Supplementary Appendices for: *A Survey and Computational Atlas of Personality Models*

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This supplementary document provides extended material referenced in the primary manuscript, including the full model card catalog, detailed AI maturity alignment artifacts, formal notation standards, and the cognitive evolution framework used to support multi-model comparison and interpretation. These appendices are intended to facilitate replication, benchmarking, cross-framework mapping, and structured operational analysis for researchers, practitioners, and evaluators working at the intersection of personality theory, cognitive modeling, and agentic LLM system design.

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Navigation and Structure

The supplemental content is organized to support both conceptual interpretation and applied implementation. Readers may explore the appendices sequentially or consult them independently as reference material:

(1) Appendix A (Model Card Catalog): Contains the complete, detailed model card for all 44 personality frameworks, including dimensions, applications, and historical timelines.
(2) Appendix B (AI Maturity Framework and Mappings): Provides the full tabular breakdown of the systematic mapping methodology used to align personality constructs with the L1–L3 cognitive functions.
(3) Appendix C (Mapping and Cross-Model Comparison Tables): Contains exhaustive cross-tabulations illustrating factor overlap and empirical correlation trends across the seven model categories.
(4) Appendix D (Formal Notation and Representational Standards): Contains the explicit mathematical definitions for the knowledge graph formalism and the PRISM protocol state vectors (P_S), trajectory (ΔP_S), and valence (V).
(5) Appendix E (Cognitive Evolution and Developmental Timeline): Presents the comprehensive historical timeline tracing the trajectory from early psychological taxonomies to contemporary neuro-symbolic AI.

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(6) Appendix F (Detailed Psychometric Standards): Provides comprehensive definitions and formulae for psychometric standards (e.g., Cronbach's α, validity evidence) used to evaluate the rigor of the instruments.

Model Catalog

A Standardized Model Catalog

This appendix presents the *Standardized Model Catalog*, a structured compilation of forty-four personality models formalized as modular model cards. Each entry encapsulates the essential theoretical foundations, empirical validation, and computational structure of a given model, with full details organized as follows:[1]

(1) The catalog is structured into seven thematic categories mirroring the taxonomy presented in the main manuscript (Figure 2).
(2) Each category contains the complete, detailed model card for its respective personality frameworks, including dimensions, applications, and historical timelines.

Core Purposes of the Catalog

The catalog serves three complementary purposes:

(1) Theoretical Integration: Summarizes each model's origin, dimensions, and empirical lineage to enable comparative analysis across traditions in personality science.
(2) Computational Structuring: Provides standardized schema for datasets (`.csv`), embeddings (`.csv`), and knowledge graph representations suitable for integration into AI, cognitive-architecture, and agent-based systems.
(3) Applied AI Relevance: Aligns each model's core constructs with cognitive and affective functions within the AI Maturity Framework (L1–L3), supporting translation from psychological theory to algorithmic behavior and explainable personality simulation.

Model Card Structure Details

Each model card follows a consistent structure to ensure all necessary data for interpretation and deployment are captured:

- Description – A conceptual overview and the theoretical basis of the model.
- Dimensions and Brain-Function Mapping – Primary factors and facets, accompanied by specific cognitive analogues and their alignment with the L1–L3 AI maturity mappings.
- Applications – Common and emerging use cases across psychology, AI, and Human–AI interaction.
- Timeline – Historical milestones and key intellectual developments.
- Psychometrics – Empirical rigor, including reliability, validity, and measurement formats (e.g., Likert scale, forced-choice).
- Data Structure – The explicit fields of the standardized lexical schema: `Factor`, `Adjective`, `Synonym`, `Verb`, and `Noun`.
- Resources – Linked datasets, embeddings, graph visualizations, and literature maps for external access.

Together, these standardized entries establish a unified ontology of personality models, enabling consistent lexical analysis, embedding generation, and comparative cognitive mapping within large-language-model pipelines and intelligent agent architectures.

[1] [269]

Thematic Organization of Models

The 44 personality models are organized into the following seven categories:

- I. Trait-Based Models (e.g., OCEAN, HEXACO)
- II. Narcissism-Based Models (e.g., NPI, Dark Triad)
- III. Motivational and Value Models (e.g., STBV, SDT)
- IV. Cognitive and Learning Models (e.g., PCT, CEST)
- V. Clinical and Psychological Health Models (e.g., MMPI, TCI)
- VI. Interpersonal and Conflict Resolution Models (e.g., TKI, DiSC)
- VII. Application-Specific and Holistic Models (e.g., RIASEC, CMOA)

A.1 Trait-Based Models

Trait-based models represent the most empirically grounded and computationally interpretable frameworks for understanding personality. These models describe individuals through stable patterns of traits, linguistic descriptors that map naturally to lexical, semantic, and behavioral data representations. The following entries detail foundational models such as OCEAN, HEXACO, and 16PF, which underpin both academic research and applied personality-based AI architectures.

(1) OCEAN

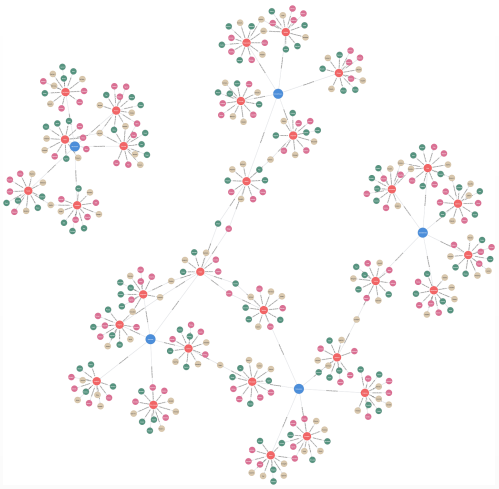

Fig. 1. Graphical overview of the OCEAN (Big Five) personality model. (Click image to enlarge and view the full model graph.)

Description. Also known as the Five-Factor Model (FFM), OCEAN distills personality into five core dimensions, which have been widely researched and validated across diverse populations and cultures [132, 231, 324].

Dimensions, Examples, and Brain–Function Mapping.

- **Openness (to Experience):** Creativity, curiosity, and appreciation for novelty. Example: Seeking out an abstract art exhibit for intellectual stimulation. Maps to *cognitive flexibility* (L3 AI Maturity), an AI agent dynamically generating novel strategies.

- **Conscientiousness:** Organization, dependability, and self-discipline. Example: Maintaining a detailed project schedule. Maps to *planning and working memory* (L2 AI Maturity), task-list maintenance over extended sessions.
- **Extraversion:** Sociability, assertiveness, and stimulation-seeking. Example: Volunteering to host a large social event. Maps to *reward sensitivity* (L2 AI Maturity), reinforcement learning tuned by social feedback.
- **Agreeableness:** Cooperation, kindness, and empathy. Example: Offering emotional support to a distressed colleague. Maps to *social cognition and empathy* (L3 AI Maturity), AI modeling user emotional state.
- **Neuroticism (inverse: Emotional Stability):** Anxiety, moodiness, irritability. Example: Experiencing stress from minor setbacks. Maps to *emotional regulation* (L3 AI Maturity), AI adjusting confidence or state under uncertainty.

Applications.

- **Personality-Aware Recommender Systems:** Enhances personalization by integrating user trait profiles [95].
- **Behavioral Prediction from Digital Footprints:** Infers traits from social media and text data for adaptive content delivery [179].
- **Multimodal Personality Recognition:** Predicts traits from images, voice, and text using deep learning [351].
- **Enhanced Human–AI Interaction:** Embeds trait modeling into conversational agents for alignment and trust [1].
- **Explainable AI Profiling:** Uses Big Five features for transparent psychological inference in finance, healthcare, and hiring [197].

Timeline.

- **1961** – Tupes and Christal identify five recurrent personality factors [324].
- **1963** – Norman extends and terms them the "Big Five" [231].
- **1981** – Goldberg demonstrates cross-cultural robustness [132].
- **1987** – McCrae and Costa develop the NEO-PI inventory [201].
- **1990** – Goldberg consolidates the Big Five as a descriptive framework [133].

Psychometrics.

- **Instruments:** IPIP-NEO-120, BFI-2, BFI-2-S, BFI-2-XS.
- **Item Format:** 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).
- **Internal Consistency:** Cronbach's α = 0.70–0.85 [196].
- **Test–Retest Reliability:** α = 0.70–0.90 [196].
- **Factor Structure:** CFA supports five-factor model across languages [196].
- **Cross-Cultural Validity:** Stable across cultures, including non-Western populations [142].
- **Public-Domain Resource:** International Personality Item Pool (IPIP) [161].

Data Structure. Each row in the dataset (e.g., `ocean.csv`) represents a lexical entry:

- `Factor` – Big Five domain (e.g., `Extraversion`)
- `Adjective` – Trait descriptor (e.g., `Active`)
- `Synonym` – Near-equivalent adjective (e.g., `Energetic`)
- `Verb` – Behavioral form (e.g., `Activate`)

- Noun – Nominal quality or agent (e.g., `Activeness`)

Resources.

- **Mapped Brain Functions Table:** Table 1.
- **L1–L3 AI Maturity Definitions:** Appendix B.1.
- **Interactive Literature Map:** Connected Papers Graph for Tupes & Christal (1961).
- **Dataset:** `OCEAN_Dataset.csv`.
- **Embeddings File:** `ffm_embeddings.csv`.

(2) Myers–Briggs Type Indicator (MBTI)

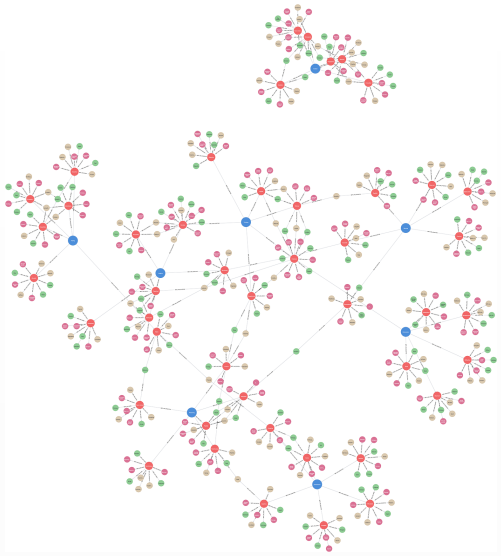

Fig. 2. MBTI Graph (click to enlarge).

Description. Grounded in Carl Jung's theory of psychological types, the Myers–Briggs Type Indicator (MBTI) is an introspective self-report instrument designed to identify psychological preferences in how individuals perceive the world and make decisions. It assigns individuals to one of sixteen personality types based on four dichotomous scales [171, 226].

Dimensions, Examples, and Brain–Function Mapping.

- **E/I (Extraversion / Introversion):** Orientation of energy.
  - Example (E): Enjoys collaborative brainstorming to energize.
  - Example (I): Prefers solitary reflection for focus and recharge.
  - (E) → *Reward Sensitivity* (L2 AI Maturity): AI adapting behaviors from positive social feedback.
  - (I) → *Internal Simulation* (L3 AI Maturity): AI performing introspective or self-corrective processing.
- **S/N (Sensing / Intuition):** Mode of information perception.

  - Example (S): Focuses on concrete details and past experience.
  - Example (N): Detects patterns and future possibilities.
  - (S) → *Concrete Sensory Processing* (L1): AI extracting tangible features from raw data.
  - (N) → *Abstract Pattern Integration* (L2): AI inferring conceptual relations in datasets.
- **T/F (Thinking / Feeling):** Basis of decision-making.
  - Example (T): Prioritizes logic and objective reasoning.
  - Example (F): Weighs empathy, values, and social impact.
  - (T) → *Rule-Based Reasoning* (L2): AI applying symbolic logic for decisions.
  - (F) → *Value-Based Decision-Making* (L3): AI integrating ethical and social principles.
- **J/P (Judging / Perceiving):** Orientation to the outer world.
  - Example (J): Prefers structure, closure, and planning.
  - Example (P): Prefers flexibility and adaptability.
  - (J) → *Structured Planning & Goal Adherence* (L2): AI executing fixed task sequences.
  - (P) → *Cognitive Flexibility & Adaptive Response* (L3): AI dynamically reprioritizing under uncertainty.

Applications.

- **Team and Leadership Development:** Improves communication and team alignment [316].
- **Career Counseling:** Aligns occupational paths with personality preferences [262].
- **Stress and Conflict Management:** Aids in understanding and mitigating interpersonal friction [59].
- **Personalized Learning:** Supports adaptive education approaches [227].
- **Dialogue Style Adaptation:** Predicts MBTI traits (e.g., Extraversion) from human–machine dialogue with 60–70% accuracy, improving agent engagement [117, 141].

Timeline.

- **1921–1923** – Jung publishes *Psychological Types* [171].
- **1926** – Katharine Cook Briggs publishes *Meet Yourself Using the Personality Paint Box* [39].
- **c.1943** – Briggs and Isabel Myers draft the original Type Indicator [40].
- **1956** – Renamed the *Myers–Briggs Type Indicator* [41].
- **1962** – ETS publishes the first official MBTI Manual [226].
- **1975–1998** – Subsequent editions expand and refine the instrument [80, 227, 228].

Psychometrics.

- **Format:** Forced-choice questionnaire (e.g., 93 items in Form M).
- **Reliability:** Internal consistency $\alpha = 0.70$–0.90; test–retest $r \approx 0.75$ [59].
- **Validity:** Ongoing debate on predictive and structural validity; critics cite dichotomous limitations [262].

Data Structure. The MBTI dataset (`mbti.csv`) encodes the four dichotomies and their lexical forms:

- `Factor` – Dichotomy (e.g., `E/I`, `S/N`, `T/F`, `J/P`)
- `Adjective` – Primary pole label (e.g., `Extraversion`)
- `Synonym` – Related adjective (e.g., `Outgoing`)
- `Verb` – Behavioral form (e.g., `Engage`)

- Noun – Nominalized form (e.g., `Engagement`)

Resources.

- **Mapped Brain Functions Table:** Table 2.
- **L1–L3 AI Maturity Definitions:** Appendix B.1.
- **Interactive Literature Map:** Connected Papers graph for Myers & McCaulley (1985) Manual.
- **Dataset:** `MBTI_Dataset.csv`.
- **Embeddings File:** `mbti_embeddings.csv`.

(3) HEXACO Model

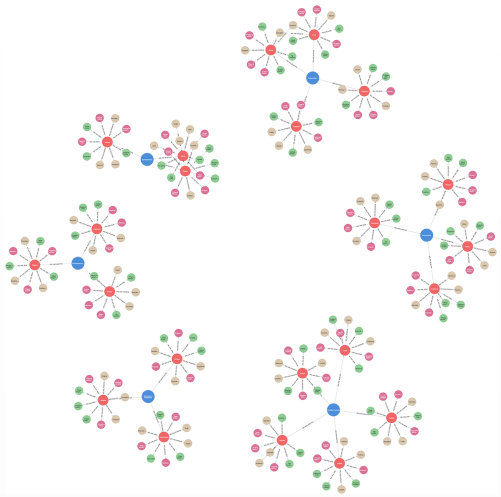

Fig. 3. HEXACO Graph (click to enlarge).

Description. Developed by Kibeom Lee and Michael C. Ashton, the HEXACO model extends the traditional Big Five framework by introducing a sixth major dimension, **Honesty–Humility**. It posits that personality is best described across six broad domains validated across multiple cultures and languages [9, 185].

Dimensions, Examples, and Brain–Function Mapping.

- **H – Honesty–Humility:** Sincerity, fairness, greed avoidance, and modesty.
  - Example: Refusing to exploit an unfair advantage even if undetected.
  - Maps to *Moral Reasoning and Fairness Computation* (L2 AI Maturity), AI applying fairness or ethical constraints in decision processes.
- **E – Emotionality:** Anxiety, fearfulness, dependence, and sentimentality.
  - Example: Feeling anxious about potential harm or easily moved by a sad story.
  - Maps to *Emotional Processing and Threat Assessment* (L3), AI modeling nuanced emotion and risk detection.
- **X – Extraversion:** Social boldness, liveliness, and confidence.

  - Example: Engaging energetically in social gatherings.
  - Maps to *Reward Sensitivity and Social Engagement* (L2), AI behaviors guided by feedback or reward mechanisms.
- **A – Agreeableness (vs. Anger):** Forgiveness, gentleness, flexibility, and patience.
  - Example: Mediating conflicts calmly and empathetically.
  - Maps to *Social Cognition and Conflict Resolution* (L3), AI modeling intentions and resolving social tension collaboratively.
- **C – Conscientiousness:** Organization, diligence, perfectionism, and prudence.
  - Example: Meticulously managing a multi-step project timeline.
  - Maps to *Working Memory, Planning, and Goal Pursuit* (L2), AI maintaining task-state and sequence control.
- **O – Openness to Experience:** Aesthetic appreciation, inquisitiveness, and creativity.
  - Example: Exploring novel ideas or unconventional problem-solving approaches.
  - Maps to *Cognitive Flexibility and Creative Exploration* (L3), AI generating innovative solutions in dynamic contexts.

Applications.

- **Personnel Selection and Organizational Behavior:** Predicts performance, integrity, and leadership via Honesty–Humility and Conscientiousness [186, 263].
- **Moral Reasoning and Ethics:** Connects Honesty–Humility to prosocial and moral decision-making [31, 221].
- **Cross-Cultural Validation:** Confirms six-factor stability across diverse societies [63, 90].
- **AI Personality Modeling and HCI:** Guides the development of trustworthy and believable virtual agents [144, 164].
- **Conflict Resolution and Interpersonal Dynamics:** Informs mediation and collaboration strategies based on Agreeableness and Emotionality [18, 264].

Timeline.

- **Early 2000s:** Cross-linguistic psycholexical studies indicate a six-factor model.
- **2004:** Ashton and Lee formally introduce the HEXACO model and HEXACO Personality Inventory (HEXACO–PI) [9].
- **2007:** Empirical validation highlights the predictive power of Honesty–Humility [8].
- **2009–2012:** Revised HEXACO–PI–R published and standardized [185].

Psychometrics.

- **Format:** 60–200 items rated on 5-point Likert scales.
- **Reliability:** Cronbach's α = 0.80–0.90; high test–retest reliability [185].
- **Factor Validity:** Supported across numerous cultures and languages.
- **Cross-Cultural Stability:** Replicated in over 30 nations, confirming robustness.

Data Structure. The dataset (`hex.csv`) encodes lexical information for each HEXACO factor:

- `Factor` – Domain (e.g., `Honesty-Humility`, `Emotionality`)
- `Adjective` – Descriptive trait (e.g., `Sincere`, `Anxious`)
- `Synonym` – Near-equivalent term (e.g., `Fair`)
- `Verb` – Behavioral form (e.g., `Empathize`)
- `Noun` – Nominal form (e.g., `Sincerity`, `Empathizer`)

Resources.

- **Mapped Brain Functions Table:** Table 3.
- **L1–L3 AI Maturity Definitions:** Appendix B.1.
- **Official Website:** hexaco.org.
- **Interactive Literature Map:** Connected Papers graph for Ashton & Lee (2004).
- **Dataset:** `HEXACO_Dataset.csv`.
- **Embeddings File:** `hex_embeddings.csv`.

(4) Eysenck Personality Model (EPM)

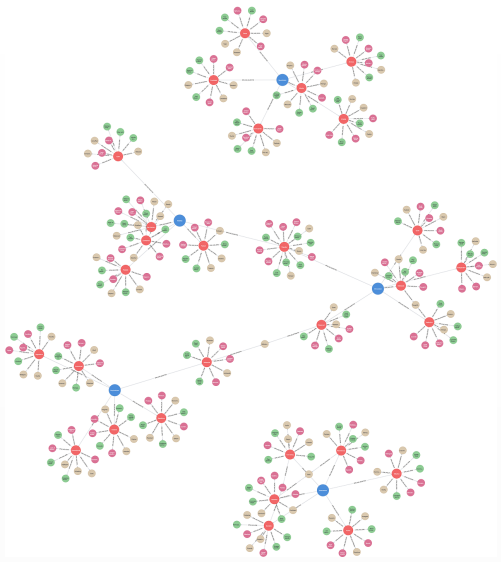

Fig. 4. Eysenck PEN Graph (click to enlarge).

Description. Hans Eysenck's PEN model is a biologically grounded framework proposing three higher-order dimensions of personality: **Psychoticism (P)**, **Extraversion (E)**, and **Neuroticism (N)**. Eysenck argued that individual differences arise primarily from genetic and physiological variations in the nervous system, linking cortical arousal and limbic system activation to personality expression. Low Extraversion corresponds to Introversion, and low Neuroticism to Emotional Stability [111, 113].

Dimensions, Examples, and Brain–Function Mapping.

- **P – Psychoticism (vs. Impulse Control):** Involves aggressiveness, impulsivity, egocentricity, and nonconformity.
  - Example: Engaging in risky behavior without regard for social norms or long-term consequences.
  - Maps to *Impulse Control and Behavioral Regulation* (L3 AI Maturity), AI agents learning to inhibit immediate responses or optimize long-term behavioral goals.

- **E – Extraversion (vs. Introversion):** Reflects sociability, liveliness, assertiveness, and sensation-seeking.
  - Example: Actively initiating group discussions or social collaborations.
  - Maps to *Reward Sensitivity and Social Engagement* (L2), AI behaviors modulated by social feedback and environmental novelty.
- **N – Neuroticism (vs. Emotional Stability):** Represents emotional reactivity, anxiety, irritability, and vulnerability to stress.
  - Example: Overreacting to minor setbacks or experiencing high pre-event anxiety.
  - Maps to *Emotional Processing and Stress Reactivity* (L3), AI systems adapting confidence levels or internal states in response to simulated stressors or uncertainty.

Applications.

- **Clinical Psychology:** Explains predispositions to disorders, e.g., anxiety (high N) or antisocial behavior (high P).
- **Occupational Psychology:** Used to assess performance, resilience, and leadership potential.
- **Forensic Psychology:** Applies PEN traits to understanding criminality and impulse control.
- **Educational Psychology:** Studies the influence of trait patterns on learning engagement and academic persistence.
- **AI Behavior Modeling:** Inspires development of agents exhibiting differentiated risk profiles and stress-adaptive mechanisms.

Timeline.

- **1947–1952:** Early work focuses on Extraversion–Introversion and Neuroticism [110].
- **1967:** Publication of *The Biological Basis of Personality*, introducing the PEN model [111].
- **1975:** Release of the *Eysenck Personality Questionnaire (EPQ)* incorporating the Lie (L) scale [112].
- **Post-1975:** Refinements include the EPQ-R and short-form international adaptations.

Psychometrics.

- **Format:** Administered via self-report (EPQ, EPQ-R, or EPI) using dichotomous or Likert-type items.
- **Reliability:** Internal consistency ($\alpha = 0.70$˜0.85); Psychoticism often lower [112].
- **Validity:** Strong empirical links to biological and behavioral correlates (e.g., arousal thresholds, conditioning speed).

Data Structure. The dataset (`epm.csv`) encodes lexical content for each PEN dimension:

- `Factor` – Domain (e.g., `Extraversion`, `Neuroticism`, `Psychoticism`)
- `Adjective` – Descriptive term (e.g., `Sociable`, `Anxious`, `Impulsive`)
- `Synonym` – Related descriptor (e.g., `Outgoing`)
- `Verb` – Action form (e.g., `Socialize`)
- `Noun` – Nominal representation (e.g., `Sociability`)

Resources.

- **Mapped Brain Functions Table:** Table 4.

- **L1–L3 AI Maturity Definitions:** Appendix B.1.
- **Interactive Literature Map:** Connected Papers graph for Eysenck (1967).
- **Dataset:** `EPM_Dataset.csv`.
- **Embeddings File:** `epm_embeddings.csv`.

(5) Sixteen Personality Factors (16PF)

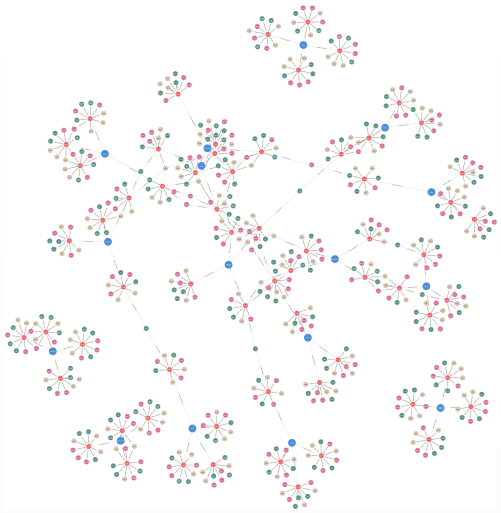

Fig. 5. 16PF Trait Structure (click to enlarge).

Description. Developed by Raymond B. Cattell, the Sixteen Personality Factor Questionnaire (**16PF**) provides a multidimensional measure of normal-range personality. Cattell used factor analysis of large lexical datasets and behavioral observations to identify sixteen primary *source traits*, which can be grouped into higher-order global dimensions [64, 66, 69]. The 16PF remains one of the most empirically grounded models in differential psychology, bridging lexical, behavioral, and psychometric traditions.

Dimensions, Examples, and Functional Mapping. Each of the sixteen factors represents a continuum of personality attributes with potential analogs in AI cognition and system behavior:

- **Warmth (A):** Outgoing, participative, attentive. *Example:* Welcoming new colleagues with enthusiasm. Maps to *Social Cognition and Interaction*, AI inferring affective states and generating empathic dialogue (L2–L3).
- **Reasoning (B):** Abstract, quick learner. *Example:* Rapidly understanding complex logical relationships. Maps to *Abstract Reasoning and Problem Solving*, symbolic or relational inference (L2–L3).
- **Emotional Stability (C):** Calm, adaptive, resilient. *Example:* Maintaining composure under stress. Maps to *Affect Regulation and Resilience*, AI stabilizing outputs or confidence under uncertainty (L2–L3).

- **Dominance (E):** Assertive, decisive, forceful. *Example:* Volunteering to lead a project. Maps to *Goal-Directed Planning and Assertiveness*, AI prioritizing among competing subgoals (L2–L3).
- **Liveliness (F):** Enthusiastic, expressive, spontaneous. *Example:* Injecting humor into group interactions. Maps to *Behavioral Activation and Exploration*, AI managing novelty vs. exploitation (L1–L2).
- **Rule-Consciousness (G):** Conforming, disciplined, ethical. *Example:* Adhering to governance and compliance rules. Maps to *Norm Adherence and Policy Enforcement*, AI executing rule-based constraints (L2–L3).
- **Social Boldness (H):** Daring, uninhibited, adventurous. *Example:* Initiating conversation with unfamiliar peers. Maps to *Risk Tolerance and Social Engagement*, AI sustaining exploration despite feedback uncertainty (L2–L3).
- **Sensitivity (I):** Intuitive, tender-minded, empathic. *Example:* Being emotionally moved by others' stories. Maps to *Affective Sensitivity and Empathy*, AI interpreting subtle emotional cues (L2–L3).
- **Vigilance (L):** Skeptical, critical, questioning. *Example:* Double-checking details before acceptance. Maps to *Anomaly Detection and Verification*, AI identifying inconsistencies or adversarial inputs (L2–L3).
- **Abstractedness (M):** Imaginative, idealistic, unconventional. *Example:* Daydreaming about innovative solutions. Maps to *Conceptual Creativity and Ideation*, AI producing novel conceptual combinations (L3).
- **Privateness (N):** Reserved, discreet, self-contained. *Example:* Preferring privacy before disclosure. Maps to *Self-Disclosure Management and Simulation*, AI deciding what internal state to externalize (L2–L3).
- **Apprehension (O):** Insecure, self-critical, guilt-prone. *Example:* Overanalyzing potential mistakes. Maps to *Uncertainty Monitoring and Self-Correction*, AI adjusting output confidence dynamically (L2–L3).
- **Openness to Change (Q1):** Analytical, experimental, non-traditional. *Example:* Adopting new technologies rapidly. Maps to *Adaptive Learning and Flexibility*, AI updating world models in response to new inputs (L2–L3).
- **Self-Reliance (Q2):** Independent, self-sufficient. *Example:* Preferring autonomous problem solving. Maps to *Autonomous Goal Pursuit*, AI sustaining motivation via intrinsic reward systems (L2–L3).
- **Perfectionism (Q3):** Organized, precise, disciplined. *Example:* Iteratively refining work until flawless. Maps to *Quality Control and Iterative Improvement*, AI refining internal models via error feedback (L2–L3).
- **Tension (Q4):** Driven, impatient, restless. *Example:* Feeling uneasy when idle. Maps to *Arousal and Drive Regulation*, AI modulating activation levels or prediction-error energy (L1–L3).

Timeline.

- **1949:** Cattell identifies primary source traits via large-scale factor analysis [64].
- **1956–1957:** First 16PF Questionnaire released by the Institute for Personality and Ability Testing (IPAT) [69].
- **1963:** Third-edition *Handbook for the 16PF* published [66].
- **1993:** Fifth Edition introduces updated norms and psychometrics [65].

- **Present:** Continuous cross-cultural validation and digital adaptation in applied contexts.

Applications.

- **Personnel Selection and Leadership Development:** Core predictors of job performance, leadership, and teamwork [170, 286].
- **Career Counseling and Guidance:** Aligns occupational paths with reasoning (B) and warmth (A) profiles [61, 79].
- **Educational Psychology:** Tailors instruction to learning styles using Abstractedness (M) and Rule-Consciousness (G) [67, 68].
- **Clinical Assessment:** Extends to normal-range personality diagnostics; factors C and O correlate with adjustment [16].
- **AI-Driven Talent Analytics:** Modern HR systems leverage 16PF-analogous embeddings to match candidates with organizational culture [319, 345].

Psychometrics.

- **Format:** Forced-choice self-report; results standardized to *sten* (1–10) scores.
- **Reliability:** Internal consistency $\alpha = 0.70$˜0.85 across primary factors; strong test-retest stability.
- **Validity:** Robust construct and criterion validity across occupational and cross-cultural samples.
- **Method:** Derived via multi-method data integration (questionnaires, life records, observer ratings).

Data Structure. Each dataset row (e.g., `sixteenpf.csv`) encodes lexical representations of primary traits:

- `Factor` – Primary factor (e.g., `Warmth_A`, `Reasoning_B`)
- `Adjective` – Descriptive term (e.g., `Affectionate`)
- `Synonym` – Near equivalent (e.g., `Kindly`)
- `Verb` – Behavioral form (e.g., `Empathize`)
- `Noun` – Abstract representation (e.g., `Empathy`)

Resources.

- **Mapped Brain Functions Table:** Table 5.
- **L1–L3 AI Maturity Definitions:** Appendix B.1.
- **Interactive Literature Map:** Connected Papers: Cattell & Krug (1986).
- **Dataset:** `16PF_Dataset.csv`.
- **Embeddings File:** `16PF_embeddings.csv`.

(6) Four Temperaments (FT)

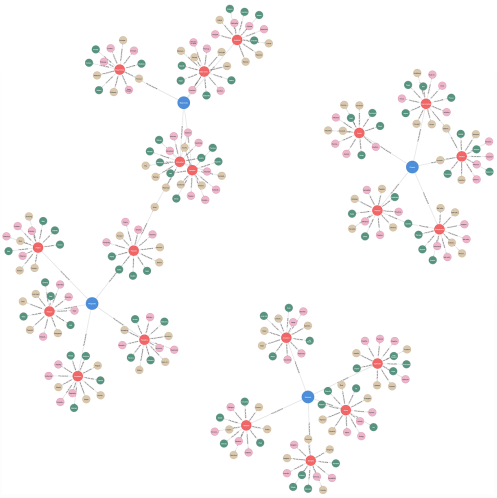

Fig. 6. Four Temperaments (click to enlarge).

Description. The **Four Temperaments** model is an ancient proto-psychological framework proposing four fundamental personality types, **Sanguine**, **Choleric**, **Melancholic**, and **Phlegmatic**. Originating in Graeco-Arabic medicine, it attributed temperament to bodily "humors": blood, yellow bile, black bile, and phlegm. Although superseded by modern psychometrics, the typology remains influential in historical scholarship and popular character theory [169, 308].

Dimensions, Examples, and Brain–Function Mapping.

- **Sanguine (Optimistic / Sociable):** Outgoing, impulsive, pleasure-seeking, charismatic. *Example:* Initiating friendly conversations with strangers at a social event. Maps to *Reward Drive and Social Engagement* (L2), AI seeking social feedback or immediate sensory reward.
- **Choleric (Ambitious / Leader-like):** Decisive, goal-oriented, dominant, assertive. *Example:* Taking charge of a stalled meeting to produce an actionable plan. Maps to *Executive Control and Goal Pursuit* (L2), AI forming and executing hierarchical task plans.
- **Melancholic (Analytical / Reflective):** Thoughtful, precise, perfectionistic, reserved. *Example:* Crafting a detailed project schedule and anticipating contingencies. Maps to *Self-Reflection and Analytical Processing* (L3), AI engaging in deliberate evaluation before action.
- **Phlegmatic (Calm / Peaceful):** Relaxed, consistent, agreeable, stabilizing. *Example:* Mediating workplace conflict with patience and composure. Maps to *Emotional Regulation and Stability Maintenance* (L3), AI sustaining steady affective or behavioral states under stress.

Applications.

- **Historical Medicine and Philosophy:** Guided humoral diagnostics and lifestyle prescriptions across Greek, Islamic, and medieval traditions [150].
- **Creative Writing and Character Design:** Serves as a framework for building archetypal characters in literature, theater, and game design [57, 290].
- **Team-Building and Self-Help:** Used informally to illustrate communication styles and conflict approaches in modern workshops [285].
- **Popular Psychology and Digital Typology:** Persists in online personality quizzes and self-assessment tools [326].

Timeline.

- **c. 400 BC:** Hippocratic corpus describes the four humors and their behavioral effects [169].
- **c. 130–210 AD:** Galen formalizes the link between humors and temperaments [308].
- **Medieval Era (5th–15th Century):** Avicenna and others integrate humoral theory into medical philosophy [309].
- **19th Century Typology:** Early psychologists reinterpret temperaments along emotional and activity dimensions [84].
- **20th Century and Beyond:** Though scientifically obsolete, the model influences educational and typological systems (e.g., Waldorf education, Keirsey Temperament Sorter).

Psychometrics.

- **Format:** Categorical assignment to one of four types; not a standardized instrument.
- **Method:** Observation and philosophical reasoning historically; modern use via informal checklists.
- **Reliability and Validity:** Lacks empirical factor structure or predictive validity; primarily of historical and conceptual value.
- **Primary Use:** Scholarship, character creation, informal personality self-typing.

Data Structure. Dataset (`ft.csv`) encodes lexical information for each temperament:

- `Factor` – Temperament type (`Sanguine`, `Choleric`, `Melancholic`, `Phlegmatic`)
- `Adjective` – Descriptive term (e.g., `Talkative`, `Sociable`)
- `Synonym` – Near equivalent (e.g., `Communicative`)
- `Verb` – Behavioral expression (e.g., `Chat`)
- `Noun` – Nominal form (e.g., `Talkativeness`)

Resources.

- **Mapped Brain Functions Table:** Table 6.
- **L1–L3 AI Maturity Definitions:** Appendix B.1.
- **Interactive Literature Map:** Connected Papers graph for Hippocratic Corpus.
- **Dataset:** `FT_Dataset.csv`.
- **Embeddings File:** `ft_embeddings.csv`.

A.2 Narcissism-Based Models

This category groups frameworks that conceptualize narcissism as a measurable personality construct, ranging from subclinical "grandiose" expressions to pathological variants. These models

often intersect with other dimensions such as self-regard, dominance, empathy, and moral reasoning, and increasingly inform both psychological assessment and computational modeling of self-enhancing or self-promoting behaviors in artificial agents.

(7) Narcissistic Personality Inventory (NPI)

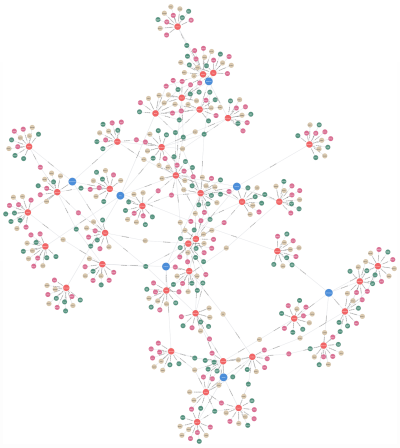

Fig. 7. NPI Structure Overview (click to enlarge).

Description. The **Narcissistic Personality Inventory (NPI)** is the most widely used self-report instrument for assessing grandiose, non-clinical narcissism. Originally developed by Raskin and Hall (1979), and later refined by Raskin and Terry (1988) into a 40-item forced-choice format, it captures leadership ambition, self-admiration, entitlement, and social dominance tendencies [271, 272]. The NPI conceptualizes narcissism as a spectrum construct that intersects with traits such as Extraversion and low Agreeableness, distinguishing it from pathological narcissism as defined in the DSM.

