

Closest Pair of Points

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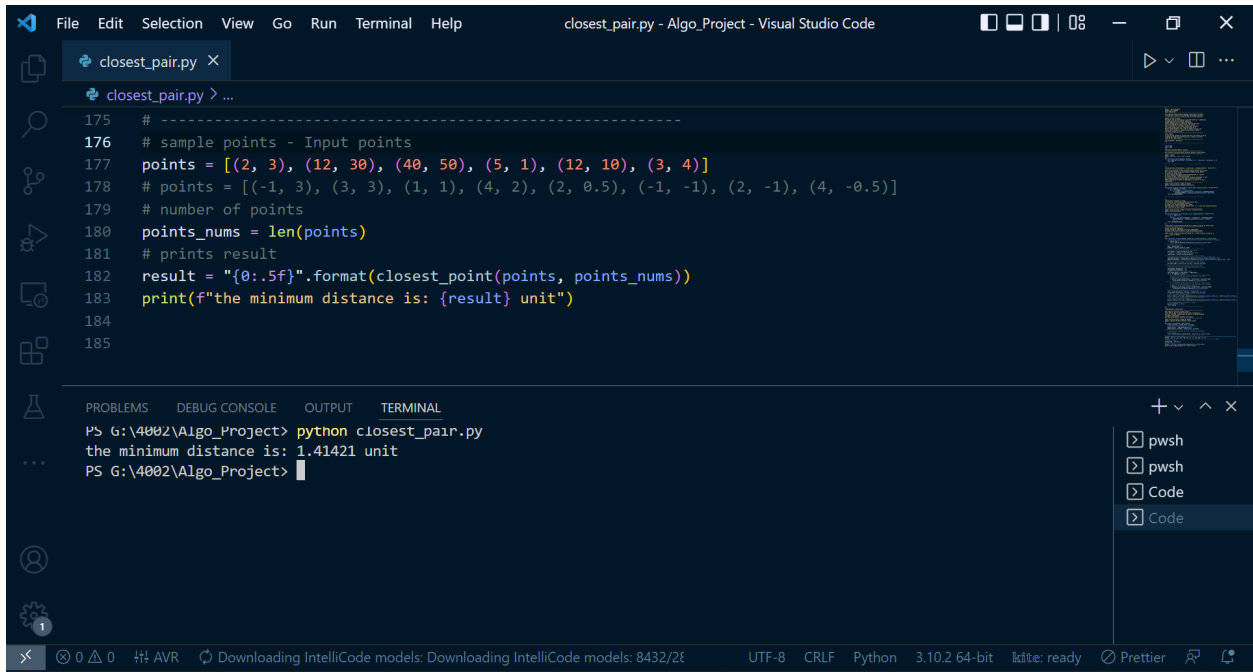
Algorithm:

- 1) Find middle-point of the sorted array
- 2) Divide the array into 2 halves, one is all elements before and up to the midpoint and the second is all elements after the midpoint.
- 3) Find the smallest distance in both the sub-arrays recursively, left (i) and right (j)
- 4) Find the minimum of the left and right (k)
- 5) We have the upper and lower bound of the minimum point now (i and j)
- 6) We now know that one point is in the left half and the other is in the right so we can find all the points with x coordinates closer to k than i and j, we then build an array with these points l
- 7) Sort this array in relation to their y coordinates
- 8) Find the smallest distance in l
- 9) Return the minimum of k and the smallest distance from l

