

# CS 4040

Milestone 2

Author: Viraj Parmar

Date: November 1, 2025

## Overview

Implemented **Counting Sort**, a stable, linear-time integer sorting algorithm.

Measured runtimes for different input sizes  $n$  and maximum values  $k \in \{10, n, n^2\}$ .

## Algorithm Implemented

Algorithms	Stable	File
Counting sort	Yes	Main.py

## Functions

Function	Purpose
Functions	Sorts array with $O(n + k)$ time
Test_Me_CountingSort()	Verifies correctness
Test_Stability()	Confirms stability
measure_runtime()	Measures median runtime
main()	Runs tests, prints table, saves plot

## How to Run

1. Install matplotlib: `pip install matplotlib`
2. Run: `python main.py`

## Observations

- Runtime grows linearly with  $n$  for small  $k$ .
- For large  $k$  (like  $n^2$ ), runtime increases due to count array size.