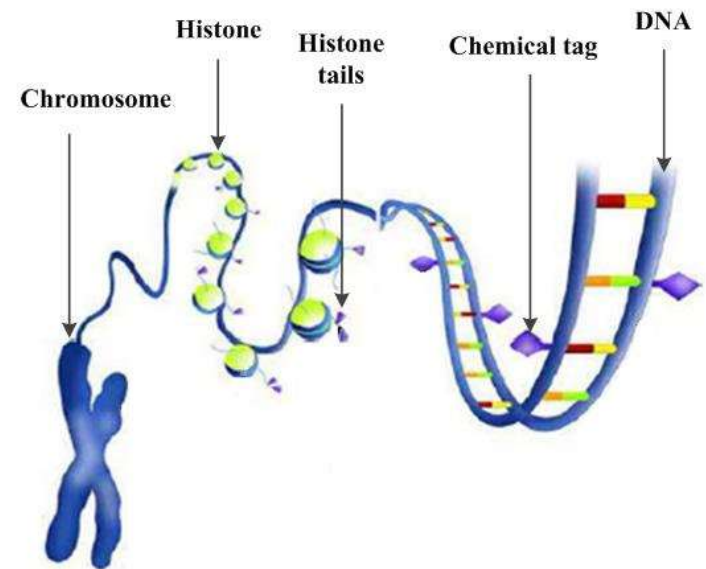


# PROJECT REPORT

## Solving Equations Using Genetic Algorithms

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Course : Project 1  
Course ID : IT3910E  
Instructor : Assoc. Prof. Tran Dinh Khang  
Group : HelaX



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1. Introduction
2. Method
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# 1. Introduction

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$$f(x) = 0 \quad \rightarrow \quad x = ?$$

$f(x)$  is an elementary function (polynomial, trigonometric,...)

