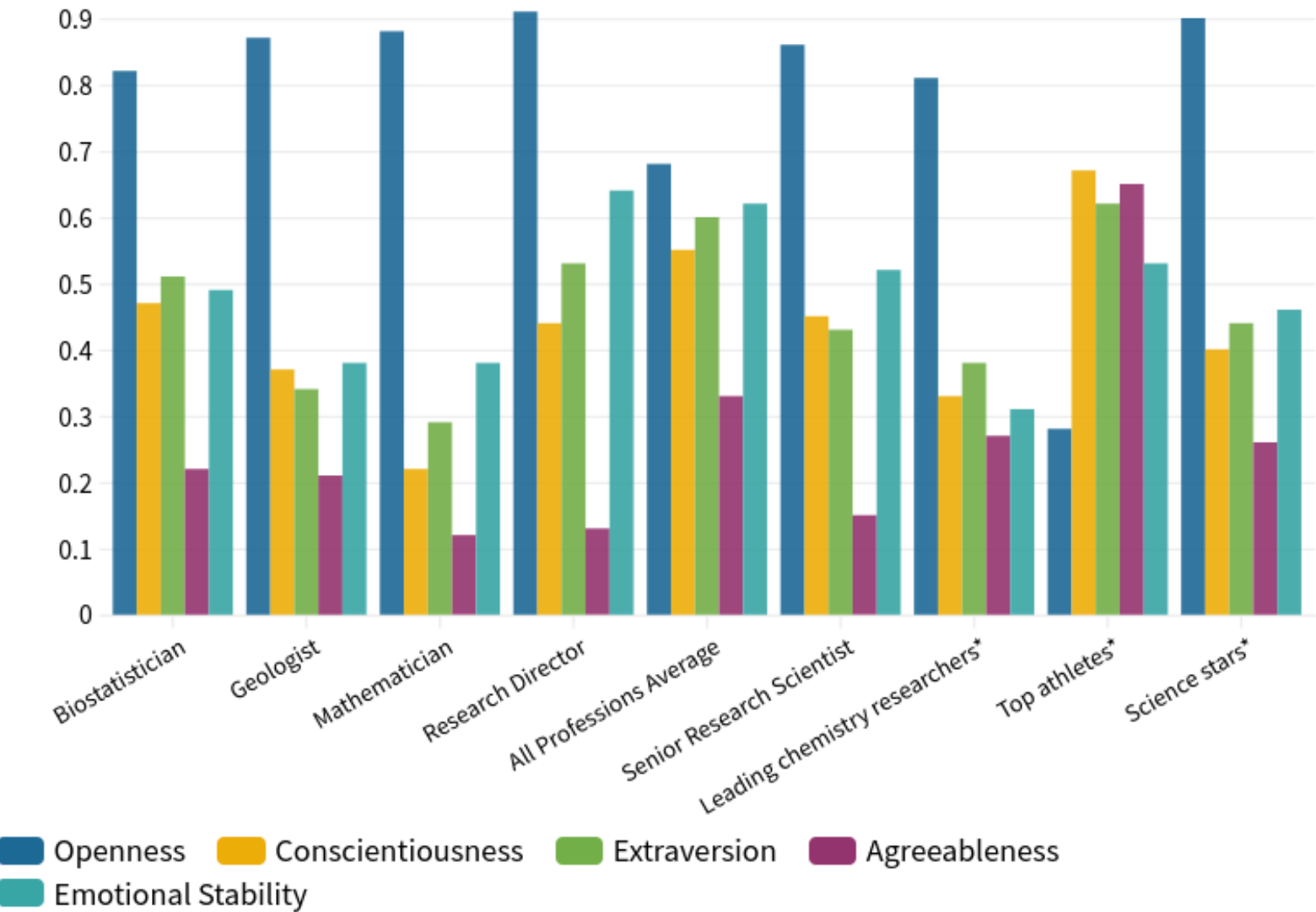


Scientists are curious and passionate and ready to argue

12 February 2020
Catherine Armitage



Behavioral Data Science



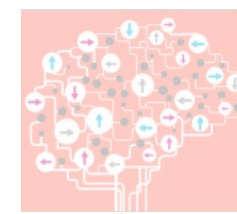
Mathematicians & geologists (abstract things) – more open^