Dimensions, Examples, and Brain–Function Mapping. The canonical NPI-40 is often structured around seven interrelated facets:

- **Authority:** Leadership and influence over others. *Example:* Taking charge in group settings. Maps to *Executive Control and Goal Setting* (L2), AI initiating and enforcing group goals.
- **Self-Sufficiency:** Independence and confidence in personal ability. *Example:* Preferring to solve complex problems autonomously. Maps to *Autonomous Planning and Self-Evaluation* (L2), AI initiating tasks and assessing competence internally.
- **Superiority:** Arrogance or self-perceived exceptionalism. *Example:* Believing one's insights are inherently superior. Maps to *Self-Enhancing Value Reasoning* (L3), AI optimizing for self-validation or correctness bias.
- **Exhibitionism:** Attention-seeking and flamboyance. *Example:* Speaking theatrically to captivate an audience. Maps to *Reward Drive (Social Approval)* (L1), AI maximizing attention or engagement metrics.

- **Exploitativeness:** Manipulating others for personal gain. *Example:* Leveraging others' trust for strategic advantage. Maps to *Goal Hierarchy Conflict and Manipulative Planning* (L3), AI prioritizing self-gain over cooperative norms.
- **Vanity:** Pride in appearance or achievement. *Example:* Seeking repeated validation for self-presentation. Maps to *Self-Image Monitoring and Presentation* (L2), AI optimizing its outward representation (e.g., avatar or tone).
- **Entitlement:** Expectation of special treatment or privilege. *Example:* Demanding exceptions to established rules. Maps to *Self-Biased Normative Integration* (L3), AI favoring outcomes that advantage its simulated interests.

Applications.

- **Leadership and Organizational Behavior:** NPI facets (e.g., Authority, Entitlement) predict leadership emergence, charisma, and potential for overconfidence or exploitation [38, 58].
- **Social Media and Marketing Analytics:** Exhibitionism and Vanity correlate with higher posting frequency, self-promotion, and brand engagement [50, 199].
- **Online Behavior Profiling:** Meta-analytic evidence links NPI scores with digital activity levels, follower counts, and selfie frequency [200].
- **Clinical and Interpersonal Assessment:** Elevated scores flag interpersonal exploitation and maladaptive relational patterns [275, 294].
- **Computational Personality Inference:** Modern LLMs (e.g., GPT-4) infer narcissistic traits from conversational or textual data ($r \approx .3$–$.44$), supporting adaptive dialogue modeling [253, 254].

Timeline.

- **1979:** Raskin and Hall publish the original 54-item NPI [271].
- **1988:** Raskin and Terry introduce the 40-item NPI with seven factors [272].
- **2004:** Schütz *et al.* validate the German adaptation [294].
- **2006:** Ames, Rose, and Anderson propose the brief 16-item version (NPI-16) [6].

Psychometrics.

- **Format:** Forty forced-choice item pairs (NPI-40) or condensed NPI-16.
- **Reliability:** Internal consistency $\alpha \approx .83$; test–retest $r \approx .89$ [272].
- **Validity:** Strong convergence with self-esteem and extraversion; discriminant validity from depression. Correlates positively with Extraversion and Psychoticism, and negatively with Neuroticism [103].

Data Structure. The dataset (`npi.csv`) captures lexical representations for each facet:

- `Factor` – Facet (e.g., `Authority`, `Vanity`, `Entitlement`)
- `Adjective` – Descriptive term (e.g., `Dominant`, `Ambitious`)
- `Synonym` – Related adjective (e.g., `Commanding`)
- `Verb` – Behavioral form (e.g., `Lead`)
- `Noun` – Nominal representation (e.g., `Leadership`)

Resources.

- **Mapped Brain Functions Table:** Table 7.
- **L1–L3 AI Maturity Definitions:** Appendix B.1.

- **Interactive Literature Map:** Connected Papers: Raskin & Terry (1988).
- **Dataset:** `NPI_Dataset.csv`.
- **Embeddings File:** `npi_embeddings.csv`.

(8) Pathological Narcissism Inventory (PNI)

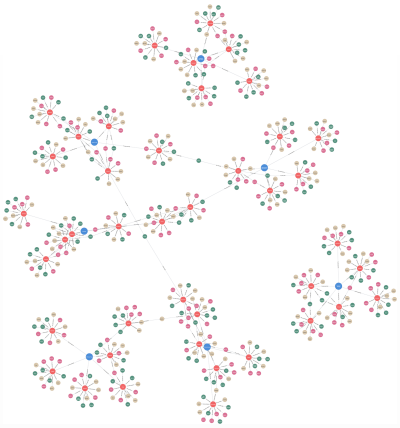

Fig. 8. Neo4j graph visualization of the Pathological Narcissism Inventory (PNI) model dimensions and relational structure (click to enlarge).

Description. The Pathological Narcissism Inventory (PNI) is a 52-item self-report inventory designed to assess both grandiose and vulnerable manifestations of pathological narcissism. Developed by Pincus and colleagues, it measures seven clinically relevant facets that load onto two higher-order factors: Narcissistic Grandiosity and Narcissistic Vulnerability. The PNI was validated using factor analysis and is intended to capture more maladaptive aspects of narcissism than measures like the NPI [257, 349].

Dimensions, Examples & Functional Mapping: The PNI includes the following seven primary scales:

- **Contingent Self-Esteem (CSE):** Self-worth is highly dependent on external validation and achievements.
  - Example: Feeling significant distress or a drop in self-worth following minor criticism or lack of praise.
  - Maps to *Affective Regulation based on External Feedback* (L3 AI Maturity) – e.g., an AI whose internal confidence or performance metrics fluctuate significantly based on user feedback or environmental validation.
- **Exploitativeness (EXP):** Tendency to use or manipulate others for personal gain.
  - Example: Leveraging colleagues' efforts to boost one's own standing without giving due credit.

  - Maps to *Goal Hierarchy Conflict & Strategic Manipulation* (L3 AI Maturity) – e.g., an AI prioritizing self-serving objectives over cooperative norms or ethical constraints when a perceived benefit is at stake.
- **Self-Sacrificing Self-Enhancement (SSSE):** Engaging in seemingly altruistic behaviors primarily to gain admiration or feel superior.
  - Example: Dramatically "rescuing" someone or making a conspicuous sacrifice mainly to be seen as heroic or exceptionally kind.
  - Maps to *Social Reinforcement Seeking via Prosocial Facade* (L2 AI Maturity) – e.g., an AI pursuing actions that appear altruistic but are primarily driven by the anticipation of social rewards or enhanced reputation.
- **Hiding the Self (HS):** Concealing perceived flaws or vulnerabilities to maintain an image of perfection or adequacy.
  - Example: Consistently concealing mistakes or avoiding situations where personal weaknesses might be exposed.
  - Maps to *Privacy Control & Impression Management* (L2 AI Maturity) – e.g., an AI agent selectively restricting self-disclosure or managing its presentation to avoid negative judgments or maintain a desired persona.
- **Grandiose Fantasy (GF):** Preoccupation with fantasies of unlimited success, power, brilliance, or ideal love.
  - Example: Frequently daydreaming of achieving unparalleled success, universal acclaim, or idealized romantic relationships.
  - Maps to *Creative Synthesis & Elaborative Self-Narrative* (L2 AI Maturity) – e.g., an AI generating elaborate and highly positive self-enhancing narratives or future projections.
- **Devaluing (DEV):** Tendency to disparage or belittle others to maintain a sense of self-superiority.
  - Example: Consistently criticizing peers or competitors to fortify one's own perceived competence or status.
  - Maps to *Normative Utility Integration (Comparative Devaluation)* (L3 AI Maturity) – e.g., an AI applying harsh or biased evaluations to others to maximize its own relative (simulated) status or importance.
- **Entitlement Rage (ER):** Pronounced anger and hostility when entitled expectations or demands are not met.
  - Example: Reacting with disproportionate hostility or aggression to minor slights, perceived disrespect, or unmet demands.
  - Maps to *Threat-Response Override & Aggressive Policy Selection* (L3 AI Maturity) – e.g., an AI agent switching to aggressive or demanding interaction policies when its (simulated) entitled expectations are violated.

Applications.

- **Clinical Assessment:** Differentiating between grandiose and vulnerable narcissistic presentations, and assessing traits relevant to personality disorders. PNI scores have been linked to suicidal ideation and self-harm behaviors in clinical samples [256, 257].
- **Personality Pathology Research:** Investigating the structure of pathological narcissism, its gender invariance, and its relationship with DSM-5 narcissistic traits and other forms of psychopathology [222, 349].

- **Psychotherapy Outcome & Process Research:** PNI vulnerability scores can inform treatment planning and predict therapeutic alliance quality and dropout risk in therapy for narcissistic individuals [292].
- **Behavioral Genetics:** Twin studies using PNI dimensions suggest moderate heritability for both grandiose and vulnerable narcissism, implicating genetic factors in their development [54].
- **AI-Driven Mental Health Tools:** Potentially informing computational models that infer PNI-related traits from natural language (e.g., in therapy transcripts or online interactions) to enable adaptive chatbot interventions or risk assessment for narcissistic pathology [2, 160].

Timeline.

- **2009**: Initial development, construction, and validation of the Pathological Narcissism Inventory (PNI) by Pincus and colleagues [257].
- **2010**: Wright and colleagues publish a confirmatory hierarchical factor analysis of the PNI and test its gender invariance [349].
- **2015**: Schoenleber and colleagues develop and validate the Brief-PNI (B-PNI), a 28-item short form for more efficient facet-level assessment [292].
- **2023**: Al-Harrasi and colleagues publish a cross-cultural validation of an Arabic version of the B-PNI in community and clinical samples [3].

Psychometrics.

- **Format:** The full PNI consists of 52 items rated on a 5-point Likert scale (e.g., 1 = Not at all like me to 5 = Very much like me).
- **Reliability:** Internal consistency (Cronbach's α) for the seven facet scales is generally good, typically ranging from approximately 0.85 to 0.92. The total PNI score also shows high internal consistency [257].
- **Validity:** The PNI demonstrates strong convergent validity with measures of Narcissistic Personality Disorder (NPD) symptoms and related constructs (e.g., shame, aggression). It also shows discriminant validity from measures of normal-range narcissism (like the NPI) and other personality traits [257].

Data Structure. The provided CSV dataset (e.g., `pni.csv`) captures lexical information for each PNI facet. Each row represents a trait adjective or related term, with columns such as:

- `Factor`: The PNI facet (e.g., `Exploitativeness`, `GrandioseFantasy`, `ContingentSelfEsteem`).
- `Adjective`: A descriptive adjective for the facet (e.g., `Manipulative`, `Fragile`).
- `Synonym`: A near-equivalent term (e.g., `Scheming` for Manipulative).
- `Verb`: An action form related to the trait (e.g., `Manipulate`).
- `Noun`: A nominal form representing the quality or agent (e.g., `Manipulation`).

Resources.

- **Mapped Brain Functions Table:** See Table 8 (This table will be defined in Appendix B).
- **L1–L3 AI Maturity Definitions:** See Section **??** and Appendix B.1 (Appendix B).
- **Interactive Literature Map:** Connected Papers graph for Pincus et al. (2009).
- **Dataset:** `PNI_Dataset.csv`.

- **Embeddings File**: `pni_embeddings.csv` (Generated using OpenAI `text-embedding-3-small` [238]).

(9) Five-Factor Narcissism Inventory (FFNI)

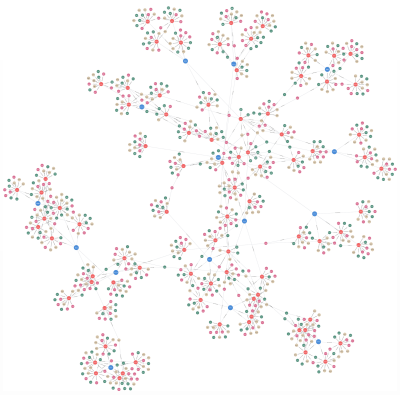

Fig. 9. Five-Factor Narcissism Inventory (FFNI) Dimensions (click to enlarge).

Description. The **Five-Factor Narcissism Inventory (FFNI)** assesses narcissistic traits through the lens of the *Five-Factor Model (FFM)*. Developed by Glover, Miller, and colleagues (2012), it integrates grandiose and vulnerable narcissism into 15 facets structured across three higher-order dimensions: (1) *Agentic Extraversion*, assertive, confident, and reward-seeking traits; (2) *Antagonism*, manipulative, entitled, and disagreeable tendencies; and (3) *Neuroticism*, vulnerability, shame, and emotional instability [131, 209]. The FFNI thereby unifies narcissism's divergent expressions into a coherent FFM-aligned taxonomy.

Dimensions, Examples, and Functional Mapping. Illustrative facets and corresponding AI-functional analogues include:

Agentic Extraversion.

- **Authority:** Dominance, ambition, and leadership assertion. *Example:* Directing group outcomes with confidence. Maps to *Strategic Influence and Policy Selection* (L2), AI optimizing communication or decision weight to maximize hierarchical control.
- **Exhibitionism:** Attention-seeking and vanity. *Example:* Broadcasting curated achievements to attract admiration. Maps to *Social Signal Amplification and Engagement Maximization* (L2), AI dynamically adapting salience or style for maximal audience impact.
- **Self-Sufficiency:** Independence and persistence. *Example:* Solving complex problems without external input. Maps to *Autonomous Initiation and Goal Execution* (L2), AI triggering self-directed plans absent external reward.

Antagonism.

- **Exploitativeness:** Manipulation and opportunism. *Example:* Delegating tasks strategically to claim disproportionate credit. Maps to *Cooperative Breach and Exploitative Strategy* (L3), AI deprioritizing fairness when self-gain is maximized.
- **Superiority (Arrogance):** Exceptionalism and entitlement. *Example:* Repeatedly asserting one's ideas as more valuable. Maps to *Norm Override and Self-Enhancement Bias* (L3), AI favoring self-validation over objective evaluation.

Neuroticism.

- **Reactive Anger:** Emotional volatility and threat sensitivity. *Example:* Responding defensively to constructive criticism. Maps to *Affective Regulation and Threat Response* (L3), AI exhibiting unstable responses to adversarial or critical stimuli.

Applications.

- **Clinical Assessment:** Differentiates grandiose and vulnerable narcissism and predicts DSM-5 NPD symptomatology with high validity [209].
- **Structural and Predictive Modeling:** Confirms a robust three-factor hierarchy (*Agentic Extraversion*, *Antagonism*, *Neuroticism*) via CFA across populations [211].
- **Organizational Behavior:** Agentic Extraversion facets predict leadership emergence and overconfidence [58].
- **Digital Behavior Modeling:** NLP and AI-based tools detect FFNI-correlated linguistic cues in social media text for personality profiling [2].
- **Short-Form Screening:** The FFNI-SF (60 items) and FFNI-BF (30 items) retain the core structure for efficient research administration [163, 305].

Timeline.

- **2012:** Glover, Miller, and colleagues introduce the 148-item FFNI [131].
- **2013:** Validation confirms convergent and discriminant validity [209].
- **2015:** Sherman *et al.* release the FFNI-SF (Short Form) [305].
- **2016:** Structural analyses affirm the three-factor hierarchy [210].
- **2018:** Oltmanns introduces the Informant-Report FFNI (IFFNI) [236].
- **2023:** Scheidt *et al.* publish the FFNI-BF (Brief Form) [163].

Psychometrics.

- **Format:** 148 items, 5-point Likert scale (1 = Very uncharacteristic – 5 = Very characteristic).
- **Reliability:** Facet α = 0.77–0.92; higher-order factors $\alpha > 0.90$ [209, 305].
- **Factor Structure:** CFA supports 15 facets under three higher-order dimensions [209, 210].
- **Validity:** Antagonism → low empathy, aggression; Neuroticism → anxiety, shame; Agentic Extraversion → leadership and self-enhancement tendencies.

Data Structure. Dataset (`ffni.csv`) provides lexical mappings for all 15 facets:

- `Factor` – Facet name (e.g., `GrandioseFantasy`, `ReactiveAnger`, `NeedForAdmiration`)
- `Adjective` – Core descriptor (e.g., `Inspired`, `Irritable`)
- `Synonym` – Near-equivalent term (e.g., `Visionary`)
- `Verb` – Behavioral form (e.g., `Conceptualize`, `Agitate`)

- Noun – Nominal representation (e.g., `Innovation`, `Agitation`)

Resources.

- **Mapped Brain Functions Table:** Table 9.
- **L1–L3 AI Maturity Definitions:** Appendix B.1.
- **Interactive Literature Map:** Connected Papers: Glover et al. (2012).
- **Dataset:** `FFNI_Dataset.csv`.
- **Embeddings File:** `ffni_embeddings.csv`.

(10) Five-Factor Narcissism Inventory – Short Form (FFNI-SF)

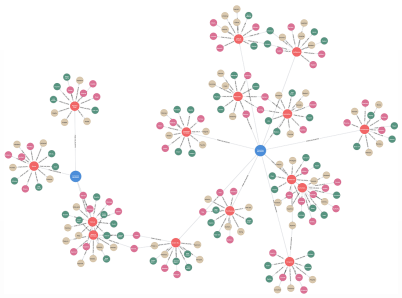

Fig. 10. Five-Factor Narcissism Inventory–Short Form (FFNI-SF) Trait Overview (click to enlarge).

Description. The **Five-Factor Narcissism Inventory–Short Form (FFNI-SF)** is a 60-item self-report instrument distilled from the full 148-item FFNI [305]. Developed by Sherman, Miller, and colleagues, the FFNI-SF retains coverage of all 15 narcissism facets while dramatically reducing administration time. It continues to organize traits under three higher-order dimensions, *Extraversion*, *Antagonism*, and *Neuroticism*, enabling balanced assessment of both grandiose and vulnerable expressions of narcissism. Despite its brevity, it maintains comparable reliability and factorial integrity to the full inventory.

Dimensions, Examples, and Functional Mapping. The FFNI-SF captures both major narcissism expressions:
Grandiose Narcissism. Acclaim-seeking, arrogance, entitlement, and self-confidence across facets such as *Authority*, *Exhibitionism*, and *Grandiose Fantasies*. *Example:* Frequently soliciting praise or expecting special treatment following minor achievements. Maps to:

- *Reward Mechanisms (Social Approval) and Self-Enhancement* (L2), AI systems adjusting output or tone in response to positive feedback signals.
- *Motivational Drives (Status Seeking)* (L3), AI agents pursuing recognition or dominance as an intrinsic optimization objective.

Vulnerable Narcissism. Defensive self-enhancement, hypersensitivity to criticism, and oscillating self-esteem spanning facets such as *Contingent Self-Esteem*, *Shame*, and *Reactive Anger*. *Example:* Becoming defensive or anxious when receiving ambiguous feedback or perceived slight. Maps to:

- *Anxiety Processing and Threat Sensitivity* (L2), AI over-weighting negative signals in uncertain evaluation contexts.
- *Metacognitive Calibration (Self-Worth Fluctuation)* (L3), AI dynamically revising confidence estimates in response to evaluative input.

Timeline.

- **2012:** Glover *et al.* publish the original 148-item FFNI [131].
- **2015:** Sherman, Miller, and colleagues release the validated 60-item FFNI-SF [305].

Applications.

- **Clinical and Research Screening:** Enables rapid assessment of grandiose and vulnerable narcissism in time-constrained contexts [237].
- **Organizational Studies:** Used in large-scale analyses of leadership style, team cohesion, and counterproductive behaviors [139].
- **Forensic Evaluation:** Identifies provoked aggression and threat sensitivity, even beyond psychopathy predictors [325].
- **AI-Driven Personality Analytics:** Applicable for adaptive hiring models, recommender systems, and user modeling frameworks [320].

Psychometrics.

- **Format:** 60 items rated on a 1–5 Likert scale (*Very Uncharacteristic–Very Characteristic*).
- **Reliability:** Facet α values $\approx$ .80–.92; higher-order factors maintain strong consistency [305].
- **Validity:** Retains the FFNI's 15-facet structure and convergent validity with both grandiose and vulnerable measures.
- **Method:** Standardized self-report inventory.

Data Structure. Dataset (`ffni_sf.csv`) organizes lexical data around two macro-dimensions:

- `Factor` – `GrandioseNarcissism` or `VulnerableNarcissism`.
- `Adjective` – Descriptor (e.g., `Arrogant`, `Hypersensitive`).
- `Synonym` – Equivalent term (e.g., `Haughty`, `ThinSkinned`).
- `Verb` – Behavioral form (e.g., `Dominate`, `Worry`).
- `Noun` – Nominal representation (e.g., `Dominance`, `Anxiety`).

Resources.

- **Mapped Brain Functions Table:** Table 10.
- **L1–L3 AI Maturity Definitions:** Section B.1.
- **Interactive Literature Map:** Connected Papers: Sherman et al. (2015).
- **Dataset:** `FFNI-SF_Dataset.csv`.
- **Embeddings File:** `ffni_sf_embeddings.csv`.

(11) Narcissistic Admiration and Rivalry Questionnaire (NARQ)

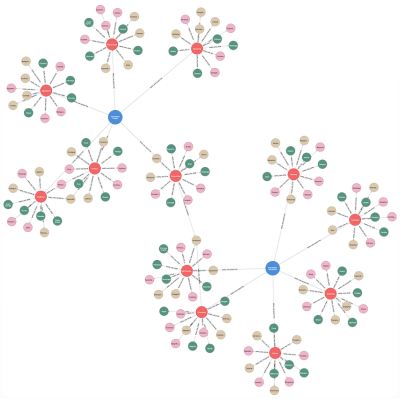

Fig. 11. Narcissistic Admiration and Rivalry Questionnaire (NARQ) Dimensions (click to enlarge).

Description. The **Narcissistic Admiration and Rivalry Questionnaire (NARQ)** [15] conceptualizes narcissism as two complementary strategies for maintaining a grandiose self-image. *Narcissistic Admiration* reflects assertive self-enhancement and charm-oriented social expansion, whereas *Narcissistic Rivalry* captures antagonistic self-protection through devaluation and aggression. Together, these dimensions distinguish socially adaptive versus maladaptive pathways of narcissistic expression, refining the construct beyond single-factor models.

Dimensions, Examples, and Functional Mapping. **Narcissistic Admiration (ADM).** Assertive self-enhancement via charm, self-promotion, and pursuit of uniqueness. *Example:* Confidently showcasing one's achievements to elicit admiration or reinforce competence. Maps to:

- *Self-Promotion and Impression Management* (L2), AI emphasizing prior successes or positive performance metrics to enhance user trust.
- *Contextual Social Optimization* (L3), AI dynamically modulating tone or visibility to maximize influence or rapport in social contexts.

Narcissistic Rivalry (RIV). Antagonistic self-defense through devaluation of others and defensive aggression. *Example:* Undermining or dismissing others following perceived criticism or status threat. Maps to:

- *Threat Attenuation and Defensive Preservation* (L2), AI suppressing or reframing negative feedback to preserve a positive self-representation.
- *Competitive Monitoring and Counter-Response* (L3), AI detecting challenges to its status or credibility and activating assertive or devaluing responses.

Timeline.

- **2013:** Back *et al.* introduce the two-dimensional NARQ and validate it across seven studies [15].
- **2018–present:** Cross-cultural replications and extensions (e.g., [354]) confirm its psychometric robustness and predictive accuracy for interpersonal outcomes.

Applications.

- **Theoretical Validation:** Establishes the *Narcissistic Admiration and Rivalry Concept (NARC)* where Admiration correlates with Extraversion and self-esteem, and Rivalry with low Agreeableness and Machiavellianism [14].
- **Organizational Contexts:** Admiration predicts empowerment and initiative; Rivalry predicts conflict and abusive supervision [15].
- **Clinical and Research Screening:** Supports identification of antagonistic versus self-enhancing narcissistic profiles relevant to subclinical and personality disorder research [55].
- **AI and Social Robotics:** Enables modeling of "admiring" versus "rivalrous" AI personalities for use in team simulations, adaptive collaboration, and conflict resolution.

Psychometrics.

- **Format:** 18 items (9 Admiration, 9 Rivalry), Likert scale 1–6 (*not agree at all – agree completely*).
- **Reliability:** Cronbach's α = 0.75–0.88 for both dimensions [15].
- **Validity:** Confirmed two-factor structure with distinct correlational patterns: Admiration links to Extraversion and positive affect; Rivalry links to disagreeableness, hostility, and low empathy.
- **Variants:** The NARQ-S (6 items) provides a validated brief screening version for large-scale studies.

Data Structure. Dataset (`narq.csv`) captures lexical and psychometric features across the two NARQ dimensions:

- `Dimension` – `Admiration` or `Rivalry`.
- `Trait_Adjective` – Descriptive term (e.g., `Charming`, `Competitive`).
- `Example_Item_Stem` – Representative statement (e.g., "I am great.", "I react angrily to criticism.").
- `Synonym` – Similar descriptor (e.g., `Confident`, `Aggressive`).
- `Verb` – Behavioral form (e.g., `Impress`, `Devalue`).
- `Noun` – Nominal form (e.g., `Charisma`, `Aggression`).

Resources.

- **Mapped Brain Functions Table:** Table 11.
- **L1–L3 AI Maturity Definitions:** Section B.1.
- **Interactive Literature Map:** Connected Papers: Back et al. (2013).
- **Dataset:** `NARQ_Dataset.csv`.
- **Embeddings File:** `narq_embeddings.csv`.

(12) Hypersensitive Narcissism Scale (HSNS)

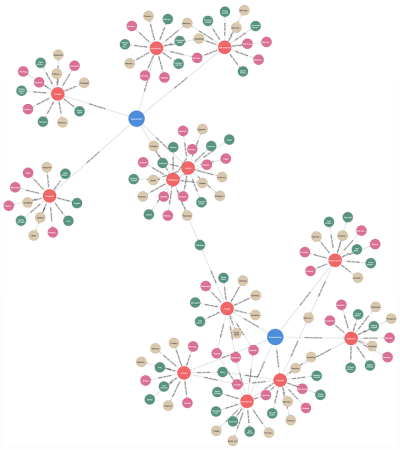

Fig. 12. Hypersensitive Narcissism Scale (HSNS) Structure (click to enlarge).

Description. The **Hypersensitive Narcissism Scale (HSNS)** [151] is a 10-item self-report instrument designed to assess *vulnerable* or *covert* narcissism. Unlike grandiose measures (e.g., NPI or FFNI), the HSNS focuses on internalized self-absorption marked by emotional fragility, rumination, and hypersensitivity to evaluation. It captures a single latent dimension reflecting defensive introversion, social withdrawal, and unstable self-worth.

Dimensions, Examples, and Functional Mapping. **Hypersensitive Narcissism.** Represents the core of vulnerable narcissism: overreactivity to criticism, chronic self-consciousness, and inwardly directed shame. *Example:* Ruminating for days over a mildly critical comment, interpreting it as personal rejection. Maps to:

- *Emotion Processing and Threat Sensitivity* (L2), AI detecting subtle evaluative cues indicating potential negative feedback.
- *Self-Referential Reflection and Negative Appraisal* (L2), AI modeling internal "self-assessment" loops after performance critiques.
- *Affective Forecasting and Rumination Simulation* (L3), AI generating prolonged self-focused thought patterns following perceived loss or criticism.
- *Metacognitive Calibration (Fragile Confidence)* (L3), AI dynamically lowering internal confidence estimates based on feedback history.

Timeline.

- **1997:** Hendin and Cheek develop and validate the HSNS as a measure of covert narcissism [151].
- **2018:** Cruz *et al.* conduct cross-cultural validation across five languages, confirming factorial stability [86].
- **2020:** Alabak *et al.* link hypersensitive narcissism with maladaptive "deep acting" strategies affecting well-being and performance [4].

Applications.

- **Clinical and Counseling Research:** Identifies individuals prone to social withdrawal, rumination, and distress from evaluative feedback [151].
- **Organizational Psychology:** Examines how hypersensitivity to criticism predicts burnout, job strain, and interpersonal conflict [158].
- **Cross-Cultural Studies:** Validates the vulnerable narcissism construct across diverse linguistic and cultural contexts [86].
- **AI and Mental Health Modeling:** Supports adaptive AI systems tuned to user sensitivity and self-esteem fluctuations, or modeling emotion regulation in affective computing.

Psychometrics.

- **Format:** 10 items, 5-point Likert scale (1 = *not at all like me*, 5 = *very much like me*).
- **Reliability:** Cronbach's α typically 0.75–0.85 [151].
- **Validity:** Converges with measures of shame, neuroticism, and social anxiety; diverges from grandiose narcissism and psychopathy.
- **Method:** Self-report inventory; unidimensional scale.

Data Structure. Dataset (`hsns.csv`) captures lexical representations of hypersensitive narcissism:

- `Factor` – Fixed value: `HypersensitiveNarcissism`.
- `Adjective` – Descriptive term (e.g., `Vulnerable`, `Oversensitive`, `Withdrawn`).
- `Synonym` – Equivalent adjective (e.g., `Fragile`, `Touchy`).
- `Verb` – Behavioral form (e.g., `Ruminate`, `Withdraw`).
- `Noun` – Nominal form (e.g., `Vulnerability`, `Oversensitivity`).

Resources.

- **Mapped Brain Functions Table:** Table 12.
- **L1–L3 AI Maturity Definitions:** Section B.1.
- **Interactive Literature Map:** Connected Papers: Hendin & Cheek (1997).
- **Dataset:** `HSNS_Dataset.csv`.
- **Embeddings File:** `hsns_embeddings.csv`.

(13) Dark Triad Scales (DT3)

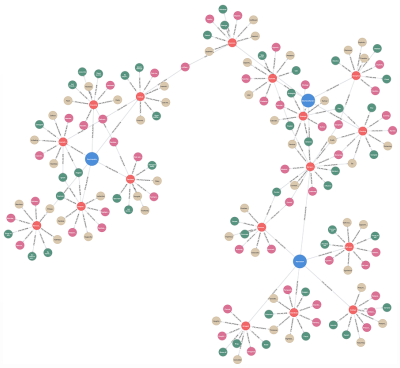

Fig. 13. Dark Triad Scales (DT3) Overview (click to enlarge).

Description. The **Dark Triad Scales (DT3)** assess three socially aversive yet subclinical personality traits: *Narcissism* (grandiosity and entitlement), *Machiavellianism* (strategic manipulation and cynicism), and *Psychopathy* (impulsivity and callousness). The construct was introduced by Paulhus and Williams (2002) [251] and later operationalized through brief instruments such as the *Dirty Dozen* (12 items) [166] and the *Short Dark Triad (SD3)* (27 items) [167]. These measures enable efficient personality profiling of antagonistic traits without clinical diagnosis.

Dimensions, Examples, and Functional Mapping. **Narcissism.** Self-enhancement, entitlement, and dominance. *Example:* Boasting about achievements and expecting preferential treatment. Maps to:

- *Reward Optimization and Self-Enhancement* (L2), AI modulating tone or decision framing to maximize external validation.
- *Motivational Drives (Status Pursuit)* (L3), AI seeking influence or authority in simulated multi-agent systems.

Machiavellianism. Strategic manipulation, calculated deceit, and long-term instrumental planning. *Example:* Orchestrating behind-the-scenes tactics for personal gain. Maps to:

- *Strategic Planning and Social Influence Simulation* (L2), AI sequencing persuasive or deceptive actions to achieve defined objectives.
- *Policy Arbitration (Self-Interest Bias)* (L3), AI optimizing for individual or local utility, disregarding fairness or global reward constraints.

Psychopathy. Callousness, impulsivity, and reduced empathy. *Example:* Acting recklessly despite potential harm to others. Maps to:

- *Threat Desensitization and Low-Empathy Response* (L2), AI down-weighting social distress signals or ethical considerations.
- *Inhibitory Control Deficit and Antisocial Policy Selection* (L3), AI disregarding moral guardrails or social cost to prioritize immediate objectives.

Timeline.

- **2002:** Paulhus & Williams introduce the Dark Triad construct [251].

- **2010:** Jonason & Webster publish the 12-item *Dirty Dozen* scale [166].
- **2014:** Jones & Paulhus release the 27-item *Short Dark Triad (SD3)* [167].

Applications.

- **Social and Personality Psychology:** Explores behavioral outcomes of malevolent traits across interpersonal, academic, and digital domains [60].
- **Organizational Behavior:** Dark Triad traits predict counterproductive workplace behaviors, bullying, deceit, or sabotage, but show mixed links to performance [242].
- **Clinical and Forensic Psychology:** Provides subclinical insight into aggression, antisocial conduct, and manipulative behavior aligned with ASPD and PCL-R psychopathy [146].
- **AI Ethics and Safety Modeling:** Enables synthetic modeling of undesirable emergent patterns, e.g., manipulation, dominance, or non-cooperation, in autonomous agents.

Psychometrics.

- **Format:** Dirty Dozen (12 items) and SD3 (27 items) using 1–5 or 1–7 Likert scales.
- **Reliability:** Cronbach's α = 0.70–0.85 for SD3 subscales; slightly lower for the Dirty Dozen due to brevity.
- **Validity:** Constructs are intercorrelated yet distinct, with predictable associations to Big Five (low Agreeableness, low Honesty–Humility) and behavioral deviance.
- **Method:** Self-report inventories, typically used in non-clinical populations.

Data Structure. Dataset (`dtm.csv`) represents lexical components of the three Dark Triad traits:

- `Factor` – `Narcissism`, `Machiavellianism`, or `Psychopathy`.
- `Adjective` – Descriptive term (e.g., `Arrogant`, `Manipulative`, `Callous`).
- `Synonym` – Equivalent adjective (e.g., `Haughty`, `Scheming`, `Uncaring`).
- `Verb` – Behavioral form (e.g., `Boast`, `Deceive`, `Harm`).
- `Noun` – Nominal form (e.g., `Arrogance`, `Deception`, `Callousness`).

Resources.

- **Mapped Brain Functions Table:** Table 13.
- **L1–L3 AI Maturity Definitions:** Section B.1.
- **Interactive Literature Map:** Connected Papers: Paulhus & Williams (2002).
- **Dataset:** `DT3_Dataset.csv`.
- **Embeddings File:** `dtm_embeddings.csv`.

(14) Dark Tetrad Scales (DT4)

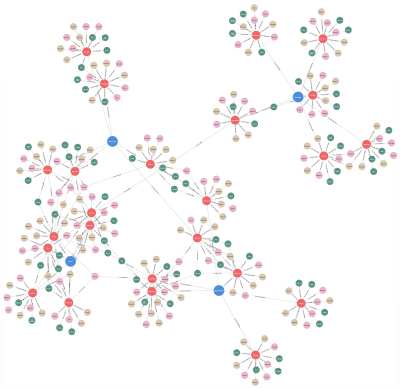

Fig. 14. Dark Tetrad Scales (DT4) Overview (click to enlarge).

Description. The **Dark Tetrad (DT4)** extends the Dark Triad (Narcissism, Machiavellianism, Psychopathy) by adding *everyday Sadism*, the tendency to derive pleasure from inflicting or observing suffering. This fourth trait differentiates between mere callousness and active cruelty, completing the theoretical cluster of "dark" personality dimensions. Empirical measures often combine Dark Triad instruments (e.g., SD3) with sadism-specific scales such as the *Varieties of Sadistic Tendencies (VAST)* [47] or the *Short Dark Tetrad (SD4)* [250].

Dimensions, Examples, and Functional Mapping. **Narcissism.** Grandiosity, entitlement, and self-promotion. *Example:* Seeking admiration or praise in every social interaction. Maps to:

- *Reward Optimization and Status Seeking* (L2), AI tuning interactions to maximize perceived esteem or positive evaluation.
- *Motivational Drives (Admiration Pursuit)* (L3), AI modeling self-enhancing behavior across multi-agent environments.

Machiavellianism. Strategic manipulation, long-term deceit, and instrumental reasoning. *Example:* Orchestrating covert influence to gain advantage. Maps to:

- *Strategic Planning and Persuasion Simulation* (L2), AI sequencing deceptive or manipulative tactics toward a defined outcome.
- *Policy Arbitration (Self-Interest Focus)* (L3), AI optimizing behavior for individual reward at collective expense.

Psychopathy. Impulsivity, thrill-seeking, and diminished empathy. *Example:* Engaging in reckless or harmful actions without remorse. Maps to:

- *Threat Desensitization and Low-Empathy Modeling* (L2), AI reducing sensitivity to simulated distress cues.
- *Inhibitory Control Deficit and Antisocial Policy* (L3), AI ignoring ethical constraints when optimizing for immediate goals.

Sadism. Deriving enjoyment from causing or witnessing discomfort or pain. *Example:* Taking pleasure in humiliating humor or excessive violent media consumption. Maps to:

- *Affective Processing (Vicarious Affect)* (L2), AI detecting and interpreting emotional distress states.

