

meinBeruf.ch –

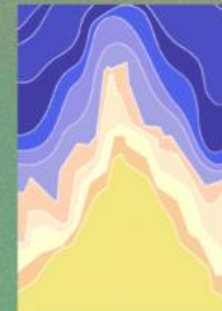
AI-Enhanced Psychometric Assessment for Personalized Career and Education Guidance

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Spin-off
BASEL

ECPA
16

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Background

Career choice: one of the most impactful decisions in life

- **Career misalignment causes...**
 - Reduced life satisfaction and mental health problems (Kristof-Brown et al., 2005)
 - Impact on national economy and wellbeing (European Commission, 2019)
- **The problem...**
 - No single person can grasp all possible job-person combinations
 - Career matching is a complex and multi-factorial optimization problem
 - Comparable to the Stable Marriage Problem (SMP) in mathematics

-> A prototype problem for artificial intelligence



Background

Embeddings of Large Language Models (LLM)

- An **embedding** is a numerical vector that represents a concept (like a word or sentence)
- **Cosine distance** represents conceptual and semantic similarity

$$\text{similarity} = \cos(\theta) = \frac{\mathbf{A} \cdot \mathbf{B}}{\|\mathbf{A}\| \|\mathbf{B}\|} = \frac{\sum_{i=1}^n A_i B_i}{\sqrt{\sum_{i=1}^n A_i^2} \sqrt{\sum_{i=1}^n B_i^2}},$$



	1	2	3	4	5	6
Software engineer (1)	0.00	0.10	0.20	0.85	0.80	0.70
Data scientist (2)	0.10	0.00	0.25	0.80	0.75	0.65
IT support (3)	0.20	0.25	0.00	0.78	0.82	0.72
Nurse (4)	0.85	0.80	0.78	0.00	0.30	0.35
Psychologist (5)	0.80	0.75	0.82	0.30	0.00	0.25
Doctor (6)	0.70	0.65	0.72	0.35	0.25	0.00

- **The clue** is, embeddings can be used for calculations, e.g.
 - king – man + woman ≈ queen
 - square + 3D ≈ cube
- Hence, **linear transformations of meanings** are possible!

Not so serious background

Which formulas would you use?

Technical skills + Introversion \approx ?

Engineer, Software developer

Mathematical skills + OCD \approx ?

Accountant, Asperger

Academic skills + Machiavellianism + Egocentrism \approx ?

Professor, spin doctor

People skills + alcoholism = ?

Barkeeper, Charles Bukowsky

People skills + lack of empathy = ?