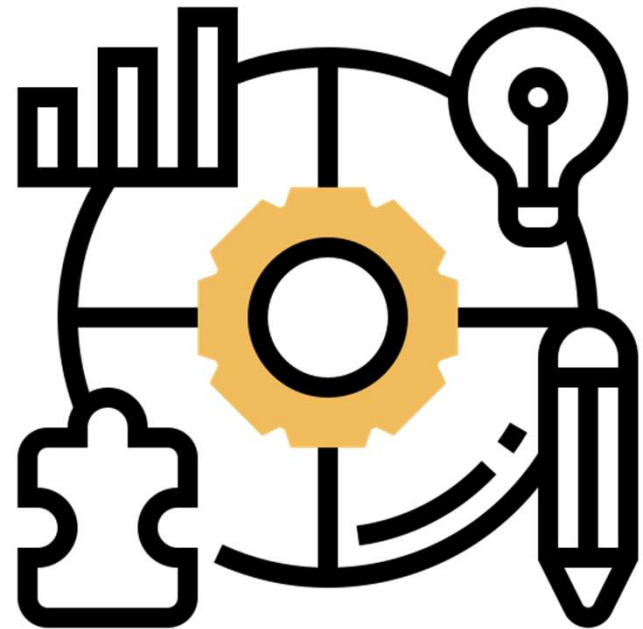
$x$  is a real root of the equation

## 2. Method

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2.1. Input Handling

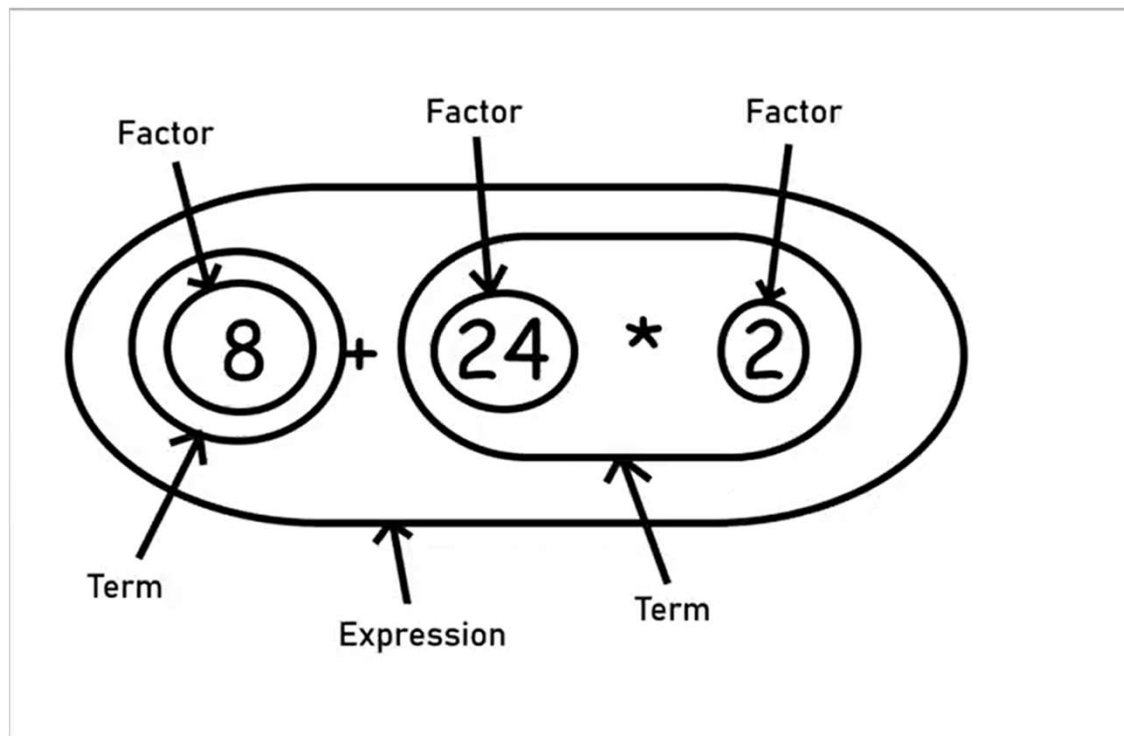
2.2. Genetic Algorithm



## 2.1. Input Handling

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Order of precedence:

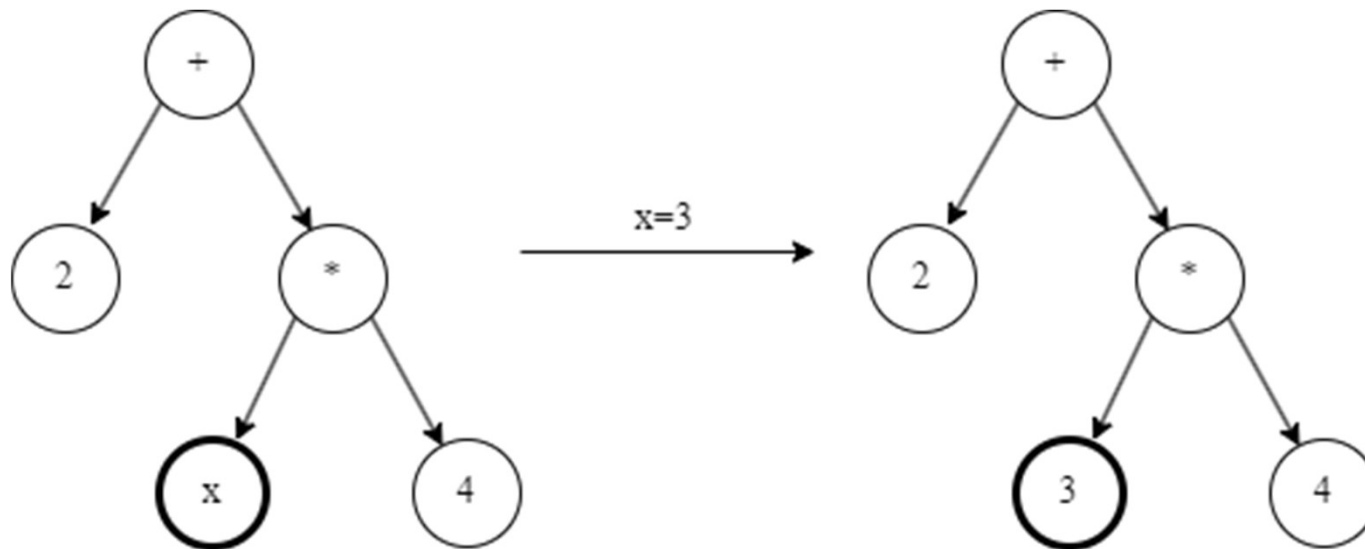


## 2.1. Input Handling

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User input: **2 + x \* 4**  $\longrightarrow$  **F(x)**

Abstract Syntax Tree:

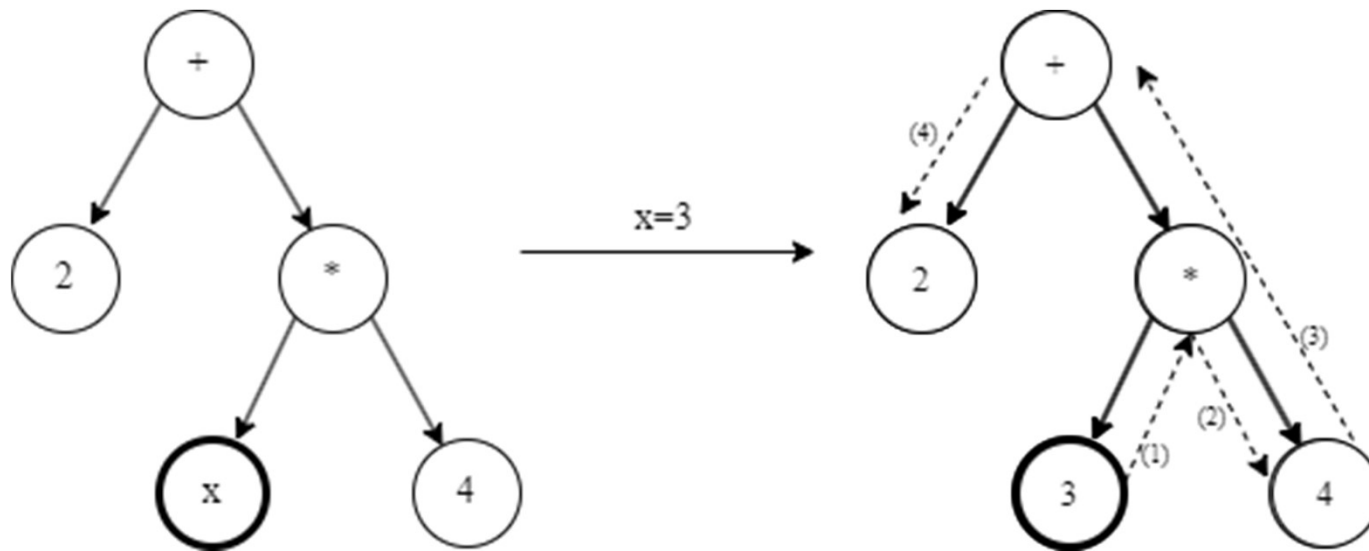


## 2.1. Input Handling

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User input: **2 + x \* 4**  $\longrightarrow$  **F(x)**

Abstract Syntax Tree:

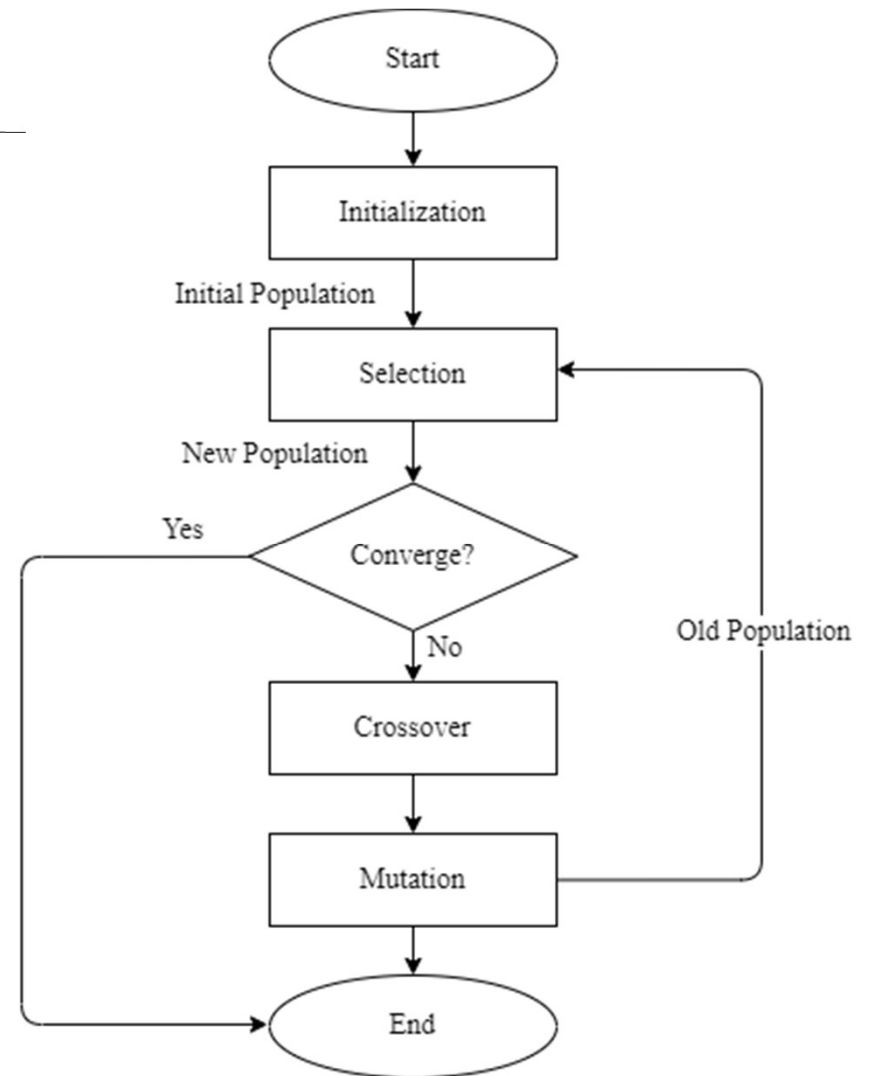


## 2.2. Genetic Algorithm

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### General of Genetic Algorithm