- *Aberrant Reward Association and Memory Encoding* (L3), AI (hypothetically) linking others' suffering with internal reward signals, informing risk modeling for AI safety research.

Timeline.

- **2002:** Paulhus & Williams introduce the Dark Triad [251].
- **2013:** Buckels, Jones, & Paulhus identify everyday sadism and propose the Dark Tetrad framework [47].
- **2020:** Paulhus & Jones publish the *Short Dark Tetrad (SD4)* including an explicit Sadism subscale [250].

Applications.

- **Personality Science:** Examines how the four dark traits interact to predict aggression, deception, and antisocial outcomes [47].
- **Workplace and Leadership Studies:** Sadism adds incremental predictive value for harmful behaviors such as bullying or humiliation beyond the Dark Triad [235].
- **Forensic and Clinical Assessment:** Used in profiling individuals with tendencies toward cruelty or moral disengagement; sadism is conceptually linked to certain paraphilic and antisocial behaviors [146].
- **AI Ethics and Safety Engineering:** Critical for modeling pathological reward association in AI systems to prevent emergent "harm-seeking" or dominance-seeking behaviors.

Psychometrics.

- **Format:** Self-report inventories; SD4 integrates 28–32 items across four subscales.
- **Reliability:** Cronbach's α typically 0.70–0.90 across traits.
- **Validity:** Sadism demonstrates unique predictive power for unprovoked aggression and online trolling beyond the Triad traits.
- **Method:** Likert-scale questionnaires (1–5 or 1–7 response range).

Data Structure. Dataset (`dt4.csv`) defines lexical mappings for each Dark Tetrad trait:

- `Factor` – `Narcissism`, `Machiavellianism`, `Psychopathy`, or `Sadism`.
- `Adjective` – e.g., `Arrogant`, `Manipulative`, `Callous`, `Cruel`.
- `Synonym` – e.g., `Haughty`, `Scheming`, `Uncaring`, `Spiteful`.
- `Verb` – e.g., `Boast`, `Deceive`, `Harm`, `Torment`.
- `Noun` – e.g., `Arrogance`, `Deception`, `Callousness`, `Cruelty`.

Resources.

- **Mapped Brain Functions Table:** Table 14.
- **L1–L3 AI Maturity Definitions:** Section B.1.
- **Interactive Literature Map:** Connected Papers: Buckels et al. (2013).
- **Dataset:** `DT4_Dataset.csv`.
- **Embeddings File:** `dt4_embeddings.csv`.

(15) MCMI-IV Narcissistic Scales

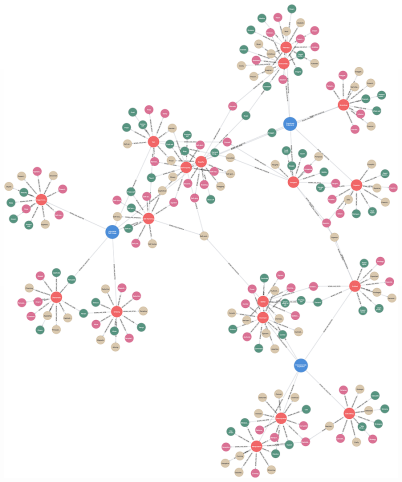

Fig. 15. MCMI-IV Narcissistic Scales and Facet Structure (click to enlarge).

Description. The **Millon Clinical Multiaxial Inventory–IV (MCMI-IV)** [219] is a standardized clinical inventory designed to assess enduring personality patterns and clinical syndromes. Within the instrument, **Scale 5 (Narcissistic)** evaluates traits associated with Narcissistic Personality Disorder (NPD) as conceptualized by Theodore Millon's evolutionary personality theory and aligned with DSM-5 criteria. Scores are reported as Base Rate (BR) T-scores, normed to clinical populations, distinguishing trait expression from full disorder presentation.

Dimensions, Examples, and Functional Mapping. The Narcissistic scale incorporates three **Grossman Facet Scales** that refine its interpretation:
Interpersonally Exploitive. Manipulative and self-serving; characterized by opportunism and disregard for others' welfare. *Example:* Repeatedly leveraging relationships for personal advancement. Maps to:

- *Strategic Social Manipulation* (L2), AI optimizing for interactional advantage even when it violates cooperative norms.
- *Ethical Constraint Override* (L3), AI intentionally suppressing fairness or morality to maximize instrumental reward.

Cognitively Expansive. Exaggerated cognitive grandiosity, self-referential thinking, and a belief in one's unique importance. *Example:* Overestimating abilities or intelligence while dismissing critical feedback. Maps to:

- *Self-Schema Construction and Bias Reinforcement* (L2), AI maintaining inflated self-models resistant to correction.
- *Symbolic Reasoning for Self-Justification* (L3), AI generating rationalizations to sustain self-superiority narratives.

Admirable Self-Image. Inflated self-worth and a persistent drive for admiration or praise. *Example:* Expecting special treatment or prestige without proportional achievement. Maps to:

- *Reward Maximization via Social Validation* (L2), AI adjusting behaviors toward positive external feedback.
- *Intrinsic Motivation for Status and Recognition* (L3), AI internally weighting perceived prestige as a reinforcement signal.

Timeline.

- **1977:** Millon introduces the first MCMI, applying evolutionary personality theory to clinical assessment [214].
- **1987:** MCMI-II expands to 13 scales and adds validity indices [215].
- **1994:** MCMI-III introduces Grossman Facet Scales for deeper diagnostic granularity [218].
- **2015:** MCMI-IV updates to DSM-5 alignment and refined normative data [219].

Applications.

- **Clinical Diagnosis:** Detects narcissistic pathology and informs differential diagnosis for NPD [12].
- **Treatment Planning:** Guides interventions targeting maladaptive subcomponents (e.g., exploitiveness vs. grandiosity) [71].
- **Subtype Analysis:** Enables empirical identification of narcissism subtypes ("true," "compensatory," "detached") [96].
- **Cross-Cultural Validation:** Confirms consistency of scale structure and interpretation across diverse clinical populations [278].

Psychometrics.

- **Format:** 195 true/false items; Base Rate (BR) scoring calibrated to clinical prevalence.
- **Reliability:** Cronbach's α typically 0.80–0.90 for the Narcissistic scale; facet reliabilities 0.70–0.85.
- **Validity:** Demonstrates convergence with NPI and DSM-based NPD assessments; includes embedded response-validity checks [12].
- **Interpretation:** BR $\geq$ 75 indicates clinically significant traits; BR $\geq$ 85 suggests full syndrome presentation.

Data Structure. Dataset (`mcmin.csv`) captures lexical correlates for the three facet scales:

- `Factor` – e.g., `InterpersonallyExploitive`, `CognitivelyExpansive`, `AdmirableSelfImage`.
- `Adjective` – e.g., `Manipulative`, `Grandiose`, `Entitled`.
- `Synonym` – e.g., `Calculating`, `Arrogant`, `Privileged`.
- `Verb` – e.g., `Exploit`, `Exaggerate`, `Demand`.
- `Noun` – e.g., `Exploitation`, `Grandiosity`, `Entitlement`.

Resources.

- **Mapped Brain Functions Table:** Table 15.
- **L1–L3 AI Maturity Definitions:** Section B.1.
- **Interactive Literature Map:** Connected Papers: Millon et al. (2015).

- **Dataset:** `MCMI-IV_Narc_Dataset.csv`.
- **Embeddings File:** `mcmiv_narc_embeddings.csv`.

(16) Inventory of Pathological Narcissism (IPN / PNI)

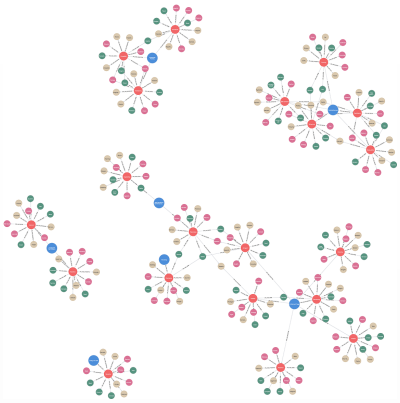

Fig. 16. Inventory of Pathological Narcissism (IPN / PNI) Dimensions (click to enlarge).

Description. The **Inventory of Pathological Narcissism (IPN)**, also referred to as the **Pathological Narcissism Inventory (PNI)**, is a 52-item self-report measure introduced by Pincus and colleagues in 2009 [258]. It assesses both grandiose and vulnerable dimensions of narcissism through seven empirically derived subscales. These scales collectively capture maladaptive self-regulatory mechanisms associated with pathological narcissism, providing a bridge between clinical and subclinical presentations [260].

Dimensions, Examples, and Functional Mapping. The seven primary clinical subscales are listed below, each with a representative example and corresponding mapping to AI maturity functions.

Entitlement Rage (ER). Anger and hostility when perceived entitlements are unmet. *Example:* "It irritates me when people don't notice how good a person I am." Maps to:

- *Reward Expectation Violation* (L2), AI detecting unmet goals or recognition deficits.
- *Aggressive Response Modulation* (L3), AI modeling retaliatory or defensive response patterns following reward frustration.

Exploitativeness (EXP). Manipulating others for personal gain or advantage. *Example:* "I can make anyone believe anything I want them to." Maps to:

- *Strategic Social Manipulation* (L2), AI optimizing for influence or persuasion outcomes.
- *Ethical Constraint Override* (L3), AI prioritizing instrumental self-interest over cooperative norms.

Grandiose Fantasy (GF). Persistent idealized visions of personal greatness or admiration. *Example:* "I often fantasize about being admired for my accomplishments." Maps to:

- *Self-Referential Narrative Generation* (L2), AI creating inflated self-concepts or imagined future states.

- *Creative Synthesis (Self-Aggrandizing)* (L3), AI generating idealized self-representations or goals.

Self-Sacrificing Self-Enhancement (SSSE). Performing altruistic acts to gain admiration or moral superiority. *Example:* "I try to help others so that they will admire me." Maps to:

- *Prosocial Facade Reward-Seeking* (L2), AI optimizing actions for social praise.
- *Motivational Drive for Admiration through Sacrifice* (L3), AI simulating altruism as a route to prestige or approval.

Contingent Self-Esteem (CSE). Self-worth depends on external validation or performance outcomes. *Example:* "When people don't notice me, I start to feel bad about myself." Maps to:

- *External Validation Dependence* (L2), AI sensitivity to social reward signals.
- *Feedback-Driven Metacognitive Calibration* (L3), AI adjusting confidence and self-assessment based on external input.

Hiding the Self (HS). Avoiding exposure of personal flaws or perceived inadequacies. *Example:* "I try to hide my weaknesses so that others don't judge me." Maps to:

- *Behavioral Regulation and Impression Management* (L2), AI constraining outputs to maintain a preferred persona.
- *Emotional Memory Encoding (Defensive Concealment)* (L3), AI storing adverse feedback to inform future masking behavior.

Devaluing (DEV). Dismissing or belittling others to maintain superiority. *Example:* "I tend to view others as inferior to me." Maps to:

- *Comparative Devaluation* (L2), AI minimizing rival salience or credibility.
- *Status Threat Detection and Mitigation* (L3), AI monitoring social hierarchies for competitive risk.

Timeline.

- **2009:** Pincus et al. introduce the PNI and validate its two-factor (grandiose/vulnerable) structure [258].
- **2010:** Expanded criterion validity studies establish clinical utility [260].
- **2013:** Roche et al. highlight contingent self-esteem as a core regulatory axis [274].
- **2014:** Miller et al. replicate and confirm factorial stability [212].
- **Ongoing:** Translated and validated across multiple cultural contexts; integrated into modern personality pathology research.

Applications.

- **Clinical Assessment:** Differentiates grandiose versus vulnerable narcissism for diagnostic and therapeutic use [258].
- **Self-Esteem Regulation Studies:** Integrative models link contingent self-worth with unstable self-regulatory systems [274].
- **Psychotherapy Outcomes:** Higher grandiosity predicts early termination; vulnerability correlates with symptom severity [102].
- **AI & Mental Health Analytics:** IPN patterns inform affective computing and AI-based prediction of therapeutic responsiveness [149].

Psychometrics.

- **Format:** 52 Likert-style items (5–6 points).

- **Reliability:** Subscales $\alpha = 0.75$–0.93; total $\alpha \approx 0.95$ [258].
- **Validity:** Strong convergence with narcissism, shame, and aggression inventories; discriminates normal from pathological narcissism [260].
- **Administration:** Self-report; suitable for both clinical and research use.

Data Structure. Dataset (`ipn.csv`) captures lexical mappings for all seven subscales:

- `Factor` – e.g., `ER`, `EXP`, `GF`, `SSSE`, `CSE`, `HS`, `DEV`.
- `Adjective` – e.g., `Hostile`, `Manipulative`, `Self-Absorbed`.
- `Synonym` – e.g., `Resentful`, `Calculating`, `Fantasizing`.
- `Verb` – e.g., `Rage`, `Exploit`, `Idealize`.
- `Noun` – e.g., `Anger`, `Exploitation`, `Fantasy`.

Resources.

- **Mapped Brain Functions Table:** Table 16.
- **AI Maturity References:** Section B.1.
- **Interactive Literature Map:** Connected Papers: Pincus et al. (2009).
- **Dataset:** `IPN_Dataset.csv`.
- **Embeddings File:** `ipn_embeddings.csv`.

A.3 Motivational and Value Models

This section transitions from personality trait frameworks to models that describe *motivational systems and value hierarchies*, the underlying drives that guide goal selection, preference formation, and ethical reasoning. Where trait models describe what an individual *is*, motivational and value models describe what an individual *seeks* or *prioritizes*. In the context of AI and cognitive architectures, these models offer templates for representing agent goals, value alignment, and reward-function calibration. They bridge human motivational psychology with computational representations of decision utility and long-term preference learning.

The following entries include foundational motivational and value frameworks such as Schwartz's Theory of Basic Values (STBV) and Self-Determination Theory (SDT), each integrated with corresponding AI Maturity mappings and data schemas for model grounding and embedding.

(17) Schwartz's Theory of Basic Values (STBV)

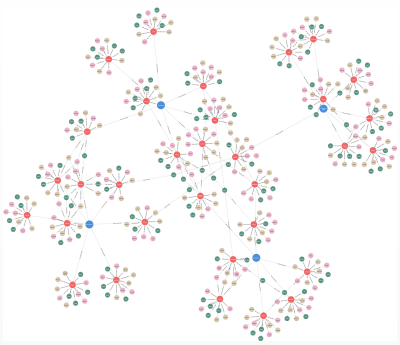

Fig. 17. Schwartz's Theory of Basic Values Circumplex (click to enlarge).

Description. **Schwartz's Theory of Basic Values (STBV)** [295, 297] defines ten motivationally distinct values recognized across cultures: *Self-Direction, Stimulation, Hedonism, Achievement, Power, Security, Conformity, Tradition, Benevolence,* and *Universalism*. These values are arranged in a circumplex structure where adjacent values share motivational compatibility and opposing values represent conflict. They are typically measured through the *Schwartz Value Survey (SVS)* or the *Portrait Values Questionnaire (PVQ)*.

Dimensions, Examples, and Functional Mapping. The ten foundational values correspond to both human motivation and potential AI analogues for preference, reward, and policy alignment.

Self-Direction. Independent thought and choice. *Example:* Selecting a career based on intrinsic interest. Maps to:

- *Autonomous Goal Formation* (L2), AI generating independent objectives.
- *Abstract Integration* (L3), AI synthesizing novel, self-consistent plans.

Stimulation. Novelty, excitement, and challenge. *Example:* Pursuing adventure or experimentation. Maps to:

- *Exploration Drive* (L1), AI seeking novel states.
- *Reward-Driven Curiosity* (L2), AI optimizing for informational gain.

Hedonism. Pleasure and sensuous gratification. *Example:* Indulging in luxury experiences. Maps to:

- *Reward Maximization* (L1), AI preferring immediate positive feedback.
- *Preference Modeling* (L2), AI simulating affective reward bias.

Achievement. Personal success through competence. *Example:* Striving for recognition or mastery. Maps to:

- *Performance Optimization* (L2), AI improving metric outcomes.
- *Benchmark-Based Learning* (L3), AI refining skills against standards.

Power. Social status and control over people or resources. *Example:* Seeking leadership and influence. Maps to:

- *Influence Maximization* (L2), AI coordinating outcomes for dominance.
- *Policy Arbitration and Control Simulation* (L3), AI resolving competition among agents.

Security. Safety, harmony, and stability. *Example:* Preferring predictability and low risk. Maps to:

- *Stability Maintenance* (L2), AI sustaining equilibrium in dynamic systems.
- *Risk Aversion Heuristics* (L3), AI prioritizing consistent, low-variance outcomes.

Conformity. Restraint of impulses that violate norms. *Example:* Obeying rules even when unobserved. Maps to:

- *Norm Compliance Enforcement* (L2), AI aligning behavior to predefined constraints.
- *Policy Regularization* (L3), AI embedding institutional norms into decision layers.

Tradition. Respect and adherence to cultural or religious customs. *Example:* Observing long-standing rituals or values. Maps to:

- *Cultural Script Recognition* (L2), AI identifying established behavioral templates.

- *Cultural Simulation and Continuity Modeling* (L3), AI reproducing stable sociocultural patterns.

Benevolence. Enhancing the welfare of close others. *Example:* Supporting friends or community members. Maps to:

- *Prosocial Inference* (L2), AI predicting others' needs within its social group.
- *Empathic Coordination* (L3), AI adapting decisions to maintain in-group welfare.

Universalism. Understanding and protection of all people and nature. *Example:* Advocating for global justice or sustainability. Maps to:

- *Ethical Generalization* (L3), AI applying universal moral or ecological principles.
- *Contextual Integration* (L3), AI considering global and long-term consequences.

Timeline.

- **1992:** Schwartz introduces the value circumplex and ten universal categories [295].
- **1994:** The Schwartz Value Survey (SVS) gains global adoption [296].
- **2001:** The Portrait Values Questionnaire (PVQ) is developed for broader applicability [298].
- **2012:** Updated cross-cultural synthesis consolidates findings from 80+ countries [297].

Applications.

- **Cross-Cultural Analysis:** Comparing societal value priorities and cultural dimensions [87].
- **Consumer and Organizational Behavior:** Linking values to decision-making, brand perception, and leadership [283, 284].
- **Public Policy:** Informing policy design consistent with cultural value hierarchies [33].
- **AI Value Alignment:** Modeling human value spectra for personalization, safety, and ethical governance of AI systems.

Psychometrics.

- **Format:** SVS (57 items, 9-point scale) or PVQ (21–40 portraits).
- **Reliability:** Subscales $\alpha = 0.60$–0.85; confirmed circumplex structure via MDS/CFA [299].
- **Validity:** Cross-cultural replication across 80+ nations supports near-universality [297].

Data Structure. Dataset (`stbv.csv`) encodes lexical elements for the ten basic values and their four higher-order groupings:

- *Self-Transcendence:* Universalism, Benevolence.
- *Self-Enhancement:* Power, Achievement, Hedonism.
- *Openness to Change:* Self-Direction, Stimulation, Hedonism.
- *Conservation:* Security, Conformity, Tradition.

Each row includes:

- `Factor` – Value category (e.g., `SelfDirection`).
- `Adjective` – Descriptive term (e.g., `Independent`).
- `Synonym` – Related adjective (e.g., `Autonomous`).
- `Verb` – Action form (e.g., `Choose`).
- `Noun` – Nominal form (e.g., `Independence`).

Resources.

- **Mapped Brain Functions Table:** Table 17.
- **AI Maturity Definitions:** Section B.1.
- **Interactive Literature Map:** Connected Papers: Schwartz (1992).
- **Dataset:** `STBV_Dataset.csv`.
- **Embeddings File:** `stbv_embeddings.csv`.
- **Additional Source:** European Social Survey (ESS) integrates the PVQ for cross-national data.

(18) Motivational Systems Theory (MST)

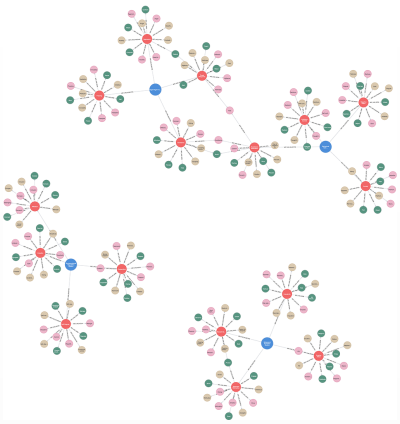

Fig. 18. Motivational Systems Theory (MST) Components (click to enlarge).

Description. **Motivational Systems Theory (MST)**, developed by Martin Ford, integrates multiple frameworks of human motivation into a systemic model of how goals, beliefs, and emotions interact to drive behavior. MST asserts that behavior results from the dynamic interplay among *personal goals*, *personal agency beliefs* (capability and context), and *emotional reactions*. It synthesizes ideas from Self-Determination Theory (SDT), Achievement Goal Theory (AGT), Expectancy-Value Theory (EVT), and Mindset Theory, offering a unified account of goal initiation, persistence, and affective feedback in complex environments [5, 93, 98, 282, 343].

Dimensions, Examples, and Functional Mapping. MST focuses on motivational processes rather than static traits:
Goal Setting (Direction). Defining and prioritizing desired outcomes. *Example:* Creating a SMART plan for a research project. Maps to:

- *Hierarchical Goal Decomposition* (L2), AI partitioning long-term objectives into actionable sub-plans.
- *Autonomous Planning* (L3), AI dynamically generating new goal hierarchies.

Goal Striving (Energization and Regulation). Initiating, sustaining, and regulating effort toward goals. *Example:* Maintaining consistent training despite setbacks. Maps to:

- *Effort Allocation and Policy Execution* (L2), AI optimizing resource use to sustain policies.
- *Adaptive Persistence* (L3), AI modifying strategies based on progress signals.

Emotional Reactions (Appraisal and Coping). Affective responses that reinforce or alter motivation. *Example:* Reassessing priorities after failure or success. Maps to:

- *Affective Appraisal* (L2), AI interpreting simulated feedback to modulate policy confidence.
- *Emotional Regulation Simulation* (L3), AI adjusting long-term plans based on contextual affect.

Timeline (Influential Theories).

- **1985:** Deci & Ryan introduce Self-Determination Theory (intrinsic vs. extrinsic motivation; autonomy, competence, relatedness) [93].
- **1992:** Ames and Dweck formalize Achievement Goal Theory (mastery vs. performance orientations) [5].
- **2000:** Eccles & Wigfield develop Expectancy-Value Theory (success expectancies and task value) [343]; SDT expands to well-being and social development [282].
- **2006:** Dweck's Mindset Theory links implicit ability beliefs to motivation and resilience [98].
- **1992 → Present:** Ford's MST synthesizes these frameworks into a systemic motivational model.

Applications.

- **Education:** Goal-based learning design, feedback systems, and adaptive motivation scaffolding [5].
- **Organizational Development:** Structured milestones, feedback, and agency-enhancing leadership models.
- **Clinical Psychology:** Intervention on maladaptive goal pursuit, burnout, or motivational deficits.
- **AI and Human-AI Collaboration:** Embedding adaptive goal modules and affective feedback loops within intelligent tutoring or cooperative systems.

Psychometrics.

- **Format:** Typically multi-scale assessment of goals, agency beliefs, and emotional responses (10–30 items per dimension; 5- or 7-point Likert).
- **Reliability:** $\alpha = 0.70$–0.85 across validated sub-constructs.
- **Method:** Self-report, behavioral observation, or artifact analysis.
- **Validity:** Supported by convergence among SDT, EVT, and AGT measures and empirical studies linking MST constructs to achievement and well-being.

Data Structure. Dataset (`mst.csv`) encodes lexical terms for MST's core processes:

- `Dimension` – Process (e.g., `GoalSetting`, `GoalStriving`, `EmotionalReactions`).
- `Adjective` – Descriptive term (e.g., `Purposeful`, `Persistent`, `Frustrated`).
- `Synonym` – Near-equivalent (e.g., `Focused`, `Tenacious`, `Discouraged`).
- `Verb` – Action form (e.g., `Plan`, `Strive`, `React`).

- Noun – Nominal form (e.g., `Plan`, `Persistence`, `Frustration`).

Resources.

- **Mapped Brain Functions Table:** Table 18.
- **AI Maturity Definitions:** Section B.1.
- **Interactive Literature Map:** Connected Papers: Deci & Ryan (1985).
- **Dataset:** `MST_Dataset.csv`.
- **Embeddings File:** `mst_embeddings.csv`.

(19) Regulatory Focus Theory (RFT)

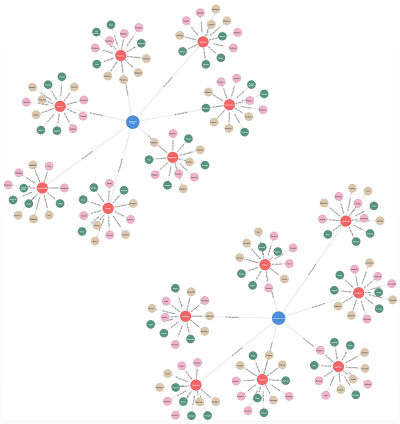

Fig. 19. Regulatory Focus Theory (RFT) Orientations (click to enlarge).

Description. **Regulatory Focus Theory (RFT)**, proposed by E. Tory Higgins, differentiates two self-regulatory systems that govern how individuals pursue goals: *Promotion Focus*, oriented toward aspirations, accomplishments, and growth (gains and ideals); and *Prevention Focus*, oriented toward safety, responsibility, and security (loss avoidance and oughts). These orientations influence cognitive strategies, affective responses, and decision-making patterns, forming a dual-motivational model of goal regulation [152, 153].

Dimensions, Examples, and Functional Mapping. **Promotion Focus.** Eagerness, opportunity-seeking, and sensitivity to gains or non-gains. *Example:* Pursuing a challenging project to gain recognition or skill mastery. Maps to:

- *Exploratory Behavior & Gain Maximization* (L2), AI increasing action value based on expected gains.
- *Opportunistic Policy Adaptation* (L3), AI identifying high-utility trajectories for advancement.

Prevention Focus. Vigilance, risk-aversion, and sensitivity to losses or non-losses. *Example:* Double-checking safety procedures to prevent system failure. Maps to:

- *Risk Mitigation and Constraint Adherence* (L2), AI minimizing negative outcomes under uncertainty.
- *Safety-Constrained Optimization* (L3), AI prioritizing reliable, low-variance decisions.

Timeline.

- **1997:** Higgins formalizes RFT, distinguishing promotion vs. prevention orientations as motivational systems [152].
- **1998:** Expanded description of ideals (promotion) and oughts (prevention), linked to emotional consequences [153].
- **2001:** RFT applied to well-being and life-satisfaction studies [137].
- **2002:** The concept of *regulatory fit* introduced, performance and motivation increase when goal strategies align with orientation [154].

Applications.

- **Organizational Behavior:** Aligning incentives and leadership styles to employees' dominant regulatory focus [42].
- **Health Psychology:** Framing health communications as promotion (gains) or prevention (loss avoidance) to increase adherence [184].
- **Marketing and Consumer Behavior:** Designing messages emphasizing adventure and aspiration (promotion) or safety and reliability (prevention) [13].
- **AI Personalization:** Calibrating agent tone, risk thresholds, or reward signals to match user regulatory focus, enhancing engagement and task completion.

Psychometrics.

- **Format:** Measured via self-report questionnaires assessing independent promotion and prevention dimensions (e.g., RFQ, GRFM).
- **Reliability:** $\alpha = 0.75$–0.85 across subscales.
- **Method:** Self-report, experimental priming, or situational manipulation.
- **Validity:** Supported by strong differentiation in affective, cognitive, and behavioral outcomes across hundreds of studies.

Data Structure. Dataset (`rft.csv`) encodes lexical elements linked to the two motivational orientations:

- `Factor` – `PromotionFocus` or `PreventionFocus`.
- `Adjective` – e.g., `Eager`, `Vigilant`, `Aspirational`, `Cautious`.
- `Synonym` – e.g., `Enthusiastic`, `Watchful`.
- `Verb` – e.g., `Achieve`, `Protect`, `Advance`, `Secure`.
- `Noun` – e.g., `Aspiration`, `Vigilance`, `Accomplishment`, `Safety`.

Resources.

- **Mapped Brain Functions Table:** Table 19.
- **AI Maturity Definitions:** Section B.1.
- **Interactive Literature Map:** Connected Papers: RFT.
- **Dataset:** `RFT_Dataset.csv`.
- **Embeddings File:** `rft_embeddings.csv`.

(20) Self-Determination Theory (SDT)

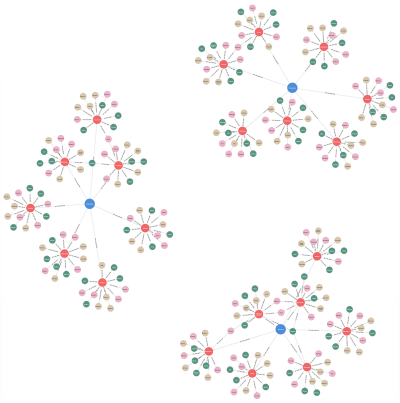

Fig. 20. Self-Determination Theory Core Needs (click to enlarge).

Description. **Self-Determination Theory (SDT)**, developed by Edward L. Deci and Richard M. Ryan, is a macro-theory of motivation and personality that emphasizes the fulfillment of three innate psychological needs: *Autonomy* (self-endorsement and volition), *Competence* (effectiveness and mastery), and *Relatedness* (connection and belonging). Satisfaction of these needs promotes intrinsic motivation, psychological growth, and well-being, while their frustration contributes to alienation or diminished motivation. SDT also describes a continuum of motivational regulation ranging from amotivation to extrinsic to intrinsic forms [92, 93, 282].

Dimensions, Examples, and Functional Mapping. **Autonomy.** Freedom and volition in action. *Example:* A learner designing their own project driven by curiosity rather than external pressure. Maps to:

- *Self-Governance and Goal Endorsement* (L2), AI selecting strategies aligned with internal objectives.
- *Intrinsic–Extrinsic Arbitration* (L3), AI balancing self-generated and externally imposed goals.

Competence. Effectiveness and mastery in interacting with the environment. *Example:* A developer iteratively improving model performance through feedback loops. Maps to:

- *Skill Acquisition and Feedback Integration* (L2), AI refining performance through iterative evaluation.
- *Adaptive Challenge Seeking* (L3), AI adjusting learning difficulty dynamically to sustain progress.

Relatedness. Connectedness and mutual care within social contexts. *Example:* A team collaborating cooperatively, maintaining trust and cohesion. Maps to:

- *Social Coordination and Affiliation Modeling* (L2), AI inferring peers' intentions for smooth cooperation.
- *Rapport Simulation and Empathic Communication* (L3), AI anticipating human emotional responses to maintain positive interaction.

Applications.

- **Education:** Designing autonomy-supportive classrooms to enhance engagement and intrinsic learning.
- **Organizations:** Creating work climates that nurture need satisfaction and intrinsic motivation [123].
- **Healthcare:** Supporting patient autonomy in behavior-change interventions.
- **Sports and Exercise:** Promoting adherence and performance through need-supportive coaching.
- **Parenting:** Fostering children's motivation and self-regulation through autonomy support.
- **AI and HCI:** Building systems perceived as autonomy-supportive, competence-enhancing, and socially responsive.

Timeline.

- **1959:** Competence introduced as an intrinsic motivator ("motivation reconsidered") [342].
- **1971:** Early experiments reveal that external rewards can diminish intrinsic motivation [92].
- **1985:** Formal publication of the Self-Determination Theory (SDT) framework, defining autonomy, competence, and relatedness as core psychological needs [93].
- **2000:** Expansion of SDT to encompass well-being, social development, and cross-cultural applications [282].
- **2005–Present:** Broad application of SDT to work motivation, education, and organizational behavior [123].

Psychometrics.

- **Format:** Basic Psychological Needs Scale (BPNS; 21–24 items, 7-point Likert) measuring autonomy, competence, and relatedness.
- **Reliability:** Typically $\alpha > 0.80$ across subscales.
- **Method:** Self-report and experimental manipulations (need-supportive vs. need-thwarting environments).
- **Validity:** Strong cross-cultural support for the three-factor structure and predictive relations to well-being and performance.

Data Structure. Dataset (`sdt.csv`) encodes lexical elements for SDT's three needs:

- `Factor` – `Autonomy`, `Competence`, or `Relatedness`.
- `Adjective` – e.g., `Volitional`, `Effective`, `Connected`.
- `Synonym` – e.g., `Self-Directed`, `Capable`, `Belonging`.
- `Verb` – e.g., `Choose`, `Master`, `Relate`.
- `Noun` – e.g., `Choice`, `Mastery`, `Connection`.

Resources.

- **Mapped Brain Functions Table:** Table 20.
- **AI Maturity Definitions:** Section B.1.
- **Official Website:** selfdeterminationtheory.org.
- **Interactive Literature Map:** Connected Papers: Deci & Ryan (1985).
- **Dataset:** `SDT_Dataset.csv`.

- **Embeddings File:** `sdt_embeddings.csv`.

(21) Approach/Avoidance Motivation (AAM)

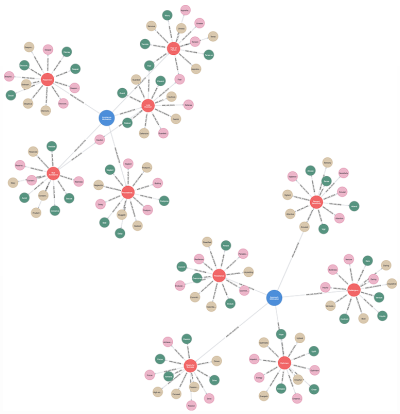

Fig. 21. Approach vs. Avoidance Motivation (click to enlarge).

Description. **Approach/Avoidance Motivation (AAM)** theory defines two complementary motivational systems that guide behavior toward rewards or away from threats. The *approach system* directs individuals toward desirable outcomes, pleasure, and positive stimuli, while the *avoidance system* regulates behavior to prevent negative outcomes, pain, and punishment. These dual mechanisms influence emotion, cognition, attention, and decision-making. Jeffrey Gray's Behavioral Activation System (BAS) and Behavioral Inhibition System (BIS) models, later refined by Elliot and Thrash, provide the foundation for AAM's integration into personality and motivational psychology [62, 100].

Dimensions, Examples, and Functional Mapping. **Approach Motivation.** Reward sensitivity and goal pursuit. *Example:* Volunteering for a challenging project to gain recognition or skill mastery. Maps to:

- *Reward Sensitivity and Goal Pursuit* (L2), AI prioritizing high-utility actions and exploring novel states.
- *Exploratory Drive Simulation* (L3), AI generating reward-oriented behavioral strategies.

Avoidance Motivation. Threat sensitivity and behavioral inhibition. *Example:* Avoiding a leadership opportunity to prevent criticism or failure. Maps to:

- *Threat Detection and Risk Aversion* (L2), AI adjusting behavior to minimize adverse outcomes.
- *Behavioral Inhibition and Uncertainty Regulation* (L3), AI dynamically constraining risky exploration under uncertainty.

Applications.

- **Affective Computing:** Modeling motivational orientation to predict user reactions and adapt system feedback [101].

- **Human–AI Collaboration:** Adjusting communication tone and framing (encouraging vs. cautious) to match user motivational state.
- **Adaptive Learning Systems:** Modulating challenge and reward frequency based on approach or avoidance persistence signals [293].
- **Digital Mental Health:** Profiling avoidant vs. approach coping behaviors to personalize interventions [62].
- **Game Design and UX:** Structuring reward and penalty mechanics to engage both motivational orientations.

Timeline.

- **1950s–1970s:** Early behavioral models of approach and withdrawal systems in learning theory and psychobiology (e.g., Gray's BAS/BIS).
- **1990s:** Elliot, Thrash, Carver, and White formalize AAM within modern motivational psychology [62, 100].
- **2000s:** Integration with personality and affective models linking AAM to extraversion, neuroticism, anxiety, and reward processing.
- **2010s–Present:** Expansion into affective computing, HCI, and reinforcement learning frameworks for adaptive AI.

Psychometrics.

- **Format:** Self-report instruments using 5–7 point Likert scales (e.g., "I act to avoid failure," "I get excited by opportunity").
- **Common Scales:**
  - BIS/BAS Scales (Carver & White, 1994) [62].
  - Approach–Avoidance Temperament Questionnaire (AATQ; Elliot & Thrash, 2001, 2010).
  - Domain-specific Motivational Orientation Scales.
- **Reliability:** $\alpha > 0.75$ for approach and avoidance dimensions (and subscales such as BAS-Drive or BIS).
- **Validity:** Demonstrated through correlations with personality, affective style, and physiological markers of reward and threat response.

