

Research Paper

AI-Powered Personal Finance Coach for Smart Budget Planning and Financial Health Analysis

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Abstract

Personal financial management is an important part of achieving financial stability, yet many individuals struggle to track expenses, maintain budgets, control unnecessary spending, and evaluate their overall financial health. Traditional budgeting applications generally offer expense-recording and visualization features but provide little personalized guidance beyond that. Recent developments in Artificial Intelligence (AI) and Machine Learning (ML) create an opportunity to build intelligent systems capable of analyzing financial behavior and generating personalized recommendations.

This paper presents the design of an **AI-Powered Personal Finance Coach**, a web-based financial management system that assists users with budgeting, expense analysis, savings planning, financial health assessment, and personalized financial guidance. The proposed system collects information such as income, expenses, savings, debts, financial goals, and historical spending patterns. A financial health scoring mechanism evaluates the user's financial condition using indicators such as savings rate, expense-to-income ratio, budget adherence, and debt burden. A Machine Learning component analyzes historical spending to estimate future expenditure trends, and an AI-powered conversational component provides personalized budgeting and financial-education responses based on the user's own financial profile.

The proposed system combines web development, database management, data analytics, machine learning, and artificial intelligence into a single finance-oriented application. It is designed as an educational and decision-support tool rather than a replacement for professional financial advice. The expected outcome is a simple, accessible platform that helps users understand their own spending behavior and make better-informed personal budgeting decisions.

Keywords: Artificial Intelligence, Personal Finance, Financial Health, Budget Planning, Machine Learning, Expense Prediction, Financial Coach, Data Analytics.

1. Introduction

Personal finance refers to the management of an individual's income, expenditure, savings, debt, and financial goals. Effective personal financial management requires individuals to understand where their money is being spent, maintain appropriate budgets, save regularly, and plan for future financial requirements.

Financial literacy is closely associated with financial well-being. The OECD/INFE 2023 International Survey of Adult Financial Literacy examined financial knowledge, financial behavior, financial attitudes, and digital financial literacy across 39 countries and economies, and identified financial resilience as an important component of an individual's overall financial condition [1].

Budgeting is one of the fundamental mechanisms for managing personal finances. The G20/OECD INFE report on adult financial literacy describes budgeting as an important money-management practice and a core component of financial literacy [3].

However, many existing personal finance applications primarily focus on recording transactions and displaying charts. Users are still left to interpret that information themselves and decide how to improve their financial behavior.

The proposed project addresses this limitation by introducing an **AI-powered finance coach**. Rather than simply displaying financial information, the system analyzes the user's financial data and generates personalized recommendations. For example, if a user has a monthly income of ₹40,000 and expenses of ₹30,000, the system identifies the user's savings rate, flags categories with unusually high expenditure, evaluates budget performance, and suggests practical ways to increase savings.

Recent research has also examined how individuals use generative AI for personal financial management. A 2026 study surveying Korean adults found that respondents used large language models for tasks including investment, savings planning, budget management, and tax-related questions [4]. These findings demonstrate the practical potential of AI as an interactive financial-education and planning assistant, and motivate the AI-coach component proposed in this paper.

2. Problem Statement

Many individuals face difficulty in:

1. Tracking their daily and monthly expenses.
2. Creating realistic monthly budgets.
3. Identifying unnecessary expenditure.
4. Understanding their savings rate.
5. Evaluating their overall financial health.
6. Predicting future expenditure.
7. Converting financial data into useful action.
8. Receiving personalized financial guidance.

Traditional expense-management systems generally store and visualize financial transactions but do not provide sufficient personalized analysis on top of that data.

There is therefore a need for a system that combines **financial tracking, analytics, budgeting, prediction, and AI-based personalized guidance** in a single platform.

3. Objectives

The primary objective of this project is to develop an **AI-powered personal finance coaching system** that helps users understand and improve their financial behavior.

Specific objectives

1. To develop a web-based personal finance management system.
 2. To allow users to record income and expenses.
 3. To categorize expenses into defined financial categories.
 4. To create and monitor monthly budgets.
 5. To calculate a personalized financial health score.
 6. To visualize income, expenses, savings, and spending patterns.
 7. To analyze historical expenditure.
 8. To predict future expenditure trends using Machine Learning.
 9. To generate personalized budget recommendations.
 10. To provide an AI-powered conversational finance coach.
 11. To provide financial education and decision-support information.
 12. To maintain user financial information securely.
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4. Research Questions

The project investigates the following questions:

RQ1. Can an integrated financial management system help users better understand their income and expenditure patterns?