- Initialization
- Fitness Assignment
- Selection
- Reproduction
- Termination

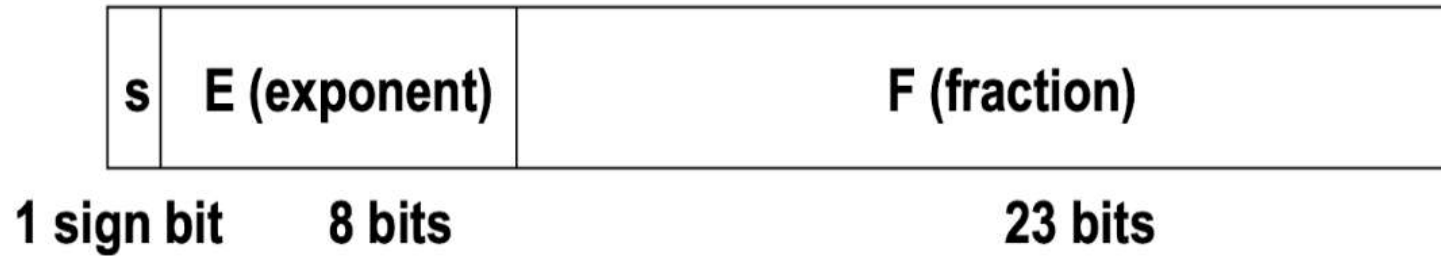




## 2.2. Genetic Algorithm

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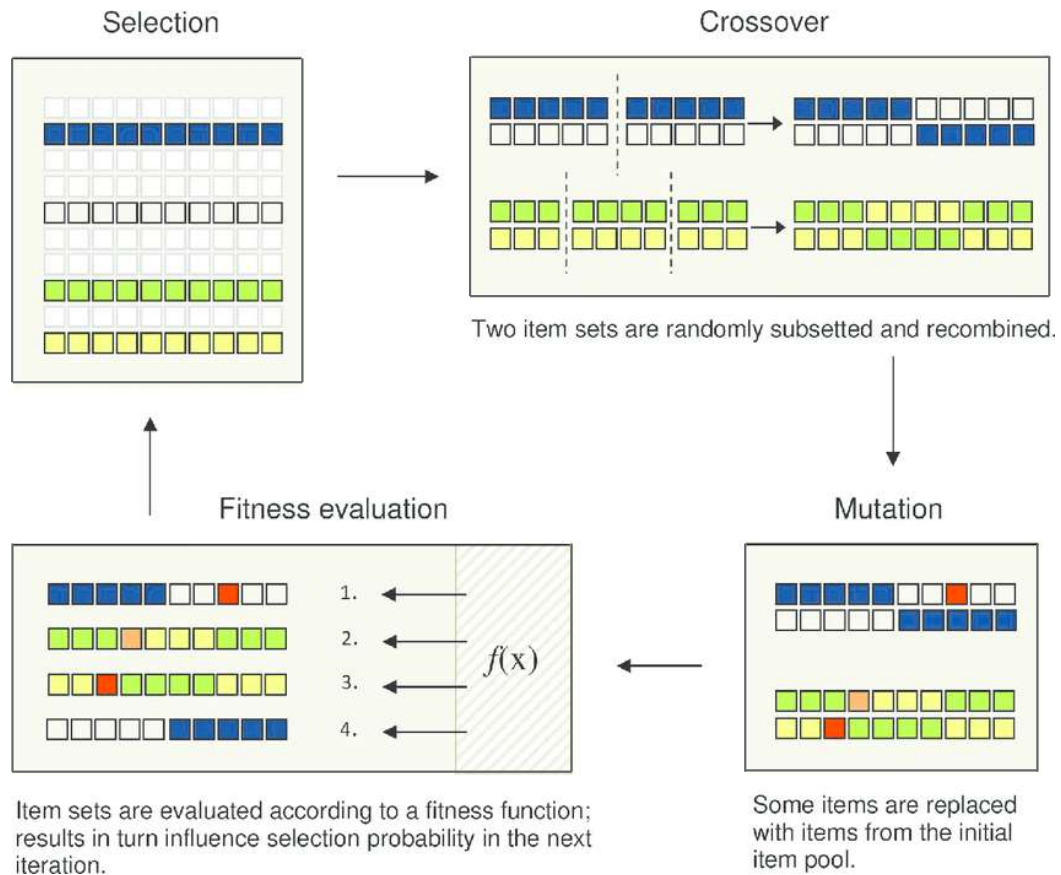
### Search Space