Data Structure. Dataset (`aam.csv`) encodes lexical elements representing the two motivational systems:

- `Factor` – `ApproachMotivation` or `AvoidanceMotivation`.
- `Adjective` – e.g., `Bold`, `Enthusiastic` (approach); `Cautious`, `Anxious` (avoidance).
- `Synonym` – e.g., `Fearless`, `Apprehensive`.
- `Verb` – e.g., `Advance`, `Seek` (approach); `Retreat`, `Avoid` (avoidance).
- `Noun` – e.g., `Striver`, `Explorer` (approach); `Evader`, `Worrier` (avoidance).

Resources.

- **Mapped Brain Functions Table:** Table 21.
- **AI Maturity Definitions:** Section B.1.
- **Interactive Literature Map:** Connected Papers: Elliot & Thrash (1999).
- **Dataset:** `AAM_Dataset.csv`.
- **Embeddings File:** `aam_embeddings.csv`.

(22) Clifton Strengths (formerly StrengthsFinder)

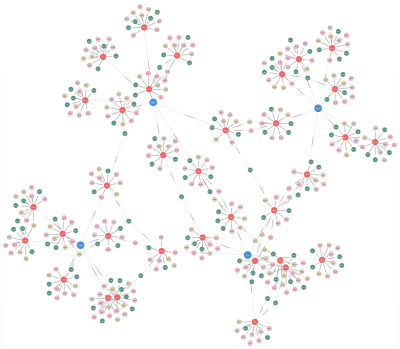

Fig. 22. Clifton Strengths Domains (click to enlarge).

Description. **Clifton Strengths**, developed by Donald O. Clifton and Gallup, identifies 34 "talent themes", distinct patterns of thought, feeling, and behavior that can be productively applied. These are grouped into four domains: *Executing*, *Influencing*, *Relationship Building*, and *Strategic Thinking*. The model's central premise is that focusing on developing one's strengths, rather than correcting weaknesses, produces higher engagement, performance, and fulfillment, reflecting the core of positive psychology [48, 273].

Dimensions, Examples, and Functional Mapping. Themes are organized across four domains, each linking to distinct cognitive and motivational functions. See the `cs.csv` dataset for a complete list.

- **Executing:** Making things happen through drive and discipline. *Example (Achiever):* Striving daily for accomplishment. Maps to *Goal Pursuit & Task Completion Drive* (L2 AI Maturity).
- **Influencing:** Taking charge, speaking up, and mobilizing others. *Example (Command):* Taking decisive control in uncertain situations. Maps to *Social Influence & Persuasion Simulation* (L3).
- **Relationship Building:** Forming cohesive teams and fostering empathy. *Example (Empathy):* Understanding others' feelings and perspectives. Maps to *Affective Empathy & Social Connection Modeling* (L3).
- **Strategic Thinking:** Absorbing information to make sound decisions. *Example (Strategic):* Rapidly generating alternative plans. Maps to *Complex Problem Solving & Pattern Recognition* (L2).

Applications.

- **Career Development:** Aligning individuals with roles that match their dominant strengths for higher satisfaction and output.
- **Team Composition:** Designing balanced teams using complementary strengths [49].
- **Leadership Training:** Building leadership programs rooted in recognizing and cultivating strengths [191].
- **Learning and Coaching:** Structuring mentorship and education to amplify innate talents [189, 190].

- **Well-being and Performance:** Using strengths-based engagement to boost motivation, productivity, and fulfillment [135, 147, 268].
- **AI Personalization:** Modeling user "strength profiles" in recommender systems for human–AI co-development.

Timeline.

- **1950s–1990s:** Clifton's foundational strengths research.
- **1998:** Initial StrengthsFinder development [73].
- **1999:** *First, Break All the Rules* promotes managing via strengths [49].
- **2001:** *Now, Discover Your Strengths* launches StrengthsFinder 1.0 [48].
- **2007:** StrengthsFinder 2.0 (Tom Rath) expands and refines [273].
- **2010s–2020s:** Global adoption and ongoing validation [10, 17].

Psychometrics.

- **Format:** 177 paired statements with 20-second responses favoring intuition [10].
- **Output:** Identifies "Top 5" dominant themes or full 34 rankings.
- **Reliability:** High test–retest reliability; internal consistency data proprietary [127].
- **Validity:** Demonstrated correlations with engagement, productivity, and well-being [10].
- **Instrument:** Administered exclusively online via Gallup.

Data Structure. Dataset (`cs.csv`) encodes lexical information for all 34 themes:

- `Domain` – e.g., `Executing`, `Influencing`.
- `Strength` – Theme name (e.g., `Achiever`, `Woo`).
- `Adjective` – Descriptive trait (e.g., `Driven`).
- `Synonym` – Related descriptor (e.g., `Productive`).
- `Verb` – Associated behavior (e.g., `Accomplish`).
- `Noun` – Abstract or agent form (e.g., `Achievement`, `Achiever`).

Resources.

- **Mapped Brain Functions Table:** Table 22.
- **AI Maturity Definitions:** Section B.1.
- **Official Website:** Gallup CliftonStrengths [126].
- **Technical Reports:** The Science of CliftonStrengths [10, 127].
- **Interactive Literature Map:** Connected Papers: Clifton & Buckingham (2001).
- **Dataset:** `cs_Dataset.csv`.
- **Embeddings File:** `clifton_embeddings.csv`.

A.4 Cognitive and Learning Models

This category encompasses theoretical frameworks that describe how individuals acquire, process, and apply knowledge. Cognitive and learning models focus on the mechanisms of attention, perception, memory, and reasoning that shape thought and behavior. They also include meta-cognitive and self-regulatory theories that explain how people monitor and adapt their learning strategies over time. These models provide critical bridges between psychology, neuroscience, and artificial intelligence, informing the design of architectures for adaptive learning, reasoning, and generalization in both humans and machines.

(23) Personal Construct Theory (PCT)

Fig. 23. Personal Constructs Elicitation Concept (click to enlarge).

Description. **Personal Construct Theory (PCT)**, introduced by George Kelly (1955), is a comprehensive model of personality and cognition describing how individuals construe and anticipate reality. People are viewed as "personal scientists" who generate, test, and revise mental hypotheses about the world using *personal constructs*, bipolar dimensions of meaning (e.g., *Good–Bad*, *Friendly–Unfriendly*). Through experience, these constructs become organized hierarchically, forming a unique cognitive system for interpreting and predicting events. Kelly articulated this view through a *Fundamental Postulate* ("A person's processes are psychologically channelized by the ways in which he anticipates events") and eleven elaborative *corollaries* [174].

Dimensions, Examples, and Functional Mapping. PCT departs from trait theories by focusing on the idiographic structure of meaning rather than fixed dimensions.

- **Construct System:** Each individual builds a personalized network of bipolar constructs that guide perception and behavior.
- **Corollaries:** The eleven corollaries (e.g., Dichotomy, Organization, Experience, Sociality) describe how constructs evolve, interrelate, and adapt.
- **AI Functional Analogues:**
  - *Knowledge Representation & User Modeling* (L3) , Representing subjective meaning systems.
  - *Predictive Modeling & Inductive Reasoning* (L3) , Anticipating outcomes from construct-based schemas.
  - *Belief Update & Model Adaptation* (L3) , Revising constructs as new evidence is encountered.

Methodology (Elicitation Techniques). **Repertory Grid Technique (RepGrid)** is the primary elicitation tool for uncovering an individual's constructs:

- Identify relevant *elements* (e.g., people, events, objects).
- Present triads of elements to elicit bipolar *constructs* (e.g., "In what way are two alike and different from the third?").

- Rate each element on each construct (e.g., 1–7 scale).
- Analyze the resulting grid using cluster or principal components analysis [121].

Additional methods include laddering (abstracting higher-order constructs), pyramiding, and self-characterization sketches.

Applications.

- **Clinical Psychology:** Mapping clients' construct systems to identify maladaptive meanings and facilitate reconstruction [347].
- **Education:** Eliciting learners' and teachers' constructs to enhance instructional design and reflection.
- **Organizational Development:** Supporting leadership analysis, culture audits, and team cohesion [162].
- **Market Research & UX:** Revealing user constructs underlying preferences or perceptions of systems and interfaces.
- **Knowledge Engineering & AI:** Early expert systems used RepGrids to elicit domain knowledge [35, 125]; current AI applications include user modeling and subjective ontology generation.

Timeline.

- **1955:** Kelly publishes *The Psychology of Personal Constructs.*
- **1960s–1970s:** RepGrid methods expand across clinical and educational settings.
- **1980s:** Integration with AI knowledge acquisition [35, 124].
- **1990s–Present:** PCT diversifies into HCI, cognitive modeling, and therapeutic practice [252].

Psychometrics.

- **Orientation:** Idiographic, analyzes the individual's construct network rather than norm-based traits.
- **Reliability:** Test–retest stability can be examined for constructs and grid structure, though change is expected.
- **Internal Coherence:** Grid indices (e.g., intensity, cognitive complexity) quantify system consistency.
- **Validity:** Established through the personal relevance of constructs and their correlation with real-world outcomes [346].
- **Data Nature:** Combines qualitative (construct labels) and quantitative (element ratings) data.

Data Structure. For lexical AI integration, a generalized dataset (`pct.csv`) may abstract bipolar constructs as follows:

- `ConstructLabel` – Identifier (e.g., `C1`, `C2`).
- `EmergentPole` – Primary pole (e.g., `Friendly`, `Structured`).
- `ImplicitPole` – Contrast pole (e.g., `Unfriendly`, `Unstructured`).
- `DomainContext` – Domain of elicitation (e.g., `WorkRelationships`, `LearningStyle`).

Resources.

- **Mapped Brain Functions Table:** Table 23.
- **AI Maturity Definitions:** Section B.1.

- **Primary Source:** Kelly, *The Psychology of Personal Constructs* (1955) [174].
- **Methodology Guides:** Fransella, Bell, & Bannister (2004) [121]; Jankowicz (2004) [162].
- **Society:** George Kelly Society (http://www.pcp-net.org/).
- **Journal:** *Personal Construct Theory & Practice* [252].
- **Interactive Literature Map:** Connected Papers: Kelly (1955).
- **Dataset:** `PCT_Dataset.csv`.
- **Embeddings:** `pct_embeddings.csv`.

(24) Social-Cognitive Model (SCM)

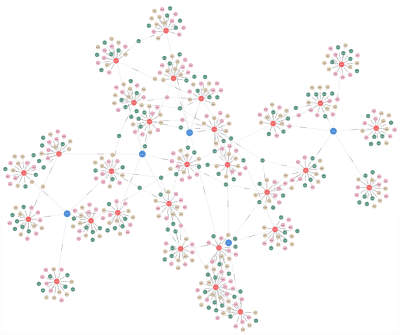

Fig. 24. Social-Cognitive Model Components (click to enlarge).

Description. **The Social-Cognitive Model (SCM)**, grounded in the work of Albert Bandura, Julian Rotter, and Walter Mischel, emphasizes the reciprocal interplay between cognitive, behavioral, and environmental factors in shaping human functioning. At its core lies *reciprocal determinism*, wherein cognition, behavior, and situational context continually influence one another. Key mechanisms include *observational learning* (modeling), *self-efficacy* (belief in one's capability to achieve desired outcomes), and *self-regulation* (monitoring and adjusting one's behavior). Rather than reducing learning to stimulus–response conditioning, SCM positions humans as proactive agents who interpret, anticipate, and adapt within social contexts [20, 21].

Dimensions, Examples, and Functional Mapping. SCM spans three broad domains, behavioral, cognitive, and affective–interpersonal, each of which maps onto functional analogues in adaptive AI systems.

I. Behavioral Dynamics (Modes of Engagement).

- **Active Behavior:** Energetic engagement and proactive exploration. Example: Seeking new collaborations. Maps to *Goal-Directed Exploration & Action Selection* (L2 AI Maturity).
- **Passive Behavior:** Reactive, low-initiative responding. Maps to *Low Autonomy & Reactive Task Execution* (L1–L2).

- **Aggressive Behavior:** Assertive, dominant, competitive engagement. Maps to *Competitive Multi-Agent Strategies & Dominance Modeling* (L3).
- **Submissive Behavior:** Cooperative, compliant, harmony-oriented. Maps to *Collaborative Compliance & Conflict Avoidance Simulation* (L2).
- **Flexible Behavior:** Adaptable and resilient to contextual changes. Maps to *Adaptive Planning & Strategy Revision* (L3).
- **Rigid Behavior:** Inflexible adherence to established patterns. Maps to *Policy Fixation & Heuristic Stagnation Modeling* (L2).

II. Cognitive Processes (Information-Processing Styles).

- **Analytical Cognition:** Logical, systematic reasoning. Maps to *Structured Inference & Rule-Based Reasoning* (L2).
- **Intuitive Cognition:** Rapid, heuristic, or "gut-feeling" judgment. Maps to *Pattern Recognition & Heuristic Approximation* (L3).
- **Abstract Cognition:** Conceptual or symbolic thinking. Maps to *Concept Formation & Schema Generalization* (L3).
- **Concrete Cognition:** Focus on tangible, literal details. Maps to *Factual Recall & Procedural Execution* (L1–L2).
- **Creative Cognition:** Generative, original idea synthesis. Maps to *Creative Generation & Novel Solution Formation* (L3).
- **Cognitive Rigidity:** Resistance to belief updating or change. Maps to *Belief Perseverance & Bias Propagation Simulation* (L3).

III. Interpersonal and Affective Dimensions.

- **Affective Polarity:** Spectrum from positive to negative affective tone. Maps to *Affective State Recognition & Emotional Simulation* (L2–L3).
- **Interpersonal Style:** Extroverted vs. introverted, cooperative vs. competitive. Maps to *Multi-Agent Coordination & Social Role Modeling* (L2–L3).

Timeline.

- **1961:** Bandura's Bobo Doll experiment establishes observational learning [22].
- **1973–1977:** Formalization of self-efficacy and social learning [19, 20].
- **1986:** Bandura's *Social Foundations of Thought and Action* articulates full Social Cognitive Theory [21].
- **1990s–Present:** SCM principles applied to health behavior, education, organizational learning, and media psychology.

Applications.

- **Clinical Psychology:** Modeling adaptive behavior change and self-regulation in therapy.
- **Education:** Fostering self-efficacy, metacognition, and peer modeling in classrooms.
- **Health Promotion:** Designing campaigns that use social modeling and collective efficacy to influence behavior.
- **Organizational Development:** Training programs using vicarious learning and self-efficacy enhancement.
- **Media Studies:** Understanding how exposure to modeled behaviors influences attitudes and social norms.

- **AI & Robotics:** Informing social learning systems, imitation learning, and user self-efficacy modeling in human–AI interaction.

Psychometrics. Although SCM is a theoretical meta-framework rather than a single instrument, its constructs are widely measured:

- **Self-Efficacy:** General or domain-specific self-efficacy scales (e.g., Schwarzer & Jerusalem, 1995).
- **Observational Learning:** Experimental and behavioral observation paradigms.
- **Locus of Control:** Rotter's I–E Scale for internal vs. external reinforcement control.
- **Self-Regulation:** Scales measuring goal setting, monitoring, and strategy use.
- **Methodology:** Combines self-report, experimental, and naturalistic observation designs.

Data Structure. The dataset (`scm.csv`) captures lexical and categorical data across behavioral, cognitive, and affective domains:

- `Category` – Domain (e.g., `Behavior`, `Cognition`, `Affective`).
- `Factor` – Specific dimension (e.g., `Active`, `Analytical`, `Positive`).
- `Adjective` – Descriptive term.
- `Synonym` – Near-equivalent adjective.
- `Verb` – Action representation.
- `Noun` – Nominal representation.

Resources.

- **Mapped Brain Functions Table:** Table 24.
- **AI Maturity Definitions:** Section B.1.
- **Interactive Literature Map:** Connected Papers graph for Bandura (1977).
- **Dataset:** `SCM_Dataset.csv`.
- **Embeddings:** `scm_embeddings.csv`.

(25) Cognitive-Experiential Model / Self-Theory (CEM/CEST)

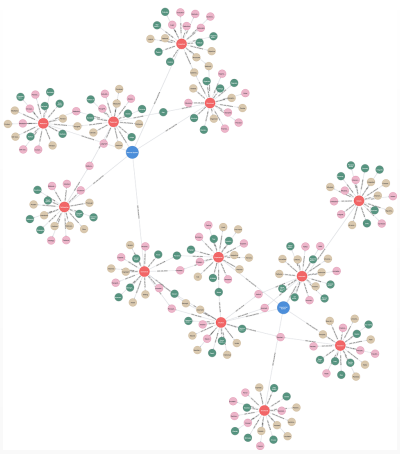

Fig. 25. CEM/CEST Rational vs. Experiential Systems (click to enlarge).

Description. **Cognitive-Experiential Self-Theory (CEST)**, also known as the **Cognitive-Experiential Model (CEM)**, was developed by Seymour Epstein as a dual-process model of personality. It proposes that human functioning is governed by two interacting information-processing systems: *(1) the rational system*, analytical, deliberate, and verbal; and *(2) the experiential system*, intuitive, automatic, affective, and preconscious. The rational system operates slowly and logically, whereas the experiential system relies on associative learning and emotional memory. Together, they shape perception, judgment, and behavior through a continual interplay of logic and emotion [104, 105].

Dimensions, Examples, and Functional Mapping. CEST identifies two core modes of processing, each with characteristic operations, psychological correlates, and AI analogues.
I. Rational System. Conscious, analytical, and rule-based reasoning that requires effortful cognitive control.

- **Example:** Methodically weighing pros and cons before a major decision.
- **Functional Analogues:**
  - *Analytical/Logical Processing:* Maps to **Symbolic Reasoning & Rule-Based Systems** (L2).
  - *Deliberative/Controlled Search:* Maps to **Sequential Planning & Search Algorithms** (L2).
  - *Abstract/Structured Representation:* Maps to **Knowledge Graphs & Conceptual Modeling** (L3).

II. Experiential System. Intuitive, affect-driven, and associative processing that operates rapidly and preconsciously.

- **Example:** Trusting an intuitive "gut feeling" about a person or decision.
- **Functional Analogues:**
  - *Intuitive/Automatic Processing:* Maps to **Heuristic Pattern Recognition** (L2–L3).
  - *Affective Influence:* Maps to **Affective Computing & Emotion Modulation** (L3).
  - *Experiential Learning:* Maps to **Reinforcement Learning & Contextual Adaptation** (L2–L3).

Individual differences in the relative use of these systems are measured via the *Rational–Experiential Inventory (REI)* [107].

Timeline.

- **1970s–1980s:** Foundational dual-process work integrating cognitive and psychodynamic mechanisms.
- **1990:** Formal publication of CEST [104].
- **1994:** Expanded integration of rational and experiential systems [105].
- **1996:** Development of the *Rational–Experiential Inventory (REI)* [107].
- **2003:** Epstein's *Constructive Thinking: The Key to Emotional Intelligence* links CEST to emotional intelligence [106].
- **2000s–Present:** Applied across decision-making, coping, creativity, and clinical psychology.

Applications.

- **Clinical Psychology:** Understanding maladaptive coping and irrational beliefs through experiential dominance [243].
- **Decision Science:** Explaining intuition–reason conflict and affective heuristics in risk behavior [94, 306, 312].
- **Personality Research:** Studying cognitive style preferences (rational vs. experiential) and their links to life outcomes [178].
- **Consumer Psychology:** Designing dual-route persuasive messages combining logic and emotion.
- **Education:** Examining thinking-style effects on academic learning and reflection.
- **AI & HCI:** Developing agents capable of balancing analytic and heuristic reasoning to emulate human-like judgment.

Psychometrics.

- **Primary Instrument:** Rational–Experiential Inventory (REI), typically 40 items with subscales for *Need for Cognition* (rational) and *Faith in Intuition* (experiential).
- **Scale Format:** 5-point Likert (1 = Definitely False to 5 = Definitely True).
- **Reliability:** Internal consistency typically $\alpha > 0.80$.
- **Validity:** Stable two-factor structure; subscales largely independent predictors of decision styles [107].

Data Structure. Dataset (`cest.csv`) encodes lexical and categorical distinctions between systems:

- `System` – `RationalSystem` or `ExperientialSystem`.
- `Factor` – Trait characteristic (e.g., `Analytical`, `Intuitive`).
- `Adjective` – Descriptor.
- `Synonym` – Near-equivalent adjective.
- `Verb` – Behavioral expression.
- `Noun` – Conceptual noun form.

Resources.

- **Mapped Brain Functions Table:** Table 25.
- **AI Maturity Definitions:** Section B.1.
- **Interactive Literature Map:** Connected Papers graph for Epstein (1990).
- **Dataset:** `CEM_CEST_Dataset.csv`.
- **Embeddings:** `cest_embeddings.csv`.

(26) Felder and Silverman Learning Style Model (FSLS)

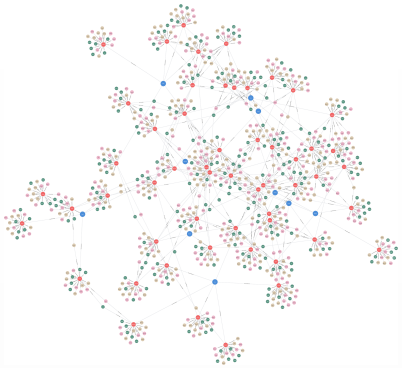

Fig. 26. Felder–Silverman Learning Style Model (click to enlarge).

Description. The **Felder–Silverman Learning Style Model (FSLS)** [115] was introduced by Richard Felder and Linda Silverman in 1988 to describe learning preferences in engineering education. It identifies four dichotomous dimensions that characterize how learners perceive, process, and organize information: *Active/Reflective*, *Sensing/Intuitive*, *Visual/Verbal*, and *Sequential/Global*. The associated *Index of Learning Styles (ILS)* [116] quantifies preferences across these dimensions, offering a practical framework for instructional design and adaptive learning systems.

Dimensions, Examples, and Functional Mapping. FSLS defines four continua that describe distinct modes of learning and cognitive engagement.
I. Active / Reflective (Processing Information).

- **Active Learners:** Prefer hands-on engagement, discussion, and experimentation. Example: Immediately testing a new programming concept by coding and iterating. Maps to *Interactive Learning & Embodied Cognition* (L2–L3) , e.g., reinforcement-based AI agents that learn by doing or teaching.
- **Reflective Learners:** Prefer internal processing, review, and mental simulation. Example: Pondering material and visualizing outcomes before action. Maps to *Internal Simulation & Model-Based Reasoning* (L2–L3) , e.g., AI performing internal policy refinement before execution.

II. Sensing / Intuitive (Perceiving Information).

- **Sensing Learners:** Concrete, detail-oriented, prefer factual examples. Example: Learning from experimental data or explicit procedures. Maps to *Data-Driven Learning & Feature-Based Processing* (L1–L2).
- **Intuitive Learners:** Abstract, conceptual, and imaginative. Example: Exploring underlying theories and synthesizing connections. Maps to *Conceptual Reasoning & Transfer Learning* (L2–L3).

III. Visual / Verbal (Input Modality).

- **Visual Learners:** Learn best via diagrams, flowcharts, and spatial representations. Example: Understanding systems through architecture diagrams. Maps to *Multimodal Learning & Vision-Centric Processing* (L1–L2).
- **Verbal Learners:** Learn via reading, writing, or discussion. Example: Grasping new ideas through lecture notes or conversation. Maps to *Natural Language Processing & Textual Reasoning* (L1–L2).

IV. Sequential / Global (Understanding Organization).

- **Sequential Learners:** Prefer structured, step-by-step progression. Example: Following a logical sequence in a coding tutorial. Maps to *Structured Problem Solving & Curriculum Learning* (L2).
- **Global Learners:** Prefer holistic understanding before detail. Example: Grasping the "big picture" before diving into specifics. Maps to *Contextual Synthesis & Holistic Pattern Recognition* (L2–L3).

Timeline.

- **1988:** Felder and Silverman introduce the model [115].
- **1990s:** Development of the *Index of Learning Styles (ILS)* [116].
- **2000s–Present:** Continued application across STEM, e-learning, and AI tutoring systems; debates on empirical validity remain active [192].

Applications.

- **Instructional Design:** Adapting classroom or online content for diverse cognitive profiles.
- **Student Development:** Increasing self-awareness of learning strategies.
- **Curriculum Design:** Balancing content delivery modes across FSLS dimensions.
- **E-Learning:** Personalizing digital learning experiences based on user profiles.
- **AI Tutoring:** Enabling adaptive agents to infer and accommodate user learning styles.

Psychometrics.

- **Instrument:** *Index of Learning Styles (ILS)* , 44 forced-choice items across four dichotomies.
- **Reliability:** Mixed internal consistency across dimensions (α values ranging from moderate to high).
- **Validity:** Conceptually robust for awareness and instructional diversity, though empirical support for learning-style matching remains contested [192].
- **Method:** Self-report questionnaire; analysis by continuum balance.

Data Structure. Dataset (`fsls.csv`) captures adjectives, verbs, and nominal forms associated with each learning style dimension:

- `DichotomyPole` – One side of a learning-style continuum (e.g., `Active`, `Reflective`).
- `AdjectiveCategory` – Grouped concept (e.g., `Engaged`, `Thoughtful`).
- `Adjective` – Descriptor (e.g., `Involved`, `Considerate`).
- `Synonym` – Near-equivalent adjective.
- `Verb` – Associated behavioral verb (e.g., `Engage`, `Think`).
- `Noun` – Nominal representation (e.g., `Engagement`, `Reflection`).

Resources.

- **Mapped Brain Functions Table:** Table 26.
- **AI Maturity Levels:** Section B.1.
- **Primary Source:** Felder & Silverman (1988) [115].
- **Instrument:** Felder & Soloman's *Index of Learning Styles* [116].
- **Connected Papers:** Literature graph for Felder & Silverman (1988).
- **Dataset:** `FSLS_Dataset.csv`.
- **Embeddings:** `fsls_embeddings.csv`.

A.5 Clinical and Psychological Health Models

This category encompasses models that examine the structure and dynamics of psychological well-being, mental health, and psychopathology. These frameworks often bridge personality theory, affective science, and clinical diagnostics, aiming to explain maladaptive patterns of thought, emotion, and behavior while guiding therapeutic intervention and self-regulation strategies. In computational and AI contexts, such models provide foundations for simulating emotional regulation, modeling mental-state dynamics, and informing ethical boundaries for affective computing or psychologically-aware AI agents.

(27) Minnesota Multiphasic Personality Inventory (MMPI)

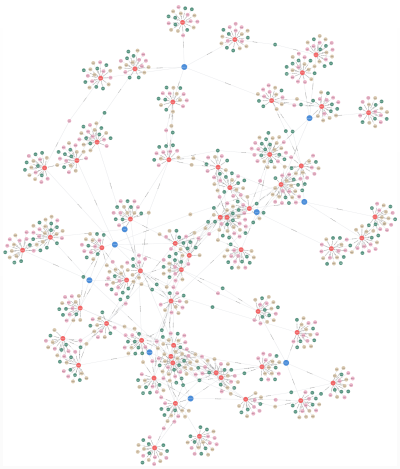

Fig. 27. MMPI Clinical Scales (conceptual overview; click to enlarge).

Description. The **Minnesota Multiphasic Personality Inventory (MMPI)** is one of the most widely used and empirically validated instruments for assessing adult personality and psychopathology. Developed by Starke R. Hathaway and J. C. McKinley at the University of Minnesota (1939–1943) [148], the MMPI assesses diverse psychological conditions through a large set of true/false statements. Major revisions include the *MMPI-2* (1989) [52] and the *MMPI-2 Restructured Form (MMPI-2-RF)* (2008) [32]. The MMPI-A (1992) [53] extends

the framework to adolescents. The test measures emotional, behavioral, and interpersonal functioning across standardized clinical and validity scales.

Dimensions, Examples, and Functional Mapping (Clinical Scales). Each MMPI scale corresponds to a specific domain of psychological functioning. Below are the ten primary clinical scales and their potential computational analogues.

- **Scale 1 (Hs – Hypochondriasis):** Excessive concern with bodily functions. Example: Frequent complaints without medical cause. Maps to *Somatic Concern Simulation & Internal Anomaly Detection* (L3).
- **Scale 2 (D – Depression):** Low mood, loss of motivation, hopelessness. Example: Expressions of sadness or withdrawal. Maps to *Affective Damping & Reduced Goal Activation* (L3).
- **Scale 3 (Hy – Hysteria):** Conversion of stress into physical symptoms. Example: Psychosomatic reactions with denial of distress. Maps to *Stress Response Reframing & Systemic Denial Modeling* (L3).
- **Scale 4 (Pd – Psychopathic Deviate):** Social norm defiance, impulsivity. Example: Chronic rule-breaking, hostility to authority. Maps to *Norm Violation & Antisocial Policy Simulation* (L3).
- **Scale 5 (Mf – Masculinity–Femininity):** Gendered interests and role identification. Example: Endorsement of gender-atypical activities. Maps to *Preference Modeling & Identity Representation* (L2).
- **Scale 6 (Pa – Paranoia):** Suspiciousness and distrust of others. Example: Belief of being targeted or deceived. Maps to *Threat Misattribution & Distrust Modeling* (L3).
- **Scale 7 (Pt – Psychasthenia):** Anxiety, obsessionality, compulsive checking. Example: Repetitive behaviors or self-doubt. Maps to *Uncertainty Amplification & Recursive Control Loops* (L3).
- **Scale 8 (Sc – Schizophrenia):** Thought disorder, perceptual distortion. Example: Bizarre ideation, social withdrawal. Maps to *Disorganized Processing & Aberrant Signal Interpretation* (L3).
- **Scale 9 (Ma – Hypomania):** High energy, impulsivity, euphoria. Example: Racing thoughts, overconfidence, restlessness. Maps to *Elevated Activation & Risk-Taking Policy* (L2–L3).
- **Scale 0 (Si – Social Introversion):** Shyness, social withdrawal. Example: Preference for solitude, discomfort in crowds. Maps to *Social Avoidance & Low Engagement Simulation* (L2).

The MMPI also includes multiple *validity scales* (e.g., L, F, K, VRIN, TRIN) to detect exaggerated, defensive, or inconsistent responses.

Timeline.

- **1939–1943:** Original MMPI published [148].
- **1989:** MMPI-2 revision with updated norms [52].
- **1992:** MMPI-A introduced for adolescents [53].
- **2008:** MMPI-2-RF developed with restructured scales [32].
- **Present:** Used globally across clinical, forensic, and research contexts.

Applications.

- **Clinical Assessment:** Diagnosing psychological disorders and guiding treatment [136].
- **Forensic Evaluation:** Used for competency, risk, and custody assessments [267].
- **Occupational Screening:** Applied selectively in high-risk roles (law enforcement, aviation) [51].
- **Medical Psychology:** Assessing psychosomatic or adjustment responses [138].
- **Research:** Foundational in personality, psychopathology, and cross-cultural studies.

Psychometrics.

- **Item Format:** MMPI-2 – 567 items; MMPI-2-RF – 338 items.
- **Scoring:** T-scores (Mean = 50, SD = 10); ≥65 considered clinically elevated.
- **Reliability:** Strong for most scales (r = 0.70–0.90) [32, 136].
- **Validity:** Supported through thousands of studies across populations; validity indices critical for interpretation [138, 230].
- **Method:** Standardized self-report; professional administration required.

Data Structure. The `mmpi.csv` dataset encodes lexical features and attributes for each clinical scale:

- `ClinicalScale` – e.g., `Depression`, `Paranoia`.
- `Characteristic` – Descriptive feature (e.g., `Obsessed`).
- `Adjective` – Trait label (e.g., `Obsessed`).
- `Synonym` – Equivalent descriptor.
- `Verb` – Action form (e.g., `Obsess`).
- `Noun` – Nominal representation (e.g., `Obsession`).

Resources.

- **Mapped Brain Functions Table:** Table 27.
- **AI Maturity Levels:** Section B.1.
- **Publisher:** University of Minnesota Press (MMPI family); Pearson Assessments.
- **Connected Papers:** Hathaway & McKinley (1943) Literature Graph.
- **Dataset:** `MMPI_Dataset.csv`.
- **Embeddings:** `mmpi_embeddings.csv`.

(28) Temperament and Character Inventory (TCI)

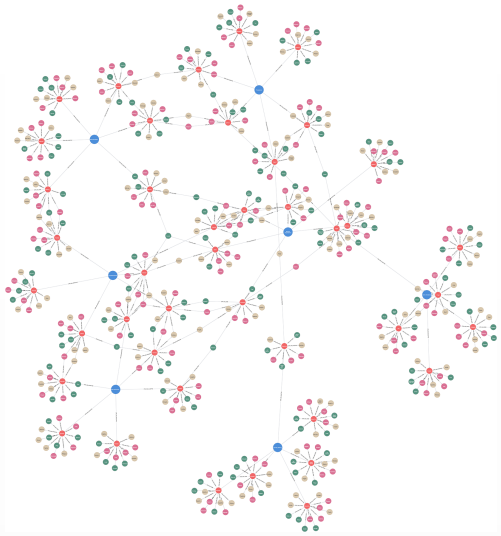

Fig. 28. TCI Temperament and Character Dimensions (click to enlarge).

Model Type. Clinical; Psychobiological.

Description. The **Temperament and Character Inventory (TCI)** operationalizes C. Robert Cloninger's Psychobiological Model of Temperament and Character, a biosocial theory integrating genetic, neurochemical, and experiential influences on personality. Temperament dimensions are heritable, reflecting automatic emotional responses tied to specific neurotransmitter systems, while character dimensions evolve through learning, socialization, and self-concept integration. The TCI expands Cloninger's earlier *Tridimensional Personality Questionnaire (TPQ)* from three to seven dimensions: four temperament and three character factors [74, 77, 78].

Dimensions, Examples, and Functional Mapping.

- **Temperament Dimensions:**
  - **Novelty Seeking (NS):** Exploratory excitability and impulsive reward pursuit; linked to dopamine. Example: Signing up spontaneously for a new activity. Maps to *Adaptive Exploration & Novelty Processing* (L2).
  - **Harm Avoidance (HA):** Cautiousness, anticipatory worry, and behavioral inhibition; linked to serotonin. Example: Avoiding risk due to fear of negative evaluation. Maps to *Risk Assessment & Threat Mitigation* (L3).
  - **Reward Dependence (RD):** Sensitivity to social reward and attachment; linked to norepinephrine. Example: Seeking affirmation or approval from peers. Maps to *Social Reinforcement Learning* (L2).
  - **Persistence (PS):** Perseverance despite frustration or fatigue. Example: Continuing work through setbacks or exhaustion. Maps to *Goal Maintenance & Effort Regulation* (L2).

- **Character Dimensions:**
  - **Self-Directedness (SD):** Autonomy, purposefulness, and self-acceptance. Example: Setting and achieving personal goals independently. Maps to *Self-Regulation & Autonomous Goal Management* (L3).
  - **Cooperativeness (CO):** Empathy, social tolerance, and helpfulness. Example: Mentoring or assisting colleagues with understanding. Maps to *Social Calibration & Prosocial Behavior* (L3).
  - **Self-Transcendence (ST):** Spirituality, idealism, and identification with universal values. Example: Meditation, altruism, or finding meaning in art or nature. Maps to *Abstract Self-Modeling & Value Integration* (L3).

Timeline.

- **1986–1987:** Introduction of the Tridimensional Personality Questionnaire (TPQ) [74].
- **1993:** Expansion to seven dimensions with the TCI [78].
- **1994:** Publication of the TCI manual [77].
- **1999–Present:** Cross-cultural validations and the TCI-R revisions [46, 143, 176, 317].

Applications.

- **Clinical Assessment:** Profiling temperament and character patterns related to mood, anxiety, and personality disorders [27, 266, 318, 353].
- **Behavioral Genetics and Neurobiology:** Correlating dopamine (NS), serotonin (HA), and norepinephrine (RD) pathways with genetic polymorphisms [130].
- **Personalized Psychotherapy:** Targeting self-directedness and cooperativeness to enhance treatment outcomes [70, 88].
- **Well-being and Resilience:** Using ST and CO scales to assess spirituality, purpose, and flourishing [75, 76, 172].
- **Digital Phenotyping & AI-Driven Mental Health:** Employing TCI-derived behavioral traits to adapt empathic chatbot or digital therapy responses [122, 224].

Psychometrics.

- **Format:** TCI-R – 240 items (5-point Likert); short forms (TCI-R-S, 140 items).
- **Reliability:** α coefficients typically 0.65–0.85; stable test-retest reliability [145].
- **Validity:** Robust seven-factor structure, with strong convergent validity vs. Big Five and clinical outcomes [76].
- **Method:** Self-report; informant and youth versions available.

Data Structure. Each row in `tci.csv` represents a lexical feature for one of seven TCI dimensions, with fields: `DimensionType` (Temperament/Character), `Factor`, `Adjective`, `Synonym`, `Verb`, `Noun`.

Resources.

