Technical Report: Architecture and Functionality of meinBeruf.ch

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Abstract

meinBeruf.ch is a psychologically informed, AI-based platform for individualized career and study guidance. It integrates standardized psychometric assessments (Big Five Inventory–2, RIASEC, Hagen Matrices Test) with narrative self-descriptions (Strengths, Weaknesses, Aspirations) and external occupational databases (O*Net, SWISSDOC, berufsberatung.ch). User data are anonymized and transformed into semantic embeddings, which are matched with enriched vocational profiles via the proprietary JobMatch© algorithm.

The system emphasizes explainable AI (XAI), algorithmic self-determination (users can weight traits, interests, and narratives), and fairness through gender neutrality and bias checks. Outputs include ranked career and study recommendations, explanations of drivers and frictions, and links to official databases, alongside curated perspectives on sustainability and diversity.

Empirical evaluation (N = 196 students, Germany & Switzerland) demonstrated strong reliability for personality and interest measures, but limited reliability for the HMT. Narrative themes correlated meaningfully with standardized traits, supporting construct validity. Usability testing showed high acceptance (>90%) and completion times under 45 minutes.

By combining structured psychometrics, narrative input, and explainable AI, *meinBeruf.ch* functions as a scalable, objective decision-support tool. Its role is not to replace but to enrich professional counseling by providing a transparent, data-driven foundation for informed conversations.

1. System Overview

meinBeruf.ch is an AI- and psychology-based guidance platform for career and study orientation. It integrates validated psychometric assessments, narrative self-reflections, and external occupational databases (O*Net, SWISSDOC, berufsberatung.ch). The system transforms user input into semantic embeddings and computes similarity scores with vocational targets using the proprietary JobMatch© algorithm.

Central design principles:

- **Explainable AI (XAI)** – transparent, auditable, and interpretable results (Guleria & Sood, 2023)
- **Algorithmic self-determination** – users can reweight criteria, e.g., personality, interests, ability, narratives (Milossi et al., 2021)
- **Fairness & Bias Mitigation** – anonymization, gender neutrality, and systematic fairness checks (Ho et al., 2025)
- **Scalability & Objectivity** – designed as a modular, psychometrically grounded tool for both end-users and professional counseling.

2. Inputs and Assessments

The foundation of the system lies in the quality of its assessments. meinBeruf.ch uses a combination of validated psychometric instruments and open-format narrative inputs to capture a broad spectrum of user characteristics. Standardized tests ensure objectivity and comparability across users, while the narrative module adds depth and individuality to the profiles. This combination enables the platform to reflect both quantifiable psychological traits and more subjective aspects of personal meaning and motivation.

1. **Psychometric Tests**
    - **Big Five Inventory–2 (BFI-2)** (Danner et al., 2016)**:** α/ω = .80–.88 across scales
    - **RIASEC Inventory** (Liao et al., 2008) **:** α/ω = .76–.89
    - **Hagen Matrices Test (HMT)** (Heydasch, 2014)**:** α = .47; ω ≈ 0 → low reliability, under review (due to effects of test motivation)
2. **Narrative Input (SWA: Strengths, Weaknesses, Aspirations)**
    - Open-text reflections + structured items.
    - LLMs extract semantic themes (e.g., creativity, teamwork, autonomy).
3. **Evaluation Study**
    - **Sample:** N = 196 students (Germany & Switzerland).
    - **Findings:**
        - High user acceptance (>90%).
        - Completion time <45 minutes.
        - Narrative themes correlated meaningfully with structured psychometric traits.

3. Pre-Processing and Privacy

Since sensitive psychological data are involved, strict pre-processing procedures are applied before analysis. Anonymization routines remove or neutralize identifying information, including gendered cues, to minimize potential bias in downstream AI components. Data are stored in pseudonymized form with minimal retention, aligning with best practices in privacy and compliance. This ensures that the system not only respects legal requirements but also builds user trust by safeguarding confidentiality.

- **Anonymization & Gender Neutralization** before LLM processing.
- **Minimal data retention** with pseudonymized IDs.
- **No demographic inputs** (e.g., gender, age, ethnicity) in the JobMatch computation.

4. Role of Large Language Models (LLM)

Large Language Models are a central enabling technology within *meinBeruf.ch*. They are used to generate written personality profiles, enrich descriptors of occupations and study programs, and transform narrative self-descriptions into analyzable embeddings. In addition, they can impute missing data for large-scale meta-analyses, thereby improving comparability and completeness of occupational datasets. This multifaceted use of LLMs allows the system to bridge the gap between structured psychometric data and unstructured textual information.

