Optimal Hospital Placement

# Description:

You are tasked with developing a function that optimally places two hospitals on a 1000x1000 grid containing 10 cities, such that the distance between each city and its nearest hospital is minimized. The function should take a list of city coordinates (x, y) as input and return a list of coordinates for the two hospital locations.

Your goal is to minimize the distance between cities and hospitals while ensuring that each city is served by the nearest hospital. You can assume that the cities cannot overlap, and the hospitals cannot overlap. A hospital has to be placed inside an existing city.

One way to calculate the distance between two points (x1, y1) and (x2, y2), for example, is the Euclidean distance formula:

**distance = sqrt{ (x1 - x2)^2 + (y1 - y2)^2 }**

Your solution should aim to minimize the distance between cities and hospitals.

You should provide both the answer you reached and a notebook or code that displays your thought process.

# Function Signature:

***def place\_hospitals(city\_coordinates):***

***# returns list of two tuples of hospital coordinates***

***pass***

# Input:

- `city\_coordinates` (list of tuples): A list of coordinates (x, y) representing the locations of the cities. The list will contain 10 coordinates, where each coordinate is a tuple of two integers. The coordinates are within the range of (0, 0) to (999, 999).

# Output:

- `hospital\_coordinates` (list of tuples): A list of coordinates (x, y) representing the locations of the two hospitals. Each coordinate is a tuple of two integers.

# Constraints:

* **There will always be exactly 10 cities.**
* **There will always be exactly 2 hospitals.**
* **The city and hospital coordinates are unique and within the range of (0, 0) to (999, 999).**
* **Cities coordinates cannot overlap**
* **A hospital has to be placed inside an existing city.**