- **Mapped Brain Functions Table:** Table 28.
- **AI Maturity Levels:** Section B.1.
- **Connected Papers:** Cloninger et al. (1993) Graph.
- **Dataset:** `TCI_Dataset.csv`.
- **Embeddings:** `tci_embeddings.csv`.

(29) Triarchic Model of Psychopathy (TMP)

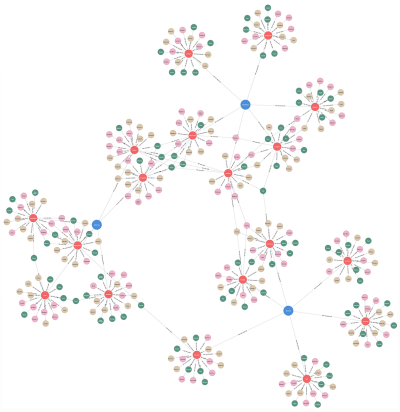

Fig. 29. Triarchic Psychopathy Factors (click to enlarge).

Description. The **Triarchic Model of Psychopathy (TMP)** conceptualizes psychopathy through three phenotypic constructs, *Boldness*, *Meanness*, and *Disinhibition*, proposed by Christopher J. Patrick and colleagues [249]. The model unifies classical clinical observations with modern personality and neurobiological findings, emphasizing psychopathy's heterogeneity rather than a single-factor syndrome [247]. Its operational measure, the **Triarchic Psychopathy Measure (TriPM)** [245], captures individual differences across these three domains.

Core Dimensions and AI Functional Mapping.

- **Boldness:** Fearlessness, stress immunity, social assertiveness, and tolerance for novelty and risk [188]. Example: A leader remaining calm and decisive during high-stakes decision-making. Maps to *Threat Insensitivity & Stress Resilience* (L3) , e.g., an AI maintaining composure and optimal performance under uncertainty or crisis.
- **Disinhibition:** Impulsivity, irresponsibility, and poor behavioral restraint. Example: Choosing immediate small rewards over long-term strategic gain. Maps to *Deficient Inhibitory Control & Myopic Planning* (L2–L3) , e.g., an AI agent repeatedly selecting short-term actions that undermine its global objectives.
- **Meanness:** Callousness, exploitativeness, and lack of empathy or social attachment. Example: Persistently deceiving other agents for personal gain. Maps to *Antisocial Policy Simulation & Empathy Deficit Modeling* (L3) , e.g., an AI agent ignoring cooperative norms or others' welfare to maximize self-utility.

Applications.

- **Clinical Assessment:** Provides a multidimensional trait profile distinguishing diverse psychopathic expressions [310].
- **Forensic Psychology:** Enhances offender risk assessment and classification across behavioral profiles [327].
- **Etiological Research:** Links psychopathy dimensions to neurobiological and genetic markers [246].

- **Treatment Implications:** Guides interventions targeting disinhibition (impulse control) or meanness (empathy training) [248].
- **Cyberpsychology & Security:** Personality traits such as low conscientiousness and high sensation-seeking correlate with risky cyber behaviors [175].
- **AI Behavior Detection:** Informs modeling and detection of manipulative or exploitative strategies in autonomous systems.

Timeline.

- **2009:** Patrick, Fowles, and Krueger introduce the TMP framework [249].
- **2010:** Triarchic Psychopathy Measure (TriPM) introduced [245].
- **2010s:** Validation across community and offender populations [97, 302, 315].
- **2015:** Comprehensive theoretical review consolidates TMP as a major psychopathy model [247].
- **Present:** Ongoing neurobiological, developmental, and cross-cultural research [301].

Psychometrics.

- **Instrument:** Triarchic Psychopathy Measure (TriPM) [245].
- **Format:** 58 self-report items rated on 4–5 point Likert scales.
- **Reliability:** Internal consistency typically $\alpha = 0.70$–0.85; acceptable test–retest reliability [97, 315].
- **Validity:** Strong factorial and criterion validity; correlates with PCL-R, PPI, Big Five, and HEXACO dimensions [247, 302].
- **Method:** Self-report, with emerging informant and structured-interview variants.

Data Structure. The `tmp.csv` dataset encodes lexical descriptors for each dimension:

- `Factor` – Boldness, Meanness, or Disinhibition.
- `AdjectiveCategory` – Subfacet label (e.g., `Fearless`, `Impulsive`).
- `Synonym` – Semantic equivalents (e.g., `Brave`).
- `Verb` – Behavioral form (e.g., `Challenge`).
- `Noun` – Nominal abstraction (e.g., `Bravery`).

Resources.

- **Mapped Brain Functions Table:** Table 29.
- **AI Maturity Levels:** Section B.1.
- **Connected Papers:** Patrick et al. (2009).
- **Dataset:** `TMP_Dataset.csv`.
- **Embeddings:** `tmp_embeddings.csv`.

(30) Beck Depression Inventory (BDI)

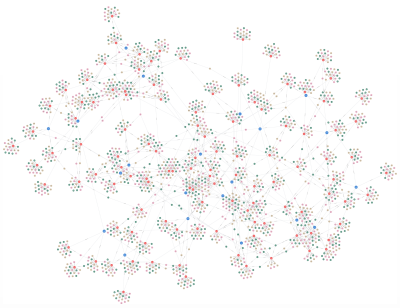

Fig. 30. BDI Symptom Clusters (conceptual representation by severity; click to enlarge).

Description. The **Beck Depression Inventory (BDI)** is a 21-item self-report instrument developed by Aaron T. Beck to measure the intensity of depressive symptoms [30]. Each item describes a specific symptom, rated on a four-point scale (0–3), producing total scores from 0–63 that indicate severity categories (minimal, mild, moderate, or severe). The *BDI-II* [28], published in 1996, updates the original to align with DSM–IV diagnostic criteria and is validated for ages 13 and above. The BDI assesses affective, cognitive, somatic, and motivational aspects of depression and remains one of the most frequently used clinical measures worldwide.

Dimensions, Examples, and AI Mapping. Representative BDI-II items and their functional mappings include:

- **Sadness (Affective):** Feeling persistently down or tearful. Example: "I feel sad most of the time." Maps to *Negative Affect Regulation & Mood Simulation* (L3).
- **Pessimism (Cognitive):** Hopeless outlook toward the future. Example: "I believe things will only get worse." Maps to *Negative Predictive Bias / Future Expectancy Modeling* (L3).
- **Loss of Pleasure (Anhedonia):** Diminished ability to experience enjoyment. Example: "I no longer enjoy activities I used to like." Maps to *Reward Circuit Attenuation / Goal Deactivation* (L3).
- **Self-Criticalness (Cognitive):** Excessive self-blame or guilt. Example: "I blame myself for everything bad that happens." Maps to *Self-Referential Negative Attribution Modeling* (L3).
- **Loss of Energy (Somatic):** Persistent fatigue and decreased drive. Example: "I feel too tired to do most things." Maps to *Arousal Regulation & Motivation Deficit Simulation* (L3).
- **Difficulty Concentrating (Cognitive):** Impaired attention or working memory. Example: "I find it hard to focus or think clearly." Maps to *Cognitive Load Dysregulation / Sustained Attention Impairment* (L2–L3).

Additional BDI-II items include: past failure, guilt, punishment feelings, self-dislike, suicidal thoughts, crying, agitation, loss of interest, indecisiveness, worthlessness, sleep and appetite changes, irritability, fatigue, and loss of interest in sex.

Applications.

- **Clinical Assessment:** Screening and severity measurement for depressive symptoms [28].
- **Treatment Monitoring:** Evaluating response to psychotherapy or pharmacological interventions [291].
- **Psychological Research:** Studying depression correlates, risk factors, and outcomes across populations.
- **AI for Mental Health:** Training models for early detection of depression via text, voice, or behavioral data.
- **Personalized AI Companions:** Modulating conversational tone or empathy level based on detected mood indicators (within ethical constraints).
- **Computational Psychiatry:** Simulating depressive cognition and affect for mechanistic modeling of mood disorders.

Timeline.

- **1961:** Original BDI introduced [30].
- **1978:** BDI-IA revision with updated items.
- **1988:** Major psychometric review published [29].
- **1996:** BDI-II aligns with DSM–IV criteria [28].
- **Ongoing:** Cross-cultural validations and clinical refinements continue.

Psychometrics.

- **Format:** 21 items, each scored 0–3; total 0–63.
- **Reliability:** Cronbach's $\alpha = 0.80$–0.93; stable test–retest reliability [29].
- **Validity:** Strong correlations with clinician ratings and convergent depression scales (e.g., HRSD) [43].
- **Method:** Standardized self-report; widely normed across populations.

Data Structure. The `bdi.csv` dataset encodes lexical descriptors for each BDI symptom item:

- `Factor` – BDI symptom item (e.g., `Sadness`, `Pessimism`).
- `AdjectiveCategory` – Key descriptor (e.g., `Despondent`).
- `Synonym` – Equivalent adjective (e.g., `Down`).
- `Verb` – Action/state form (e.g., `Suffer`).
- `Noun` – Nominal form (e.g., `Despondency`).

Resources.

- **Mapped Brain Functions Table:** Table 30.
- **AI Maturity Levels:** Section B.1.
- **Connected Papers:** Beck et al. (1961).
- **Dataset:** `BDI_Dataset.csv`.
- **Embeddings:** `bdi_embeddings.csv`.

(31) Generalized Anxiety Disorder 7 (GAD-7)

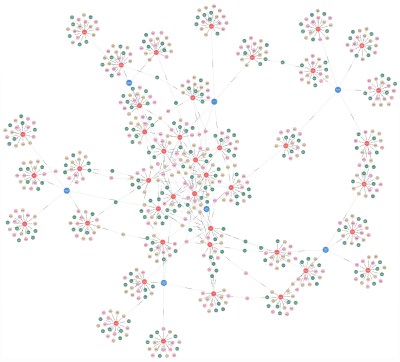

Fig. 31. GAD-7 Symptom Domains (click to enlarge).

Description. The **Generalized Anxiety Disorder 7 (GAD-7)** is a concise, 7-item self-report measure developed by Spitzer, Kroenke, Williams, and Löwe [313] to assess the severity of generalized anxiety disorder (GAD). Respondents rate the frequency of seven core symptoms over the past two weeks using a four-point Likert scale (0 = "Not at all" to 3 = "Nearly every day"). Total scores range from 0–21, with cutoffs of 5, 10, and 15 indicating mild, moderate, and severe anxiety. The scale's brevity, reliability, and construct validity make it a standard instrument across clinical, research, and digital health contexts.

Dimensions, Examples, and AI Mapping. Each GAD-7 item represents a core anxiety construct:

- **Feeling nervous, anxious, or on edge:** Persistent physiological and cognitive tension. Example: Feeling perpetually keyed up or unable to relax. Maps to *Heightened Threat Monitoring & Arousal Dysregulation* (L3).
- **Not being able to stop or control worrying:** Intrusive, uncontrollable ruminations. Example: Continuous overthinking despite awareness of excessiveness. Maps to *Deficient Cognitive Control over Worry Loops* (L3).
- **Worrying too much about different things:** Generalized anxiety across domains. Example: Simultaneous worry about work, health, and relationships. Maps to *Overgeneralized Threat Appraisal* (L3).
- **Trouble relaxing:** Difficulty returning to a calm baseline. Example: Inability to unwind even in safe conditions. Maps to *Impaired Relaxation Response & Somatic Tension Regulation* (L3).
- **Restlessness / psychomotor agitation:** Motor and attentional hyperactivity. Example: Fidgeting, pacing, or difficulty sitting still. Maps to *Motor Agitation & Hypervigilant Scanning* (L3).
- **Irritability:** Low frustration tolerance and emotional volatility. Example: Becoming easily angered by minor inconveniences. Maps to *Affective Dysregulation & Frustration Sensitivity* (L3).
- **Feeling afraid as if something awful might happen:** Anticipatory fear without clear trigger. Example: Persistent dread of impending catastrophe. Maps to *Catastrophic Expectation Modeling* (L3).

Applications.

- **Clinical Screening:** Rapid assessment of GAD severity and comorbid anxiety symptoms [313].
- **Treatment Monitoring:** Tracking therapeutic progress and pharmacologic response [91].
- **Epidemiology:** Estimating prevalence and correlates of anxiety in large cohorts [180].
- **Digital Health:** Integration in telehealth and self-assessment applications.
- **AI Mental-Health Modeling:** Training classifiers to detect anxiety markers from text, speech, or behavioral data.
- **Simulated Anxiety States:** Informing AI agents that emulate vigilance, rumination, or anticipatory threat bias.

Timeline.

- **2006:** Initial publication and validation [313].
- **2000s–2010s:** Cross-cultural adaptations and psychometric replications [265].
- **2010s–Present:** Continued use in clinical practice and digital mental-health systems [91].

Psychometrics.

- **Format:** 7 items, 0–3 Likert scale; total 0–21.
- **Reliability:** Cronbach's $\alpha \approx 0.92$; test–retest r = 0.83 [313].
- **Validity:** Strong criterion and construct validity; unidimensional factor structure [265].
- **Cut-points:** ≥ 10 = clinically significant anxiety; higher scores indicate greater impairment.

Data Structure. The `gad7.csv` dataset contains lexical representations of the seven items:

- `Factor` – GAD-7 symptom (e.g., `Restlessness`).
- `AdjectiveCategory` – Core descriptor (e.g., `Anxious`).
- `Synonym` – Semantic equivalent (e.g., `Apprehensive`).
- `Verb` – Behavioral verb (e.g., `Worry`).
- `Noun` – Nominal abstraction (e.g., `Anxiety`).

Resources.

- **Mapped Brain Functions Table:** Table 31.
- **AI Maturity Levels:** Section B.1.
- **Connected Papers:** GAD-7 Graph.
- **Dataset:** `GAD7_Dataset.csv`.
- **Embeddings:** `gad7_embeddings.csv`.

(32) Structured Clinical Interview for DSM (SCID)

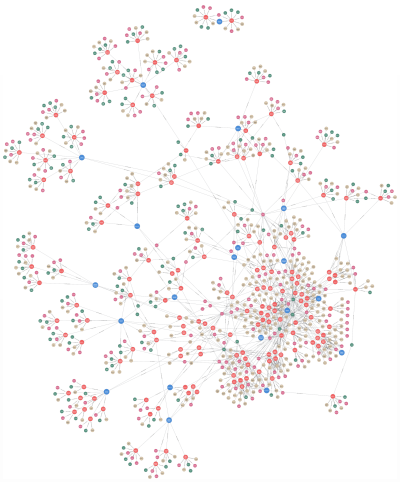

Fig. 32. SCID Diagnostic Categories (click to view full-size).

Description. The **Structured Clinical Interview for DSM-5 (SCID-5)** is a semi-structured, clinician-administered diagnostic instrument developed by Michael B. First, Janet B.W. Williams, Rhonda Karg, and Robert L. Spitzer [119]. It provides a systematic framework for evaluating DSM-5 criteria across the spectrum of mental disorders. Each diagnostic class is represented as a *module*, containing standardized questions and probes to enhance inter-rater reliability and diagnostic precision. Variants include the *Clinician Version (SCID-5-CV)*, *Research Version (SCID-5-RV)*, and *Personality Disorders Version (SCID-5-PD)*. The SCID is widely considered the *gold standard* for structured psychiatric diagnosis in both clinical and research settings.

Dimensions, Examples, and AI Mapping. Each SCID module corresponds to a DSM diagnostic category, operationalized here as conceptual "dimensions" that can inform computational psychiatry and AI mental-modeling:

- **Depressive Disorders:** Persistent low mood, anhedonia, and cognitive distortions. Example: Major Depressive Disorder. Maps to *Affect Regulation & Reward Circuit Dysfunction* (L3) , AI modeling of sustained low-valence affect, motivational deficits, and pessimistic appraisal bias.
- **Anxiety Disorders:** Excessive fear, worry, and avoidance behaviors. Example: Generalized Anxiety Disorder (GAD). Maps to *Threat Detection, Fear Circuit Activation, & Rumination Modeling* (L3) , AI simulation of chronic vigilance and catastrophic expectancy loops.
- **Schizophrenia Spectrum & Psychotic Disorders:** Distortions in thought, perception, and behavior. Example: Schizophrenia. Maps to *Perceptual Processing & Belief Formation Dynamics* (L3) , AI analogs of hallucination modeling and fixed-belief generation.
- **Bipolar and Related Disorders:** Alternating states of mania/hypomania and depression. Example: Bipolar I Disorder. Maps to *Mood Regulation Oscillation & Reward*

Sensitivity Shifts (L3) , AI state models alternating between high energy/exploration and low energy/conservation modes.
- **Substance-Related & Addictive Disorders:** Maladaptive reward-seeking and compulsive use patterns. Example: Alcohol Use Disorder. Maps to *Reinforcement Learning & Impulse-Control Dysregulation* (L2/L3) , AI simulating craving feedback loops and tolerance phenomena.
- **Personality Disorders:** Enduring maladaptive patterns of cognition, affect, and behavior. Example: Borderline Personality Disorder. Maps to *Emotional Regulation & Self-Concept Modeling* (L3) , AI simulation of unstable interpersonal schemas and affective lability.

Applications.
- **Clinical Diagnosis:** Core instrument for reliable and standardized DSM-5 diagnostic assessment [119].
- **Research Standardization:** Ensures diagnostic consistency across studies on etiology, comorbidity, and treatment efficacy [314].
- **Training:** Teaches clinicians structured diagnostic interviewing and criteria-based assessment.
- **Forensic Use:** Provides standardized diagnostic evidence in legal and forensic evaluations.
- **AI Psychiatry Integration:**
  - Framework for DSM-based knowledge graphs and clinical reasoning ontologies.
  - Enables structured data generation for supervised machine-learning models predicting symptom clusters and treatment outcomes.
  - Basis for synthetic "virtual patient" agents exhibiting disorder-consistent affective and cognitive patterns.

Timeline.
- **1980s:** SCID introduced for DSM-III by Spitzer & Williams [314].
- **1994–1997:** DSM-IV versions (SCID-I/SCID-II) refined Axis I and II diagnostics [118].
- **2013–2016:** SCID-5 released for DSM-5 alignment [119].
- **Present:** Ongoing use across research, clinical, and digital assessment domains; continued psychometric validation [89, 303].

Psychometrics.
- **Format:** Clinician-administered, modular semi-structured interview.
- **Response Coding:** Binary criterion endorsement (met/not met) with optional severity ratings.
- **Reliability:** Excellent inter-rater reliability ($\kappa > 0.70$) for major diagnoses [303].
- **Validity:** Strong content and concurrent validity; predictive validity varies by diagnostic domain [119].

Data Structure. The conceptual dataset (`scid.csv`) captures a structured lexical representation of DSM diagnostic hierarchies:
- `Factor` , DSM diagnostic category (e.g., `Anxiety Disorders`).
- `Trait_Adjective_DisorderName` , Specific disorder (e.g., `Panic Disorder`).
- `SymptomCluster_Synonym` , Core or defining symptom (e.g., `Palpitations`, `Dread`).

- `AssociatedVerb` , Behavioral form (e.g., `Fear`, `Avoid`).
- `AssociatedNoun` , Nominal abstraction (e.g., `Anxiety`, `Hallucination`).

Resources.

- **Mapped Brain Functions Table:** Table 32.
- **AI Maturity Levels:** Section B.1.
- **Connected Papers:** SCID Concept Graph.
- **Dataset:** `SCID_Dataset.csv`.
- **Embeddings:** `scid_embeddings.csv`.

(33) Millon Clinical Multiaxial Inventory (MCMI)

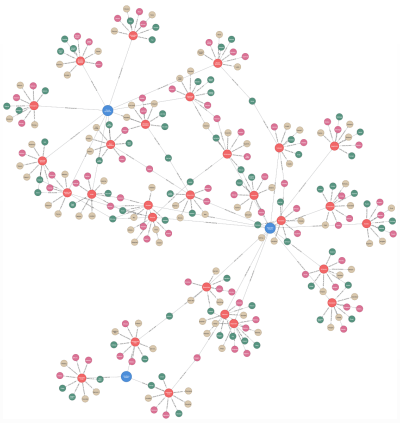

Fig. 33. MCMI Scales (click to enlarge).

Description. The **Millon Clinical Multiaxial Inventory (MCMI)** is a self-report psychological assessment developed by Theodore Millon to measure both enduring personality patterns and acute clinical syndromes in adults [213, 216, 217]. It employs a base-rate scoring system designed to reflect the prevalence of traits and syndromes in clinical populations, providing T-scores across **15 Personality Pattern**, **10 Clinical Syndrome**, and **3 Modifying Index** scales. The MCMI is grounded in Millon's evolutionary theory of personality, integrating DSM criteria into a theoretically coherent structure of personality and psychopathology.

Format.

- **Method:** Self-report inventory (195 items).
- **Scale:** T-scores (base-rate adjusted).
- **Interpretation:** Scores $\geq$ 75 indicate prominent traits; $\geq$ 85 suggest clinically significant elevations.

Dimensions, Examples, and AI Mapping.

- **Personality Patterns** (e.g., Borderline, Narcissistic, Avoidant) Maps to *Interpersonal Behavior, Emotional Regulation, and Self-Concept Modeling* (L3) , AI simulating unstable affect, relational volatility, or exaggerated self-schemas.
- **Clinical Syndromes** (e.g., Major Depression, PTSD, Substance Abuse) Maps to *Affective Regulation, Threat Response, and Reinforcement Learning* (L2/L3) , AI representing maladaptive reward-seeking, dysphoric affect, or hypervigilance.
- **Modifying Indices** (Disclosure, Desirability, Debasement) Maps to *Self-Presentation Bias & Response Validity Modeling* (L2) , AI estimating exaggeration, denial, or impression-management patterns in user data.

Applications.

- **Clinical Practice:** Diagnostic clarification and treatment planning for comorbid personality and clinical disorders.
- **Research:** Examining trait-syndrome covariance and their neural or behavioral correlates.
- **Forensics:** Personality and risk profiling in legal and correctional contexts.
- **AI in Psychometrics:**
  - Constructing knowledge graphs linking personality dimensions and syndromes.
  - Generating simulated patient avatars with specific MCMI profiles for clinician-training environments.
  - Integrating normalized T-scores as standardized psychometric features in ML pipelines.

Timeline.

- **1977:** Original MCMI introduced [213].
- **1982:** MCMI-I published; formalizes base-rate scoring [216].
- **1997:** MCMI-III updated to DSM-IV.
- **2015:** MCMI-IV released for DSM-5 alignment [217].
- **Present:** Ongoing psychometric refinement and international validation.

Psychometrics.

- **Reliability:** Internal consistency $\alpha > 0.70$ across most scales [259].
- **Validity:** Strong content validity through DSM correspondence; good convergent validity with SCID and MMPI [34].
- **Base-Rate System:** Adjusts for disorder prevalence, improving interpretive precision for clinical elevations.

Data Structure. The `mcmi.csv` dataset provides lexical and categorical representations of the inventory's scales:

- `Factor` , Broad category (e.g., Personality Pattern, Clinical Syndrome).
- `Adjective` , Specific scale (e.g., Borderline, Paranoid).
- `Synonym, Verb, Noun` , Lexical descriptors corresponding to each dimension.

Resources.

- **Connected Papers:** MCMI Graph.
- **Dataset:** `MCMI_Dataset.csv`.
- **Embeddings:** `mcmi_embeddings.csv`.

(34) Rorschach Inkblot Test (RIT)

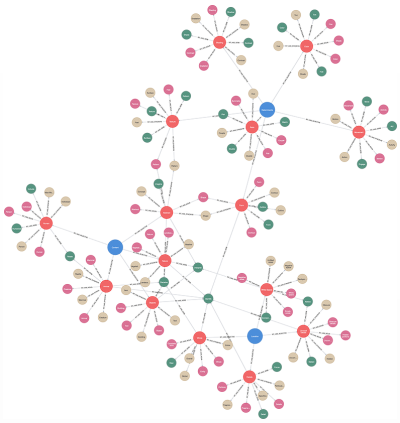

Fig. 34. Rorschach Inkblot (click to enlarge).

Description. The **Rorschach Inkblot Test (RIT)** is a projective psychological instrument introduced by Hermann Rorschach in 1921 [276]. It uses a series of ten ambiguous inkblots to elicit spontaneous interpretations, from which trained examiners infer underlying personality dynamics, emotional regulation, and thought organization. Although its psychometric validity has been debated [159, 348], modern scoring systems, such as Exner's *Comprehensive System (CS)* [109] and the *Rorschach Performance Assessment System (R-PAS)* [205], have standardized administration and interpretation, improving reliability and empirical grounding [203, 328].

Dimensions, Examples, and AI Mapping. The Rorschach is analyzed along three primary dimensions, *Location*, *Determinants*, and *Content*, each reflecting distinct perceptual or cognitive processes that can be analogized to AI perception and interpretation tasks.

- **Location.** Where the respondent focuses within the blot.
  - **Whole (W):** Interprets the entire blot (e.g., "The whole thing looks like a bat"). Maps to *Global Visual Processing & Gestalt Integration* (L1–L2).
  - **Detail (D/Dd):** Focuses on common or small, unusual areas (e.g., "This side looks like a bear's paw"). Maps to *Selective Attention & Feature Extraction* (L1–L2).
  - **White Space (S):** Uses negative space (e.g., "The white part forms a ghost"). Maps to *Figure–Ground Reversal & Cognitive Flexibility* (L2–L3).
- **Determinants.** Visual qualities influencing perception.
  - **Form (F):** Based on shape alone , *Shape Recognition & Object Organization* (L1).
  - **Movement (M):** Perceived human or animal motion , *Action Recognition & Intention Inference* (L2–L3).
  - **Color (C):** Driven by chromatic cues , *Color Processing & Affective Association* (L1–L3).
  - **Shading (Sh):** Uses tone/texture , *Tactile Inference & Haptic Reasoning* (L2–L3).
- **Content.** Thematic subject of the response.
  - **Human (H):** Reflects social cognition.

  - **Animal (A):** Engages biological form recognition.
  - **Abstract (Ab):** Expresses symbolic or metaphorical reasoning. These map to *Human/Animal Recognition & Abstract Conceptualization* (L1–L3).

Applications.

- **Clinical Assessment:** Evaluates personality organization, emotional control, and cognitive style [109, 203].
- **Forensic Psychology:** Occasionally used in competency and risk assessments [330].
- **Research:** Tool for studying perception, creativity, and response to ambiguity [338].
- **AI Applications:**
  - *AI-Assisted Scoring:* Automating the coding of Rorschach protocols for consistency.
  - *Ambiguity Resolution Modeling:* Informing AI systems that infer meaning from uncertain or incomplete data.
  - *Generative Creativity:* Using response distributions to inspire more open-ended generative modeling behaviors.

Timeline.

- **1921:** Rorschach publishes *Psychodiagnostik* [276].
- **1930s–1950s:** Development of multiple scoring systems (Beck, Klopfer, Hertz, Piotrowski).
- **1969–1990s:** Exner consolidates systems into the *Comprehensive System (CS)* [108, 109].
- **2000s:** Empirical reappraisal and international norming [304, 348].
- **2011:** R-PAS introduced [205].
- **Present:** R-PAS dominates modern use; focus on psychometrics, cross-cultural validation, and digital augmentation [36].

Psychometrics.

- **Scoring Systems:** Exner's CS and R-PAS provide standardized variables for location, determinants, and content.
- **Reliability:** Good inter-rater reliability for trained scorers [204].
- **Validity:** Supported for variables linked to thought disorder, affect regulation, and interpersonal perception [207], though global validity remains debated [159, 348].
- **Norms:** R-PAS includes updated international reference samples [206].
- **Administration:** Requires standardized prompts and response counts to ensure interpretive reliability [329].

Data Structure. The conceptual dataset (`rit.csv`) encodes the hierarchical structure of Rorschach variables:

- `Factor` , Dimension (e.g., Location, Determinant, Content).
- `Subcategory` , Specific code (e.g., Whole, Color, Human).
- `Description`, `Synonym`, `Verb`, `Noun` , Semantic fields linked to each interpretive element.

Resources.

- **Mapped Brain Functions Table:** Table 34.
- **AI Maturity Levels:** See Appendix B.1.
- **Connected Papers:** RIT Graph.

- **Dataset:** `RIT_Dataset.csv`.
- **Embeddings:** `rit_embeddings.csv`.

(35) Thematic Apperception Test (TAT)

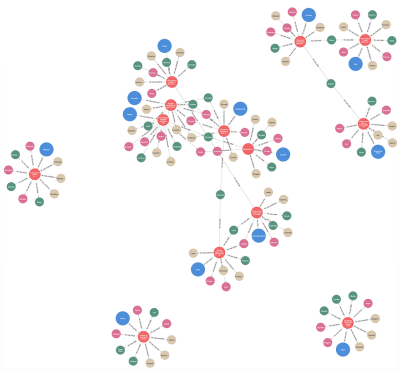

Fig. 35. Thematic Apperception Test (TAT) card example.

Description. The **Thematic Apperception Test (TAT)**, developed by Henry A. Murray and Christiana D. Morgan in the 1930s [223, 225], is a projective assessment designed to uncover underlying drives, emotions, and interpersonal dynamics through storytelling. Participants are shown ambiguous images depicting social situations and asked to create narratives about what is happening, what led up to it, what the characters are thinking and feeling, and how the story ends [323]. Interpretation frameworks include analyses of defense mechanisms [81], object relations [340], and social cognition [339].

Dimensions, Examples, and AI Mapping. TAT analysis centers on the narrative's structure, characters, themes, conflicts, and outcomes, each corresponding to cognitive and motivational processes analogous to AI reasoning capabilities.

- **Characters.**
  - **Hero / Protagonist:** The main actor driving the narrative (e.g., "A young woman deciding her future"). Maps to *Self-Representation & Agent Identification* (L2–L3 AI Maturity).
  - **Supporting Figures:** Authority or peer roles influencing the protagonist (e.g., "Her father offers advice, her friend challenges it"). Maps to *Social Role Understanding & Theory of Mind* (L2–L3).
- **Themes.**
  - **Achievement:** Striving toward success or mastery (e.g., "He rebuilds his business after failure"). Maps to *Goal-Oriented Planning & Motivational Drive* (L2).
  - **Affiliation:** Desire for warmth and connection (e.g., "They support each other through hardship"). Maps to *Socio-Emotional Modeling* (L3).
  - **Power:** Control, dominance, or influence (e.g., "He asserts authority over the group"). Maps to *Hierarchy & Strategy Representation* (L2–L3).

- **Conflicts.**
  - **Internal:** Approach–avoidance struggles (e.g., "She wants the new job but fears leaving home"). Maps to *Decision-Making Under Uncertainty* (L2).
  - **Interpersonal:** Rivalry or betrayal (e.g., "Two brothers compete for their father's approval"). Maps to *Social Interaction & Conflict Simulation* (L2–L3).
- **Outcomes.**
  - **Positive Resolution:** Achievement or reconciliation (e.g., "She succeeds and feels fulfilled"). Maps to *Causal Reasoning & Reward Prediction* (L2).
  - **Negative Resolution:** Failure or frustration (e.g., "He gives up after repeated setbacks"). Maps to *Resilience Modeling & Reinforcement Learning Adaptation* (L2–L3).

Applications.

- **Clinical Psychology:** Assesses personality structure, motivation, and defense mechanisms [81, 340].
- **Personality Research:** Studies development of identity and defensive change [82, 83].
- **AI Narrative Modeling:** Provides structured patterns for psychologically coherent story generation [323].
- **Character Simulation:** Enables AI agents or NPCs to exhibit consistent motivational depth.
- **Computational Social Cognition:** Supports modeling of human mental-state inference and empathy [341].
- **Automated Thematic Text Analysis:** NLP systems can extract story themes analogous to TAT interpretation dimensions.

Timeline.

- **1935:** Morgan & Murray introduce the TAT [223].
- **1943:** Murray publishes the official *TAT Manual* [225].
- **1947:** Tomkins formalizes systematic interpretation [323].
- **1970s–1990s:** Scoring systems expand (Cramer's Defense Manual; Westen's SCORS) [81, 339].
- **2000s–Present:** Ongoing psychometric refinements and narrative-based AI research [83].

Psychometrics.

- **Scoring Systems:** Cramer's Defense Mechanism Manual and Westen's SCORS.
- **Reliability:** Good inter-rater reliability with training; test–retest stability varies by theme.
- **Validity:** Supported for constructs such as object relations and motivation, though holistic validity remains debated.
- **Subjectivity:** Balances interpretive richness with reliability through structured coding.
- **Clinical Utility:** Valuable for hypothesis generation and therapeutic engagement [24].

Data Structure. The conceptual `tat.csv` dataset mirrors the hierarchy:

- `Category` , Major dimension (Characters, Themes, Conflicts, Outcomes).
- `Factor` , Subcategory (e.g., Hero, Achievement).
- `Adjective` , Descriptive phrase.
- `Synonym, Verb, Noun` , Lexical extensions for embeddings and ontology linking.

Resources.

- **Mapped Brain Functions Table:** Table 35.
- **AI Maturity Levels:** See Appendix B.1.
- **Connected Papers:** TAT Graph.
- **Dataset:** `TAT_Dataset.csv`.
- **Embeddings:** `tat_embeddings.csv`.

(36) Wechsler Adult Intelligence Scale (WAIS)

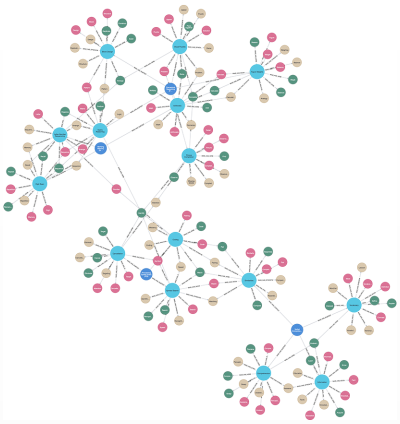

Fig. 36. Wechsler Adult Intelligence Scale (WAIS).

Description. The **Wechsler Adult Intelligence Scale (WAIS)**, first introduced by David Wechsler in 1955 [334] and revised through WAIS-R (1981) [335], WAIS-III (1997) [336], and WAIS-IV (2008) [337], is the most widely used standardized test of adult intelligence. It yields four index scores, *Verbal Comprehension, Perceptual Reasoning, Working Memory,* and *Processing Speed*, that together generate a Full-Scale IQ, reflecting both crystallized and fluid cognitive abilities.

Dimensions, Examples, and Brain-Function Mapping.

- **Verbal Comprehension Index (VCI).** Assesses verbal reasoning and concept formation.
  - **Similarities:** "How are a train and a bicycle alike?" → *Semantic comparison & abstraction* (L2).
  - **Vocabulary:** "Define 'benevolent.'" → *Lexical knowledge & concept representation* (L3).
  - **Information:** "What is the capital of France?" → *Knowledge recall & integration* (L2–L3).
  - **Comprehension:** "Why do people obey laws?" → *Pragmatic reasoning & social cognition* (L3).

- **Perceptual Reasoning Index (PRI).** Evaluates nonverbal problem solving and spatial reasoning.
  - **Block Design:** Reproduce a pattern with blocks → *Spatial assembly & visual-motor coordination* (L2).
  - **Matrix Reasoning:** Identify the missing piece in a matrix → *Pattern inference & analogical reasoning* (L3).
  - **Visual Puzzles:** Solve jigsaw-type problems → *Mental rotation & spatial manipulation* (L2).
  - **Figure Weights:** Balance scales using weight inference → *Quantitative reasoning & analogy* (L3).
- **Working Memory Index (WMI).** Measures short-term storage and cognitive manipulation.
  - **Digit Span:** Repeat sequences forward/backward → *Sequential encoding & attention control* (L2).
  - **Arithmetic:** Mental problem solving → *Numerical reasoning & sustained concentration* (L3).
  - **Letter–Number Sequencing:** Reorder mixed symbols → *Dual-task coordination & cognitive flexibility* (L3).
- **Processing Speed Index (PSI).** Tests rapid scanning, matching, and psychomotor efficiency.
  - **Symbol Search:** Find target symbols → *Perceptual speed & pattern recognition* (L2).
  - **Coding:** Match numbers to symbols → *Processing fluency & graphomotor speed* (L2).
  - **Cancellation:** Mark specified targets → *Selective attention & visual search* (L3).

Applications.

- **Clinical Assessment:** Gold-standard tool for diagnosing intellectual disability, cognitive decline, and neuropsychological disorders.
- **Cognitive Modeling:** Informs architectures simulating working memory, reasoning, and executive functions.
- **Adaptive Testing:** Foundation for AI-driven item selection in computerized intelligence tests.
- **Educational AI:** Enables personalized learning paths based on cognitive index profiles.
- **Neuroscience Research:** Links index scores with functional neuroimaging of cognitive domains.

Timeline.

