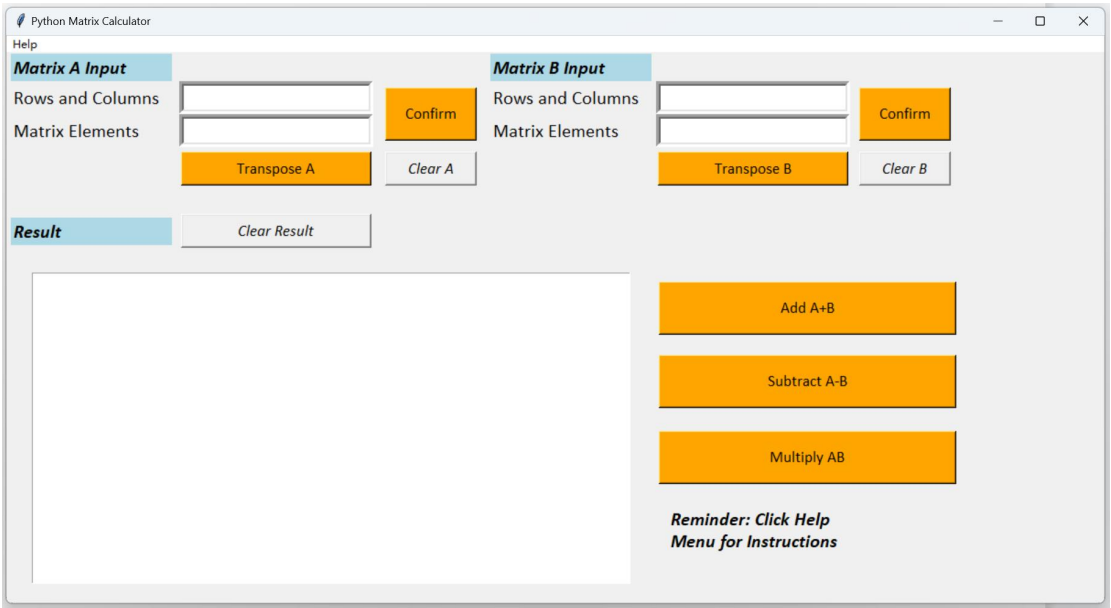


Software User Guide

Environment dependencies

- The software has to be run under Python 3 environment.
- A python package, “Tkinter”, must be installed in advance.
- Windows system is recommended for running.

Software Interface



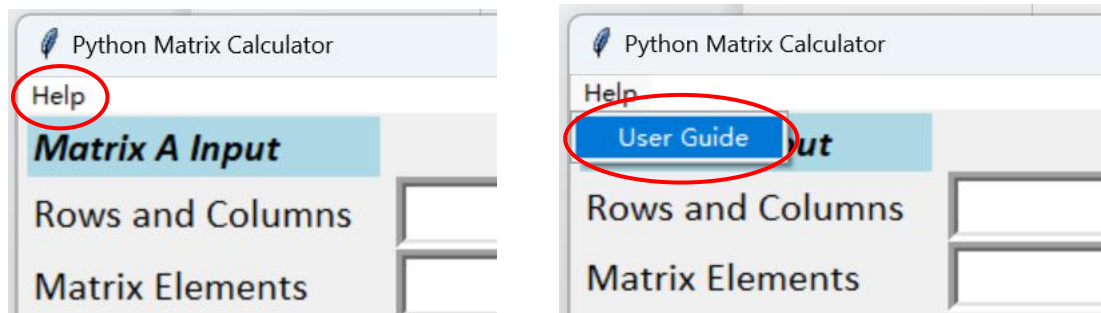
- **Layout**

Part 1 Matrix A Input	Entries for the content of Matrix A
Part 2 Matrix B Input	Entries for the content of Matrix B
Part 3 Result	Display of processing results.
Part 4 Operation Buttons	Buttons to manipulate matrix calculations.

- **Button**

Confirm Buttons	“Confirm”	Confirm the inputs of matrices.
Clear Buttons	“Clear A/B”	Clear corresponding matrix content.
	“Clear Result”	Clear all processing results.
Matrix Operation Buttons	“Transpose A/B”	Transpose corresponding matrix.
	“Add A+B”	Addition of matrix A and matrix B.
	“Subtract A-B”	Subtraction of matrix A and matrix B.
	“Multiply AB”	Multiplication of matrix A and matrix B.

- **Dropdown Menu**



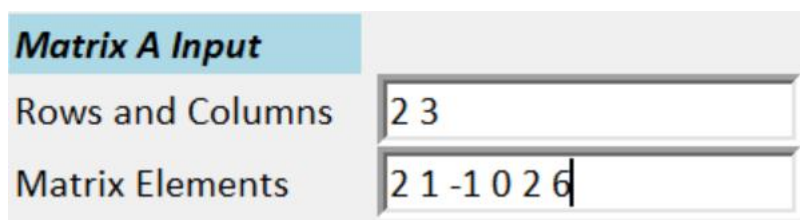
Click “User Guide” under the “Help” menu, a simple version of instruction for this software will be popped up. Users can look through it as an operating reminder.

Step Guidelines for Usage

- **Important Notice 1**

1. The inputs of matrix have to be integers.
2. The two adjacent numbers must be separated by a space.
3. The elements should be input from matrix top left to right bottom in row order.

For example, a 2 by 3 matrix $\begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 6 \end{bmatrix}$ should be input as below:

The image shows a screenshot of the 'Matrix A Input' section of the software. It has two input fields. The first field, labeled 'Rows and Columns', contains the text '2 3'. The second field, labeled 'Matrix Elements', contains the text '2 1 -1 0 2 6'. The 'Matrix A Input' label is highlighted in blue.

