**🎯 Key Features:**

**Sorting Algorithms Implemented:**

* **Bubble Sort** - Simple comparison-based algorithm
* **Selection Sort** - Finds minimum element repeatedly
* **Insertion Sort** - Builds sorted array one element at a time
* **Merge Sort** - Divide-and-conquer approach
* **Quick Sort** - Efficient divide-and-conquer with pivot
* **Heap Sort** - Uses binary heap data structure
* **Shell Sort** - Improved insertion sort with gaps

**Visual Features:**

* **Real-time Animation** - See bars being compared, swapped, and sorted
* **Color Coding**:
  + Red bars = Currently being compared
  + Teal bars = Being swapped
  + Blue bars = Already sorted
* **Adjustable Speed** - From very fast to very slow animations
* **Progress Bar** - Shows completion status

**Performance Analysis:**

* **Timing Measurement** - Precise millisecond timing for each algorithm
* **Results Display** - Individual cards showing execution times
* **Interactive Chart** - Bar graph comparing all algorithm performances
* **Real-time Updates** - Results update as algorithms complete

**User Controls:**

* **Array Size** - Customizable from 10 to 200 elements
* **Value Range** - Set minimum and maximum values
* **Random Generation** - Create new test arrays instantly
* **Individual Testing** - Run single algorithms or all at once

**Technical Highlights:**

* **Responsive Design** - Works on desktop and mobile
* **Modern UI** - Glass-morphism effects and smooth animations
* **Performance Optimized** - Efficient rendering and state management
* **Educational** - Perfect for learning algorithm complexity differences

**🚀 How to Use:**

1. **Generate Array** - Set size and value range, then click "Generate New Array"
2. **Run Tests** - Either test all algorithms at once or individual ones
3. **Analyze Results** - View timing results and performance comparison chart
4. **Experiment** - Try different array sizes to see how algorithms scale