2

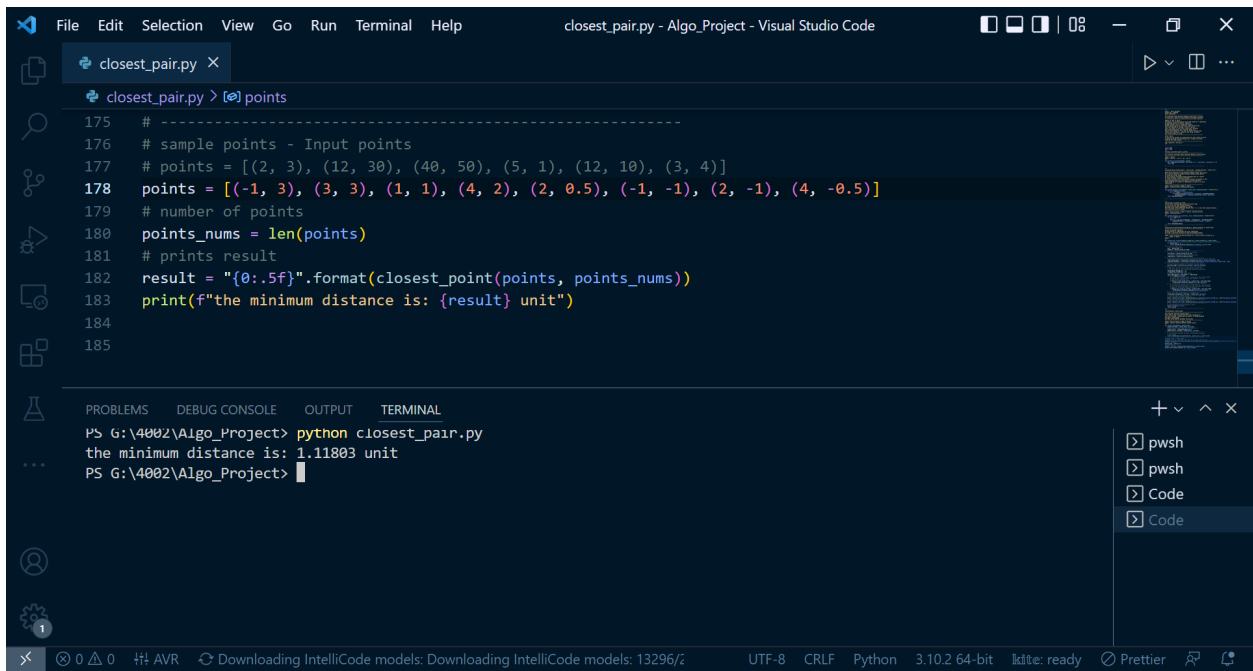
❖ Sample of different Inputs and Outputs

1)



```
File Edit Selection View Go Run Terminal Help closest_pair.py - Algo_Project - Visual Studio Code
closest_pair.py X
closest_pair.py > ...
175 # -----
176 # sample points - Input points
177 points = [(2, 3), (12, 30), (40, 50), (5, 1), (12, 10), (3, 4)]
178 # points = [(-1, 3), (3, 3), (1, 1), (4, 2), (2, 0.5), (-1, -1), (2, -1), (4, -0.5)]
179 # number of points
180 points_nums = len(points)
181 # prints result
182 result = "{0:.5f}".format(closest_point(points, points_nums))
183 print(f"the minimum distance is: {result} unit")
184
185
PROBLEMS DEBUG CONSOLE OUTPUT TERMINAL
PS G:\4002\Algo_Project> python closest_pair.py
the minimum distance is: 1.41421 unit
PS G:\4002\Algo_Project>
```

2)



```
File Edit Selection View Go Run Terminal Help closest_pair.py - Algo_Project - Visual Studio Code
closest_pair.py X
closest_pair.py > [0] points
175 # -----
176 # sample points - Input points
177 points = [(2, 3), (12, 30), (40, 50), (5, 1), (12, 10), (3, 4)]
178 points = [(-1, 3), (3, 3), (1, 1), (4, 2), (2, 0.5), (-1, -1), (2, -1), (4, -0.5)]
179 # number of points
180 points_nums = len(points)
181 # prints result
182 result = "{0:.5f}".format(closest_point(points, points_nums))
183 print(f"the minimum distance is: {result} unit")
184
185
PROBLEMS DEBUG CONSOLE OUTPUT TERMINAL
PS G:\4002\Algo_Project> python closest_pair.py
the minimum distance is: 1.11803 unit
PS G:\4002\Algo_Project>
```