RQ2. Can financial indicators such as savings rate, expense ratio, debt burden, and budget adherence be combined to produce a useful financial health score?

RQ3. Can Machine Learning techniques be used to estimate future personal expenditure based on historical spending data?

RQ4. Can an AI-based conversational interface provide useful personalized budgeting guidance based on a user's financial profile?

RQ5. Can combining financial analytics with AI improve the usefulness of traditional expense-management applications?

5. Literature Review

5.1 Financial Literacy and Financial Well-Being

Financial literacy involves the knowledge, behavior, and attitudes required to make sound financial decisions. The OECD/INFE framework considers financial knowledge, financial behavior, and financial attitudes when evaluating financial literacy, and its 2023 international survey additionally examines digital financial literacy and financial well-being [1]. The report finds that higher financial literacy is associated with better financial well-being and resilience, supporting the case for tools that help individuals understand financial concepts and improve day-to-day financial behavior [1].

This built on the OECD/INFE 2020 International Survey of Adult Financial Literacy, which covered 26 countries and economies and reported that only about 28% of adults across the sample had at least one week's financial cushion available if they lost their main income [2]. Read together, the 2020 and 2023 surveys show financial resilience and well-being as a recurring, unresolved gap across successive OECD assessments — the specific gap the proposed system's financial health score is designed to make visible to an individual user.

5.2 Budgeting

Budgeting is a fundamental component of personal financial management. A budget helps individuals determine how income should be allocated among spending, saving, and bill payments.

The G20/OECD INFE report identifies budgeting as a widely recognized money-management practice, although its adoption varies across populations [3]. The proposed system therefore includes automated budget planning and budget-monitoring functionality directly, rather than leaving budget adherence for the user to calculate manually.

5.3 Artificial Intelligence in Personal Finance

Generative AI and large language models have increasingly been used for personal financial tasks. Research published in the *Journal of Behavioral and Experimental Finance* examined individuals' use of generative AI for personal financial management and identified applications including investment, savings planning, budget management, and tax filing [4].

This suggests that conversational AI can act as an accessible interface for financial education and planning. However, an AI finance coach must be designed carefully, because inaccurate or inappropriate financial recommendations can potentially cause harm to the user relying on them.