$$value = (-1)^{-s} \times 1.F \times 2^{E-bias}$$

## 2.2. Genetic Algorithm

### Operators



## 2.2. Genetic Algorithm

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### **Fitness Score**

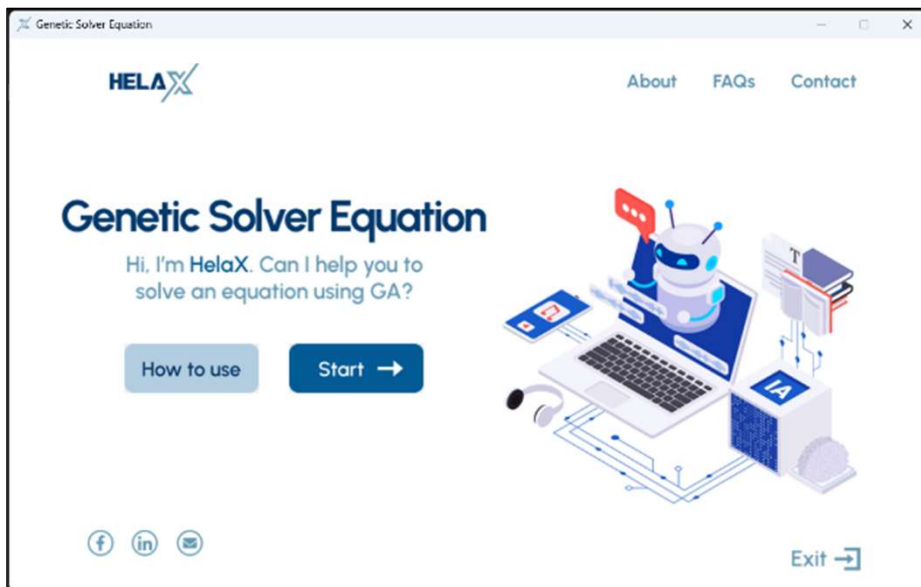
$$\textit{Difference} = \textit{abs}(\textit{LHS} - \textit{RHS})$$

$$\textit{Fitness Score} = 1 / (\textit{Difference} + 1)$$

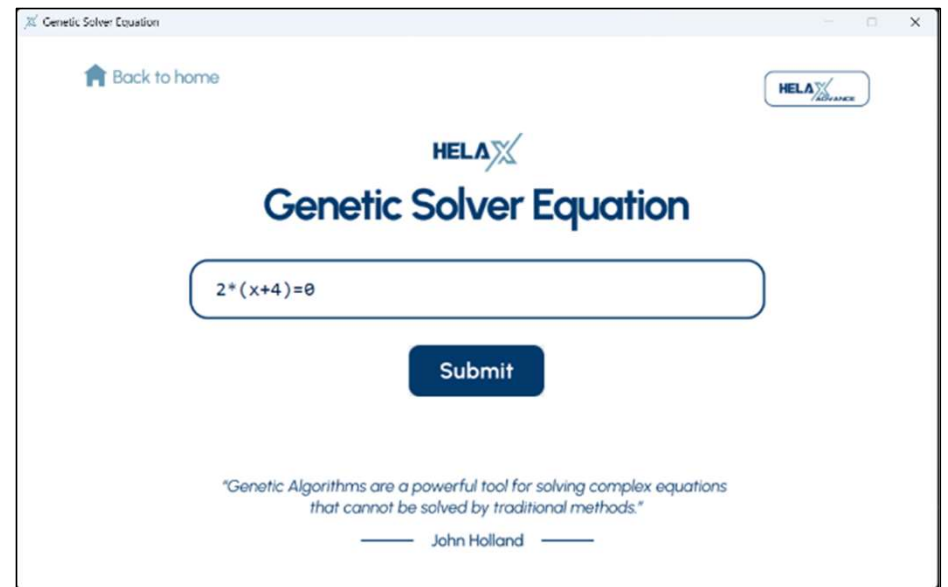
When Difference --> 0 => Fitness Score --> 1

