



# Human-AI Life Decision Support System using Machine Learning (HAIL-DSS)

P.Anu Uthayam<sup>1</sup>, Kashiqa Shabnam A<sup>2</sup>, Krishnamma S<sup>3</sup>, Akshitha D<sup>4</sup>, Bindu Sri PN<sup>5</sup>

<sup>1</sup>Assistant Professor, Department of Information Technology, Er.Perumal Manimekalai College of Engineering, Hosur, Tamil Nadu, India.

<sup>2,3,4</sup>UG Scholar, Department of Information Technology, Er.Perumal Manimekalai College of Engineering, Hosur, Tamil Nadu, India

## How to cite this paper:

P.Anu Uthayam<sup>1</sup>, Kashiqa Shabnam A<sup>2</sup>, Krishnamma S<sup>3</sup>, Akshitha D<sup>4</sup>, Bindu Sri PN<sup>5</sup>, "Human-AI Life Decision Support System using Machine Learning (HAIL-DSS)", IJIRE-V7I2-434-436.



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**Abstract:** In today's digital world, individuals face difficulty making important life decisions due to information overload, lack of structured thinking, and privacy concerns. This paper presents the Human-AI Life Decision Support System (HAIL-DSS), a privacy-first decision intelligence platform designed to assist users in making complex life decisions such as career, education, finance, and lifestyle planning. Unlike traditional decision support systems that rely heavily on data collection and machine learning models, the proposed system uses rule-based reasoning and weighted scoring techniques to generate decision recommendations. The system processes user data locally and provides explainable outputs including pros and cons, confidence scores, and ranking of options. The proposed system ensures data privacy, transparency, and personalized decision support. The results show that the system provides structured decision guidance while maintaining user data confidentiality.

**Key Words:** Decision Support System, Explainable AI, Privacy-First Architecture, Rule-Based System, Decision Intelligence, Human-AI Collaboration

## I. INTRODUCTION

In today's fast-paced and information-rich world, individuals face increasing difficulty in making important life decisions related to career, education, finance, and personal development. The abundance of unstructured data, lack of personalized reasoning, and growing privacy concerns make decision-making complex and stressful.

The proposed system, Human-AI Life Decision Support System (HAIL-DSS), is designed to assist users as a "thinking partner" rather than just providing direct answers. It offers structured decision intelligence by analyzing user inputs such as goals, constraints, and preferences while ensuring complete data privacy. Unlike conventional AI systems, HAIL-DSS adopts a privacy-first architecture, where user data remains on the local device.

## II. RELATED WORK

Existing decision support systems and AI-based recommendation platforms primarily rely on large-scale data collection and predictive analytics. These systems often provide generalized outputs and lack personalization. Additionally, many applications store sensitive user data on centralized servers, leading to privacy risks.

Recent advancements in Explainable AI (XAI) aim to improve transparency in AI decisions. However, most solutions still depend on cloud-based processing and machine learning models.

### HAIL-DSS differentiates itself by:

- Combining privacy-by-design principles
- Using rule-based reasoning instead of heavy ML models. Providing transparent and explainable outputs
- Enabling local-first data processing This creates a unique balance between personalization, transparency, and privacy.

## III. SYSTEM ARCHITECTURE

The system follows a decoupled, privacy-first architecture consisting of frontend, backend decision engine, API layer, and local storage.

### A. Components of the System

- Frontend Layer
- Built using React/Angular
- Handles user interaction and input forms
- API Layer
- RESTful APIs (FastAPI/Express)

- Manages communication between frontend and backend
- Decision Engine
- Core module implementing rule-based logic
- Performs scoring and ranking of options
- Local Storage
- Stores encrypted user data
- Ensures privacy and data sovereignty

### B. Architecture Workflow

The system operates in the following steps:

- User inputs goals, constraints, and preferences
- Input validation ensures data quality
- Data sent via API request
- Decision engine processes inputs using weighted scoring
- Results generated with rankings, pros/cons, and confidence
- Results stored locally and displayed via dashboard

### C. System Architecture Diagram

*User → Frontend UI → API Layer → Decision Engine → Results*



*Local Encrypted Storage*

## IV. PROPOSED METHODOLOGY

The proposed system uses a rule-based decision-making methodology combined with structured input collection.

**Key steps:**

- Multi-step guided input collection (goal, options, constraints)
- Weighted evaluation of alternatives
- Generation of multiple decision paths
- Explanation generation for transparency
- The system focuses on:
  - Structured thinking
  - Personalized reasoning
  - Privacy preservation

## V. ALGORITHMS USED

The system uses a Weighted Scoring Algorithm with rule-based evaluation.

**Steps:**

- Define decision parameters:
  - Goals (G)
  - Options (O)
  - Constraints (C)
  - Risk tolerance (R)
- Assign weights to criteria:
  - Score =  $\sum (W_i \times C_i)$

**Where:**

- $W_i$  = weight of factor
- $C_i$  = criterion value
- Evaluate each option:
  - Financial score
  - Feasibility score
  - Emotional score

**Generate:**

- Total score
- Pros and cons
- Confidence level
- Rank options based on final score.

## VI. IMPLEMENTATION

The system is implemented as a full-stack application:

- Frontend
- React with Vite
- Interactive UI and dashboard
- Visualization (charts, ranking display)
- Backend
- Node.js / Express.js or FastAPI
- REST APIs for communication
- Rule-based decision engine
- Database
- Local storage (encrypted)
- Optional PostgreSQL/MongoDB
- Features Implemented
- Multi-step input wizard
- Real-time result generation
- Confidence scoring
- Explainable outputs

## VII. ADVANTAGES

- Privacy-first (no centralized data storage)
- Explainable AI decisions
- Personalized recommendations
- Structured decision-making approach
- Fast response time (low latency)
- Works across multiple domains (career, finance, education)

## VIII. LIMITATIONS

- Limited scalability of rule-based logic
- No deep learning-based insights
- Depends on user input accuracy
- Limited adaptability compared to ML systems
- Requires manual weight tuning

## IX. FUTURE WORK

- Integration with advanced AI models (e.g., LLMs like Gemini)
- Mobile application development
- Multi-user collaboration features
- Enhanced visualization and analytics
- Hybrid model combining rule-based + ML

## X. CONCLUSION

The HAIL-DSS system presents a novel approach to decision support by combining privacy-first architecture, explainable AI, and structured reasoning. Unlike traditional systems that prioritize data collection, HAIL-DSS empowers users with control over their data and decision-making process.

The system demonstrates that ethical AI solutions can be both practical and effective, offering a new direction for future decision support technologies.

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