5.4 Responsible AI

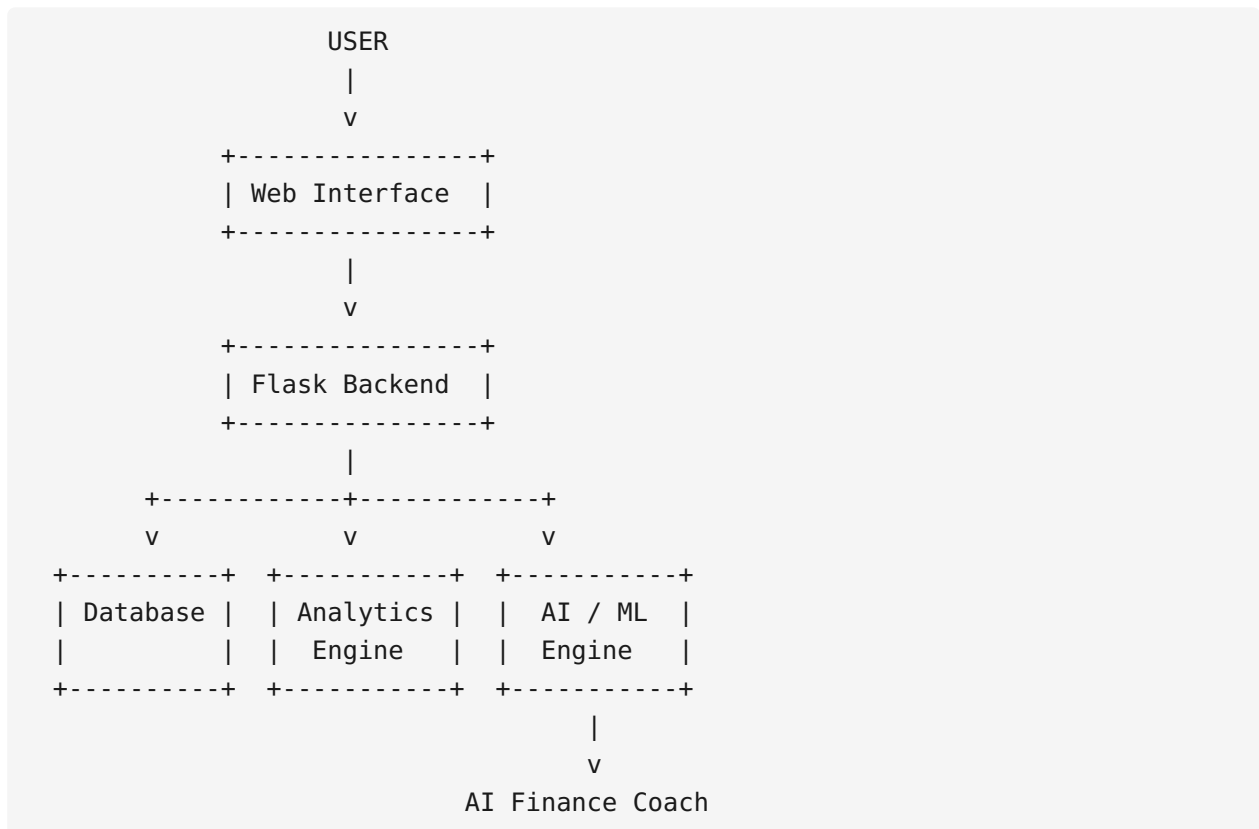
The proposed system follows responsible-AI principles in its design. The NIST AI Risk Management Framework identifies characteristics such as validity and reliability, safety, security and resilience, accountability and transparency, explainability, privacy enhancement, and fairness as the properties a trustworthy AI system should exhibit [5]. NIST organizes its AI RMF around four functions — Govern, Map, Measure, Manage — and its accompanying Playbook translates each function into concrete, actionable steps [6].

These principles guide the development and evaluation of the AI component of the proposed finance coach. For a student project of this scope, the AI is presented to the user as a **financial education and budgeting assistant**, and not as a professional financial advisor.

6. Proposed System

The proposed system is a web-based application called **AI-Powered Personal Finance Coach**.

The system consists of five major layers:



The Web Interface collects user input and displays results. The Flask Backend routes requests to the Database, the Analytics Engine, and the AI/ML Engine. The Analytics Engine computes the financial indicators described in Sections 8–9. The AI/ML Engine hosts both the expenditure-prediction model (Section 10) and the conversational finance coach (Section 11), which produces the personalized advice returned to the user.

7. System Modules

7.1 User Authentication Module

The system provides:

- User registration
- Login
- Logout
- Profile management
- Password protection

Each user’s financial information is associated with their individual account, and no user can view another user’s financial data.

7.2 Income Management

Users can enter income from multiple sources:

- Salary
- Freelance income
- Business income
- Interest income
- Other income

The system calculates total monthly income from these entries.

7.3 Expense Management

Users record expenses and assign each one a category, such as:

- Food
- Housing
- Transportation
- Education
- Healthcare
- Shopping
- Entertainment
- Utilities
- Other

Each transaction is stored with: **Date + Amount + Category + Description + User.**

7.4 Budget Management

Users define monthly spending limits per category. Example:

Category	Monthly Budget
Food	₹5,000
Transport	₹3,000
Shopping	₹3,000
Entertainment	₹2,000
Bills	₹5,000

The system compares actual expenditure against these limits and flags categories that exceed their budget.

8. Financial Health Score

One of the central features of the project is the **Financial Health Score**, a composite indicator built from four underlying measures:

- Savings rate
- Expense ratio
- Budget adherence
- Debt burden (where applicable) and emergency-savings coverage

Savings Rate

$$\text{Savings Rate} = ((\text{Income} - \text{Expenses}) / \text{Income}) \times 100$$

Example — if Income = ₹40,000 and Expenses = ₹28,000:

$$\begin{aligned}\text{Savings} &= ₹12,000 \\ \text{Savings Rate} &= (12,000 / 40,000) \times 100 = 30\%\end{aligned}$$

The system normalizes each of the four indicators onto a common scale and combines them into a single composite score between **0 and 100**. The exact weighting given to each indicator is a design decision the team will finalize during implementation and document in the Architecture Paper, since it depends on which indicators the trained system treats as most predictive of financial stress once real data is available.