Life scientists (bio-statisticians, horticulturalists) – more extroverted and agreeable^

^ according to



Presentation outline



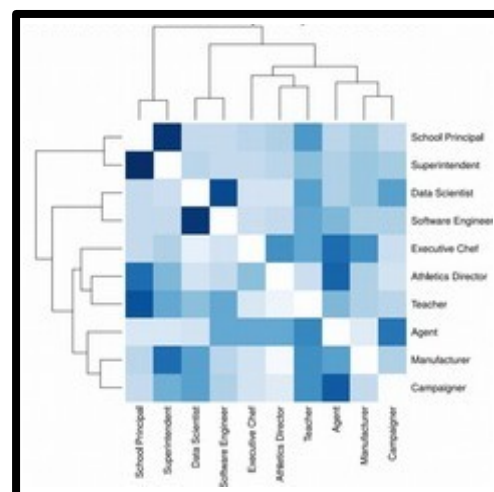
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Profiling personality traits using social media data

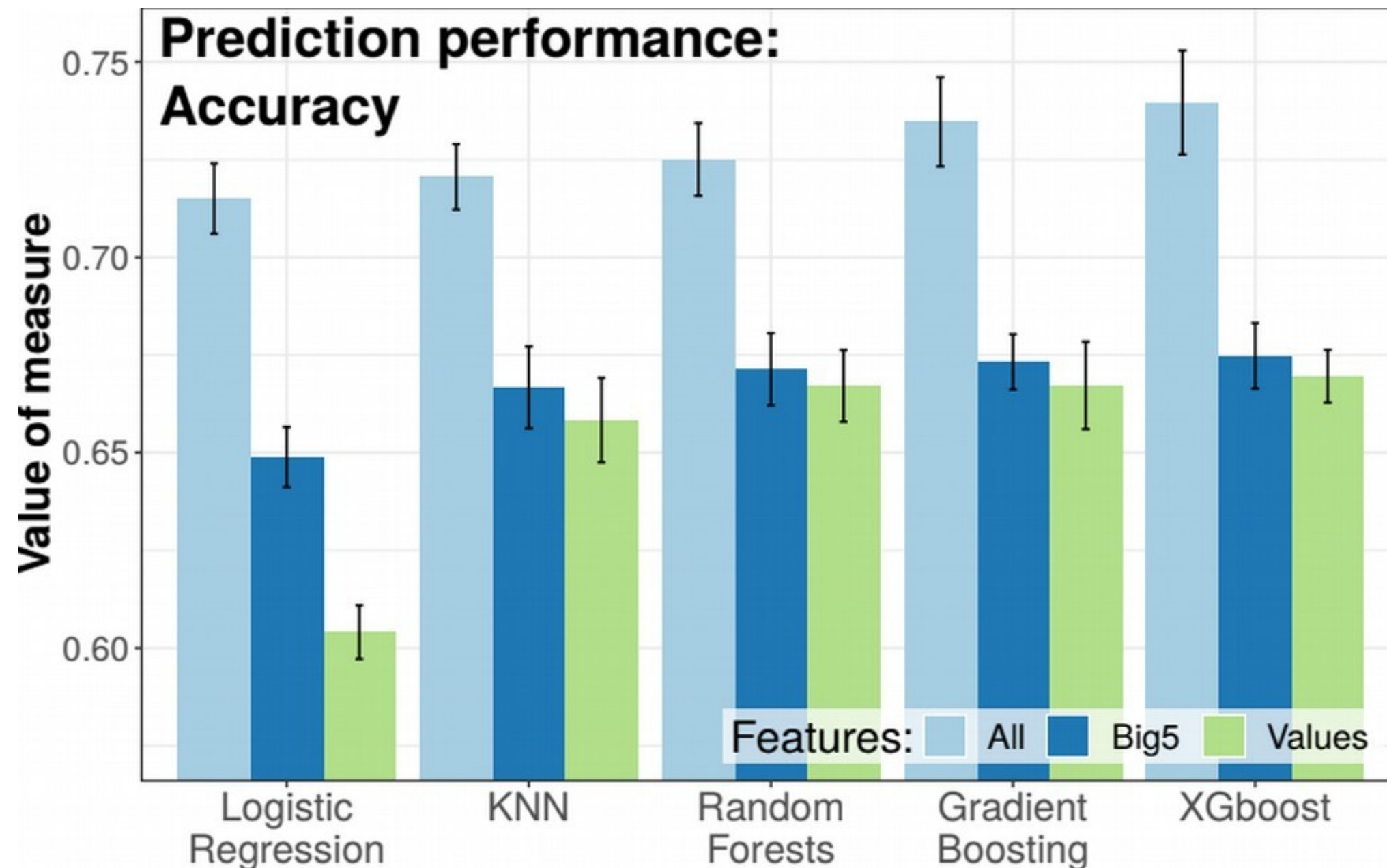
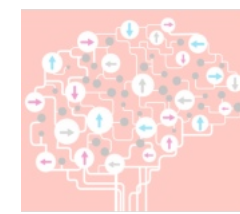