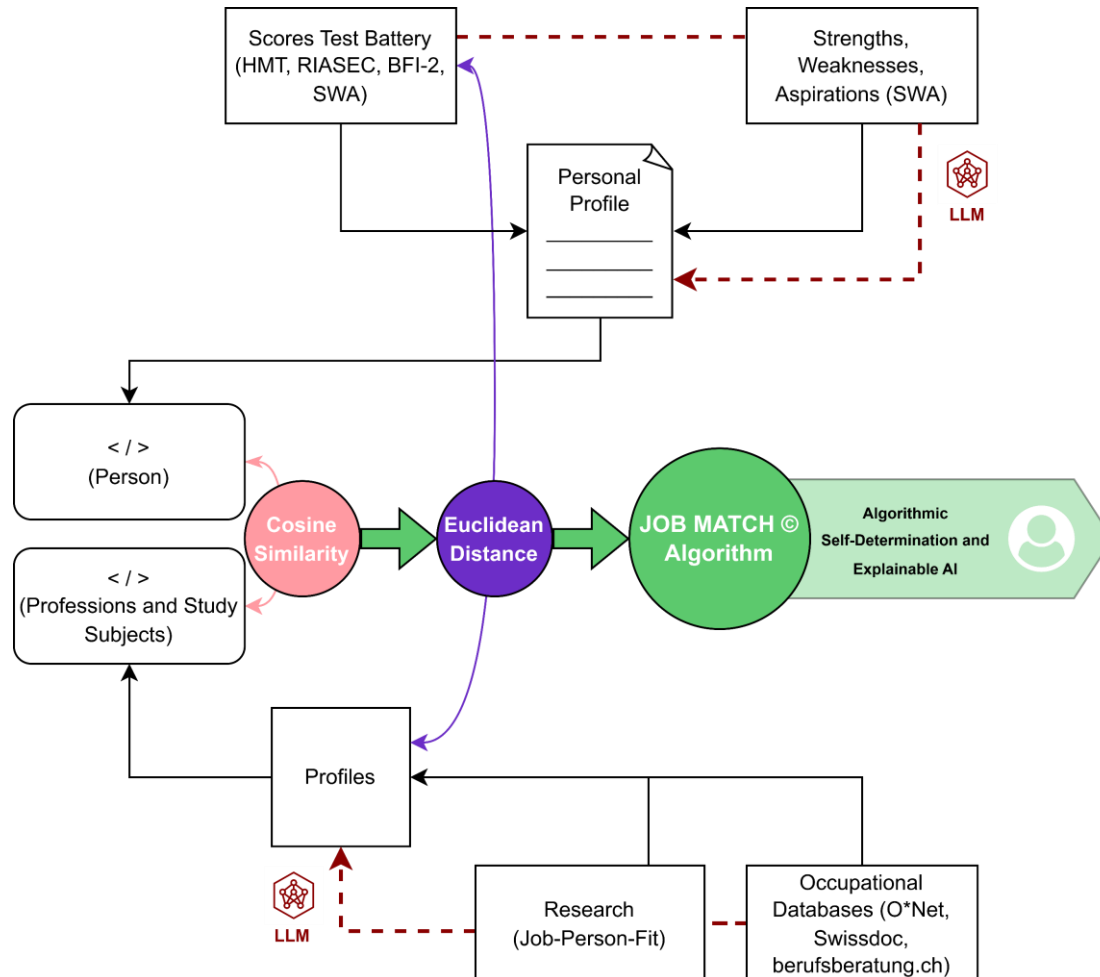
Human Ressources

Lack of empathy + alcoholism = ?