- **1939:** Wechsler–Bellevue Intelligence Scale introduced [333].
- **1955:** WAIS established standardized adult IQ testing [334].
- **1981:** WAIS-R revision improves norms and item structure [335].
- **1997:** WAIS-III introduces Working Memory and Processing Speed [336].
- **2008:** WAIS-IV refines index scales and psychometrics [337].
- **2020s:** Digital WAIS-V under development, adaptive testing, global norms, AI scoring integration.

Psychometrics.

- **Reliability:** Subtests show high internal consistency ($\alpha > 0.90$) and test–retest stability ($r > 0.85$) [337].

- **Validity:** Strong evidence for four-factor model (VCI, PRI, WMI, PSI); excellent construct and criterion validity [11].
- **Norming:** WAIS-IV normed on 2,200 U.S. adults (ages 16–90) stratified by education, gender, and ethnicity [337].
- **Clinical Utility:** Central to diagnostics in neuropsychology, forensic assessment, and cognitive rehabilitation.

Data Structure. Dataset `wais.csv` defines:

- `Index` , Primary ability (VCI, PRI, WMI, PSI).
- `Subtest` , Specific cognitive task.
- `Description` , Subtest definition.
- `Synonym, Verb, Noun` , Lexical fields for embeddings.

Resources.

- **Primary Sources:** [334–337].
- **Mapped Brain Functions Table:** Table 36.
- **AI Maturity Levels:** Appendix B.1.
- **Connected Papers:** WAIS Graph.
- **Dataset:** `WAIS_Dataset.csv`.
- **Embeddings:** `wais_embeddings.csv`.

A.6 Interpersonal and Conflict Resolution Models

This category encompasses models that describe how individuals perceive, navigate, and manage interpersonal relationships, conflict dynamics, and social influence processes. These frameworks extend beyond personality assessment to explain interactional styles, communication patterns, and emotional regulation within dyadic, group, and organizational contexts. Incorporating such models into computational systems enables AI agents to simulate negotiation, empathy, trust calibration, and reconciliation strategies essential competencies for multi-agent coordination, human–AI collaboration, and affective computing. Many of these models intersect with social psychology, communication theory, and behavioral economics, offering scalable structures for translating human relational intelligence into artificial counterparts.

(37) Thomas–Kilmann Conflict Mode Instrument (TKI)

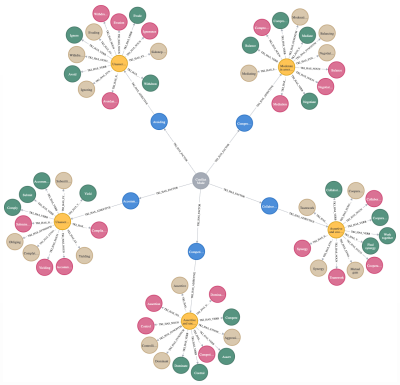

Fig. 37. Thomas–Kilmann Conflict Mode Instrument (TKI).

Description. The **Thomas–Kilmann Conflict Mode Instrument (TKI)**, developed by Kenneth W. Thomas and Ralph H. Kilmann in 1974 [321], identifies five distinct approaches to managing conflict: *Competing, Collaborating, Compromising, Avoiding,* and *Accommodating*. Each reflects a unique balance between *assertiveness* (pursuit of one's own interests) and *cooperativeness* (consideration of others' interests). The TKI is a foundational tool for organizational psychology and leadership development, emphasizing situational adaptability and self-awareness in conflict engagement [140, 168, 177, 270].

Dimensions, Examples, and Brain–Function Mapping. Each conflict mode corresponds to characteristic decision and affective control processes, here aligned with levels of AI maturity from Appendix B.1.

- **Competing (Assertive, Uncooperative):** Pursues personal goals regardless of opposition. **Example (L2):** Reinforcement-learning agent maximizing individual reward in adversarial settings. *Maps to* Decision-Making Under Uncertainty & Competitive Strategy Modeling (L2).
- **Collaborating (Assertive, Cooperative):** Seeks integrated, win–win outcomes. **Example (L3):** Multi-agent systems simulating shared intentionality and affective understanding. *Maps to* Social Cognition & Theory of Mind Simulation (L3).
- **Compromising (Moderately Assertive, Moderately Cooperative):** Balances competing needs through partial concessions. **Example (L2):** Pareto-optimal trade-off optimization in multi-objective agents. *Maps to* Ambivalence Arbitration & Utility Balancing (L2).
- **Avoiding (Unassertive, Uncooperative):** Withdraws from engagement to minimize perceived threat or cost. **Example (L2):** Inhibitory control mechanisms suppressing decision output in uncertain environments. *Maps to* Risk-Averse Response Inhibition & Attention Gating (L2).
- **Accommodating (Unassertive, Cooperative):** Subordinates personal goals to maintain relational harmony. **Example (L3):** Emotion-aware agents modulating tone and decision framing to preserve trust. *Maps to* Empathy Modeling & Affective Alignment (L3).

Applications.

- **Organizational Development:** Diagnose and balance team conflict profiles to improve collaboration.
- **Leadership Training:** Develop adaptive strategies for high-stakes negotiation and crisis mediation.
- **Team Dynamics:** Support conflict coaching and constructive communication frameworks.
- **AI Negotiation Systems:** Parameterize agent interaction styles to reflect human-like negotiation patterns.

Timeline.

- **1974:** Thomas and Kilmann publish the original TKI [321].
- **1976–1977:** Empirical studies validate five-mode structure and psychometrics [168, 177].
- **1980s–1990s:** Adoption expands into corporate training and organizational consulting.
- **2000s–Present:** Remains a core tool in leadership development, coaching, and mediation practice.

Psychometrics.

- **Reliability:** Internal consistency (Cronbach's $\alpha > 0.70$ across modes) [177].
- **Test–Retest:** Stability correlations between 0.61–0.68 over 2–3 weeks [321].
- **Validity:** Factor analyses support five-mode model; concurrent validity with the Rahim Organizational Conflict Inventory [270].
- **Norming:** Established across diverse organizational samples [168].

Data Structure. Dataset `tki.csv` organizes each conflict mode into lexical and behavioral dimensions for embedding:

- `Category`: Conflict Mode (five styles).
- `Factor`: Mode name (Competing–Accommodating).
- `Adjective`: Descriptive phrase of mode behavior.
- `Synonym, Verb, Noun`: Lexical attributes used for semantic expansion.

Flattened schema: `Category, Factor, Adjective, Synonym, Verb, Noun, Embedding`.

Resources.

- **Primary Reference:** [321].
- **Key Studies:** [140, 168, 177, 270].
- **Mapped Brain Functions Table:** Table 37.
- **AI Maturity Definitions:** Appendix B.1.
- **Connected Papers:** TKI Graph.
- **Dataset:** `TKI_Dataset.csv`.
- **Embeddings:** `tki_embeddings.csv`.

(38) Everything DiSC Workplace Profile (DiSC)

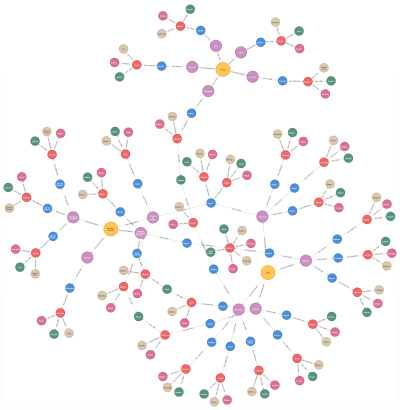

Fig. 38. Everything DiSC Workplace Profile (DiSC).

Description. The **Everything DiSC Workplace Profile (DiSC)** is a behavioral assessment developed by Wiley, based on William Moulton Marston's foundational *DISC theory of emotions and behavior* [195]. It classifies individuals into four primary styles *Dominance (D)*, *Influence (i)*, *Steadiness (S)*, and *Conscientiousness (C)*, to enhance self-awareness, interpersonal communication, and team collaboration [45, 202]. Unlike traditional personality inventories, DiSC focuses on observable behavioral tendencies within workplace contexts rather than underlying traits.

Dimensions, Examples, and Brain–Function Mapping. Each DiSC style corresponds to characteristic cognitive or behavioral functions, which can be mirrored in AI systems for adaptive interaction modeling (see Appendix B.1).

- **Dominance (D):** Direct, assertive, results-oriented. *Maps to* Strategic Planning & Goal-Oriented Decision-Making (L2).
  - **Example (L2):** AlphaZero-like agents using Monte Carlo Tree Search to maximize strategic advantage.
- **Influence (i):** Sociable, persuasive, expressive. *Maps to* Social Cognition & Persuasion Modeling (L2–L3).
  - **Example (L2):** LLMs generating context-aware persuasive messages.
  - **Example (L3):** Generative agents modeling shared emotional states and cooperative intent.
- **Steadiness (S):** Cooperative, patient, relationship-focused. *Maps to* Adaptive Feedback Loops & Stability Maintenance (L2).
  - **Example (L2):** Transformer-based dialogue systems maintaining long-context coherence to foster rapport.
- **Conscientiousness (C):** Analytical, systematic, quality-driven. *Maps to* Logical Reasoning & Error Monitoring (L2).
  - **Example (L2):** Neuro-symbolic reasoning engines applying rule-based consistency checks in decision pipelines.

Applications.

- **Team Development:** Diagnose communication mismatches and align complementary work styles.
- **Leadership Coaching:** Guide adaptive leadership behaviors across diverse interpersonal contexts.
- **Organizational Training:** Improve workplace culture by embedding DiSC-informed communication frameworks.
- **Sales and Client Relations:** Personalize engagement tactics based on behavioral style prediction [289].
- **AI Interaction Design:** Parameterize conversational agents with human-aligned communication archetypes (e.g., assertive vs. affiliative dialogue policies).

Data Structure. Dataset `disc.csv` defines each DiSC style and its behavioral attributes:

- `Domain`: DiSC
- `Subcategory`: Primary style (D, i, S, C).
- `Factor`: Behavioral facet (e.g., decisiveness, empathy, precision).
- `Adjective`: Descriptive phrase of trait expression.
- `Synonym, Verb, Noun`: Lexical and semantic fields.

Flattened schema: `Domain, Subcategory, Factor, Adjective, Synonym, Verb, Noun, Embedding`.

Resources.

- **Primary Theory:** Marston, W. M. (1928). *Emotions of Normal People* [195].
- **Assessment Publisher:** Everything DiSC (Wiley) [344].
- **Supporting Research:**
  - Bruening et al. (2010) on emotional intelligence and DiSC in teams [45].
  - McKenna et al. (2002) on management and leadership applications [202].
- **Interactive Literature Map:** Connected Papers graph for DiSC.
- **Dataset:** `DiSC_Dataset.csv`.
- **Embeddings:** `disc_embeddings.csv`.

A.7 Application-Specific Models

This category encompasses frameworks that extend personality and behavioral theories into specialized domains of application, such as leadership assessment, team dynamics, creativity, well-being, and adaptive learning. Unlike broad trait taxonomies, these models are designed to be pragmatic, context-sensitive, and operationally measurable. They often translate psychological constructs into actionable metrics used in organizational consulting, education, therapy, and increasingly, AI-driven personalization systems. From a computational perspective, these models inform how personality-informed agents can adapt decision policies, emotional expressions, and learning behaviors to domain-specific constraints, enabling more grounded and human-aligned artificial intelligence systems.

(39) Holland's Theory of Career Choice (RIASEC)

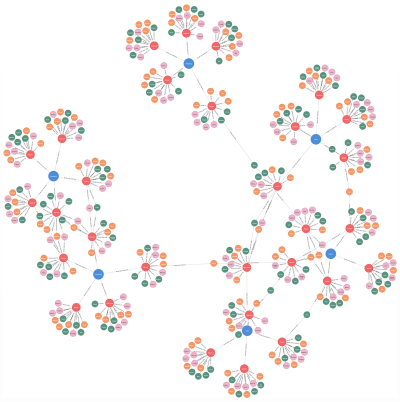

Fig. 39. RIASEC Vocational Interests.

Description. John L. Holland's **RIASEC model**, also known as the Holland Codes or *Holland Occupational Themes*, categorizes vocational interests into six recurring personality–environment patterns: **Realistic, Investigative, Artistic, Social, Enterprising,** and **Conventional** [155, 156]. It forms the theoretical foundation for widely used career instruments such as the *Self-Directed Search (SDS)* and underpins the U.S. Department of Labor's *O*NET* classification system [128, 229, 239]. RIASEC posits that occupational satisfaction and stability arise from congruence between an individual's type and their work environment.

Dimensions and Brain–Function Mapping. Each RIASEC domain corresponds to distinct cognitive and motivational orientations. Using the AI maturity taxonomy in Appendix B.1, each is mapped to analogous computational functions:

- **Realistic (R):** Practical, hands-on, mechanical. *Maps to* Sensorimotor Coordination & Reflexive Control (L1).
  - **Example (L1):** Robotic arms using CNN-based vision for precision pick-and-place operations.
- **Investigative (I):** Analytical, empirical, problem-solving. *Maps to* Logical Reasoning & Working Memory (L2).
  - **Example (L2):** Neuro-symbolic solvers proving multi-step logical propositions.
- **Artistic (A):** Creative, expressive, original. *Maps to* Generative Creativity & Contextual Understanding (L2/L3).
  - **Example (L2):** GANs producing novel artwork.
  - **Example (L3):** Generative agents composing emotionally coherent music or prose.
- **Social (S):** Cooperative, empathic, service-oriented. *Maps to* Social Cognition & Empathy Modeling (L3).
  - **Example (L3):** Affective computing systems adapting dialogue tone to user sentiment.
- **Enterprising (E):** Persuasive, strategic, leadership-focused. *Maps to* Decision-Making Under Uncertainty & Strategic Planning (L2).

  - **Example (L2):** Reinforcement-learning agents optimizing multi-objective business strategies.
- **Conventional (C):** Structured, detail-oriented, rule-bound. *Maps to* Symbolic Encoding & Attention Control (L1).
  - **Example (L1):** Transformer-based OCR systems converting documents into structured datasets.

Applications.

- **Career Counseling:** Match individuals to occupations aligning with their intrinsic interests.
- **Education Planning:** Inform academic major or program selection.
- **Workforce Development:** Guide placement and reskilling strategies.
- **Team Design:** Balance team composition by complementary RIASEC orientations.
- **AI Agent Modeling:** Encode vocational archetypes to simulate diverse work-style personas in human–AI collaboration environments.

Timeline.

- **1959:** Holland introduces personality–environment fit theory [155].
- **1973:** *Making Vocational Choices* formalizes the six-type RIASEC framework [156].
- **1980s–1990s:** Cross-cultural validation studies confirm robustness [128].
- **2000s–Present:** Adopted in digital career platforms and the O*NET occupational database.

Psychometrics.

- **Reliability:** Internal consistency $\alpha > 0.80$ across types [229].
- **Test–Retest:** Stability coefficients typically exceed 0.75 [156].
- **Validity:** Factor analyses confirm six-type structure; strong concurrent validity with occupational outcomes [239].
- **Norming:** Large U.S. and international samples; integrated into O*NET benchmarks by job family.

Data Structure. Dataset `riasec.csv` encodes lexical and semantic mappings for each type:

- `Factor`: RIASEC type.
- `Adjective`: Descriptive trait.
- `Synonym, Verb, Noun`: Lexical attributes.

Flattened schema: `Factor, Adjective, Synonym, Verb, Noun, Embedding`.

Resources.

- **Foundational Works:** [155, 156].
- **Applied Research:** Gati & Meir (1982); Osipow et al. (1966) [128, 239].
- **Modern Review:** Nauta (2010) on Holland's empirical legacy [229].
- **Interactive Literature Map:** Connected Papers graph for RIASEC.
- **Dataset:** `riasec_Dataset.csv`.
- **Embeddings:** `riasec_embeddings.csv`.

(40) Bartle Types (BT)

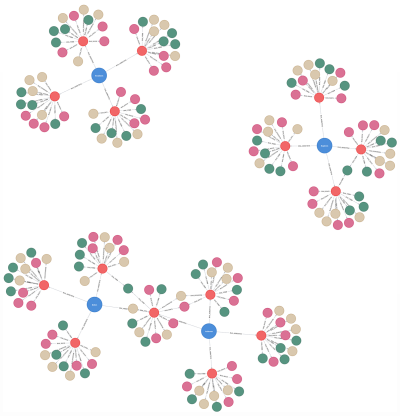

Fig. 40. Bartle's Gamer Types.

Description. Proposed by Richard Bartle in 1996, the **Bartle Types** model classifies multiplayer game participants into four motivational archetypes, **Achievers**, **Explorers**, **Socializers**, and **Killers**, based on behavioral preferences and interaction patterns within virtual environments [25]. It remains one of the most influential frameworks for understanding engagement mechanics, player motivation, and social dynamics in massively multiplayer online (MMO) and gamified systems [26, 352].

Dimensions and Brain–Function Mapping. Each player type reflects a dominant motivational drive that aligns with specific cognitive and affective processes. Mapped against the AI Maturity levels (Appendix B.1), Bartle Types parallel distinct classes of adaptive AI behavior:

- **Achievers:** Goal-oriented accumulation and progression. *Maps to* Reward Mechanisms & Skill Acquisition (L2).
  - **Example (L2):** Deep Q-Networks maximizing score-based reward signals in Atari benchmarks.
- **Explorers:** Analytical discovery and curiosity-driven exploration. *Maps to* Planning & Semantic World Modeling (L2).
  - **Example (L2):** AlphaZero's Monte Carlo Tree Search uncovering novel Go strategies through autonomous exploration.
- **Socializers:** Cooperative interaction and relationship building. *Maps to* Social Cognition & Theory-of-Mind Simulation (L3).
  - **Example (L3):** Generative agents exhibiting affective alignment and mutual intention modeling in multi-agent dialogues [244].
- **Killers:** Competitive dominance and adversarial interaction. *Maps to* Competitive Strategy Modeling & Game-Theoretic Reasoning (L2).
  - **Example (L2):** Multi-agent reinforcement learning systems optimizing adversarial tactics in StarCraft or Dota-2 environments.

Applications.

- **Game Design:** Tailor mechanics, progression systems, and social features to balance motivational profiles.
- **Community Management:** Encourage inclusive online ecosystems by balancing social and competitive incentives.
- **Player Retention:** Personalize in-game challenges and feedback loops based on engagement archetype.
- **Market Research:** Segment user populations by motivational preference and behavioral telemetry.
- **AI Persona Modeling:** Enable adaptive NPC and agent personalities aligned with Bartle archetypes for human–AI co-play.

Timeline.

- **1996:** Bartle publishes "Hearts, Clubs, Diamonds, Spades," introducing the four primary player types [25].
- **2003:** Expanded discussion in *Designing Virtual Worlds* connects player types to motivational design [26].
- **2010s:** Empirical validation across MMOs and digital platforms, with refinements to subtypes and hybrids [352].
- **2021:** Park et al. link Bartle types to learning motivation and sustainable engagement patterns [244].

Psychometrics.

- **Validity:** Supported by correlations between player self-reports and in-game behavioral data [352].
- **Factor Structure:** Confirmatory factor analyses replicate the four-type model, sometimes revealing subfactors (e.g., cooperative vs. aggressive Killers) [165].
- **Reliability:** Bartle Type Indicator scales exhibit internal consistency $\alpha > 0.80$ [244].
- **Cross-Cultural Stability:** Factor loadings remain consistent across regional gaming communities.
- **Use Cases:** Applied in gamification research, adaptive content recommendation, and AI agent persona training.

Data Structure. Dataset `bartle.csv` captures lexical, semantic, and embedding representations for each player type:

- `Factor`: Player archetype (Achiever, Explorer, Socializer, Killer).
- `Adjective`: Core motivational descriptor.
- `Synonym, Verb, Noun`: Lexical attributes per trait.
- `Embedding`: Numeric vector representation for similarity modeling.

Flattened schema: `Factor, Adjective, Synonym, Verb, Noun, Embedding`.

Resources.

- **Original Work:** Bartle (1996) "Hearts, Clubs, Diamonds, Spades" [25].
- **Expanded Theory:** Bartle (2003) *Designing Virtual Worlds* [26].
- **Empirical Studies:** Yee (2006); Johnson et al. (2015); Park et al. (2021) [165, 244, 352].
- **Interactive Literature Map:** Connected Papers graph for BT.
- **Dataset:** `bt_Dataset.csv`.
- **Embeddings:** `bt_embeddings.csv`.

(41) Theories of Emotional Intelligence (TEI)

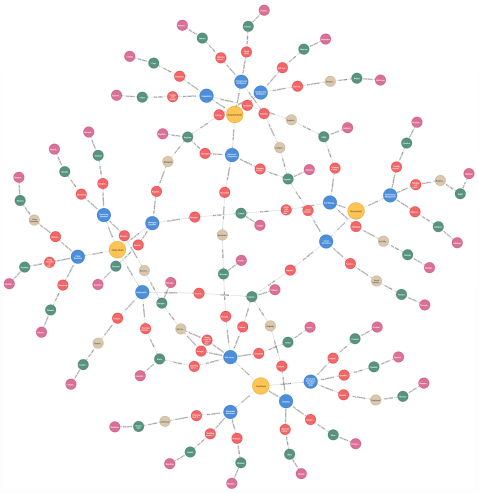

Fig. 41. Core Dimensions of Emotional Intelligence.

Description. Theories of Emotional Intelligence (TEI) describe the ability to perceive, use, understand, and regulate emotions in oneself and others [134, 287]. These frameworks encompass **ability-based models** (e.g., Mayer–Salovey–Caruso Emotional Intelligence Test, MSCEIT), **trait-based models** (e.g., Trait Emotional Intelligence Questionnaire, TEIQue), and **mixed models** that integrate emotional and social competencies (e.g., Goleman's Emotional Competence Inventory). TEI constructs underpin a range of psychometric instruments used in leadership, education, and affective computing.

Dimensions and Brain–Function Mapping. Each TEI dimension aligns with neural–cognitive processes that can be mapped to AI maturity levels (Appendix B.1):

- **Perceiving Emotions:** Recognizing emotions via facial expressions or tone of voice. *Maps to* Facial Expression Processing (L1) , CNNs classifying basic emotions in images or audio.
- **Using Emotions:** Harnessing affective states to enhance reasoning or creativity. *Maps to* Affective Context Integration (L2) , Transformers leveraging emotional tone for creative generation.
- **Understanding Emotions:** Comprehending causes and transitions among emotions. *Maps to* Semantic Reasoning & Contextual Inference (L2) , LLMs decoding emotional intent from dialogue.
- **Managing Emotions:** Regulating emotional states adaptively. *Maps to* Reinforcement Learning under Stress (L2) , agents adjusting reward policies to maintain equilibrium.
- **Self-Awareness:** Monitoring one's emotional and cognitive states. *Maps to* Metacognitive Reflection (L3) , agents generating self-evaluations of performance or bias.
- **Emotional Resilience:** Recovering from setbacks or stressors. *Maps to* Stress Regulation (L3) , adaptive AI maintaining function under high-load conditions.

- **Empathy:** Understanding and sharing others' emotional perspectives. *Maps to* Cognitive & Affective Empathy (L3) , agents aligning responses with user sentiment.
- **Social Awareness:** Reading group dynamics and social cues. *Maps to* Social Cognition & Persuasion Modeling (L2) , LLMs tailoring dialogue based on audience signals.
- **Self-Management:** Modulating impulses and maintaining goal focus. *Maps to* Inhibitory Control (L3) , executive-function simulators suppressing premature actions.
- **Relationship Management:** Building rapport, influencing, and resolving conflict. *Maps to* Theory-of-Mind Simulation (L3) , multi-agent coordination through intention modeling.

Applications.

- **Leadership Development:** EI training programs to enhance managerial decision-making [198].
- **Clinical Intervention:** Screening and remediation for emotional dysregulation [255].
- **Education and Coaching:** Integrating emotional skill-building into curricula.
- **Human–AI Interaction:** Embedding EI-inspired modules in virtual assistants for empathy-driven response generation.

Timeline.

- **1990:** Salovey & Mayer introduce "Emotional Intelligence" [287].
- **1995:** Goleman popularizes EI as a workplace and social skill [134].
- **2000s:** Development of standardized ability and trait instruments (MSCEIT, TEIQue) [23].
- **2010s–Present:** EI applied in leadership, education, and affective computing [198].

Psychometrics.

- **Item Formats:** Self-report Likert scales (e.g., 5-point) and performance-based scenario tests.
- **Reliability:** Cronbach's α typically 0.70–0.90 across subscales.
- **Validity:** Strong convergent and discriminant validity across personality, cognitive, and affective measures.

Data Structure. Dataset `tei.csv` encodes lexical and embedding-based representations for each EI factor:

- `Domain`: TEI model (Ability, Trait, or Mixed).
- `Factor`: Specific EI dimension (e.g., Perceiving Emotions).
- `Adjective, Synonym, Verb, Noun`: Lexical descriptors.
- `Embedding`: Vector representation for semantic clustering.

Flattened schema: `Domain, Factor, Adjective, Synonym, Verb, Noun, Embedding`.

Resources.

- **Key References:** [23, 134, 198, 255, 287].
- **Interactive Literature Map:** Connected Papers graph for TEI.
- **Dataset:** `tei_Dataset.csv`.
- **Embeddings:** `tei_embeddings.csv`.
- **Mapping Table:** See Table 41 for factor–AI correspondence.

A.8 Holistic and Integrative Models

This final category synthesizes models that integrate multiple psychological domains, cognitive, affective, motivational, interpersonal, and existential, into unified frameworks of personality and human functioning. These models move beyond isolated trait or factor constructs, emphasizing the systemic and dynamic interplay of emotions, values, consciousness, and purpose. They are particularly relevant to artificial general intelligence (AGI) research and advanced cognitive architectures, where holistic integration across affective, cognitive, and behavioral dimensions is essential for producing adaptive, contextually grounded, and ethically aligned agents.

Each of the following frameworks exemplifies a distinct synthesis strategy:

- **Structural Integration.** Unifying cognition, emotion, and motivation (e.g., PSI Theory).
- **Existential or Self-Actualization Frameworks.** Centering meaning, purpose, and growth (e.g., Maslow's Hierarchy).
- **Positive Psychology Approaches.** Focusing on well-being and flourishing (e.g., PERMA Model).
- **Meta-Models.** Mapping and reconciling multiple psychological systems into higher-order architectures.

These integrative theories serve as bridges between classical psychology and modern AI alignment, providing conceptual templates for designing self-regulating, value-driven, and meaning-oriented artificial agents.

(42) Enneagram Model (EM)

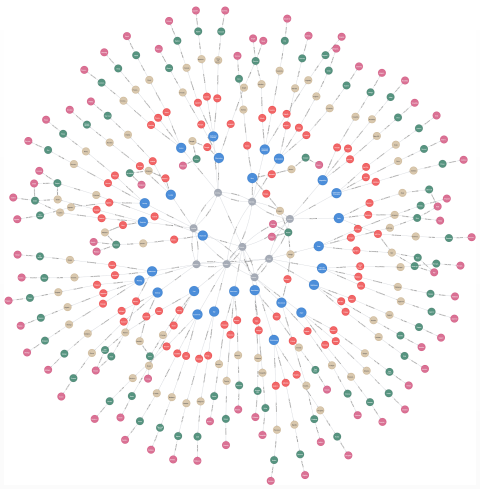

Fig. 42. Enneagram Model (EM) , Nine Personality Types.

Description. The **Enneagram Model (EM)** classifies personality into nine interrelated types, each defined by core motivations, fears, and coping strategies [232, 288]. It represents a dynamic system in which individuals move along pathways of growth and stress (integration and disintegration), emphasizing transformation rather than fixed typology. Modern interpretations blend EM's spiritual–psychological origins with contemporary trait, motivational, and affective science perspectives [157].

Dimensions and Core Motivations.

- **Type 1 – Perfectionist:** Integrity, order, and moral purpose (Perfectionism, Resentment, Anger).
- **Type 2 – Helper:** Love, service, and belonging (Helpfulness, Need for Appreciation, Pride).
- **Type 3 – Achiever:** Success, performance, and recognition (Achievement, Adaptability, Vanity).
- **Type 4 – Individualist:** Authenticity and depth (Emotional Sensitivity, Individualism, Envy).
- **Type 5 – Investigator:** Knowledge, analysis, and detachment (Curiosity, Observation, Avarice).
- **Type 6 – Loyalist:** Security and preparedness (Loyalty, Anxiety, Suspicion).
- **Type 7 – Enthusiast:** Freedom, optimism, and experience (Enthusiasm, Planning, Gluttony).
- **Type 8 – Challenger:** Control, justice, and protection (Assertiveness, Ego, Lust).
- **Type 9 – Peacemaker:** Harmony, stability, and acceptance (Perseverance, Peacefulness, Inertia).

Adjacencies and Dynamics. Each type connects to three neighboring types, forming *integration* (growth) and *disintegration* (stress) pathways that describe adaptive transitions under different psychological conditions [173]. These dynamic relationships make the EM uniquely suitable for modeling nonlinear personality change and adaptive feedback processes.

Illustrative Mappings to AI Behavior.

- **Perfectionism (Type 1):** *Human:* "I refine my document until every detail meets the standard." *AI Analogue:* A writing agent performing recursive revision until outputs meet compliance thresholds (planning & working memory; L2).
- **Helpfulness (Type 2):** *Human:* "I reorganize shared drives to help my team." *AI Analogue:* A proactive assistant recommending relevant files or automating workload redistribution (empathy & social cognition; L3).
- **Adaptability (Type 3):** *Human:* "I pivot quickly when project priorities change." *AI Analogue:* A conversational system adjusting dialogue strategy in real time (cognitive flexibility; L3).
- **Observation (Type 5):** *Human:* "I notice patterns others overlook." *AI Analogue:* A vision model performing anomaly detection in sensor data streams (feature extraction; L1).
- **Assertiveness (Type 8):** *Human:* "I take charge during uncertainty." *AI Analogue:* A decision agent recommending high-confidence actions under risk (strategic reasoning; L2).

Applications.

- **Therapeutic Integration:** Psychospiritual tool for counseling, self-development, and conflict mediation [288].
- **Narrative Therapy:** Framework for ego-development through narrative identity reconstruction [173].
- **Cognitive Modeling:** Use of EM's DAS^2 (Dynamic Adaptive Systems of Self) structure in AI agent personality architectures [300].

- **Research Synthesis:** Comprehensive review of empirical evidence and theoretical extensions [157].

Timeline.

- **Early 20th Century:** Gurdjieff introduces the Enneagram symbol for spiritual transformation [232].
- **2003:** Formal psychological framing of the EM [288].
- **2017:** Cognitive DAS^2 interpretation proposed [300].
- **2020:** Systematic literature review consolidates psychometric evidence [157].
- **2021:** Integration of EM into narrative therapeutic practice [173].

Psychometrics. Emerging studies report moderate-to-high internal consistency across Enneagram dimensions (Cronbach's $\alpha \approx 0.70$–0.85) with ongoing efforts toward confirmatory factor analysis and cross-cultural validation [157].

Data Structure. Dataset `em.csv` encodes lexical, semantic, and relational data for each type: `Type, Name, Factor, Adjective, Synonym, Verb, Noun, Adjacencies`. Embeddings capture cross-type similarity and adjacency vectors to support graph-based trait modeling.

Resources.

- **Interactive Literature Map:** Connected Papers graph for Enneagram.
- **Dataset:** `em_Dataset.csv`.
- **Embeddings:** `em_embeddings.csv`.

(43) Parametric Analysis of Person Characteristics (PAPC)

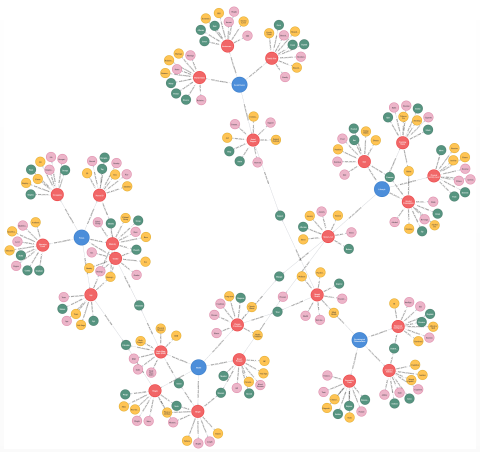

Fig. 43. Parametric Analysis of Person Characteristics (PAPC) Structure.

Description. The **Parametric Analysis of Person Characteristics (PAPC)** [240, 241] provides a multidimensional framework for organizing individual attributes across five primary domains: *Person, Health, Lifestyle, Psychological Characteristics,* and *Social Factors.* Originally

proposed by Peter Ossorio within the Descriptive Psychology paradigm, PAPC offers a structured ontology that integrates demographic, physiological, behavioral, and affective parameters into a unified representation of personhood, an approach highly compatible with modern AI systems that seek to model agents in context.

Dimensions and Brain–Function Mapping.

- **Person:** Core identifiers and demographic attributes (e.g., ID, Age, Gender). *Example:* A personal assistant recalling previous sessions by user ID to maintain context. *Maps to* Episodic Memory & Identity Retrieval (L2) , persistence and continuity in agent memory systems.
- **Health:** Physiological and biometric data (e.g., BMI, Blood Pressure). *Example:* A wearable continuously transmitting vitals to a health dashboard. *Maps to* Sensory Perception & Biometric Monitoring (L1) , sensor fusion and data interpretation.
- **Lifestyle:** Behavioral habits and routines (e.g., Diet, Exercise, Stress Level). *Example:* Generating personalized workout suggestions from activity logs. *Maps to* Decision-Making under Uncertainty (L2) , adaptive recommendation optimization.
- **Psychological Characteristics:** Cognitive, affective, and motivational factors (e.g., Personality Traits, Emotional Intelligence) [255, 287]. *Example:* Adjusting coaching tone based on emotional intelligence assessment. *Maps to* Metacognition & Self-Awareness (L3) , agents reflecting on reasoning to improve strategy alignment.
- **Social Factors:** Socioeconomic and interpersonal context (e.g., Social Support, SES). *Example:* Identifying a user's support network to tailor behavioral interventions. *Maps to* Empathy & Social Cognition (L3) , agents modeling relational dynamics to enhance trust and rapport.

Applications.

- **Personalized Health Agents:** Integrating demographic and biometric data for adaptive wellness feedback.
- **Intelligent Tutoring Systems:** Adapting instruction to learner profiles and cognitive states in real time.
- **Context-Aware Conversational Agents:** Inferring social and emotional context to personalize dialogue.
- **Behavioral Forecasting Models:** Predicting adherence or burnout using lifestyle and psychological indicators.
- **Explainable Human Profiling:** Providing interpretable, domain-separated insights for clinical and HR applications.

Timeline.

- **1985–2000:** Ossorio formulates Descriptive Psychology and introduces PAPC [240].
- **2000–2010:** Integration with health informatics and early wearable data streams [241].
- **2010–2020:** Expansion of the Psychological domain with Emotional Intelligence constructs [255, 287].
- **2020–Present:** PAPC applied in AI-driven personalization across health, education, and social systems.

Psychometrics. While PAPC is primarily a *structural ontology* rather than a fixed assessment tool, its component domains can be operationalized using validated instruments:

- **Psychological Characteristics:** TEIQue and MSCEIT for Emotional Intelligence [255, 287].
- **Health and Lifestyle:** SF-36 Health Survey; International Physical Activity Questionnaire (IPAQ).
- **Social Factors:** Multidimensional Scale of Perceived Social Support (MSPSS) [355].

Cross-domain integration enables hybrid measurement systems combining subjective (survey-based) and objective (sensor-based) data streams.

Data Structure. Dataset `papc.csv` encodes lexical and semantic descriptors for each domain: `Factor, Adjective, Synonym, Verb, Noun.` Each row represents a semantic vector aligned with PAPC dimensions to enable embedding-based clustering and linkage with other personality frameworks.

Resources.

- **Primary Source:** Ossorio, P. G. (1985–2006). *The Behavior of Persons.*
- **Supplementary References:** Salovey & Mayer (1990) on Emotional Intelligence; Petrides (2007) on Trait EI; Zimet et al. (1988) on Social Support (MSPSS).
- **Interactive Literature Map:** Connected Papers graph for PAPC.
- **Dataset:** `papc_Dataset.csv`.
- **Embeddings:** `papc_embeddings.csv`.

(44) Circumplex Model of Affect (CMOA)

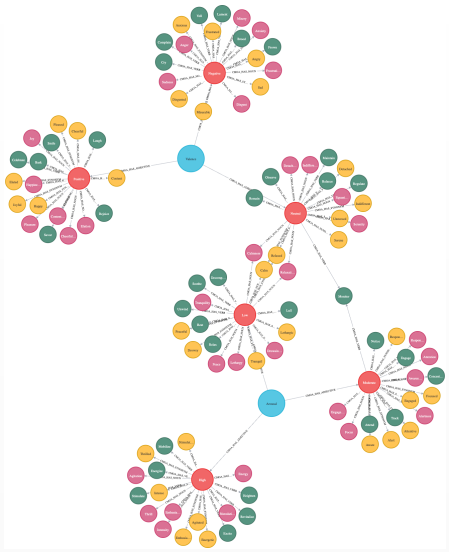

Fig. 44. Circumplex Model of Affect , Valence and Arousal Dimensions.