Personality profiles for occupations



Predicting user professions based on personality traits

Predicting the occupations of users

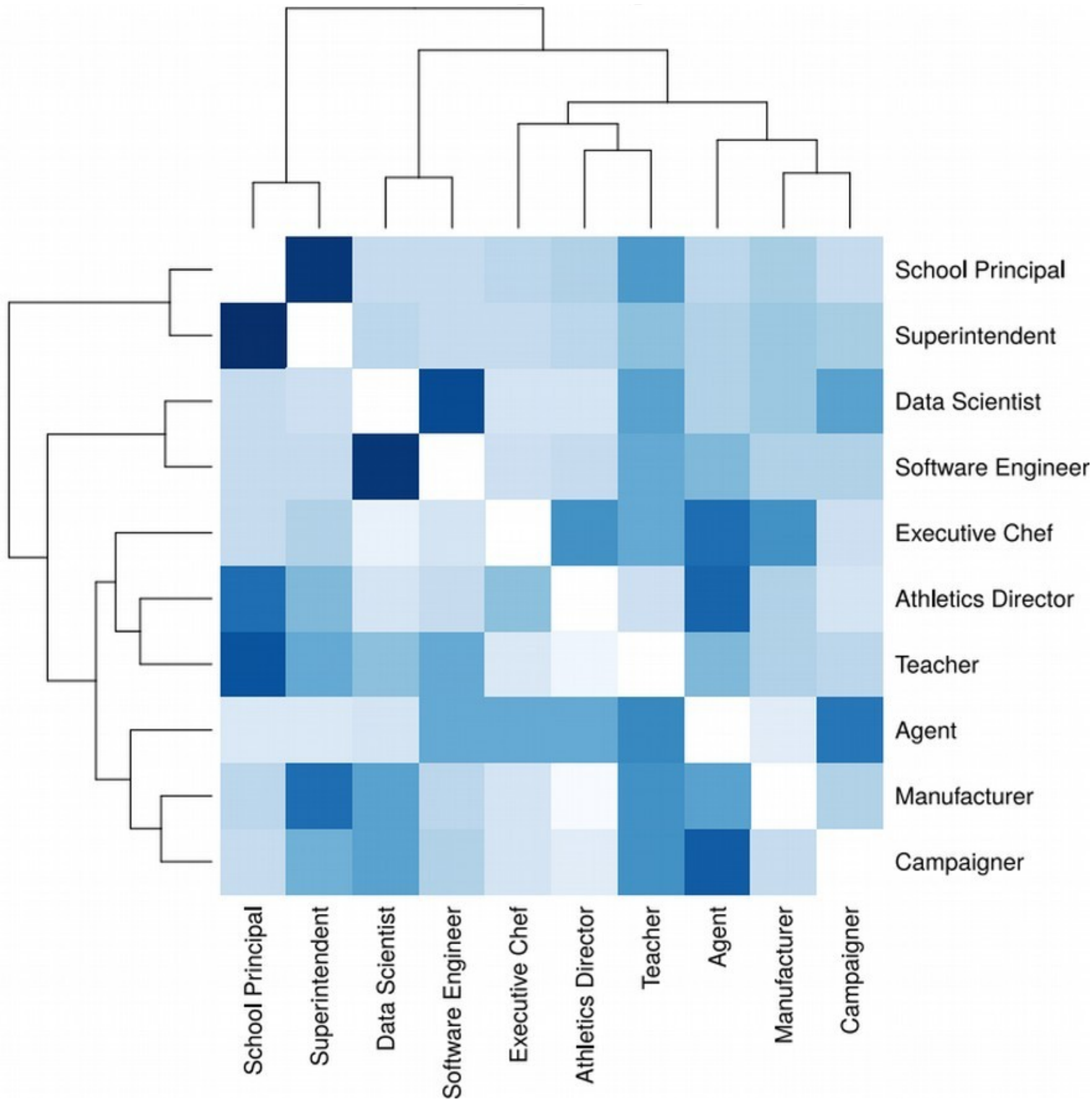


10 occupations with more than 950 users.

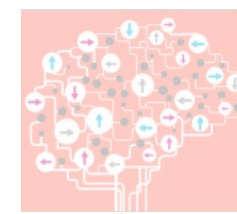
73% prediction accuracy (baseline 10%); 10-CV.

Big5 and values are complementary.