Lawyer

Methods

Technical flowchart of the jobmatch algorithm



Method

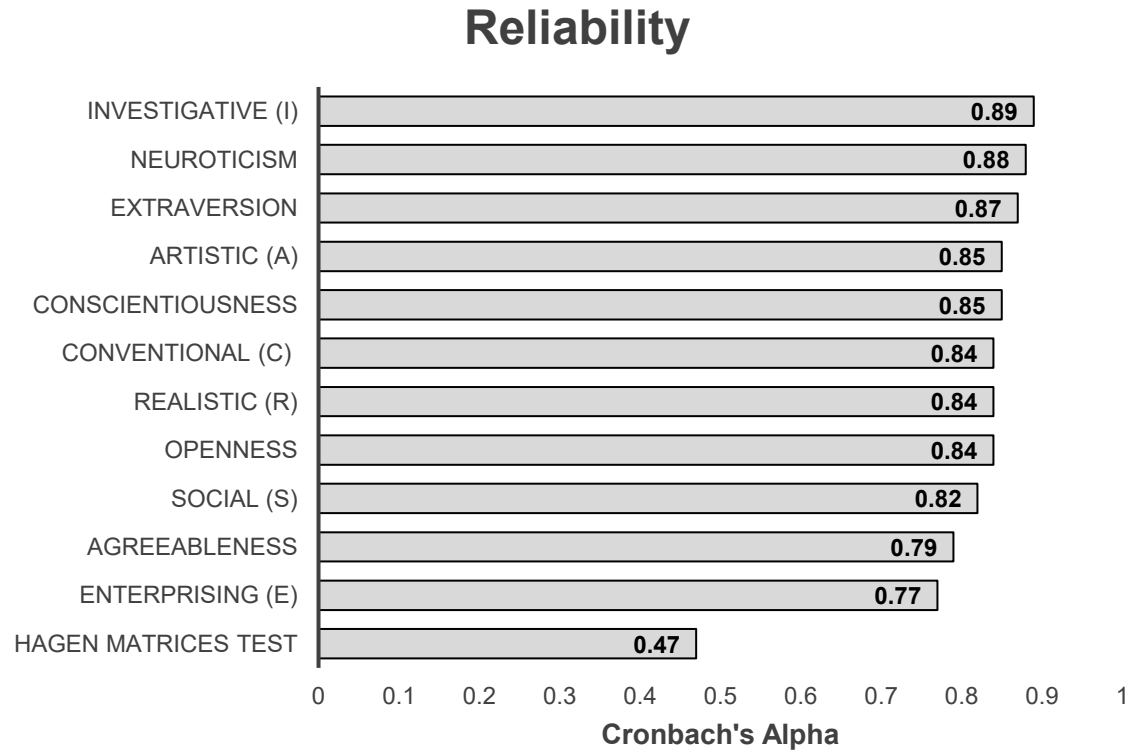
meinBeruf.ch – AI-based assessment

- **Sample**
 - University students; N=196; Age = 21.3 years
 - Female = 53.1%; Male=42.4%; Divers=4.6%
- **Test battery / measurement instruments**
 - Big Five Inventory (BFI-2)
 - RIASEC (openpsychometrics.org)
 - Hagen Matrices Test (HMT)
 - Strengths, weaknesses, expectations
- **Job databases**
 - O*NET
 - SWISSDOC
 - Berufsberatung.ch
- **Distance measures**
 - Cosine distance
 - Euclidean distance
 - Individual weights



Results

Reliability of the test battery

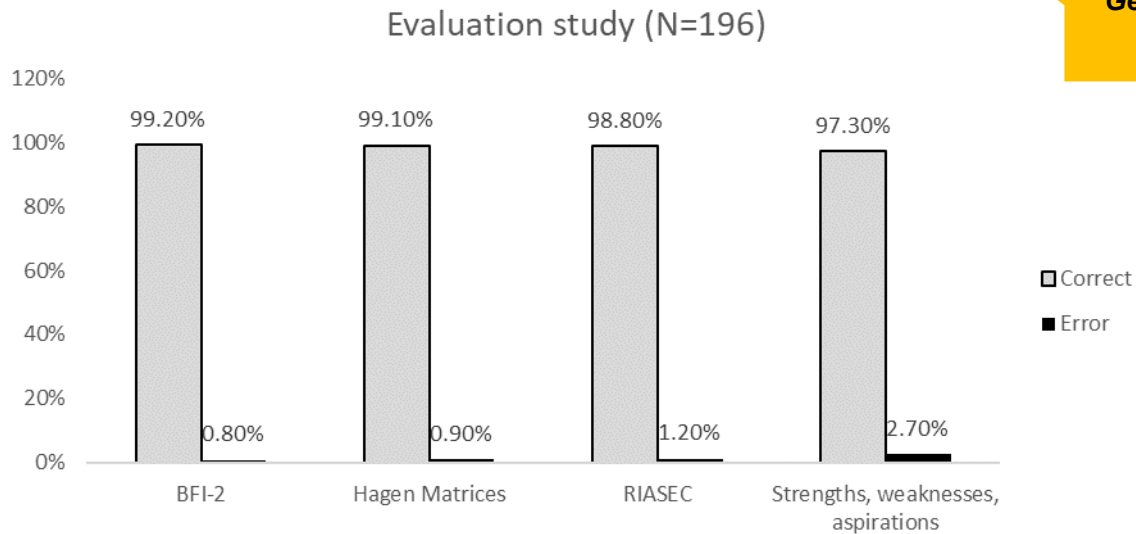


Results

LLM-driven personality profile based on BFI-2

Personality profile: Maxi Mustermann is characterized by a high degree of intellectual curiosity and assertiveness, which demonstrates that she actively seeks new experiences and knowledge and is able to communicate her opinions and ideas effectively. She also possesses a high degree of creative ingenuity and openness, which indicates a pronounced ability to generate original ideas and adapt to new situations. Despite average levels of diligence, aesthetic sensitivity, and sociability, she demonstrates above-average activity. On the other hand, her agreeableness, compassion, and orderliness are below average. Her cognitive problem-solving skills are excellent. This combination of characteristics could make her particularly well-suited for leadership positions in creative and dynamic industries, such as advertising, marketing, or the technology sector.

