PROVISIONAL PATENT DISCLOSURE

Deterministic Semantic Resolution, Adaptive Engagement, and Privacy-Preserving System for Unstructured Health Data

1. Field of the Invention

The invention relates to health informatics, semantic processing, distributed data systems, and adaptive human-computer interaction systems designed to operate under real-world behavioral constraints.

2. Background and Problem

Existing systems rely on structured data entry and assume consistent user participation. Real-world health data is unstructured, sparse, and inconsistent. Populations such as individuals with chronic illness or depression exhibit reduced engagement, making traditional systems ineffective.

Prior approaches fail due to lack of integration between semantic interpretation, engagement mechanisms, and iterative data acquisition. Additionally, systems lack deterministic processing required for reliable retrieval and analysis.

3. Summary of the Invention

The present invention provides a unified system that converts unstructured language into structured semantic representations, maintains user participation through adaptive engagement, and iteratively improves data quality through targeted data requests.

The system operates deterministically, producing consistent outputs for identical inputs under identical contextual conditions.

4. System Architecture

The system comprises multiple coordinated subsystems including input processing, privacy isolation, semantic resolution, data storage, retrieval, engagement, and temporal context processing.

Data flows through the system in a controlled pipeline while feedback loops continuously refine both interpretation and data completeness.

5. Semantic Resolution Pipeline

The resolution pipeline includes multiple stages: normalization, tokenization, phrase detection, context evaluation, rule matching, scoring, and concept assignment.

Context evaluation includes temporal markers, lexical proximity, cohort constraints, and exclusion conditions. Rule-based matching ensures deterministic outputs.

Conflict resolution mechanisms handle competing interpretations, and confidence scoring determines final concept assignment.

6. Semantic Retrieval System

The retrieval system enables concept-based querying by expanding structured queries into multiple phrase representations. This allows retrieval across heterogeneous language expressions.

Results are aggregated, ranked, and returned along with original text and associated metadata.

7. Adaptive Engagement Engine

The system includes an adaptive engagement loop designed to maintain participation under low-motivation conditions.

The loop consists of prompt generation, response capture, reinforcement, evaluation, and adaptive adjustment of future prompts.

Reward mechanisms increase over time, improving both engagement and data richness.

8. Data Request and Completion Loop

The system detects missing or ambiguous data and generates targeted requests to resolve uncertainty.

Iterative request-response cycles continue until confidence thresholds are met. Final interpretations may be confirmed with the user.

9. Sparse Input Handling

The system processes minimal inputs by combining current input with historical context and applying probabilistic inference.

Even low-information inputs are transformed into structured semantic representations.

10. Temporal Context Integration

Historical data is aggregated to detect patterns over time. This improves accuracy and enables interpretation of intermittent participation.

11. Non-Response Processing

Absence of input is treated as signal. The system detects deviations from baseline engagement and incorporates this into interpretation and engagement strategies.

12. Privacy Processing

Sensitive data is detected and separated from semantic processing using tokenization or hashing. Semantic operations occur on de-identified data while linkage is maintained indirectly.

13. Command and Control Framework

The system operates as a closed-loop command and control system, continuously ingesting signals, interpreting them, issuing actions, and refining outputs.

Communications correspond to input/output layers, intelligence to semantic processing, command to prompt generation, control to rule enforcement, and computing to infrastructure.

14. Data Acquisition System

The system actively improves data quality through targeted data requests and iterative resolution loops, converting incomplete input into structured, high-confidence data.

15. Advantages

The system provides deterministic interpretation, context-aware disambiguation, improved engagement under low participation, and reliable retrieval across unstructured language.

16. Core Inventive Concept

The invention uniquely combines semantic resolution, adaptive engagement, and iterative data acquisition to produce structured data from unstructured human input under real-world constraints.

17. Claim Direction (Non-Limiting)

A system comprising a semantic resolution engine, retrieval engine, adaptive engagement engine, and privacy layer, configured to process unstructured input deterministically and improve data completeness through iterative interaction.

18. Extended Embodiments

The system may incorporate biometric data, event-driven triggers, digital biomarkers, cohort segmentation, federated deployment, and integration with external systems.

19. Design Flexibility

The system may be implemented using rule-based, machine learning, or hybrid approaches and is not limited to specific data structures or execution models.

20. Conclusion

The invention transforms human-generated language into structured, actionable data through deterministic processing and adaptive interaction, enabling new capabilities in health data systems.