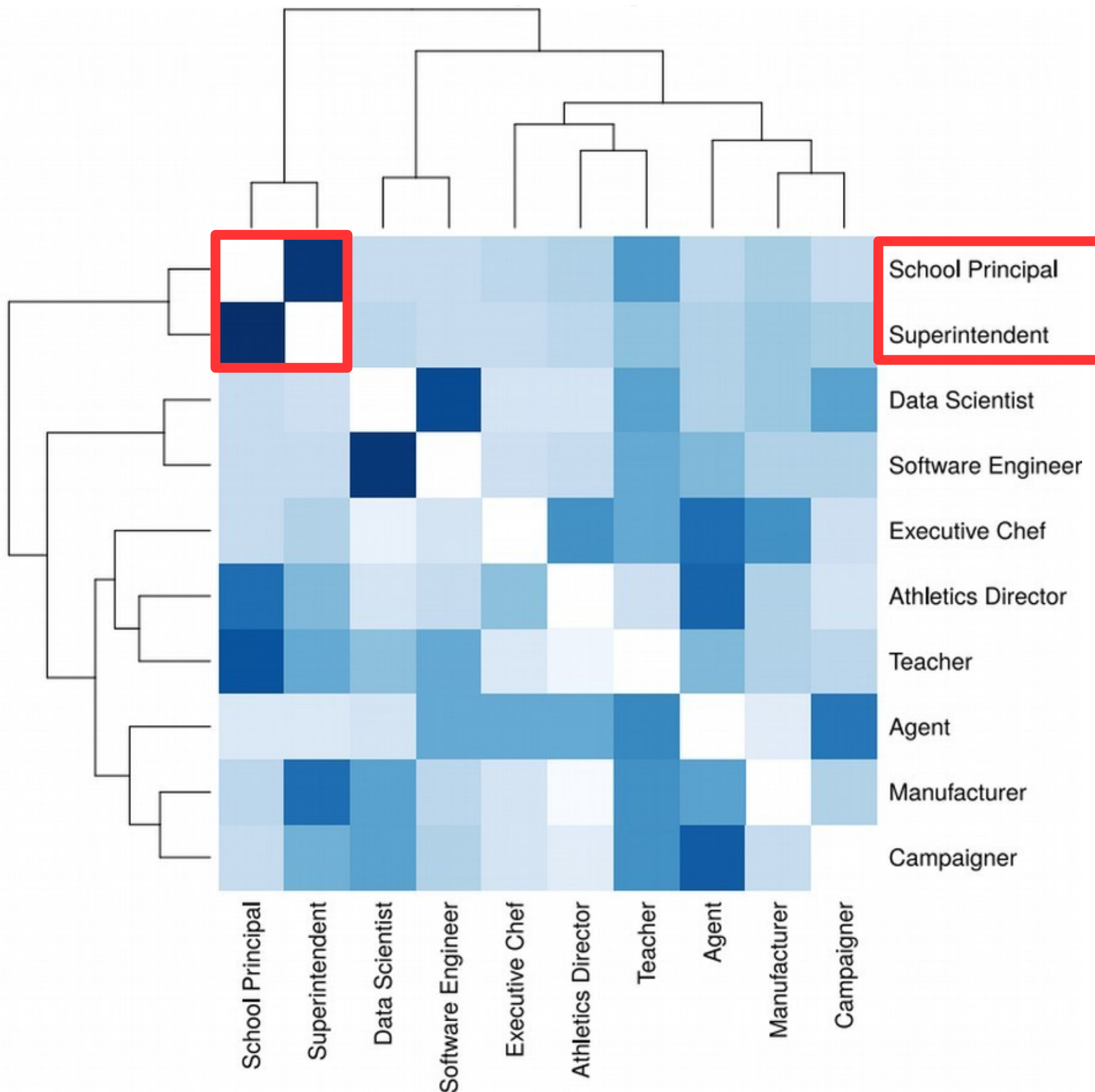
Behavioral Data Science



The errors are meaningful



