# **Task: "Sorting Algorithm Visualizer"**

⏳ Estimated Time: 3 Hours  
🎯 Goal: Create a React app that visualizes sorting algorithms (Bubble Sort, Selection Sort, Merge Sort, Quick Sort).

## **📌 Task Requirements**

✅ Generate a random array of numbers  
✅ Allow users to pick a sorting algorithm  
✅ Animate the sorting process step by step  
✅ Show sorting speed control  
✅ Display comparisons and swaps visually

## **🔹 How It Works (User Flow)**

1️⃣ User clicks "Generate Array" → Creates a new random array of bars.  
2️⃣ User selects a sorting algorithm (Bubble, Selection, Merge, Quick Sort).  
3️⃣ User clicks "Start Sorting" → The algorithm sorts the array visually step by step.  
4️⃣ Sorting bars change color to show swaps & comparisons.  
5️⃣ Final sorted array is displayed with an animation.

## **🔹 Implementation Details**

### **1️⃣ Array Generation**

* Generate a random array of numbers (size 10-20).
* Represent numbers as vertical bars (height = value).
* Use CSS animations for smooth transitions.

### **2️⃣ Sorting Algorithms to Implement**

#### **🔹 Bubble Sort (Easiest)**

* Compare adjacent elements, swap if necessary.
* Visual: Highlight bars being compared, color swaps.

#### **🔹 Selection Sort**

* Find the smallest element, swap it with the first unsorted position.
* Visual: Highlight the minimum and swapping positions.

#### **🔹 Merge Sort (Divide & Conquer)**

* Recursively divide the array, merge sorted halves.
* Visual: Show merging process in steps.

#### **🔹 Quick Sort (Efficient)**

* Select pivot, partition around pivot, recursively sort.
* Visual: Highlight pivot and moving elements.

### **3️⃣ Animation & Visualization**

* Use colors to show:
  + 🔵 Normal state
  + 🔴 Comparing elements
  + 🟢 Sorted elements
* Use setTimeout() to slow down animation.