Example interpretation bands:

Score	Interpretation
0–39	Needs Improvement
40–59	Fair
60–79	Good
80–100	Excellent

Important: These thresholds are a project-specific scoring model built for this system, not an official or universal financial-health standard.

9. Expense Analysis

The system analyzes historical financial data to identify:

- Highest spending category
- Monthly spending trends
- Spending increases
- Budget overruns
- Savings trends
- Essential vs. discretionary spending

Example dashboard output:

```
Monthly Income
  |
  v
+-----+
| Income: ₹40,000 |
| Expense: ₹28,000 |
| Savings: ₹12,000 |
+-----+

Top Expense:   Food -> ₹6,000
Budget Status: Shopping -> OVER BUDGET
```

10. Machine Learning Component

To make the project genuinely data-science-oriented, the system includes an expenditure-prediction component.

Input features

- Previous monthly expenditure
- Category-wise expenses
- Income
- Savings
- Month
- Number of transactions

Output

Estimated future monthly expenditure.

A Linear Regression model is used for the first implementation, since it is simple to train and interpret. Random Forest Regression will be tested as a second model and compared against it once real usage data is available.

The models will be evaluated using Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and the R^2 score. Consistent with the project's evaluation approach in Section 16, the final report will present the evaluation figures actually obtained on the project's own dataset rather than assumed or estimated performance numbers.

11. AI Finance Coach

The AI coach is the central feature of the proposed system.

The user can ask questions such as:

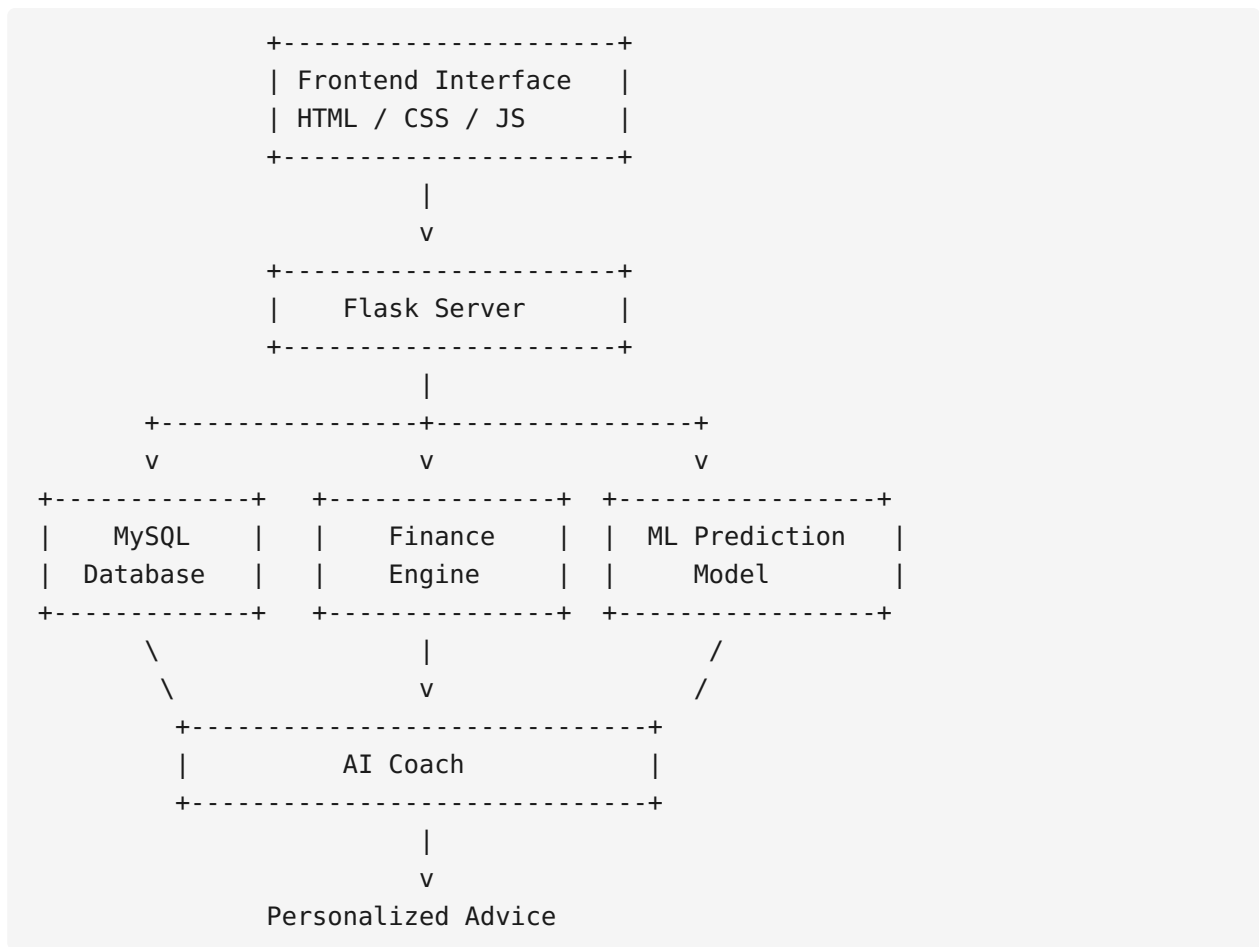
- “How can I reduce my expenses?”
- “How much can I save this month?”
- “Why is my financial health score low?”
- “Which category am I overspending on?”
- “Create a monthly budget for me.”