### 3. Results

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Menu

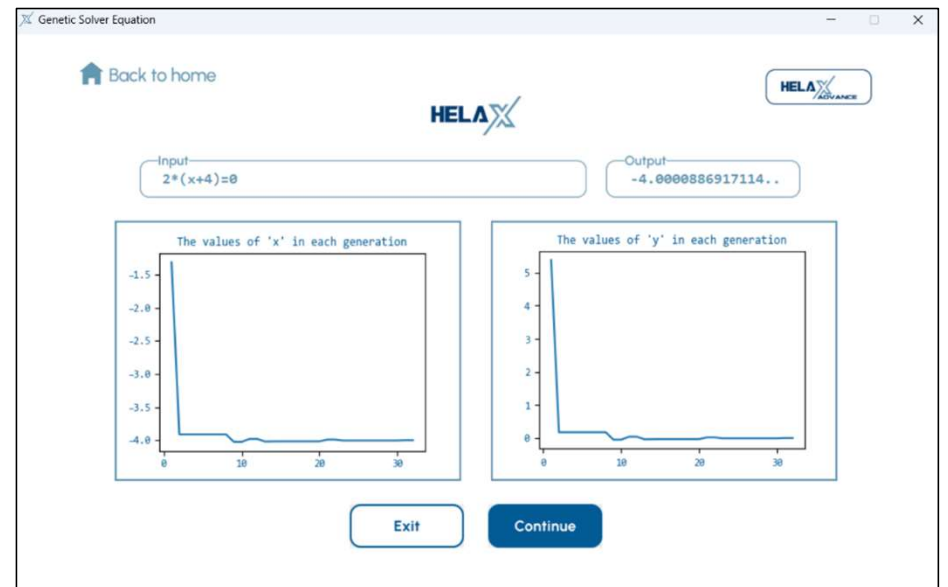


User Input

# 3. Results



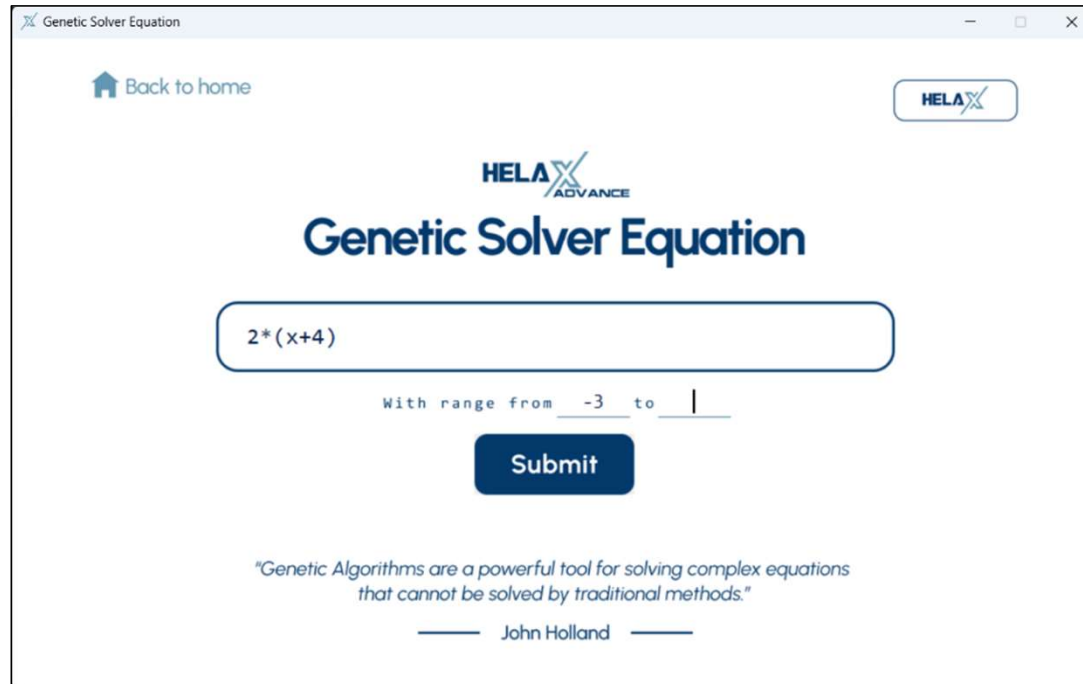
Result



Visualize

## 3. Results

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The screenshot shows a web application window titled "Genetic Solver Equation". In the top left corner, there is a "Back to home" link with a house icon. In the top right corner, there is a "HELAX" logo. The main heading is "HELAX ADVANCE Genetic Solver Equation". Below this, there is a large input field containing the equation  $2 * (x + 4)$ . Underneath the input field, there is a label "With range from" followed by a text input field containing "-3", the word "to", and another text input field containing a vertical bar "|". Below these fields is a blue "Submit" button. At the bottom of the page, there is a quote: "Genetic Algorithms are a powerful tool for solving complex equations that cannot be solved by traditional methods." attributed to "John Holland".

**Custom Interval to solve**

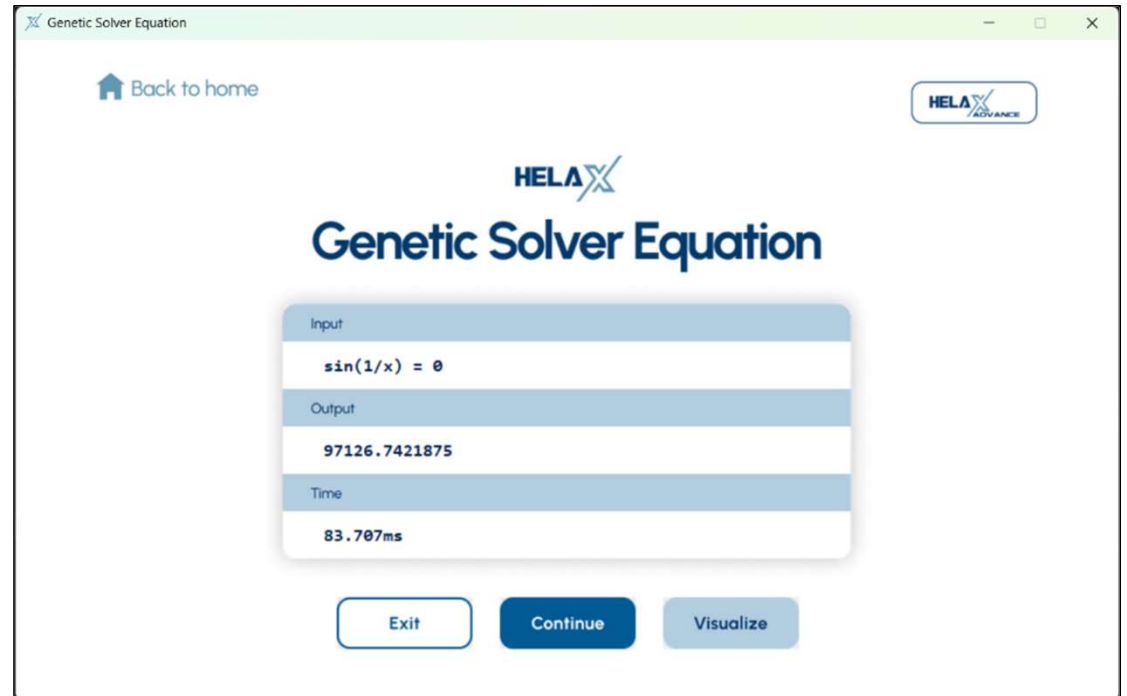
## 3. Results

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**DEMO**

## 4. Discussion

- **No Solution Condition**
- **Slow Convergence**





## 5. Conclusion

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- Easy to find solution but sometime fail
- Try more advance algorithm
- More user-friendly GUI



Thank you!