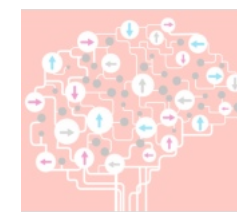
Behavioral
Data Science



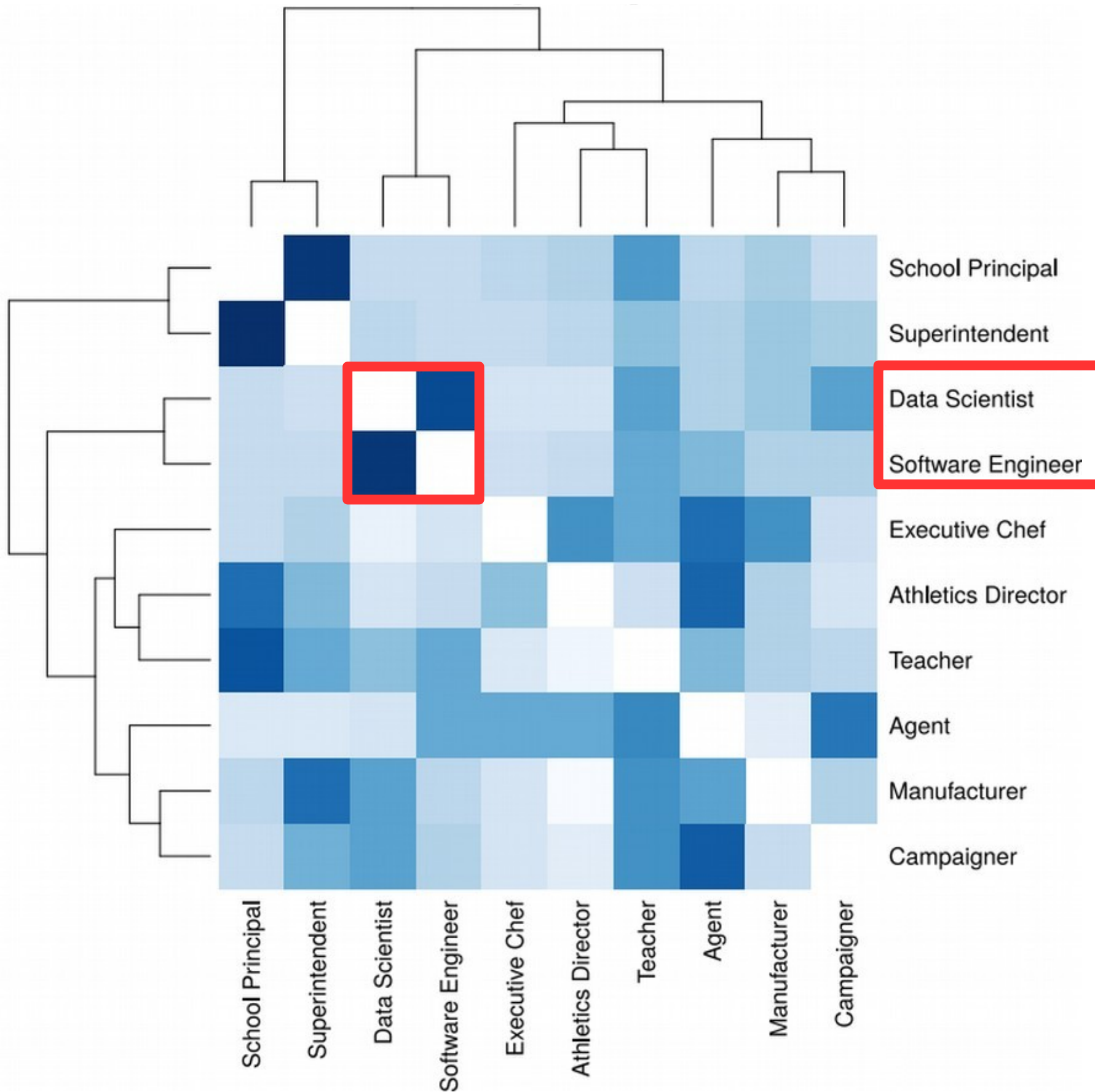
Error analysis:

Synonymous occupations
are often mistaken

The errors are meaningful



Behavioral
Data Science

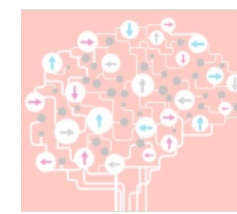


Error analysis:

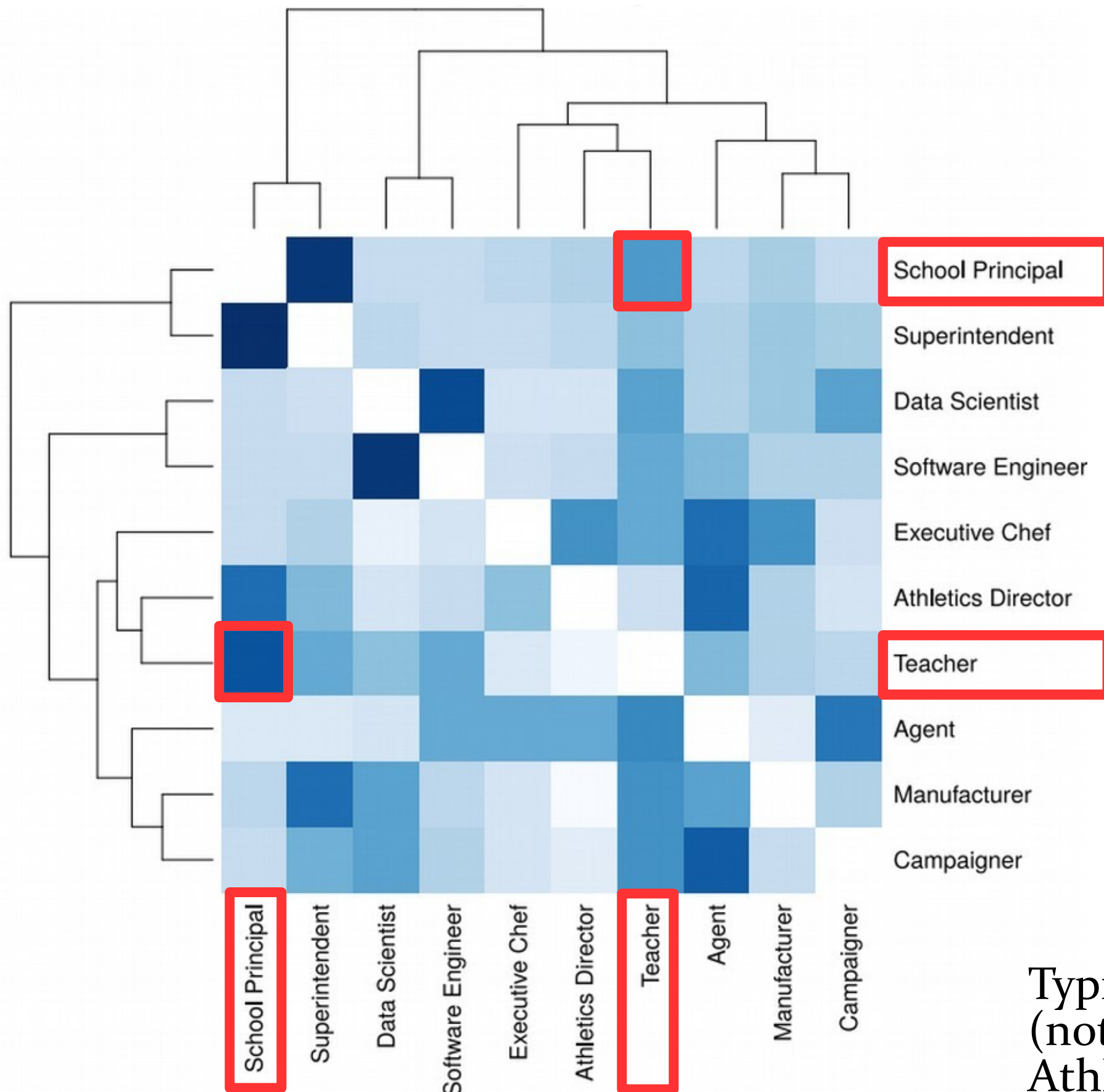
Synonymous occupations
are often mistaken

