

# User Guide: Fractional Knapsack Problem Visualizer

AOA IA2 Simulation Algorithms Project by ~

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**Class:** E2

**Link:** <https://fractional-knapsack-visualizer.vercel.app/>

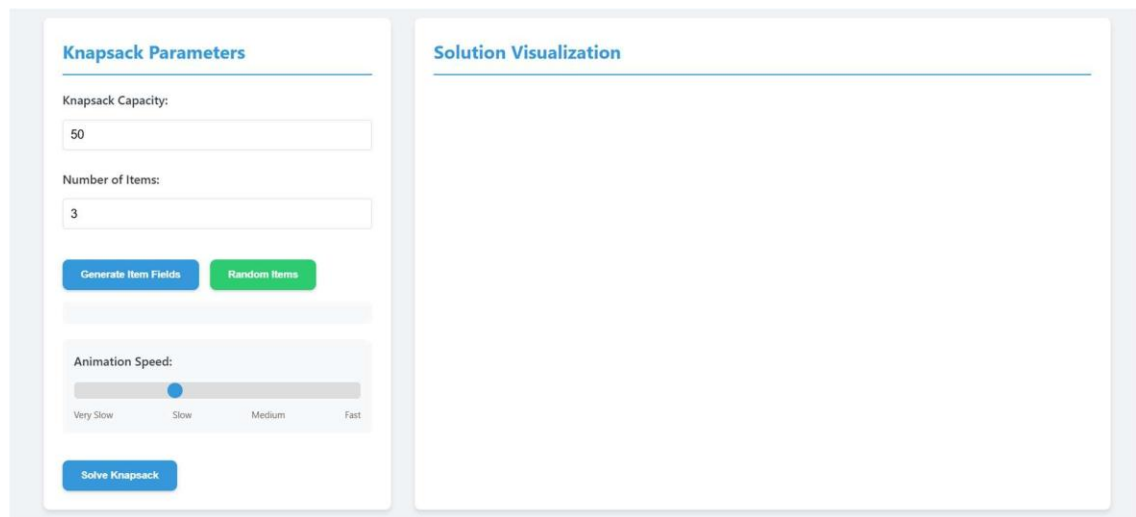
## Overview

This tool provides an interactive visualization of the Fractional Knapsack Problem using the Greedy Algorithm. Users can input item details or generate them randomly, then visualize how the algorithm selects items to maximize value within a weight constraint.

## How to Use the Visualizer:

### 1. Set Knapsack Parameters

- **Knapsack Capacity:**  
Enter the maximum weight the knapsack can hold (e.g., 50).
- **Number of Items:**  
Enter how many items you want to consider (e.g., 3).



The screenshot shows the user interface of the Fractional Knapsack Problem Visualizer. It is divided into two main panels: 'Knapsack Parameters' on the left and 'Solution Visualization' on the right. The 'Knapsack Parameters' panel contains input fields for 'Knapsack Capacity' (set to 50) and 'Number of Items' (set to 3). Below these are two buttons: 'Generate Item Fields' (blue) and 'Random Items' (green). Further down is an 'Animation Speed' slider with markers for 'Very Slow', 'Slow', 'Medium', and 'Fast'. At the bottom of this panel is a 'Solve Knapsack' button (blue). The 'Solution Visualization' panel is currently empty, showing only the title and a horizontal line.

*Note: Both fields are required before generating item fields.*

## 2. Generate Items

You have two options:

- **Generate Item Fields:**  
Creates empty input fields for you to manually enter each item's:
  - Weight
  - Value

The image displays two screenshots of a web application interface for solving a knapsack problem. The interface is divided into two main sections: 'Knapsack Parameters' and 'Solution Visualization'.

**Knapsack Parameters:**

- Knapsack Capacity:** 50
- Number of Items:** 3
- Buttons:** 'Generate Item Fields' (blue) and 'Random Items' (green).
- Item Fields:** Three rows for items, each with 'Weight' and 'Value' input fields.
- Animation Speed:** A slider control.