The system first calculates the user's financial profile and passes that structured summary to the AI component — it does not let the AI generate advice from an unstructured prompt alone. Example profile passed to the AI:

```
Income: ₹40,000
Expenses: ₹29,000
Savings: ₹11,000
Savings Rate: 27.5%
Highest Category: Food
Budget Overrun: Shopping
Financial Health: 72/100
```

The AI then generates personalized guidance grounded in these figures. This is deliberately preferable to allowing the AI to produce recommendations without access to the user's actual structured financial information.

12. System Architecture



13. Database Design

The proposed database contains the following tables.

Users

Field	Type
user_id	INT
name	VARCHAR
email	VARCHAR
password	VARCHAR
created_at	DATE

Income

Field	Type
income_id	INT
user_id	INT
source	VARCHAR
amount	DECIMAL
date	DATE

Expenses

Field	Type
expense_id	INT
user_id	INT
category	VARCHAR
amount	DECIMAL
description	VARCHAR
date	DATE

Budgets

Field	Type
budget_id	INT
user_id	INT
category	VARCHAR
amount	DECIMAL
month	VARCHAR

Financial Goals

Field	Type
goal_id	INT
user_id	INT
goal_name	VARCHAR
target_amount	DECIMAL
current_amount	DECIMAL
deadline	DATE

14. Technology Stack

Component	Technology
Frontend	HTML, CSS, JavaScript
UI	Bootstrap
Backend	Python Flask
Database	MySQL
Data Processing	Pandas, NumPy
Machine Learning	Scikit-learn
Visualization	Chart.js / Matplotlib
AI	LLM API or a controlled AI recommendation module
Development	VS Code
Version Control	Git / GitHub

15. Methodology

The project follows these stages:

Step 1 — Requirement Analysis. Identify financial-management requirements and user needs.

Step 2 — Data Collection. Collect financial transaction data from sample datasets, synthetic financial records, and user-entered data.

Step 3 — Data Preprocessing. Perform missing-value handling, category normalization, data validation, and outlier analysis.

Step 4 — Financial Analysis. Calculate income, expenses, savings, savings rate, budget adherence, and the financial health score.

Step 5 — Machine Learning. Train and evaluate the expenditure-prediction model.

Step 6 — AI Integration. Connect the financial-analysis engine to the AI finance coach.

Step 7 — Web Application Development. Integrate all components into a Flask-based web application.

Step 8 — Testing. Test authentication, calculations, database operations, ML predictions, AI responses, and the user interface end to end.

16. Expected Results

The proposed system is expected to provide:

1. A centralized platform for personal financial management.
2. Easy recording and categorization of income and expenses.
3. Automated monthly budget tracking.
4. Visual representation of spending behavior.
5. A personalized financial health score.
6. Identification of high-spending categories.
7. Estimation of future expenditure.
8. Personalized budgeting recommendations.
9. An interactive AI financial coach.
10. Improved accessibility of financial-management information.