Similar skill sets are
mistaken

The errors are meaningful



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Data Science



Error analysis:

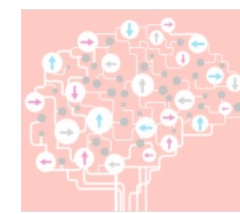
Synonymous occupations
are often mistaken

Similar skill sets are
mistaken

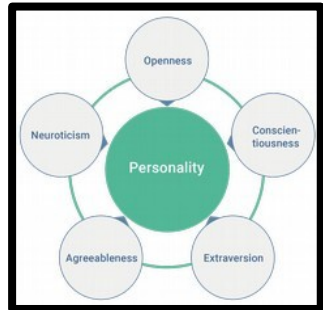
Non-symmetric error
rates

Typically makes low cost error
(not Data Scientist instead
Athletics Director)

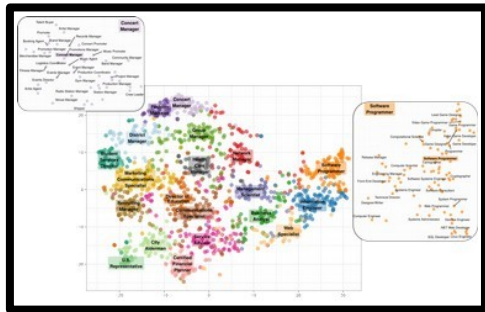
Summary



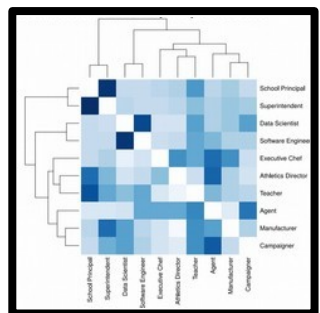
Behavioral
Data Science



Profiling personality traits using social media data



Personality profiles for occupations

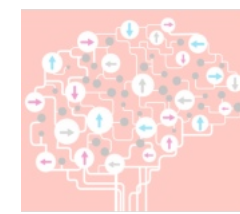


Predicting user professions based on personality traits

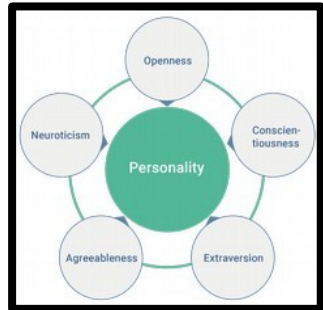
Limitations

English speaking only. Over-represents “white collar” professions. Relies on the *status quo*. Might reinforce race, gender, or age stereotypes.