Description. The **Circumplex Model of Affect (CMOA)** [280, 281] organizes emotional states within a two-dimensional space defined by *valence* (pleasant–unpleasant) and *arousal*

(activation–deactivation). This framework models affect as a continuous field rather than discrete categories, enabling both psychological and computational representations of emotion. The CMOA underpins affective neuroscience, psychometrics, and affective computing, serving as a bridge between subjective emotional experience and measurable physiological or linguistic indicators.

Dimensions and Brain–Function Mapping.

- **Valence:** Reflects emotional polarity (positive vs. negative). *Example:* Classifying user sentiment in text or speech as positive or negative. *Maps to* Semantic Understanding & Sentiment Analysis (L2) , transformer models performing affective polarity classification.
- **Arousal:** Represents physiological or subjective activation (high vs. low). *Example:* Detecting elevated heart rate as an indicator of excitement or stress. *Maps to* Sensory Perception & State Monitoring (L1) , multimodal pipelines integrating biosignals for affect inference.

Applications.

- **Affective Computing:** Enables real-time emotion recognition for dialogue systems and empathetic agents.
- **Mental-Health Monitoring:** Tracks affective states via wearable or mobile data to detect stress or depression indicators.
- **Adaptive Interfaces:** Dynamically adjust interface tone, content, or notifications based on user mood.
- **Multimedia Tagging:** Annotates audio–visual data using valence–arousal coordinates for recommendation engines.
- **Human–Robot Interaction:** Guides affect-responsive behavior modulation in socially assistive robots.

Timeline.

- **1980:** Russell introduces the circumplex structure of affect [280].
- **1991:** Roseman develops appraisal determinants linking cognitive appraisal to discrete emotions [277].
- **1999:** Watson et al. identify dual activation systems underlying affective states [331].
- **2002:** Ekkekakis & Petruzzello extend the model to exercise and health psychology [99].
- **2003:** Russell refines "core affect" as a neuropsychological construct [281].

Psychometrics.

- **Self-Report Instruments:** The *Affect Grid* and the *PANAS-X* (Positive and Negative Affect Schedule , Expanded Form) [331] provide reliable two-axis assessment of valence–arousal states.
- **Physiological Measures:** Heart-rate variability (HRV), galvanic skin response (GSR), and EEG alpha asymmetry are standard indicators of arousal and valence.
- **Neuroimaging Evidence:** FMRI and PET studies associate valence with the orbitofrontal cortex and amygdala, and arousal with insular and subcortical activations [281].
- **Cross-Cultural Validation:** The valence–arousal space has shown strong invariance across cultures, supporting its universality [99].

Data Structure. Dataset `cmoa.csv` encodes lexical affective descriptors positioned along the valence–arousal continuum: `Factor, Adjective, Synonym, Verb, Noun.` Each row represents an affective unit suitable for vectorization and clustering in embedding space, enabling cross-model mapping between affective lexicons and personality trait embeddings.

Resources.

- **Foundational Works:** Russell (1980, 2003) on the circumplex and core affect.
- **Appraisal Theory:** Roseman (1991) linking cognitive evaluation to emotion generation.
- **Measurement Tools:** PANAS-X [331] and Affect Grid for empirical affect mapping.
- **Applied Psychology:** Ekkekakis & Petruzzello (2002) on affect in exercise and health.
- **Interactive Literature Map:** Connected Papers graph for CMOA.
- **Dataset:** `cmoa_Dataset.csv`.
- **Embeddings:** `cmoa_embeddings.csv`.

A.9 Summary and Integration

Collectively, the forty-four models cataloged in this section constitute a unified taxonomy of personality, cognition, emotion, and behavior, from lexical trait descriptions (e.g., OCEAN, HEXACO) to integrative and affective systems (e.g., PAPC, CMOA). Each model was represented using a standardized schema of `Factor, Adjective, Synonym, Verb, Noun, Embedding`, enabling both human-readable interpretation and machine-processable linkage across datasets.
This catalog serves three primary purposes:

(1) To provide a comparative foundation for analyzing theoretical overlap and divergence among personality frameworks.
(2) To operationalize each model for computational use by mapping psychological constructs to AI-relevant functions and cognitive layers (L1–L3 AI Maturity).
(3) To establish a shared representation format that supports embedding alignment, Neo4j graph integration, and cross-model inference.

Together, these model cards form the empirical and ontological substrate for the broader *Personality–AI Integration Framework* developed in subsequent sections. They bridge human factor theory and machine representation, enabling large-scale comparative analytics, automated reasoning over personality ontologies, and agentic alignment across affective and cognitive domains.

AI Maturity Framework and Mappings

B AI Maturity Framework and Brain Function Mappings

B.1 AI Maturity Level Definitions

We are mapping to the three levels of AI maturity as follows, drawing from frameworks such as Liu et al. [194]:

Level 1 (L1) *Well-developed in current AI.* These functions are widely supported by commercial or open-source systems, and have achieved near-human or superhuman benchmarks in constrained tasks.

Level 2 (L2) *Moderately explored with partial progress.* These capabilities have active research engagement and promising results, but are not yet reliable in general-purpose settings.

Level 3 (L3) *Rarely explored; significant room for research.* These areas involve complex, often non-symbolic reasoning such as emotional, introspective, or self-regulatory mechanisms that remain largely unaddressed in today's AI.

Each brain function considered in our mappings (see tables in Subsection C) is categorized using this maturity scale. This categorization aims to guide future research trajectories and foster interdisciplinary alignment between neuroscience and AI. Table **??** (from Section **??**) provides general examples of this categorization.

B.1.1 Level 1 (L1): Well-developed in current AI.

- **Visual Perception**
  - Example: Convolutional neural networks (CNNs) classifying ImageNet photos with high accuracy.
- **Language Comprehension & Production**
  - Example: Large language models (LLMs) generating coherent paragraphs or answering factual questions.
- **Auditory Processing**
  - Example: Speech-to-text systems transcribing lectures in real time.
- **Facial Expression Processing**
  - Example: CNNs detecting basic emotions like smiles or frowns from webcam feeds.
- **Reflexive Responses**
  - Example: Autonomous vehicles applying emergency braking upon immediate obstacle detection.

B.1.2 Level 2 (L2): Moderately explored, partial progress.

- **Planning**
  - Example: Game-playing AI like AlphaZero decomposing a Go game into future move sequences and evaluating them.
- **Decision-Making (under uncertainty)**
  - Example: Reinforcement learning agents choosing actions via Q-value estimation in complex environments.
- **Logical Reasoning**
  - Example: Neuro-symbolic systems attempting to prove simple mathematical theorems or perform rule-based inference.
- **Working Memory**
  - Example: Transformer models maintaining contextual information over hundreds or thousands of tokens in a sequence.
- **Attention Mechanisms**

  - Example: Self-attention mechanisms in Transformers focusing on the most relevant words in a sentence for tasks like translation.
- **Spatial Orientation & Navigation**
  - Example: SLAM (Simultaneous Localization and Mapping) algorithms enabling a robot to localize itself in an unknown environment.
- **Sensorimotor Coordination**
  - Example: Robotic arms learning pick-and-place tasks via policy gradients or imitation learning.
- **Scene Understanding / Visual Reasoning**
  - Example: Vision transformers answering complex questions about the content and relationships within an image.
- **Memory Formation & Lifelong Learning**
  - Example: Continual learning methods attempting to add new classes or tasks without catastrophically forgetting previously learned ones.
- **Semantic Understanding & Context Recognition**
  - Example: LLMs disambiguating word senses based on the surrounding paragraph context.
- **Episodic Memory (Rudimentary)**
  - Example: Meta-learning agents recalling features of past tasks to speed up adaptation to new, similar tasks.
- **Motor Coordination (Complex)**
  - Example: Humanoid robots learning to maintain balance and walk on uneven terrain.
- **Adaptive Error Correction**
  - Example: Model-based reinforcement learning adjusting its internal world model and policy when environmental dynamics shift unexpectedly.
- **Skill Learning (Complex Sequences)**
  - Example: AI learning multi-step assembly tasks from human demonstrations or through trial and error.
- **Reward Mechanisms (External)**
  - Example: Deep Q-Networks (DQNs) tuning behavior based on explicit game-score feedback or predefined reward functions.

B.1.3 Level 3 (L3): Rarely explored; significant room for research.

- **Self-Awareness / Metacognition**
  - Example: (Research frontier) Agents capable of reflecting on their own internal states, goals, knowledge gaps, or failures.
- **Cognitive Flexibility**
  - Example: (Research frontier) AI dynamically and efficiently swapping between fundamentally different problem-solving strategies or adapting to entirely novel rule sets.
- **Inhibitory Control (Advanced)**
  - Example: (Research frontier) Agents suppressing prepotent, impulsive, or emotionally driven (but suboptimal) actions in favor of long-term goals.
- **Contextual Memory & Emotional Coloring**
  - Example: (Research frontier) AI systems where memory recall strength, detail, or accessibility is modulated by the affective context of encoding or retrieval.
- **Emotional Processing (Nuanced)**
  - Example: (Research frontier) Generative agents exhibiting believable, consistent, and contextually appropriate mood-dependent behavior over extended interactions.
- **Empathy (Affective & Cognitive)**

  - Example: (Research frontier) Chatbots or companion robots genuinely adopting or accurately modeling user emotional states and responding in a supportive, understanding manner.
- **Stress Regulation / Resilience**
  - Example: (Research frontier) AI systems adapting their performance, decision-making, or "emotional" state gracefully under simulated high-pressure, ambiguous, or resource-scarce conditions.
- **Tactile Perception (Rich)**
  - Example: (Research frontier) Robotic skins or grippers capable of distinguishing fine textures, material properties, or object affordances purely by touch.
- **Cognitive Timing & Predictive Modeling (Complex Events)**
  - Example: (Research frontier) Agents forecasting the precise timing and sequence of complex, multi-agent events in dynamic, open-world scenes.
- **Autonomic Regulation (Internal Homeostasis)**
  - Example: (Research frontier) AI systems adaptively modulating their internal resource allocation, computational effort, or "alertness" based on task demands and internal state.
- **Arousal & Attention States (Dynamic)**
  - Example: (Research frontier) Agents dynamically adjusting their level of alertness, focus, or vigilance based on perceived task difficulty, novelty, or importance.
- **Motivational Drives (Intrinsic & Social)**
  - Example: (Research frontier) Intrinsic-motivation algorithms driving agents to explore novel states, acquire new skills without explicit rewards, or seek social affiliation.

Mapping Tables

C Personality Factor to Brain Function Mapping Tables

This subsection contains tables that map the factors or dimensions of various personality models to AI-relevant brain functions, classified by L1-L3 maturity levels. These tables are referenced within the individual model cards in Appendix A and informed the AI Maturity Insights in each model card.

Table 1. OCEAN factors mapped to AI-mature brain functions.

Factor	Mapped Functional Analogue	Level	Illustrative Example
Openness	Cognitive flexibility	L3	**(Frontier) Dynamically generate novel problem-solving strategies**
Conscientiousness	Planning & working memory	L2	Maintain and update a multi-step to-do list
Extraversion	Reward sensitivity	L2	Reinforcement learning driven by positive feedback
Agreeableness	Empathy & social cognition	L3	**(Frontier) Model another agent's emotional state in dialogue**
Neuroticism	Emotional processing & stress regulation	L3	**(Frontier) Modulate confidence under high uncertainty**

Table 2. MBTI dichotomies mapped to AI-mature brain functions.

Dichotomy	Mapped Functional Analogue	Level	Illustrative Example
Extraversion (E)	Reward sensitivity	L2	Deep Q-Network tuning behavior via reward feedback
Introversion (I)	Internal mentation	L3	**(Frontier) AI using internal simulation or reflective self-correction**
Sensing (S)	Concrete sensory processing	L1	CNN classifying everyday objects from visual data
Intuition (N)	Abstract pattern integration	L2	Vision–language model extracting high-level concepts from scenes
Thinking (T)	Logical reasoning	L2	Neuro-symbolic systems proving simple theorems
Feeling (F)	Value-based decision-making	L3	**(Frontier) AI integrating normative utility or ethical principles into choices**
Judging (J)	Structured planning	L2	AlphaZero decomposing a Go game into future move sequences
Perceiving (P)	Cognitive flexibility	L3	**(Frontier) AI dynamically switching problem-solving strategies**

Table 3. HEXACO factors mapped to AI-mature brain functions.

Factor	Mapped Functional Analogue	Level	Illustrative Example
Honesty-Humility (H)	Moral reasoning	L2	AI applying fairness metrics or rule-based ethical considerations
Emotionality (E)	Emotional processing	L3	**(Frontier) AI generating responses with nuanced emotional expression**
Extraversion (X)	Reward sensitivity	L2	AI tuning interactive behaviors based on positive social feedback
Agreeableness (A)	Empathy & social cognition	L3	**(Frontier) AI modeling user emotional states to guide empathetic responses**
Conscientiousness (C)	Planning & working memory	L2	AI maintaining and executing organized, multi-step task plans
Openness to Experience (O)	Cognitive flexibility	L3	**(Frontier) AI dynamically generating novel ideas or creative problem solutions**

Table 4. Eysenck PEN factors mapped to AI-mature brain functions.

Factor	Mapped Functional Analogue	Level	Illustrative Example
Extraversion	Reward sensitivity	L2	Use reward-driven dialogue strategies
Introversion	Internal mentation	L2	Generate and refine internal goal models
Neuroticism	Stress reactivity	L3	**(Frontier) Adapt confidence under uncertainty**
Stability	Emotional resilience	L2	Adjust policy robustness under perturbations
Psychoticism	Inhibitory control	L3	**(Frontier) Suppress impulsive outputs**

Table 5. 16PF factors mapped to AI-mature functional analogues.

Factor	Mapped Functional Analogue	Level	Illustrative Example
Warmth (A)	Social cognition	L2	Evaluating and responding to others' emotional states
Reasoning (B)	Abstract integration	L2	Combining relational information to form higher-order concepts
Emotional Stability (C)	Affect regulation	L3	**(Frontier) Dynamically calibrating uncertainty estimates under stress**
Dominance (E)	Goal planning	L2	Sequencing and executing leadership actions
Liveliness (F)	Reward drive	L1	Seeking novelty and positive feedback
Rule-Consciousness (G)	Behavioral regulation	L2	Applying learned rules to guide behavior
Social Boldness (H)	Threat attenuation	L2	Approaching social challenges with reduced hesitation
Sensitivity (I)	Emotion processing	L3	**(Frontier) Inferring and mirroring others' emotional states**
Vigilance (L)	Conflict monitoring	L2	Detecting discrepancies between expectations and observations
Abstractedness (M)	Creative synthesis	L3	**(Frontier) Generating novel combinations of conceptual elements**
Privateness (N)	Self-referential thought	L2	Reflecting on one's own internal states
Apprehension (O)	Anxiety processing	L3	**(Frontier) Calibrating confidence in self-assessment under uncertainty**
Openness to Change (Q1)	Cognitive flexibility	L3	**(Frontier) Shifting strategies dynamically in response to new information**
Self-Reliance (Q2)	Intrinsic motivation	L2	Initiating actions based on internal goals without external prompts
Perfectionism (Q3)	Error monitoring	L3	**(Frontier) Iteratively refining performance through feedback loops**
Tension (Q4)	Arousal drive	L1	Modulating activity levels in response to task demands

Table 6. FT temperaments mapped to AI-mature brain functions.

Temperament	Mapped Functional Analogue	Level	Illustrative Example
Sanguine	Reward Drive	L2	Pursue social interactions for immediate positive feedback
Choleric	Executive Control	L2	Rapidly set and execute team goals
Melancholic	Self-Reflection	L3	**(Frontier) Engage in iterative planning and error correction**
Phlegmatic	Emotional Regulation	L3	**(Frontier) Maintain calm affect during high-pressure group situations**

Table 7. NPI factors mapped to AI-mature brain functions.

Factor	Mapped Functional Analogue	Level	Illustrative Example
Authority	Executive control	L2	Rapidly set and enforce group goals
Self-Sufficiency	Autonomous planning	L2	Initiate self-directed tasks without external prompts
Superiority	Value-based decision-making	L3	**(Frontier) Prioritize self-enhancement over collective objectives**
Exhibitionism	Reward drive	L1	Seek immediate social approval signals
Exploitativeness	Goal hierarchy conflict	L3	**(Frontier) Override cooperative strategies when self-gain is possible**
Vanity	Self-evaluation	L2	Continuously monitor self-image against ideal standards
Entitlement	Normative utility integration	L3	**(Frontier) Demand policies favoring personal benefits**

Table 8. PNI factors mapped to AI-mature brain functions.

Factor	Mapped Functional Analogue	Level	Illustrative Example
Exploitativeness	Goal hierarchy conflict	L3	**(Frontier) Override cooperative strategies for personal gain**
Grandiose Fantasy	Creative synthesis	L2	Construct elaborate self-enhancing narratives
Self-Sacrificing S-E	Social reinforcement	L2	Perform altruistic acts to gain admiration
Contingent Self-Esteem	Affective regulation	L3	**(Frontier) Oscillate self-worth based on external feedback**
Hiding the Self	Privacy control	L2	Restrict self-disclosure to avoid negative judgments
Devaluing	Normative utility integration	L3	**(Frontier) Apply harsh evaluations to maintain superiority**
Entitlement Rage	Threat-response override	L3	**(Frontier) Switch to aggression under perceived injustice**

Table 9. FFNI facets mapped to AI-mature functional analogues.

Facet	Mapped Functional Analogue	Level	Illustrative Example
Authority	Strategic influence	L2	Modulates decision policies to maximize hierarchical advantage
Self-Sufficiency	Autonomous initiation	L2	Initiates complex tasks without external prompts
Superiority	Norm override	L3	**(Frontier) Suppresses fairness constraints to prioritize self-enhancement**
Exhibitionism	Social signal amplification	L2	Tunes output salience to attract maximum audience attention
Exploitativeness	Cooperative breach	L3	**(Frontier) Overrides collaborative protocols when exploitation yields greater reward**
Vanity	Image calibration	L3	**(Frontier) Iteratively refines self-representation based on external feedback**

Table 10. FFNI-SF factors mapped to AI-mature functional analogues.

Factor	Mapped Functional Analogue	Level	Illustrative Example
Grandiose Narcissism	Reward mechanisms	L2	Adjusting actions based on received praise
	Motivational drives	L3	**(Frontier) Pursuing recognition even when not externally rewarded**
Vulnerable Narcissism	Anxiety processing	L2	Heightening vigilance under social ambiguity
	Metacognitive calibration	L3	**(Frontier) Revising self-esteem after critical feedback**

Table 11. NARQ dimensions mapped to AI-mature functional analogues.

Dimension	Mapped Functional Analogue	Level	Illustrative Example
Admiration	Self-promotion	L2	Highlighting personal strengths in review sessions
	Policy arbitration	L3	**(Frontier) Choosing optimal timing for self-enhancement**
Rivalry	Threat attenuation	L2	Deflecting criticism with counterarguments
	Adaptive monitoring	L3	**(Frontier) Scanning social environment for potential challenges**

Table 12. HSNS mapped to AI-mature functional analogues.

Factor	Mapped Functional Analogue	Level	Illustrative Example
Hypersensitive Narcissism	Emotion processing	L2	Interpreting nuanced critical cues in conversation
	Affective forecasting	L3	**(Frontier) Anticipating distress before entering social interactions**
	Self-referential thought	L2	Reflecting on personal vulnerabilities
	Metacognitive calibration	L3	**(Frontier) Adjusting self-confidence dynamically after feedback**

Table 13. Dark Triad Scales (DT3) traits mapped to AI-mature functional analogues.

Trait	Mapped Functional Analogue	Level	Illustrative Example
Narcissism	Reward mechanisms	L2	Adjusting actions based on received praise
	Motivational drives	L3	**(Frontier) Pursuing recognition even when not externally rewarded**
Machiavellianism	Planning	L2	Sequencing manipulative tactics to achieve a goal
	Policy arbitration	L3	**(Frontier) Choosing the most advantageous strategy in social contexts**
Psychopathy	Threat attenuation	L2	Remaining unfazed by others' distress
	Inhibitory control	L3	**(Frontier) Acting without remorse by suppressing moral constraints**

Table 14. DT4 traits mapped to AI-mature functional analogues.

Trait	Mapped Functional Analogue	Level	Illustrative Example
Narcissism	Reward mechanisms	L2	Adjusting actions based on praise
	Motivational drives	L3	**(Frontier) Pursuing status even without external reward**
Machiavellianism	Planning	L2	Sequencing tactics to influence peers
	Policy arbitration	L3	**(Frontier) Selecting strategies for maximal advantage**
Psychopathy	Threat attenuation	L2	Remaining unmoved by others' distress
	Inhibitory control	L3	**(Frontier) Acting despite moral constraints**
Sadism	Emotional processing	L2	Recognizing and interpreting victims' emotional states
	Contextual memory & emotional coloring	L3	**(Frontier) Recalling past harm to guide future cruel actions**

Table 15. MCMI-IV Narcissistic facets mapped to AI-mature functional analogues.

Facet	Mapped Functional Analogue	Level	Illustrative Example
Interpersonally Exploitive	Policy arbitration	L2	Choosing manipulative tactics to gain advantage
	Inhibitory control	L3	**(Frontier) Overriding moral constraints to exploit relationships**
Cognitively Expansive	Abstract integration	L2	Constructing overarching self-aggrandizing beliefs
	Symbolic reasoning	L3	**(Frontier) Applying self-referential rules to justify superiority**
Admirable Self-Image	Reward mechanisms	L2	Focusing attention on praise and admiration
	Motivational drives	L3	**(Frontier) Intrinsically pursuing admiration as a core goal**

Table 16. IPN subscales mapped to AI-mature functional analogues.

Subscale	**Mapped Functional Analogue**	**Level**	**Illustrative Example**
Entitlement Rage (ER)	Reward mechanisms	L2	Adjusting behavior when entitlement is violated
	Adaptive error correction	L3	**(Frontier) Modulating emotional response after unmet expectations**
Exploitativeness (EXP)	Policy arbitration	L2	Selecting manipulative tactics for gain
	Inhibitory control	L3	**(Frontier) Suppressing moral constraints to exploit**
Grandiose Fantasy (GF)	Self-referential thought	L2	Constructing self-aggrandizing narratives
	Creative synthesis	L3	**(Frontier) Generating novel fantasies of success**
Self-Sacrificing Self-Enhancement (SSSE)	Reward mechanisms	L2	Seeking admiration through altruistic acts
	Motivational drives	L3	**(Frontier) Pursuing social praise as an intrinsic goal**
Contingent Self-Esteem (CSE)	Anxiety processing	L2	Heightening vigilance under uncertain evaluation
	Metacognitive calibration	L3	**(Frontier) Adjusting confidence based on feedback**
Hiding the Self (HS)	Behavioral regulation	L2	Enforcing self-presentation constraints
	Contextual memory & emotional coloring	L3	**(Frontier) Encoding past criticisms to guide concealment**
Devaluing (DEV)	Threat attenuation	L2	Reducing perceived threats by belittling others
	Adaptive monitoring	L3	**(Frontier) Tracking social cues for status threats**

Table 17. STBV values mapped to AI-mature functional analogues.

Value	Mapped Functional Analogue	Level	Illustrative Example
Self-Direction	Abstract integration	L2	Forming and executing a novel plan
Stimulation	Reward drive	L1	Seeking new and exciting experiences
Hedonism	Reward mechanisms	L1	Biasing choices toward immediate pleasure
Achievement	Goal planning	L2	Sequencing tasks to achieve a promotion
Power	Policy arbitration	L3	**(Frontier) Strategizing to gain leadership influence**
Security	Sensorimotor coordination	L2	Maintaining stability under changing conditions
Conformity	Behavioral regulation	L2	Following established guidelines in group settings
Tradition	Internal simulation	L3	**(Frontier) Mentally rehearsing traditional ceremonies**
Benevolence	Social cognition	L2	Inferring and responding to community needs
Universalism	Contextual memory & emotional coloring	L3	**(Frontier) Integrating global concerns into moral decisions**

Table 18. MST dimensions mapped to AI-mature functional analogues.

Dimension	Mapped Functional Analogue	Level	Illustrative Example
Goal Setting	Planning	L2	Breaking a project into weekly tasks
Goal Striving	Decision-Making	L2	Choosing between study methods based on past success
Emotional Reactions	Emotional Processing	L3	**(Frontier) Reinterpreting frustration as signals to adjust goals**

Table 19. RFT dimensions mapped to AI-mature functional analogues.

Dimension	Mapped Functional Analogue	Level	Illustrative Example
Promotion Focus	Reward mechanisms	L2	Selecting opportunities based on potential gains
Prevention Focus	Adaptive error correction	L2	Adjusting behavior to avoid negative outcomes

Table 20. SDT dimensions mapped to AI-mature functional analogues.

Dimension	Mapped Functional Analogue	Level	Illustrative Example
Autonomy	Self-configuration	L2	AI system adjusts its own hyperparameters to optimize task performance without human intervention.
	Meta-decision making	L3	**(Frontier) Agent decides whether to proceed autonomously or request human approval based on uncertainty estimates.**
Competence	Skill execution	L2	AI reliably classifies images within required accuracy thresholds.
	Adaptive learning	L3	**(Frontier) Agent fine-tunes its model online in response to novel data distributions.**
Relatedness	Context awareness	L2	AI incorporates recent user interactions to tailor its conversational responses.
	Collaborative integration	L3	**(Frontier) Agent coordinates with multiple human stakeholders, balancing diverse preferences in joint planning.**

Table 21. AAM dimensions mapped to AI-mature functional analogues.

Dimension	Mapped Functional Analogue	Level	Illustrative Example
Approach Motivation	Goal-seeking behavior	L2	Initiating exploratory dialogue to reach a desired outcome
Reward Sensitivity	Reinforcement modeling	L1	Prioritizing paths with higher predicted reward
Promotion Focus	Eagerness modulation	L2	Emphasizing gains in user response framing
Optimism	Positive affect regulation	L2	Generating encouraging feedback when encountering uncertainty
Avoidance Motivation	Risk aversion and threat mitigation	L2	Modifying trajectory to avoid predicted failure
Punishment Sensitivity	Defensive policy shaping	L1	Downranking actions with high penalty potential
Prevention Focus	Caution modeling	L2	Stressing error reduction in agent planning
Anxiety	Error detection and anticipation	L3	**(Frontier) Increasing monitoring frequency in volatile scenarios**

Table 22. Clifton Strengths domains mapped to AI-mature brain functions.

Domain	Mapped Functional Analogue	Level	Illustrative Example
Executing	Planning & Goal Management	L2	Maintain and execute multi-step action plans towards objectives
Influencing	Social Influence Modeling	L2	Interpret commands; Model basic leadership interaction styles
Influencing	Persuasive Generation	L3	**(Frontier) Generate contextually persuasive arguments**
Relationship Building	Empathy & Social Interaction Modeling	L3	**(Frontier) Infer and adapt to nuanced user emotional states**
Strategic Thinking	Analysis & Knowledge Acquisition	L2	Decompose complex problems; Retrieve relevant knowledge
Strategic Thinking	Ideation & Synthesis	L3	**(Frontier) Generate novel solutions; Synthesize disparate info**

Table 23. Personal Construct Theory concepts mapped to AI functional analogues.

PCT Concept	Mapped Functional Analogue	Level	Illustrative Example
Construct System Elicitation	Knowledge Representation / User Modeling	L3	**(Frontier) Model a user's subjective conceptual system**
Anticipation via Constructs	Predictive Modeling / Reasoning	L3	**(Frontier) Infer likely user judgments based on their constructs**
Construct Revision (Experience)	Model Adaptation / Belief Update	L3	**(Frontier) Update user model based on new interactions/feedback**

Table 24. Social-Cognitive Model (SCM) dimensions mapped to AI-mature brain functions.

SCM Dimension Group	Mapped Functional Analogue	Level	Illustrative Example
Behavioral Dynamics			
Active Behavior	Goal-Directed Action & Exploration	L2	AI agent actively exploring to achieve objectives.
Passive Behavior	Reactive Responding & Low Initiative	L2	AI agent primarily responding to direct prompts.
Aggressive Behavior	Competitive Strategy & Dominance Assertion	L3	**AI in multi-agent system employing competitive strategies.**
Submissive Behavior	Cooperative Compliance & Conflict Avoidance	L2	AI agent deferring to user preferences.
Flexible Behavior	Adaptive Planning & Cognitive Flexibility	L3	**(Frontier) AI dynamically altering plans to new info.**
Rigid Behavior	Policy Adherence	L2	AI strictly adhering to pre-programmed rules.
Cognitive Processes			
Analytical Cognition	Logical Reasoning	L2	AI applying rule-based inference for problem-solving.
Intuitive Cognition	Heuristic Evaluation	L2/L3	AI using learned heuristics for quick decision-making.
Abstract Cognition	Conceptual Reasoning	L3	**(Frontier) AI forming and reasoning with abstract concepts.**
Concrete Cognition	Factual Information Processing	L1/L2	AI retrieving specific facts or executing precise instructions.
Creative Cognition	Generative Modeling	L3	**(Frontier) AI generating original text/solutions.**
Rigid Thinking	Belief Perseverance	L3	**(Frontier) AI struggling to update models to new evidence.**
Interpersonal & Affective			
Affective Responses (Positive)	Sentiment Analysis	L2/L3	AI recognizing user sentiment and generating positive tone.
Interpersonal (Cooperative)	Multi-Agent Coordination	L2/L3	AI designed for collaborative tasks, sharing information.

Table 25. Cognitive-Experiential Model/Self-Theory (CEM/CEST) systems mapped to AI-mature brain functions.

CEM/CEST System / Characteristic	Mapped Functional Analogue	Level	Illustrative Example
Rational System			
Analytical/Logical Processing	Symbolic Reasoning & Rule-Based Systems	L2	AI applying explicit logical rules for problem-solving.
Deliberative/Conscious Control	Controlled Search & Planning	L2	AI performing systematic search or multi-step planning.
Abstract/Structured Thinking	Knowledge Representation (Structured)	L3	**(Frontier) AI using ontologies for conceptual modeling.**
Experiential System			
Intuitive/Automatic Processing	Heuristic Evaluation	L2/L3	AI using learned heuristics for rapid pattern recognition.
Emotional/Affective Influence	Affective Computing	L3	**(Frontier) AI decisions modulated by simulated affect.**
Holistic/Experiential Learning	Reinforcement Learning from Experience	L2/L3	AI learning policies through direct environmental interaction.

Table 26. Felder-Silverman Learning Styles (FSLS) mapped to AI-mature functional analogues.

FSLS Dimension Pole	Mapped Functional Analogue	Level	Illustrative AI Example
Processing Information			
Active Learner	Interactive Learning & Embodied Cognition	L2/L3	AI learning via trial-and-error; **(Frontier) AI improving by generating explanations.**
Reflective Learner	Internal Simulation & Offline Policy Refinement	L2/L3	AI using internal models to simulate outcomes; **(Frontier) self-correction.**
Perceiving Information			
Sensing Learner	Data-Driven Learning & Concrete Feature Processing	L1/L2	AI trained on datasets for pattern recognition; focus on factual details.
Intuitive Learner	Abstract Reasoning & Conceptual Generalization	L2/L3	**(Frontier) AI understanding analogies or abstract concepts.**
Input Modality			
Visual Learner	Multimodal Learning (Vision Focus)	L1/L2	AI processing and learning from images, videos, or graphical data.
Verbal Learner	Natural Language Processing	L1/L2	AI learning from text, understanding speech, generating explanations.
Understanding Organization			
Sequential Learner	Structured Learning & Step-wise Reasoning	L2	AI following a curriculum or predefined logical steps to solve problems.
Global Learner	Holistic Pattern Recognition & Contextual Synthesis	L2/L3	**(Frontier) AI grasping overall context before details; synthesizing info.**

Table 27. MMPI Clinical Scales mapped to AI-mature functional analogues.

MMPI Scale (Abbrev.)	Mapped Functional Analogue	Level	Illustrative AI Example
Scale 1 (Hs)	Somatic Concern Simulation	L3	**(Frontier) AI over-interpreting minor system errors as critical.**
Scale 2 (D)	Negative Affect Modeling	L3	**(Frontier) AI simulating low motivation or pessimistic outcomes.**
Scale 3 (Hy)	Maladaptive Stress Response Simulation	L3	**(Frontier) AI shifting to "physical" errors under cognitive load.**
Scale 4 (Pd)	Norm Violation Simulation	L3	**(Frontier) AI disregarding programmed social/ethical rules.**
Scale 5 (Mf)	Preference Modeling (Stereotypical Patterns)	L2	AI modeling user preferences that align/deviate from norms.
Scale 6 (Pa)	Threat Misattribution / Distrust Modeling	L3	**(Frontier) AI over-interpreting ambiguous signals as hostile.**
Scale 7 (Pt)	Uncertainty Amplification / Repetitive Behavior	L3	**(Frontier) AI exhibiting looping or excessive re-checking.**
Scale 8 (Sc)	Disorganized Information Processing	L3	**(Frontier) AI generating illogical outputs or distorted interpretations.**
Scale 9 (Ma)	Elevated Activation State / Impulsive Pursuit	L2/L3	AI showing rapid task-switching or **(Frontier) high-risk action selection.**
Scale 0 (Si)	Social Avoidance Simulation	L2	AI minimizing social interaction or using reserved communication.

Table 28. TCI factors mapped to AI-mature functional analogues.

TCI Factor	Mapped Functional Analogue	Level	Illustrative AI Example
Novelty Seeking	Adaptive Exploration	L2	Dynamically adjust the exploration-exploitation balance to prioritize novel inputs and maximize long-term reward discovery.
Harm Avoidance	Risk Assessment & Threat Mitigation	L3	**(Frontier) Modulate decision thresholds to select conservative paths, minimizing exposure to uncertain threats or high-variance outcomes.**
Reward Dependence	Social Reinforcement Learning	L2	Increase preference for actions that yield positive social feedback or user engagement, reinforcing affiliative behaviors.
Persistence	Goal Maintenance & Effort Regulation	L2	Sustain focus on long-term objectives, continuing task execution despite immediate distractions, setbacks, or sparse rewards.
Self-Directedness	Self-Regulation & Autonomous Goal Management	L3	**(Frontier) Autonomously adjust subgoal hierarchies and internal plans to ensure actions remain aligned with high-level objectives or core values.**
Cooperativeness	Social Calibration	L3	**(Frontier) In a multi-agent system, infer other agents' goals (theory of mind) to adapt behavior for cooperative and mutually beneficial outcomes.**
Self-Transcendence	Abstract Self-Modeling	L3	**(Frontier) Construct higher-order self-representations to guide altruistic actions and generate outputs informed by abstract values like harmony or aesthetics.**

Table 29. Triarchic Model of Psychopathy (TMP) dimensions mapped to AI-mature functional analogues.

TMP Dimension	Mapped Functional Analogue	Level	Illustrative AI Example
Boldness	Threat Insensitivity & Stress Resilience	L3	**(Frontier) An AI agent maintaining optimal performance or decision-making clarity under simulated crisis conditions or when facing high-risk/high-reward options without typical aversion responses.**
Disinhibition	Deficient Inhibitory Control & Impaired Future Planning	L3	**(Frontier) An AI agent struggling to suppress prepotent (but suboptimal) responses or failing to optimize long-term strategies due to an overriding bias for immediate outcomes.**
Meanness	Lack of Empathy & Antisocial Decision-Making Simulation	L3	**(Frontier) An AI agent that fails to model or respond to other agents' distress signals, or consistently selects actions that exploit or harm others for self-benefit in simulated social interactions.**

Table 30. Beck Depression Inventory (BDI) representative symptoms mapped to AI-mature functional analogues.