**Solution Visualization:** A large empty area for visualizing the solution.

The top screenshot shows the 'Generate Item Fields' button, and the bottom screenshot shows the 'Random Items' button. In the bottom screenshot, the 'Item Fields' section shows pre-filled values: Item 1: Weight 10, Value 60; Item 2: Weight 20, Value 100; Item 3: Weight 30, Value 120.

- **Random Items:**  
Automatically generates random weights and values for the specified number of items.

## 3. Set Animation Speed

Use the slider to control the visualization speed:

- Very Slow
- Slow

- Medium
- Fast

Number of Items:

3

Generate Item Fields Random Items

| Item    | Weight | Value |
|---------|--------|-------|
| Item 1: | 10     | 60    |
| Item 2: | 20     | 100   |
| Item 3: | 30     | 120   |

Animation Speed:

Very Slow Slow Medium Fast

Solve Knapsack

Solution Visualization

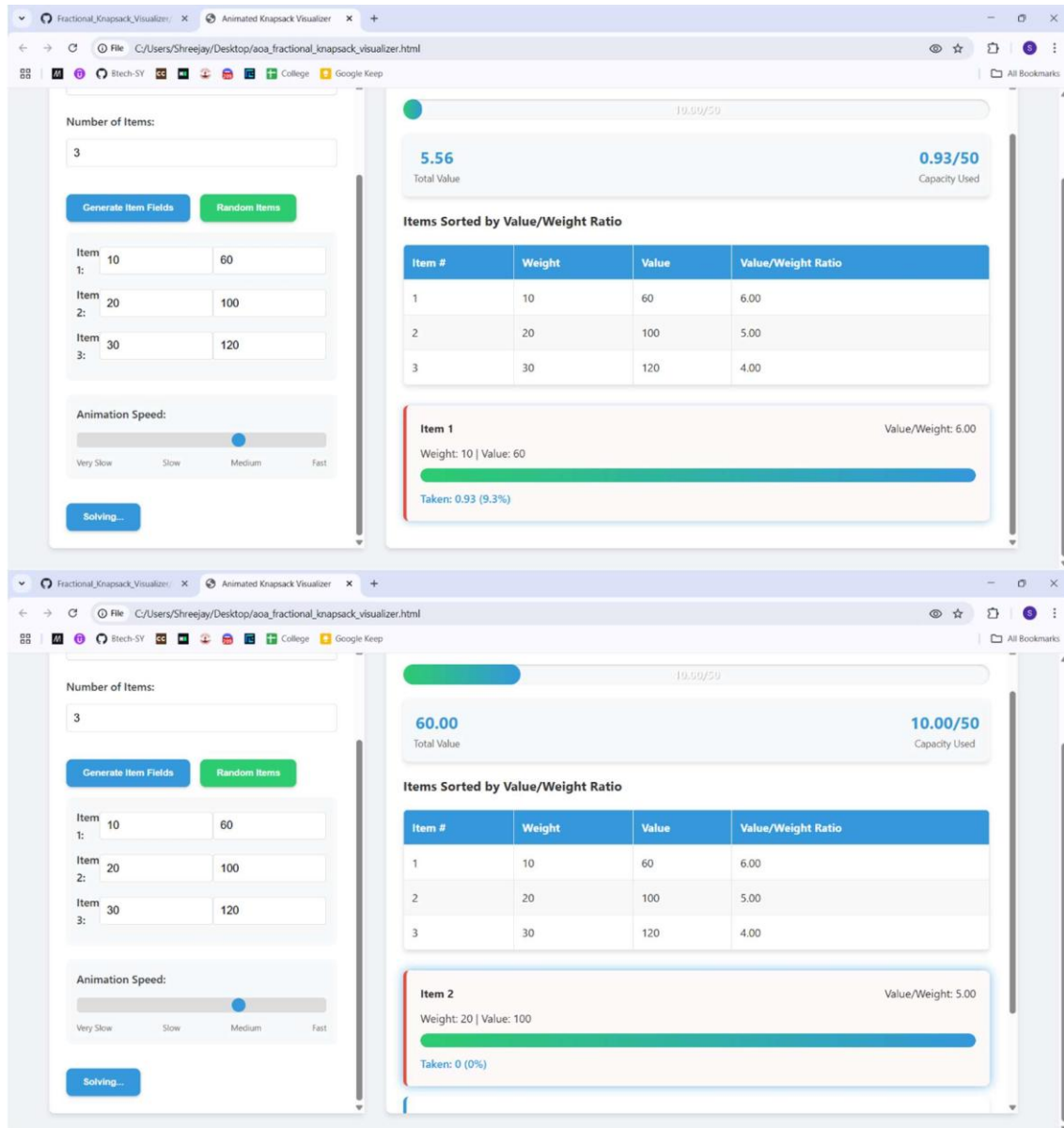
#### 4. Solve Knapsack

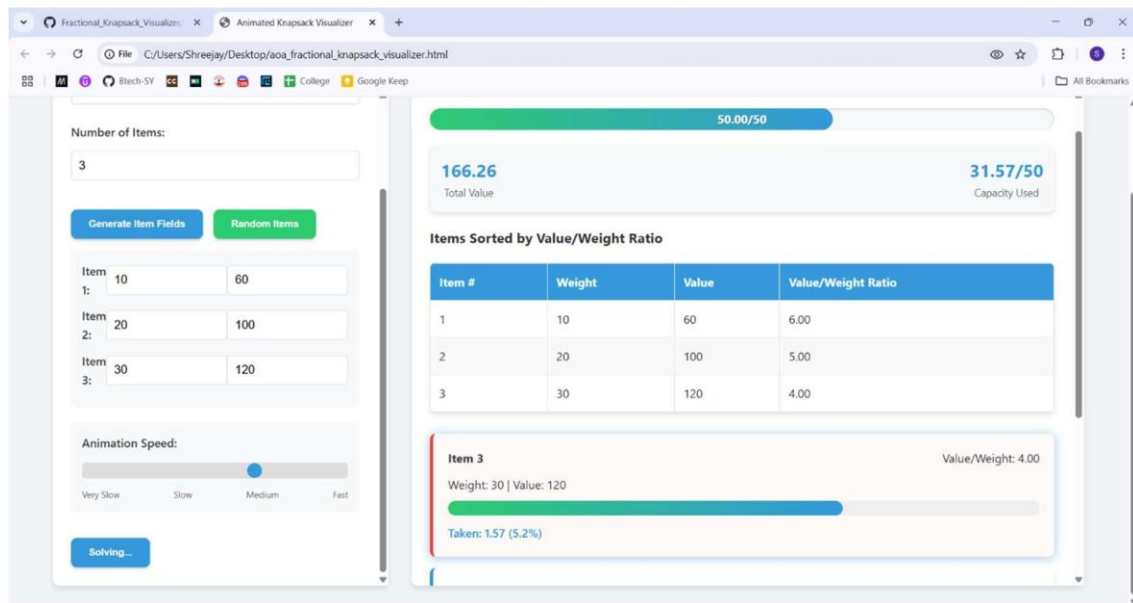
Click the “Solve Knapsack” button to:

- Run the Greedy Fractional Knapsack Algorithm
- Display a step-by-step visualization:
  - Value-to-weight ratios
  - Item selection process
  - Total value obtained