- **Profile writing**: Generate written, gender-neutral personality reports.
- **Descriptor standardization**: Normalize job descriptions across O*Net, SWISSDOC, and berufsberatung.ch.
- **Narrative integration**: Convert open-text answers into embeddings.
- **Imputation in meta-analyses**: Fill missing descriptors in occupational meta-datasets (e.g. (Wolfram, 2023)

5. JobMatch Algorithm©

At the heart of the platform lies the JobMatch algorithm, which operationalizes the matching process between individual profiles and vocational targets. It works by embedding both user data and occupational descriptors into a shared semantic space. A hybrid similarity metric based on cosine similarity and Euclidean distance calculates the degree of fit. Crucially, users can adjust weighting factors, enabling algorithmic self-determination and ensuring that the results reflect their personal priorities and values.

6. Explainability and Fairness

A key design goal of meinBeruf.ch is to ensure that recommendations are understandable and equitable. The system provides users with explanations highlighting the most important drivers of a match as well as potential frictions. Fairness checks are built in to prevent demographic or cultural biases from influencing results. The emphasis is not on deterministic prescriptions but on empowering users to reflect and engage critically with their career choices.

- **Explanations** highlight the most relevant personality/interest dimensions
- **Fairness checks** ensure no gender or cultural bias enters the rankings
- **User empowerment**: recommendations are meant as a conversation starter, not a deterministic assignment

7. Reliability, Validity, and Evaluation

The technical and psychometric robustness of the system has been carefully evaluated. Reliability analyses show strong internal consistency for the Big Five and RIASEC assessments, whereas the Hagen Matrices Test displayed limitations in its digital version. Construct validity was supported by expected correlations between traits and narrative themes. Usability studies confirmed that the platform is well accepted by users, with high satisfaction rates and efficient completion times.

- **Reliability**: Strong for BFI-2 and RIASEC; poor for HMT.
- **Validity**: Construct correlations match expectations. Narrative themes add depth.
- **Usability**: >90% satisfaction, low error rate, average completion <45 minutes.

Table 1. *Internal Consistency in data collected on meinBeruf.ch (HMT, BFI-2, RIASEC)*

Scale	Items	*N*	*Alpha*	*Omega*
BFI-2 extraversion	12	459	0.87	0.87
BFI-2 openness	12	459	0.86	0.84
BFI-2 agreeableness	12	459	0.80	0.79
BFI-2 conscientiousness	12	459	0.86	0.85
BFI-2 neuroticism	12	459	0.88	0.88
BFI-2 extraversion - sociability	4	459	0.81	0.78
BFI-2 extraversion - assertiveness	4	459	0.77	0.75
BFI-2 extraversion - activity	4	459	0.67	0.55
BFI-2 openness - intellectual curiosity	4	459	0.73	0.76
BFI-2 openness - aesthetic sensitivity	4	459	0.84	0.85
BFI-2 openness - creative imagination	4	459	0.79	0.79
BFI-2 agreeableness - compassion	4	459	0.70	0.73
BFI-2 agreeableness - respectfulness	4	459	0.62	0.57
BFI-2 agreeableness - trust	4	459	0.60	0.66
BFI-2 conscientiousness - orderliness	4	459	0.84	0.84
BFI-2 conscientiousness - industrious	4	459	0.74	0.75
BFI-2 conscientiousness - responsibility	4	459	0.61	0.61
BFI-2 neuroticism - anxiety	4	459	0.72	0.71
BFI-2 neuroticism - depression	4	459	0.81	0.83
BFI-2 neuroticism - emotional volatility	4	459	0.79	0.79
RIASEC - realistic	8	225	0.84	0.84
RIASEC - investigative	8	225	0.89	0.89
RIASEC - artistic	8	225	0.85	0.85
RIASEC - social	8	225	0.81	0.82
RIASEC - enterprising	8	225	0.76	0.77
RIASEC - conventional	8	225	0.85	0.84
Hagen Matrices Test (HMT)	20	225	0.47 [F]	0.003 [F]

Note. Cronbach's Alpha and McDonald's Omega.
[F] Reliability for the Hagen Matrices Test (HMT) was low due to motivational effects (see Steppan & Ruchti, 2025)