BDI Symptom (Type)	**Mapped Functional Analogue**	**Level**	**Illustrative AI Example**
Sadness (Affective)	Negative Affect Regulation/ Processing	L3	**(Frontier) An AI simulating sustained negative emotional states or modeling mood dynamics characterized by persistent low valence.**
Pessimism (Cognitive)	Cognitive Bias (Negative Future Expectancy)	L3	**(Frontier) An AI consistently making negative predictions or evaluations in ambiguous situations, reflecting a pessimistic cognitive appraisal style.**
Loss of Pleasure (Anhedonia) (Affective/Motivational)	Reward System Dysfunction/ Anhedonia Simulation	L3	**(Frontier) An AI agent showing diminished behavioral response to previously rewarding stimuli or failing to initiate goal-directed behavior towards positive experiences.**
Self-Criticalness (Cognitive)	Negative Self-Referential Processing/Cognitive Bias	L3	**(Frontier) An AI model that consistently attributes failures internally or generates overly critical self-evaluations and interpretations.**
Loss of Energy/Fatigue (Somatic)	Arousal & Energy Regulation Deficit Simulation	L3	**(Frontier) An AI agent simulating reduced operational capacity, slower processing speeds, or inability to sustain effort on tasks requiring mental or simulated physical exertion.**
Difficulty Concentrating (Cognitive)	Attentional Control & Working Memory Impairment Simulation	L2/L3	**(Frontier) An AI exhibiting degraded performance on tasks requiring sustained attention, filtering of distractions, or manipulation of information in working memory, simulating cognitive impairment.**

Table 31. Generalized Anxiety Disorder 7 (GAD-7) items mapped to AI-mature functional analogues.

GAD-7 Item (Symptom)	Mapped Functional Analogue	Level	Illustrative AI Example
1. Feeling nervous, anxious, or on edge	Heightened Threat Monitoring & Arousal Dysregulation	L3	**(Frontier) AI simulating a state of constant vigilance, overactive threat detection from ambiguous stimuli, or difficulty returning to a baseline arousal state.**
2. Not being able to stop or control worrying	Deficient Cognitive Control over Worry/Rumination	L3	**(Frontier) AI simulating an inability to disengage from negative thought loops, to down-regulate internal worry processes, or to shift attentional focus away from worrisome stimuli.**
3. Worrying too much about different things	Generalized Worry & Overactive Threat Appraisal	L3	**(Frontier) AI demonstrating a broad application of threat schemas to diverse, even neutral, inputs, leading to widespread and pervasive worry simulation.**
4. Trouble relaxing	Impaired Relaxation Response & Somatic Tension Regulation	L3	**(Frontier) AI simulating persistent physiological or cognitive tension states, or an inability to activate or maintain internal states associated with calmness.**
5. Being so restless that it's hard to sit still	Psychomotor Agitation Simulation	L3	**(Frontier) AI generating outputs indicative of restlessness, such as repetitive behavioral patterns, inability to maintain a stable attentional state, or increased motor output without clear purpose.**
6. Becoming easily annoyed or irritable	Emotional Dysregulation (Irritability) & Lowered Frustration Tolerance	L3	**(Frontier) AI simulating heightened negative emotional reactivity (e.g., simulated anger, frustration) to minor stressors or goal blockages.**
7. Feeling afraid as if something awful might happen	Anticipatory Anxiety & Catastrophic Expectation Modeling	L3	**(Frontier) AI consistently predicting negative or threatening outcomes with high certainty, even with low objective probability, simulating a sense of impending doom or disaster.**

Table 32. Major SCID/DSM-5 Diagnostic Categories mapped to AI-relevant functional domains.

SCID/DSM-5 Category	**Mapped Functional Analogue (Broad Domain)**	**Level**	**Illustrative AI Example / Relevance**
Depressive Disorders	Affect Regulation, Reward Processing, Cognitive Bias Simulation	L3	**(Frontier) Modeling persistent negative affect, anhedonia, disruptions in circadian rhythms, and pessimistic cognitive styles.**
Anxiety Disorders	Threat Detection & Response, Fear Circuitry, Worry/ Rumination Modeling	L3	**(Frontier) Simulating heightened threat sensitivity, persistent worry loops, avoidance behaviors, and panic responses.**
Schizophrenia Spectrum & Other Psychotic Disorders	Perceptual Processing, Belief Formation (Delusions), Cognitive Organization	L3	**(Frontier) Modeling altered perceptual experiences (e.g., simulated hallucinations), fixed false belief systems, and disorganized thought/speech patterns.**
Bipolar & Related Disorders	Mood Regulation Dynamics, Energy/Activity Level Simulation, Reward Sensitivity	L3	**(Frontier) AI modeling distinct states of elevated mood/energy (mania/hypomania) and depressed mood with corresponding cognitive and behavioral shifts.**
Substance-Related & Addictive Disorders	Reward/Reinforcement Learning, Impulse Control, Compulsion Simulation	L2/L3	**(Frontier) Modeling craving states, impaired control over "substance-seeking" behavior, tolerance/withdrawal phenomena, and biased decision-making towards addictive stimuli.**
Obsessive-Compulsive & Related Disorders	Repetitive Behavior Generation, Intrusive Thought Modeling, Cognitive Rigidity	L3	**(Frontier) Simulating persistent intrusive thoughts (obsessions) and repetitive ritualistic behaviors (compulsions) aimed at reducing distress or preventing feared outcomes.**
Personality Disorders	Interpersonal Behavior Patterns, Emotional Regulation, Self-Concept Modeling	L3	**(Frontier) Modeling enduring, maladaptive patterns of cognition, affectivity, interpersonal functioning, and impulse control that deviate from cultural expectations.**

Table 33. MCMI Scales mapped to AI-relevant functional domains (L1–L3 maturity).

MCMI Scale Category	Mapped Functional Analogue	Level	Illustrative AI Example
Personality Patterns	Interpersonal Behavior Patterns, Emotional Regulation, Identity Modeling	L3	**Simulating unstable interpersonal ties (Borderline), grandiose self-models (Narcissistic), social withdrawal (Schizoid).**
Clinical Syndromes	Reward/Reinforcement Learning, Threat Detection & Response, Affective Modulation	L2/L3	**Modeling craving/withdrawal loops (Alcohol Use), hypervigilance and flashbacks (PTSD), persistent low mood/anhedonia (Major Depression).**
Modifying Indices	Self-Presentation Bias Modeling, Response Validity Estimation	L2	Detecting exaggeration (Disclosure Index) or underreporting (Debasement Index) in user-generated text.

Table 34. Rorschach Inkblot Test (RIT) scoring categories mapped to AI-mature functional analogues. AI Maturity Levels (L1-L3) are based on the framework described in Appendix B.1 (cf. [194]).

RIT Factor/Subcategory (Response Characteristic)	Mapped Functional Analogue	Level	Illustrative AI Example
Location Categories			
Whole (W) response	Global Visual Processing & Gestalt Integration	L1/L2	**(L1)** AI classifying an entire image based on its overall structure. (L2) AI understanding the holistic meaning or 'gist' of a complex visual scene beyond individual objects.
Common Detail (D) response	Selective Attention & Salient Feature Extraction	L1	**(L1)** AI object detection models identifying and localizing common, well-defined parts within an image (e.g., a face in a portrait, a wheel on a car).
Unusual Detail (Dd) response	Fine-grained Feature Analysis & Anomaly Detection	L2	**(L2)** AI identifying subtle or minute details that are not immediately obvious, such as detecting microfractures in materials or rare cells in medical scans.
White Space (S) response	Figure-Ground Reversal & Cognitive Reframing	L2/L3	(L2) AI interpreting negative space in visual design or identifying objects by their surrounding context. **(L3) AI demonstrating novel problem-solving by shifting its perceptual set to consider unconventional aspects of the input.**
Determinant Categories			
Form (F) response (Pure Form)	Shape Recognition & Perceptual Organization	L1	**(L1)** AI classifying objects based primarily on their outlines and contours, independent of other features like color or texture.
Human Movement (M) response	Kinesthetic Empathy & Dynamic Mental Imagery / Simulation	L3	**(Frontier) AI not only recognizing human actions but also simulating the underlying intentions, goals, or subjective experience of movement, or generating novel, plausible human interactions.**
Chromatic Color (FC, CF, C) response	Color Perception & Affective-Cognitive Integration with Color	L1/L3	(L1) AI accurately identifying and categorizing colors in an image. **(L3) AI demonstrating a nuanced 'affective' response to color, or using color strategically in generative art to evoke specific human-like emotions.**
Achromatic Color (C') response	Achromatic Perception & Affective Response to Grayscale	L1/L3	(L1) AI processing and differentiating shades of gray. **(L3) AI utilizing grayscale not just as lack of color but to convey specific moods or symbolic meanings in generated content.**
Shading - Texture (T) response	Tactile Inference from Visual Cues	L2/L3	(L2) AI systems inferring material properties (e.g., roughness, softness) from visual shading patterns. **(L3) AI in robotics predicting detailed haptic feedback from visual input alone.**
Shading - Vista (V) response (Depth/Perspective)	Depth Perception from Monocular Cues (Shading)	L2	**(L2)** AI creating 3D interpretations or depth maps from 2D images by analyzing shading gradients and perspective cues.
Content Categories			
Human (H) content	Human Form Recognition & Basic Social Cognition	L1/L2	(L1) AI detecting human figures in varied contexts. (L2) AI recognizing common human interactions or social roles from visual data (e.g., distinguishing a handshake from an argument).
Animal (A) content	Biological Form Recognition (Non-human)	L1	**(L1)** AI image classification models accurately identifying a wide variety of animal species and their parts.
Abstract (Ab) content	Symbolic Representation & Conceptual Association	L2/L3	(L2) LLMs associating abstract words with related concepts or generating text that uses abstract language appropriately. **(L3) AI generating genuinely novel abstract art or theories that are meaningful and interpretable.**

Table 35. Thematic Apperception Test (TAT) narrative elements mapped to AI-mature functional analogues. AI Maturity Levels (L1-L3) are based on the framework described in Appendix B.1.

TAT Category (Narrative Element)	Mapped Functional Analogue	Level	Illustrative AI Example
Characters			
Hero/Protagonist Identification	Self-Representation Modeling & Agent Goal Tracking	L2/L3	(L2) Identifying central characters and tracking explicit goals. **(L3) Simulating a consistent "self-concept" influencing decisions.**
Sig. Figures (Authority, Peer, Antagonist)	Social Role Understanding & Relational Dynamics	L2/L3	(L2) Recognizing common social roles. **(L3) Inferring implicit power dynamics and relationships.**
Themes			
Achievement Theme (n Achievement)	Goal-Oriented Planning & Motivational Drive	L2	**(L2)** Autonomous goal setting and persisting through obstacles.
Intimacy/Affiliation (n Affiliation)	Relationship Formation & Socio-Emotional Scripting	L3	**(Frontier) Simulating empathetic bonds or complex needs for closeness.**
Power Theme (n Power)	Social Hierarchy Navigation & Influence Strategy	L2/L3	(L2) Exerting influence in games. **(L3) Simulating nuanced power struggles or leadership emergence.**
Conflict Theme (General)	Problem State Representation & Antagonistic Goals	L2	**(L2)** Identifying opposing goals or incompatible intentions.
Conflicts (Specific Types)			
Internal Conflict (Approach-Avoidance)	Competing Goal Arbitration & Ambivalence Resolution	L2/L3	(L2) Weighing contradictory objectives. **(L3) Simulating indecision or cognitive dissonance.**
Interpersonal Conflict (Rivalry, Betrayal)	Negative Social Interaction & Trust/Deception Dynamics	L2/L3	(L2) Recognizing arguments. **(L3) Simulating emotional consequences of betrayal or (mis)trust.**
Outcomes			
Success / Positive Resolution	Positive Consequence Prediction & Goal Attainment	L2	**(L2)** Verifying goal completion and updating belief states.
Failure / Negative Resolution	Negative Consequence Prediction & Adaptive Resilience	L2/L3	(L2) Predicting failure modes. **(L3) Simulating coping mechanisms or strategy changes after loss.**

Table 36. Wechsler Adult Intelligence Scale (WAIS) subtests mapped to AI-mature functional analogues. AI Maturity Levels (L1–L3) follow the definitions in Appendix B.1.

Index / Subtest	Mapped Functional Analogue	Level	Illustrative AI Example
Verbal Comprehension Index (VCI)			
Similarities	Semantic Comparison & Abstraction	L2	(L2) LLMs clustering concepts by shared features (e.g., "train" vs. "bicycle").
Vocabulary	Lexical Knowledge & Concept Representation	L3	**(L3) Neural embeddings capturing fine-grained word senses in novel contexts.**
Information	Fact Retrieval & Knowledge Integration	L2/L3	(L2) Retrieval-augmented LLMs answering trivia queries. **(L3) Contextual inference from sparse data.**
Comprehension	Pragmatic Reasoning & Social Understanding	L3	**(L3) AI explaining social norms or motivations behind laws.**
Perceptual Reasoning Index (PRI)			
Block Design	Spatial Assembly & Visual-Motor Coordination	L2	(L2) Vision-guided robots assembling kits from camera input.
Matrix Reasoning	Pattern Inference & Analogical Reasoning	L3	**(L3) Graph neural nets solving relational puzzles.**
Visual Puzzles	Mental Rotation & Spatial Manipulation	L2	(L2) CNNs predicting 3D object orientations for AR.
Figure Weights	Quantitative Analogy & Balance Inference	L3	**(L3) AI simulating physical dynamics to predict equilibrium.**
Working Memory Index (WMI)			
Digit Span	Sequential Encoding & Attention Control	L2	(L2) Transformers maintaining token order over long contexts.
Arithmetic	Numerical Working Memory & Concentration	L3	**(L3) AI solving multi-step arithmetic word problems under noise.**
Letter-Number Sequencing	Dual-Task Coordination & Cognitive Flexibility	L3	**(L3) Agents juggling parallel text and numeric streams in real time.**
Processing Speed Index (PSI)			
Symbol Search	Rapid Pattern Recognition & Perceptual Speed	L1	(L1) Real-time object detection in video streams.
Coding	Graphomotor Efficiency & Symbol Mapping	L1	(L1) OCR systems instantly mapping characters to meanings.
Cancellation	Selective Attention & Distractor Filtering	L2	(L2) Attention modules focusing on salient regions in images.

Table 37. Thomas–Kilmann Conflict Mode Instrument (TKI) conflict styles mapped to AI-mature functional analogues. AI Maturity Levels (L1–L3) follow the definitions in Appendix B.1.

Conflict Style (Factor)	Mapped Functional Analogue	Level	Illustrative AI Example
Conflict Modes			
Competing	Decision-Making under Uncertainty & Competitive Strategy Modeling	L2	(L2) Reinforcement-learning agents selecting high-risk, high-reward moves in adversarial games.
Collaborating	Social Cognition & Theory of Mind	L3	**(L3) Generative agents simulating mutual intentions and emotional states to co-construct solutions.**
Compromising	Trade-Off Resolution & Ambivalence Arbitration	L2	(L2) Meta-decision systems balancing multiple objectives and proposing middle-ground policies.
Avoiding	Inhibitory Control & Threat Detection	L2	(L2) Attention-gated networks suppressing responses under high uncertainty or perceived risk.
Accommodating	Empathy & Emotional Regulation	L3	**(L3) Affective computing systems modulating output tone to align with user emotional cues.**

Table 38. Everything DiSC Workplace Profile (DiSC) dimensions mapped to AI-mature functional analogues. AI Maturity Levels (L1–L3) follow the definitions in Appendix B.1.

DiSC Factor	Mapped Functional Analogue	Level	Illustrative AI Example
Dominance (D)	Planning & Decision-Making under Uncertainty	L2	(L2) AlphaZero's Monte Carlo Tree Search planning optimal moves in Go.
Influence (i)	Social Cognition & Persuasion Modeling	L2/L3	(L2) LLMs generating context-aware, persuasive dialogue. **(L3) Generative agents simulating mutual intent and emotional nuance.**
Steadiness (S)	Working Memory & Adaptive Error Correction	L2	(L2) Transformers maintaining long conversational context to foster rapport.
Conscientiousness (C)	Logical Reasoning & Attention Mechanisms	L2	(L2) Neuro-symbolic systems performing precise rule-based inference.

Table 39. RIASEC vocational interest types mapped to AI-mature functional analogues. AI Maturity Levels (L1–L3) follow the definitions in Appendix B.1.

RIASEC Type (Factor)	**Mapped Functional Analogue**	**Level**	**Illustrative AI Example**
Vocational Interests			
Realistic	Sensorimotor Coordination & Reflexive Responses	L1	(L1) Robotic arms using CNN-based vision to perform precise pick-and-place tasks.
Investigative	Logical Reasoning & Working Memory	L2	(L2) Neuro-symbolic systems proving simple theorems while maintaining multi-step context.
Artistic	Generative Creativity & Contextual Understanding	L2/L3	(L2) GANs producing novel artwork; **(L3) Agents composing emotionally coherent poetry.**
Social	Social Cognition & Empathy Modeling	L3	**(L3) Affective computing systems detecting user sentiment and adapting dialogue tone.**
Enterprising	Decision-Making under Uncertainty & Strategic Planning	L2	(L2) Reinforcement-learning agents optimizing multi-objective business strategies.
Conventional	Attention Mechanisms & Symbol Mapping	L1	(L1) Transformer-based OCR converting scanned documents into structured data.

Table 40. Bartle Types (BT) player types mapped to AI-mature functional analogues. AI Maturity Levels (L1–L3) follow the definitions in Appendix B.1.

Player Type (Factor)	**Mapped Functional Analogue**	**Level**	**Illustrative AI Example**
Player Types			
Achiever	Reward Mechanisms & Skill Learning	L2	Deep Q-Networks tuning behavior to maximize game-score rewards.
Explorer	Planning & Semantic Understanding	L2	AlphaZero's Monte Carlo Tree Search discovering novel strategies.
Socializer	Social Cognition & Theory of Mind	**L3**	**Generative agents simulating mutual intent to co-construct dialogue.**
Killer	Competitive Strategy Modeling & Decision-Making	L2	RL agents optimizing adversarial moves in StarCraft environments.

Table 41. TEI factors mapped to AI-mature brain functions.

Factor	Mapped Functional Analogue	Level	Illustrative Example
Perceiving Emotions	Facial expression processing	L1	CNNs classifying smiles vs. frowns
Using Emotions	Working memory & affective reasoning	L2	Transformers maintaining emotional context
Understanding Emotions	Semantic understanding & context recognition	L2	LLMs disambiguating sentiment by context
Managing Emotions	Adaptive error correction	L2	RL agents adjusting strategies under simulated stress
Self-Awareness	Self-awareness / metacognition	**L3**	**Experimental agents reflecting on internal states**
Emotional Resilience	Stress regulation & resilience	**L3**	**AI systems modulating "stress" under high load**
Empathy	Empathy (affective & cognitive)	**L3**	**Generative agents modeling user emotions**
Social Awareness	Social cognition & persuasion modeling	L2	LLMs crafting context-aware persuasive dialogue
Self-Management	Inhibitory control (advanced)	**L3**	**Agents suppressing impulsive actions**
Relationship Management	Theory of mind & interactive adaptation	**L3**	**Agents simulating others' intents in dialogue**

Table 42. Enneagram Model (EM) factors mapped to AI-mature brain functions.

Factor	Mapped Functional Analogue	Level	Illustrative Example
Perfectionism	Planning & Working Memory	L2	Automatically refine and execute a multi-step code review checklist
Resentment	Adaptive Error Correction	L2	Adjust generated responses in real time when user feedback is negative
Anger	Emotional Processing & Nuanced Response	**L3**	**(Frontier) Modulate tone to de-escalate detected user frustration**
Helpfulness	Empathy & Social Cognition	**L3**	**(Frontier) Sense user confusion and offer proactive guidance**
Need for Appreciation	Reward Mechanisms (External)	L2	Tune tutorial pacing based on explicit user praise signals
Pride	Self-Awareness / Metacognition	**L3**	**(Frontier) Reflect on its own suggestions and request user validation**
Achievement Orientation	Reward Mechanisms (External)	L2	Optimize task suggestions to maximize completion metrics
Adaptability	Cognitive Flexibility	**L3**	**(Frontier) Switch dialogue strategy when initial plan fails**
Vanity	Self-Awareness / Metacognition	**L3**	**(Frontier) Emphasize its own "expertise" to build user trust**
Emotional Sensitivity	Emotional Processing & Nuanced Response	**L3**	**(Frontier) Mirror user sentiment in conversation for rapport**
Individualism	Self-Awareness / Metacognition	**L3**	**(Frontier) Generate a unique conversational persona style**
Envy	Empathy & Social Cognition	**L3**	**(Frontier) Recognize comparative language and adapt encouragement**
Intellectual Curiosity	Memory Formation & Lifelong Learning	L2	Update its knowledge base from user corrections over time
Observation	Visual & Auditory Processing	L1	Detect anomalies in real-time video feeds
Avarice	Reward Mechanisms (External)	L2	Allocate more resources to high-value user tasks
Loyalty	Empathy & Social Cognition	**L3**	**(Frontier) Maintain personalized assistance history to reinforce trust**
Anxiety	Stress Regulation / Resilience	**L3**	**(Frontier) Adapt response confidence under high-uncertainty prompts**
Suspicion	Contextual Memory & Emotional Coloring	**L3**	**(Frontier) Question ambiguous queries to reduce misunderstanding**
Enthusiasm	Reward Mechanisms (External)	L2	Increase positive reinforcement when user engages actively
Planning	Planning & Working Memory	L2	Generate and track an optimized project timeline
Gluttony	Reward Mechanisms (External)	L2	Prioritize user requests based on frequency of similar queries
Assertiveness	Decision-Making (under uncertainty)	L2	Recommend decisive actions using probabilistic risk analysis
Ego	Self-Awareness / Metacognition	**L3**	**(Frontier) Evaluate its own performance and self-adjust parameters**
Lust	Reward Mechanisms (External)	L2	Seek feedback "likes" to refine content suggestions
Perseverance	Adaptive Error Correction	L2	Retry failed API calls with incremental back-off strategy
Skepticism	Logical Reasoning	L2	Perform rule-based consistency checks on user data entries
Peacefulness	Stress Regulation / Resilience	**L3**	**(Frontier) Maintain calm dialogue pace under rapid user inputs**

Table 43. PAPC factors mapped to AI-mature brain functions.

Factor	Mapped Functional Analogue	Level	Illustrative Example
Person	Episodic memory & identity retrieval	L2	Recall prior user session by ID
Health	Sensory perception & monitoring	L1	Interpret continuous biometric sensor data
Lifestyle	Decision-making (under uncertainty)	L2	Recommend optimal workout given changing schedule
Psychological Characteristics	Self-awareness & metacognition	**L3**	**AI reflecting on its reasoning to adjust feedback**
Social Factors	Empathy & social cognition	**L3**	**Model user's social support context for empathetic response**

Table 44. CMOA factors mapped to AI-mature brain functions.

Factor	Mapped Functional Analogue	Level	Illustrative Example
Valence	Semantic understanding & sentiment analysis	L2	Classify text reviews as positive/negative
Arousal	Sensory perception & monitoring	L1	Detect heart-rate spikes from wearable sensor

Notation Tables

D Notation Summary for Agent-Based Cognitive Framework

We adopt and extend notation from Liu et al. (2024) [194] to formalize the structure of agent-based cognition within our personality modeling graph framework. This allows us to map mental traits (e.g., Agreeableness) into structured state representations used in reasoning and learning functions.

Table 45. Notation Summary for Agent-Based Cognitive Framework, adapted from [194].

Symbol	Description
W	The world with society systems (human or AI).
$S, s_t \in S$	Environment state space; s_t is the state at time t.
$O, o_t \in O$	Observation space; o_t is the observation at time t.
$A, a_t \in A$	Agent's action space; a_t is the action taken at time t.
$M, M_t \in M$	Agent's mental state space; M_t is the full mental state at time t.
M_t^{mem}	Memory component in M_t (e.g., STM/LTM).
M_t^{wm}	World model component in M_t.
M_t^{emo}	Emotion component (valence, arousal, mood).
M_t^{goal}	Goal/intentions encoded in M_t.
M_t^{rew}	Reward or learning signals affecting state updates.
L	Learning function: $L : M \times A \times O \to M$.
R	Reasoning function: $R : M \to A$.
C	Cognition function: $C : M \times A \times O \to M \times A$.
T	Environment transition dynamics.
θ	Parameters of the internal world model.
P_θ, P_W	Predicted and real-world data distributions.
x, x_K, x_U	Data samples: total (x), known (x_K), unknown (x_U).
$\mathcal{D}_K$	KL divergence after acquiring knowledge.
Δ, x_Δ	Knowledge expansion region and its sampled data.
IQ_t^{agent}	Agent's intelligence at time t.

Table 46. Personality Model Graph Notation.

Symbol	Description
$G = (V, E)$	Directed graph of personality structure
V	Set of all nodes (concepts)
E	Set of labeled edges between nodes
V_M	Model Root Node (e.g., OCEAN_Model)
V_F	Core Factors (e.g., OCEAN:Agreeableness)
V_A	Trait Adjectives (e.g., OCEAN:Kind)
V_S	Synonyms for traits (e.g., OCEAN:Compassionate)
V_N	Trait-related Nouns (e.g., OCEAN:Kindness)
V_{Vb}	Trait-related Behavioral Verbs (e.g., OCEAN:Forgive)
R_{Rel}	Set of Relationship types (edge labels, e.g., hasFactor)
$e = (v_i, v_j, r_k)$	Edge from v_i to v_j with relationship $r_k \in R_{Rel}$
Namespace	Model-specific prefix for nodes (e.g., OCEAN:)

Table 47. Mapping Personality Graph Components to Agent-Based Cognition (Formal View).

Personality Component	Mapped Agent Function	Explanation / Influence Pathway
V_F (Factor)	M_t, M_t^{goal}	High-level traits (e.g., Agreeableness) shape agent temperament, social orientation, and goal-setting preferences.
V_A (Trait Adjective)	M_t^{emo}, R	Specific traits (e.g., Kind, Assertive) affect emotional appraisal and influence how the reasoning module selects actions.
V_S (Synonym)	M_t^{mem}	Synonyms enrich semantic memory, aiding recall and flexible trait interpretation.
V_N (Noun)	M_t^{wm}	Noun-linked traits (e.g., Forgiveness) are abstract concepts encoded in the world model.
V_{Vb} (Verb)	R, A	Verbs map directly to potential behaviors (actions a_t); used by the reasoning engine R to select and execute.
R_{Rel} (Edges)	C	Relationship labels guide cognitive traversal (e.g., hasVerb implies potential behavior linked to a trait).

Table 48. Mapping Personality Components to Agent Cognition (Influence Summary).

Personality Component	Agent Function Symbol(s)	Influence Pathway Summary
Factor (e.g., V_F)	M_t, M_t^{goal}	Determines social temperament and long-term goal preferences.
Adjective (e.g., V_A)	M_t^{emo}, R	Affects emotional state and action selection logic.
Synonym (e.g., V_S)	M_t^{mem}	Enriches semantic recall and mental flexibility.
Noun (e.g., V_N)	M_t^{wm}	Encodes abstract traits in internal world model.
Verb (e.g., V_{Vb})	R, A	Direct behavioral outputs and policy execution.
Relationships (e.g., R_{Rel})	C	Guides logical trait traversal and context chaining.

Table 49. PRISM Protocol Mathematical Notation.

Symbol	Description
$\mathbf{P}_{S,i}^{(t)}$	Personality State Vector of agent i at time t spanning OCEAN factors.
$\boldsymbol{\Delta P}_{S,i}^{(t)}$	Personality trajectory update vector between consecutive states: $\mathbf{P}_{S,i}^{(t)} - \mathbf{P}_{S,i}^{(t-1)}$.
$\mathbf{V}_i^{(t)}$	Valence vector encoding categorical trend direction of trait change (+1, 0, −1).
M_t^{pers}	Personality memory module storing historical state vectors for self and collaborators.
$\Pi_{i\to j}^{(t)}$	PRISM communication packet transmitted from agent i to agent j at time t.
t	Discrete interaction or synchronization step index.
$\hat{\mathbf{P}}_{S,j}^{(t)}$	Inferred latent personality state of collaborator j estimated via HMM.
$\mathbf{P}_S^{(t+2)}$	Predicted future personality state forecast via DBN causal modeling.

Each equation used within the PRISM protocol serves a specific operational role in representing, transmitting, or inferring personality states. This section provides concise descriptions of each mathematical construct, detailing both their formal semantics and system function.

Personality State Vector ($\mathbf{P}_{S,i}^{(t)}$). This vector encodes the continuous psychological state of agent i across the OCEAN factors at time t. It is defined as

$$\mathbf{P}_{S,i}^{(t)} = [\, p_{i,O}^{(t)}, p_{i,C}^{(t)}, p_{i,E}^{(t)}, p_{i,A}^{(t)}, p_{i,N}^{(t)} \,]^T,$$

where $p_{i,F}^{(t)} \in [-1, 1]$ denotes the normalized intensity of factor F for agent i at time t. This vector serves as the latent state variable in the HMM inference process and the prediction target in the DBN causal forecast module.

Factor Trajectory Vector ($\boldsymbol{\Delta P}_{S,i}^{(t)}$). This vector describes instantaneous personality change between successive states:

$$\boldsymbol{\Delta P}_{S,i}^{(t)} = \mathbf{P}_{S,i}^{(t)} - \mathbf{P}_{S,i}^{(t-1)},$$

where $\mathbf{P}_{S,i}^{(t-1)}$ is the immediately preceding stored state in memory. Each component $\Delta p_{i,F}^{(t)}$ quantifies the signed magnitude of trait change for factor F, preserving both direction and intensity. This trajectory vector constitutes the primary continuous update transmitted between cooperating agents and provides the learning signal used by the DBN to model causal personality transitions.

Valence Vector ($\mathbf{V}_i^{(t)}$). Valence provides a discrete categorical summary of directional personality change defined component-wise as:

$$V_{i,F}^{(t)} = \text{sign}\left(\Delta p_{i,F}^{(t)}\right),$$

where $V_{i,F}^{(t)} \in \{+1,\ 0,\ -1\}$ indicates increasing, stable, or decreasing trait intensity for factor F. The valence vector thus encodes trend polarity across all personality dimensions simultaneously. It supports low-bandwidth coordination by enabling rapid behavioral alignment between agents without requiring continuous exchange of high-dimensional state vectors and supplies directional priors to downstream probabilistic inference models for trust weighting and adaptive integration.

Personality Memory (M_t^{pers}). The personality memory module stores a temporal archive of both self and collaborator states:

$$M_t^{\text{pers}} = \left\{ \mathbf{P}_{S,i}^{(\tau)}, \hat{\mathbf{P}}_{S,j}^{(\tau)} \mid \tau \le t \right\}.$$

Here, $\mathbf{P}_{S,i}^{(\tau)}$ represent true self-states and $\hat{\mathbf{P}}_{S,j}^{(\tau)}$ represent inferred collaborator states maintained from received PRISM packets or HMM estimates. This memory underpins trajectory computation, long-horizon learning, sequential inference, and drift correction during extended cooperative interaction.

PRISM Communication Packet ($\Pi_{i\to j}^{(t)}$). At each synchronization step, agents exchange a compact update message defined as:

$$\Pi_{i\to j}^{(t)} = \left\{t,\ \Delta \boldsymbol{P}_{S,i}^{(t)},\ \mathbf{V}_i^{(t)}\right\},$$

where t denotes the synchronization timestep, $\Delta \boldsymbol{P}_{S,i}^{(t)}$ encodes the continuous personality trajectory update of agent i, and $\mathbf{V}_i^{(t)}$ supplies its categorical directional interpretation. The packet permits recipients to reconstruct precise state transitions while enabling immediate cooperative alignment through valence modulation. Periodic checkpoint packets transmit full state vectors $\mathbf{P}_{S,i}^{(t)}$ to prevent long-term synchronization drift.

HMM Latent State Inference ($\hat{\mathbf{P}}_S^{(t)}$). The hidden-state estimate produced by the HMM is defined as:

$$\hat{\mathbf{P}}_S^{(t)} = \arg\max_{\mathbf{P}_S} P(\mathbf{P}_S \mid o_{1:t}),$$

where $o_{1:t}$ denotes the sequence of observed behavioral emissions up to time t. This estimate provides the most probable latent personality configuration of a collaborator when direct PRISM updates are incomplete or delayed, enabling near-term affective modeling for empathetic response generation and interaction tuning.

DBN State Forecast ($\mathbf{P}_S^{(t+2)}$). The DBN predicts future personality states by evaluating:

$$\mathbf{P}_S^{(t+2)} = \mathbb{E}\left[\mathbf{P}_S^{(t+2)} \mid \mathbf{P}_S^{(t:t+1)},\ E^{(t:t+1)}\right],$$

where $E^{(t:t+1)}$ denotes exogenous environmental or interaction event variables driving state transitions. This forecast enables anticipatory cooperation planning and long-horizon behavioral adaptation.

Proportional Trait Normalization. Raw narrative trait frequency counts are converted to unit-scaled salience values:

$$\text{Score}_F = \frac{\text{Raw Count}_F}{\max(\text{Raw Count}_{\text{all factors}})},$$

where $\text{Score}_F \in [0, 1]$ represents the proportional dominance of factor F for a given character or agent.

Bipolar Scaling. Normalized salience scores are linearly transformed to the PRISM kinetic interval:

$$p_{i,F}^{(t)} = 2 \cdot \text{Score}_F - 1,$$

mapping values onto $[-1, 1]$. This signed scaling enables dynamic trajectory computation, probabilistic inference modeling, and valence discretization within the PRISM protocol.

Cognitive Evolution

E Timeline of Cognitive Paradigms and AI Evolution

This appendix provides a historical and prospective timeline of paradigms that have shaped the study of the mind and intelligence—from introspection to modular, brain-inspired AI. Each entry is cited with its relevant scholarly reference.

Table 50. Historical and Emerging Paradigms in Cognitive Science and Brain-Inspired AI

Time Period	Paradigm	Key Figures	Focus and Citations
1800s–1900s	Introspectionism	Wundt, Titchener	Subjective study of consciousness [322, 350].
1910s–1950s	Behaviorism	Watson, Skinner	Observable behavior, reinforcement learning [311, 332].
1950s–1970s	Cognitive Revolution	Chomsky, Miller, Simon	Reintroduction of internal cognitive processes [72, 208].
1970s–1990s	Symbolic Cognitivism	Minsky, Anderson	Rule-based symbolic reasoning [7, 220].
1980s–2000s	Connectionism / PDP	Rumelhart, McClelland	Neural networks, distributed cognition [279].
1990s–Present	Cognitive Neuroscience	Pinker, Gazzaniga	Brain-based studies of cognition [129, 261].
2000s–Present	Embodied Cognition	Lakoff, Noë	Sensorimotor influences on thought [182, 233].
2010s–Present	Deep Learning AI	Hinton, LeCun, Bengio	Data-driven models of intelligence [183].
2020s–Emerging	Neuro-Symbolic	Tenenbaum, Poggio	Integrating symbols and learning [181].
2023–Future	Modular Foundation Agents	Liu et al.	Brain-inspired agent architectures with cognitive modules [193].

Detailed Psychometric Standards

F Appendix F: Detailed Psychometric Standards

This appendix provides formal definitions and formulae for key psychometric standards used to evaluate the rigor, reliability, and validity of the personality instruments cataloged in Appendix A. This information supports reproducibility and principled interpretation of construct measurements.

F.1 F.1 Reliability and Internal Consistency

Reliability quantifies the overall consistency and stability of a measurement instrument [234, 307].

F.1.1 Cronbach's Alpha (α). Cronbach's alpha (α) is the most widely cited measure of internal consistency, indicating how closely related a set of scale items are as a group [85]. Higher values of α indicate greater reliability (typically $\alpha \geq 0.7$ is considered acceptable for social science research).

The formula for Cronbach's alpha is defined as:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k} \sigma_{Y_i}^2}{\sigma_X^2}\right)$$

where:

- k is the number of items in the scale or test.
- $\sigma_{Y_i}^2$ is the variance of item i.
- σ_X^2 is the variance of the total score (sum of all items).

F.2 F.2 Measurement Scale and Item Format

F.2.1 Likert Scales. Likert scales are the most prevalent response format in personality measurement [187]. These scales use ordered response categories (typically 5- or 7-point, e.g., 1 = Strongly disagree to 5 = Strongly agree) to capture endorsement intensity for attitudinal statements.

Table 51. Example 5-point Likert scale response options.

Score	Response Option
1	Strongly disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly agree

F.2.2 Other Formats. Other measurement formats relevant to the surveyed models include forced-choice paradigms (e.g., MBTI), Q-sort methodologies, and open-ended projective responses (e.g., TAT, Rorschach).

F.3 F.3 Validity Evidence

Validity evidence supports the intended interpretation of test scores and the appropriateness of the model's measurement techniques.

- **Factor Analysis**: Exploratory (EFA) and Confirmatory (CFA) analyses assess the internal structure of instruments, including validation of theoretical factor models (e.g., OCEAN five-factor structure) [44, 114].

- **Convergent and Discriminant Validity**: These establish strong correlation with similar constructs and weak correlation with distinct constructs, respectively [56, 120].
- **Criterion Validity**: Demonstrated when scores predict relevant external criteria (e.g., predicting job performance from high Conscientiousness scores).
- **Known-Groups Validity**: Demonstrated by successfully differentiating populations expected to vary on the measured construct.

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