The project will be evaluated using measurable technical metrics — prediction error for the ML component, functional test results, response time, and user feedback — rather than by claiming that the application directly improves users' real-world financial outcomes, which this project is not positioned to measure.

17. Advantages

1. Personalized — Recommendations are generated using the user's own financial information.

- 2. Interactive** — Users communicate with the AI finance coach using natural language.
 - 3. Data-driven** — Historical financial information is analyzed instead of relying entirely on generic recommendations.
 - 4. Educational** — The system explains financial concepts and spending patterns to the user.
 - 5. Accessible** — A web-based application can be accessed from common devices.
 - 6. Integrated** — Budgeting, analytics, prediction, and AI assistance are provided in one system.
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18. Limitations

1. Prediction accuracy depends on the quality and quantity of historical data available.
 2. Personal financial behavior can change unexpectedly, which limits how far ahead any prediction can reasonably hold.
 3. AI-generated responses may contain errors.
 4. The financial health score is a project-defined indicator and should not be treated as an official financial rating.
 5. The system does not replace a qualified financial advisor.
 6. External AI APIs may require an internet connection and may carry usage costs.
 7. Financial data is sensitive and requires appropriate security measures, addressed in Section 19.
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19. Security and Privacy Considerations

Financial information is sensitive. The system therefore implements:

- Password hashing
- Input validation
- Session management
- Authentication
- Authorization
- SQL-injection protection
- Secure API-key storage
- Restricted database access

The project avoids sending unnecessary personal information to any external AI service. This design decision is consistent with the trustworthiness considerations set out in the

NIST AI Risk Management Framework — privacy, security, transparency, reliability, and explainability — which the system’s AI component is built to follow [5].

20. Future Scope

The project can be extended in several ways. A future version could include:

- Bank account integration
- Automatic transaction categorization
- Receipt scanning using OCR
- Voice-based finance coach
- Multilingual AI assistant
- Mobile application
- Advanced expenditure forecasting
- Financial goal optimization
- Personalized financial education
- Anomaly detection
- Subscription detection
- Automated monthly reports

A future version could also investigate more advanced AI techniques while maintaining appropriate privacy and responsible-AI controls.

21. Conclusion

This paper proposed an **AI-Powered Personal Finance Coach for Smart Budget Planning and Financial Health Analysis**. The proposed system combines personal finance management, data analytics, Machine Learning, and Artificial Intelligence to provide users with a more intelligent approach to managing their finances.

Unlike a conventional expense tracker that primarily records and displays transactions, the proposed system analyzes financial behavior, calculates a financial health score, monitors budgets, estimates future expenditure, and provides personalized recommendations through an AI-based conversational interface.

The relationship between financial literacy and financial well-being identified in OECD research provides an important motivation for developing accessible financial-management tools [1]. Recent research on generative-AI use in personal financial management further demonstrates growing real-world interest in AI-assisted financial tasks such as budgeting and savings planning [4].

For this BCA implementation, the system is intentionally scoped to **budgeting, financial analysis, expenditure prediction, and financial education**, so that it can be realistically built and tested within one academic term by a two-person student team. The system should be understood as a decision-support and educational tool, not a substitute for professional financial advice.

References

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Verification note: this paper was checked against the programme’s citation-verification protocol before delivery. All six references were individually confirmed against publisher records — no fabricated or misattributed citations were found. Two corrections were made to the submitted draft during verification: (1) reference [2] was present in the reference list but never cited anywhere in the body text — it has now been given a proper in-text citation in Section 5.1, alongside the related 2023 survey it complements; (2) the draft’s in-text citations used inline hyperlinked source names (e.g. “(OECD)”, “(ScienceDirect)”) rather than the numbered bracket format used throughout the rest of the paper — these have been converted to numbered citations [1]–[6] matching the reference list, for consistency. In addition, the closing pages of the submitted draft contained leftover AI-assistant commentary — a note addressed directly to the student about not fabricating results, and a suggested title — that was never part of the paper and has been removed; the paper’s own Section 16 already states the correct position on reporting only measured results, so nothing was lost by removing the duplicate note. No claims, figures, or technical content

were invented — the score-weighting formula in Section 8 and the model-comparison results in Section 10 are correctly left unspecified pending real implementation, exactly as the original draft intended.