8. Flowchart

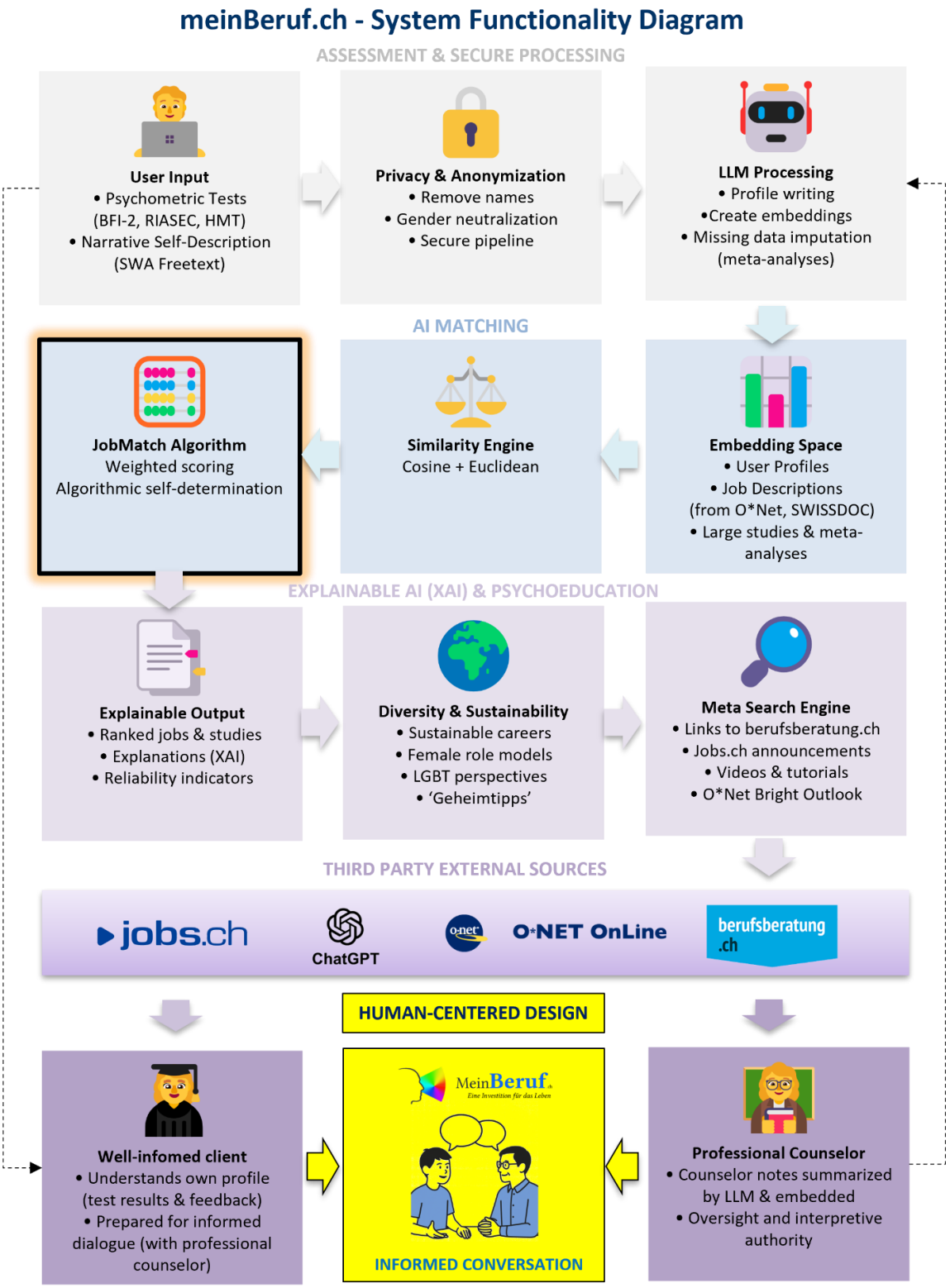

Figure 1. Flowchart illustrating the socio-technical workflow and technical procedure

9. Conclusion

meinBeruf.ch demonstrates high functionality as a scalable, psychometrically informed, AI-supported guidance tool. It is built not to replace but to facilitate meaningful conversations with professional counselors by providing a clear, data-driven starting point.

The system is designed to be objective through standardized psychological tests. However, it must be acknowledged that response biases (e.g., limited self-insight, impression management) can distort results — making the counselor's interpretive role essential.

By combining structured psychometrics, narratives, and enriched occupational databases, and by embedding values such as diversity, sustainability, and inclusivity, meinBeruf.ch positions itself as a best-practice example of Explainable, Fair, and Human-Centered AI in vocational guidance.

10. References

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