Student Name: Hriday Khubchandani

* Github Repository: [Maths in AI](https://github.com/Hriday65/IDAI101-1000257--Hriday-Khubchandani-Fomattive-Assignment-4) (<https://github.com/Hriday65/IDAI101-1000257--Hriday-Khubchandani-Fomattive-Assignment-4>)
* Candidate Registration Number: 1000257
* CRS Name: Artificial Intelligence
* Course Name: IDAI1
* School Name: Ryan Global School, Kharghar

**Project Report: AI-Based Scientific Calculator**

**Project Overview**

Our Python-built AI calculator offers students an affordable solution for handling difficult calculations. We designed our calculator to handle basic arithmetic operations as well as scientific calculations while also offering matrix operations vector manipulations graph creation and equation solver capabilities. Our tool offers an affordable scientific solution for students that matches the user-friendly experience of expensive scientific calculators.

**Objectives**

* To offer a user friendly experience in solving complicated mathematical equations.
* Incorporation of different functions (scientific, matrix, vector, graphing, solving of equations) into a single application.
* Solutions that are minimal in design but detailed in functionality to meet the needs of students at a different educational level.

**FA- 1: The Journey to a Better Tool**

**Scene 1: The Struggle of Manual Calculation:**

The equations were complex, but Jake was sitting at his desk. The steps felt important, a small mistake would send him off course. And it was long, stressful, full of potential errors.

**Scene 2: Introduction of a Basic Calculator:**

Jake looked over at his basic calculator. Simple arithmetic was easy to handle but not much else; exponents, roots, or logs were too much for it. These complex equations simply called for something more advanced.

**Scene 3: The Need for a More Effective Tool:**

What if there already was a solution, not just a possible solution but a simple, effective one, the kind that’s able to solve the hardest problems? He thought wildly of all possibilities.

**Scene 4: The High Cost of Calculators:**

The research found that advanced calculators can be prohibitively expensive, although they are often inaccessible for most students. However, the high cost turns out to be a barrier for effective learning.

**Scene 5: Limitations of the Calculator:**

The difficulty of using these expensive tools even when students can afford to buy them stumps students. If not taken care of properly, navigating through many functions without proper guidance is a daunting and frustrating matter.

**Scene 6: A New Era of Learning:**

A simple, cost effective solution is what students need that can bridge the gap. A versatile and easy to use, simple calculator that in dealing with complex equations will no longer be a problem. Every student will excel in their studies.

**FA-2 Introducing the AI-Based Scientific Calculator**

**Scene 1: Introduction to the Problem:**

Simple calculators are great for basic math but what about graphs, solving equations et cetera? Simple calculators cannot do these operations

**Scene 2: Struggling with Complex Calculations:**

Sure, you can get a high end scientific or graphing calculator, but they’re expensive and some have complicated dialogs that require advanced knowledge to use them intelligently.

**Scene 3: Introducing the AI-Based Calculator:**

Meet the AI based calculator, which is a hybrid tool that draws together the cleverness of excellent functions together with the ease you demand. One app that solves equations, graphs graphs, and perform matrix operations.

**Scene 4: The Standard Calculator Tab:**

The 'Standard' tab is wonderful for all those quick calculations for everyday problems. It’s all at your fingertips — any time you need to add, multiply, subtract or divide, or anything else

**Scene 5: The Scientific Calculator Tab:**

On the 'Scientific' tab you get advanced mathematical functions like trigonometry and logarithms. This is necessary for those students, who intend to study higher level math and science.

**Scene 6: The Matrix Operations Tab:**

'Matrix Operations' is very important for mathematics students. You can easily determine determinants, inverses, and transposes, with it.

**Scene 7: The Vector Operations Tab:**

Vectors can be tricky to deal with especially in mathematics like common dot product, cross product who does that nowadays that is why this calculator has a vector tab as well!

**Scene 8: The Graphing Tab:**

Graphs are an important part of mathematics so I added the graph section although this has it’s own limitations such as you can type simple quadratic, cubic et cetera but you cannot add coefficients

**Scene 9: The Equation Solving Tab:**

The 'Equation Solving' tab saves us when we have more complex problems. For students needing fast solutions it can solve linear, quadratic and even higher order equations and save time, frustration.

**Scene 10: The Student's Success:**

By using the right tools, students can handle the solving of complex equations. The good news is, today, a great advanced calculator is easier to get than ever.

**Scene 11: Limitations of the Calculator:**

The calculator gives errors whenever you add any coefficient before the x term in the graph tab.

**Scene 12: A New Era of Learning:**

Learning is all about technology. Get yourself the tools needed to succeed!

AI-Based Scientific Calculator

Overview

The AI-Based Scientific Calculator is a Python-based application designed to provide students with an affordable and user-friendly solution for handling complex mathematical calculations. It integrates multiple functionalities, including:

* Basic Arithmetic Operations
* Scientific Functions (trigonometry, logarithms, etc.)
* Matrix Operations (determinants, inverses, transposes)
* Vector Manipulations (dot product, cross product, addition)
* Graph Plotting
* Equation Solving (linear, quadratic, derivatives, integrals)

This tool serves as a cost-effective alternative to expensive scientific calculators while maintaining a seamless and intuitive user experience.

Features

1. Standard Calculator:

* Performs basic arithmetic operations: addition, subtraction, multiplication, and division.
* Supports decimal calculations.

1. Scientific Calculator

* Includes advanced mathematical functions such as sine, cosine, tangent, logarithm, exponentials, and square roots.
* Useful for students in advanced math and science courses.

1. Matrix Operations

* Computes the determinant of a 3x3 matrix.
* Finds the inverse and transpose of a given matrix.
* Simple user input for matrix entry.

1. Vector Operations

* Computes dot product and cross product of two vectors.
* Supports vector addition.

1. Graphing Tab

* Plots mathematical functions entered by the user.
* Supports simple quadratic, cubic, and other polynomial functions.

1. Equation Solving

* Solves linear and quadratic equations.
* Computes derivatives and integrals of given expressions.

Installation

Prerequisites

Required Python Libraries

Install the necessary dependencies using pip:

pip install numpy sympy matplotlib tkinter

Usage:

1. Open the application.
2. Navigate between different tabs using the tabbed interface.
3. Input mathematical expressions and calculations in the respective fields.
4. Click on the respective buttons to perform calculations or plot graphs.
5. View results in the designated output areas.

Limitations

* The graphing tab does not support coefficients for variables.
* Matrix operations are currently limited to 3x3 matrices.
* Some advanced scientific functions may require additional optimization.

Future Enhancements

* Support for larger matrices and more complex vector calculations.
* Improved graphing functionality with coefficient handling.
* AI-driven equation interpretation for natural language inputs.
* Enhanced user interface with more intuitive design elements.

**Conclusion:**

The AI-based scientific calculator addresses a critical need in education: The simple and financially accessible tool delivers advanced mathematical capabilities to students who need them. The tool enables student problem-solving with multiple functionality options such as standard, scientific, matrix, vector, graphing and equation solving without requiring costly or complex hardware. Students use this tool to master equations quicker and join a new direction in learning tools.