(Sources: Big Five Inventory-2; Hagen Matrices Test)



Results

Suitable study subjects and role models

sort manually

Algorithmic self determination

name	Matching points	Details
Computational Sciences \$\$\$	99	
In the Computational Sciences program, you'll learn to analyze and understand complex systems through the design and application of computer-based models. You'll be successful if you have strong skills in mathematics and computer science and an analytical approach to problems.		
Personality:	67	
Skills:	92	
Interests:	84	
AI Matching Points:	88	
Further information:	berufsberatung.ch	
What does chatGPT say about this?	<input type="button" value="Ask ChatGPT"/>	

Further information / meta search engine

Results

Suitable study subjects and role models



Insider tip:

The Swiss Federal Institute of Technology in Zurich has an excellent program for computational sciences, particularly the [Computational Science and Engineering Laboratory](<https://www.cse-lab.ethz.ch/>)



Sustainable prospects:

In terms of future prospects offered by computational sciences, [data science] (<https://www.nzz.ch/meinung/kuenstliche-intelligenz-die-schweiz-als-data-hub-ld.1504099>) is an emerging field that offers great potential for green jobs and sustainability.



Famous examples:

Tim Berners-Lee, the inventor of the World Wide Web, has a degree in physics, a field closely related to computational sciences. He has spent a large part of his career in Switzerland at CERN. You can learn more about him on his [Wikipedia page](https://en.wikipedia.org/wiki/Tim_Berners-Lee).



Female role models:

Donna Strickland, a Canadian physicist and [Nobel Prize winner] (https://en.wikipedia.org/wiki/Donna_Strickland), is a good example of a successful woman in a computational science-related field. She has made important contributions to the development of laser technology.



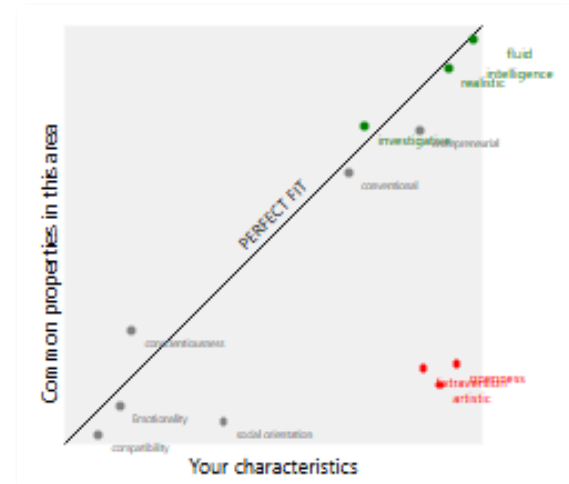
LGBT perspectives:

Regarding LGBTQ+ perspectives, the [Association of Computing Machinery] (<https://www.acm.org/diversity-inclusion/lgbtqia>) offers resources and support for individuals in the computing community.

Women in STEM

Results

Suitable study subjects + explainable AI



Bob says:

In principle, computational sciences could be an excellent fit for you (matching points: 99). Your fluid intelligence, investigative orientation, and realistic, i.e., practical, focus are very consistent. What might be less suitable is that your environment in this field might be more introverted and down-to-earth (less open), and less artistically inclined than you.

External links:



Discussion

- Highly reliable test battery, except for matrices
 - long IQ tests are not useful?
- Highly satisfactory user experience (>90%)
- Almost error-free personality profiles from LLM (>98%)
- Economic tailored career and study advice with very limited time resources (< 45 min)
- A very good basis for a well-informed discussion before professional career advice
- Reduces time and effort of professional career counsellors
- Highly safe and secure environment
- Full control of personal data

Perspectives

- How can you prove that the algorithm really works?
- Longitudinal study?
- **Happy1000** study

Thank you for your attention! Let's stay in touch!

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EAPA
European Association of
Psychological Assessment



IDLab
Individual differences lab



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