- **Important Notice 2**

1. The inputs of Matrix A and Matrix B should be the same dimension for addition and subtraction.
2. The column number of Matrix A should be the same as the row number of Matrix B for multiplication.
3. **The inputs of matrix must be confirmed by Button "Confirm" before any operation.**

- **Specific Example**

Using two matrices below as a demonstration:

$$A = \begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix}, B = \begin{bmatrix} 0 & 1 \\ 3 & 2 \end{bmatrix}$$

Step 1. Input two matrices

Enter the number of rows and columns, and elements for both matrices with separating space between any two values.

The screenshot shows the 'Python Matrix Calculator' application. It has a 'Help' link at the top left. Below it, there are two input sections: 'Matrix A Input' and 'Matrix B Input'. Each section has a 'Rows and Columns' input field (containing '2 2'), a 'Matrix Elements' input field (containing '1 -1 2 1' for A and '0 1 3 2' for B), a 'Confirm' button, a 'Transpose' button, and a 'Clear' button. At the bottom left, there is a 'Result' section with a 'Clear Result' button.

Step 2. Confirmation

Click the “Confirm” buttons and two lines of text will appear within result section, indicating that the matrices are successfully entered.

The screenshot shows the same application after clicking the 'Confirm' buttons. In the 'Result' section, a red box highlights the text: 'Matrix A: Row number:2 ,Column number:2.' and 'Matrix B: Row number:2 ,Column number:2.'. To the right of the result section, there are three large orange buttons: 'Add A+B', 'Subtract A-B', and 'Multiply AB'. At the bottom right, there is a 'Reminder: Click Help' text.

Step 3. Conduct Matrix Operation

Press the relevant buttons to process different operations of the matrices.

Addition:

Python Matrix Calculator

Help

Matrix A Input

Rows and Columns: 2 2

Matrix Elements: 1 -1 2 1

Confirm

Transpose A

Clear A

Matrix B Input

Rows and Columns: 2 2

Matrix Elements: 0 1 3 2

Confirm

Transpose B

Clear B

Result

Clear Result

Matrix A: Row number:2 ,Column number:2.
Matrix B: Row number:2 ,Column number:2.
Input Matrix A:
1 -1
2 1
Input Matrix B:
0 1
3 2
Matrix addition result:
1 0
5 3

Add A+B

Subtract A-B

Multiply AB

Reminder: Click Help Menu for Instructions

Subtraction:

Python Matrix Calculator

Help

Matrix A Input

Rows and Columns: 2 2

Matrix Elements: 1 -1 2 1

Confirm

Transpose A

Clear A

Matrix B Input

Rows and Columns: 2 2

Matrix Elements: 0 1 3 2

Confirm

Transpose B

Clear B

Result

Clear Result

3 2
Matrix addition result: :
1 0
5 3
Input Matrix A:
1 -1
2 1
Input Matrix B:
0 1
3 2
Matrix subtraction result:
1 -2
-1 -1

Add A+B

Subtract A-B

Multiply AB

Reminder: Click Help Menu for Instructions

Multiplication:

Python Matrix Calculator

Help

Matrix A Input
Rows and Columns: 2 2
Matrix Elements: 1 -1 2 1
Confirm
Transpose A
Clear A

Matrix B Input
Rows and Columns: 2 2
Matrix Elements: 0 1 3 2
Confirm
Transpose B
Clear B

Result
Clear Result

3 2
Matrix subtraction result: :
1 -2
-1 -1
Input Matrix A:
1 -1
2 1
Input Matrix B:
0 1
3 2
Matrix multiplication result:
-3 -1
3 4

Add A+B
Subtract A-B
Multiply AB

Reminder: Click Help Menu for Instructions

Transposition:

Python Matrix Calculator

Help

Matrix A Input
Rows and Columns: 2 2
Matrix Elements: 1 -1 2 1
Confirm
Transpose A
Clear A

Matrix B Input
Rows and Columns: 2 2
Matrix Elements: 0 1 3 2
Confirm
Transpose B
Clear B

Result
Clear Result

Matrix A: Row number:2 ,Column number:2.
Input Matrix A:
1 -1
2 1
Transpose Matrix A:
1 2
-1 1
Matrix B: Row number:2 ,Column number:2.
Input Matrix B:
0 1
3 2
Transpose Matrix B:
0 3
1 2

Add A+B
Subtract A-B
Multiply AB

Reminder: Click Help Menu for Instructions

Step 4. Clear

Using clear buttons to delete inputs of matrices and results history for new round operations.

Python Matrix Calculator

Help

Matrix A Input

Rows and Columns:

Matrix Elements:

Transpose A

Matrix B Input

Rows and Columns:

Matrix Elements:

Transpose B

Result

Reminder: Click Help Menu for Instructions

P.S. Error Notice

If the inputs of matrices are not followed by the principle of matrix operations, for example, input dimensions for matrix A and matrix B are not the same when adding or subtracting, an error notice will appear as below.

Python Matrix Calculator

Help

Matrix A Input

Rows and Columns:

Matrix Elements:

Transpose A

Matrix B Input

Rows and Columns:

Matrix Elements:

Transpose B

Result

Matrix A: Row number:2 ,Column number:2.
Matrix B: Row number:3 ,Column number:3.
Input Error - Unable to Calculate

Reminder: Click Help Menu for Instructions