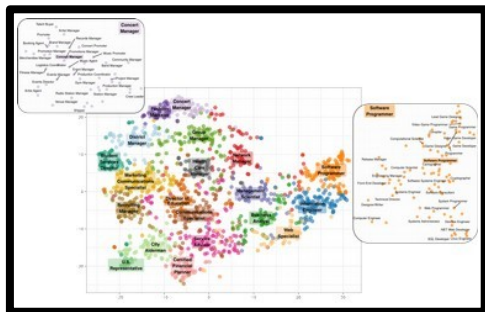
Thank you!



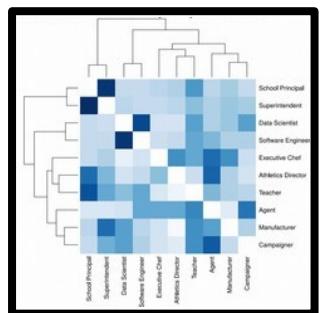
Behavioral
Data Science



Profiling personality traits using social media data



Personality profiles for occupations

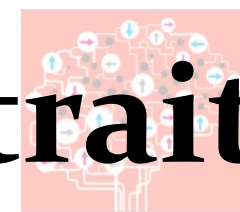


Predicting user professions based on personality traits

Limitations

English speaking only. Over-represents “white collar” professions. Relies on the *status quo*. Might reinforce race, gender, or age stereotypes. Informative, but not normative. Not representative. Ethical?

Supp: Big Five personality traits



Openness

Openness is a general appreciation for art, emotion, adventure, unusual ideas, imagination, curiosity, and variety of experience.

Conscientiousness

Conscientiousness is a tendency to display self-discipline, act dutifully, and strive for achievement against measures or outside expectations.

Extraversion

Extraversion is characterized by breadth of activities (as opposed to depth), pronounced engagement with the external world.

Agreeableness

Agreeable individuals value getting along with others, and are concerned with social harmony, considerate, kind, generous.

Neuroticism

Neuroticism is the tendency to experience negative emotions, such as anger, anxiety, or depression, with low tolerance for stress or aversive stimuli.

Supp: Additional lists of Twitter users



Table S1. Proof of concept occupations, sources, and number included

Occupation	Source	Count
Software Developers	Contribution and Influence of Developers on Github https://gist.github.com/paulmillr/2657075	236
Architects	Twitter Advanced Search-Ranked Architects (manually filtered to remove companies)	23
Elementary School Librarians	Twitter Advanced Search-Ranked Elementary School Librarians (manually filtered to remove companies)	31
Doctors and Health Care Professionals	Twitter Advanced Search-Ranked Doctors (manually filtered to remove companies)	43
Female Futurists	List of the world's top female futurists https://rossdawson.com/blog/list-of-the-worlds-top-female-futurists/	119
Science Stars	The Top 50 science stars of Twitter (AAAS) https://www.sciencemag.org/news/2014/09/top-50-science-stars-twitter	50
Top 100 Chief Information Officers	Top 100 Most Social CIOs on Twitter 2016 https://www.huffingtonpost.com/vala-afshar/2016-top-100-most-social-_b_9765538.html	93
Tennis Professionals (Male and Female)	Top Ranked Global Tennis Players on Twitter twitter.com/WTALists/lists/players/members (WTA) twitter.com/ATPWorldTour/lists/players/members (ATP)	170
Chemists	100 Chemists on Twitter https://stuartcantrill.com/2014/09/22/100-chemists-on-twitter/ (Aimed to address perceived gap in Science Stars List)	95
Total		1035