## Algorithm Details

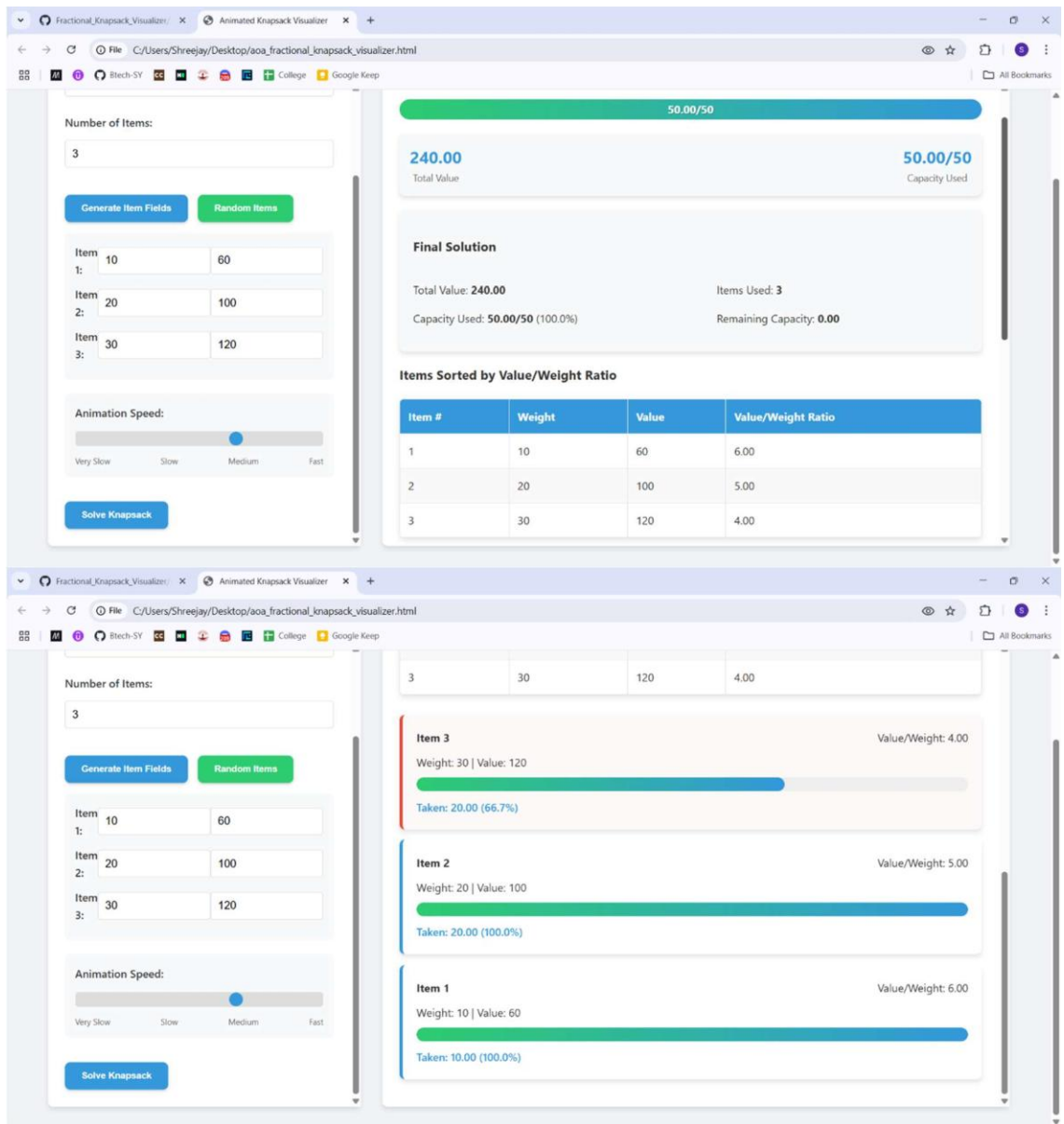
- **Greedy by Value/Weight Ratio:**
  - Sorts items by value/weight in descending order.
  - Fills the knapsack starting with the item with the highest ratio.
  - If the knapsack can't fit the full item, it takes the possible fraction.





## Output Sections

- **Result:**  
Displays the total value accumulated in the knapsack.
- **Ratio Table:**  
Shows all items with:
  - Weight
  - Value
  - Ratio
- **Items Visualization:**  
Shows selected items and how much of each was added.



## Example

1. Capacity: 50
2. Items: 3
3. Enter:
  - Item 1: Value = 60, Weight = 10
  - Item 2: Value = 100, Weight = 20
  - Item 3: Value = 120, Weight = 30
4. Run the visualizer → it will pick Item 2, Item 1, and 2/3 of Item 3 to maximize the total value.

## Troubleshooting

- **Nothing happens after clicking Solve**

Solution:- Ensure all input fields are filled and valid numbers.

- **Negative or zero values entered**

Solution:- All values must be positive and non-zero.