Problem Discussion:
Technical Room Optimization

Technical room is a room or space in a building dedicated to mechanical equipment and its associated electrical equipment, as opposed to rooms intended for human occupancy or storage. Unless a building is served by a centralized heating plant, the size of the mechanical room is usually proportional to the size of the building. A small building or home may have at most a utility room but in larger buildings, mechanical rooms can be of considerable size, often requiring multiple rooms throughout the building, or even occupying one or more complete floors.

Technical rooms typically house the following equipment:

- Air handling unit (AHU)
- Boilers
- Chillers
- Water heater and tanks
- Water pumps (for domestic, heating/cooling, and firefighting water)
- Main distribution piping and valves
- Sprinkler distribution piping and pumps
- Other HVAC (heating, ventilation, and air-conditioning) equipment.

(Source: Wikipedia)

Questions:

1. How can we use Mathematics and/or Machine Learning to arrange the components in an optimal configuration?
2. What should we consider in the optimization?
3. What are the relevant constraints in the problem?
4. How can we validate the optimization framework and the optimal solution?

Use your own assumptions and reasoning to solve the problem. You don't need to write code to solve the problem, pseudo-code or a set of algorithms is sufficient.

Figure 1: An air handling unit in the technical room with connected ventilation ducts.

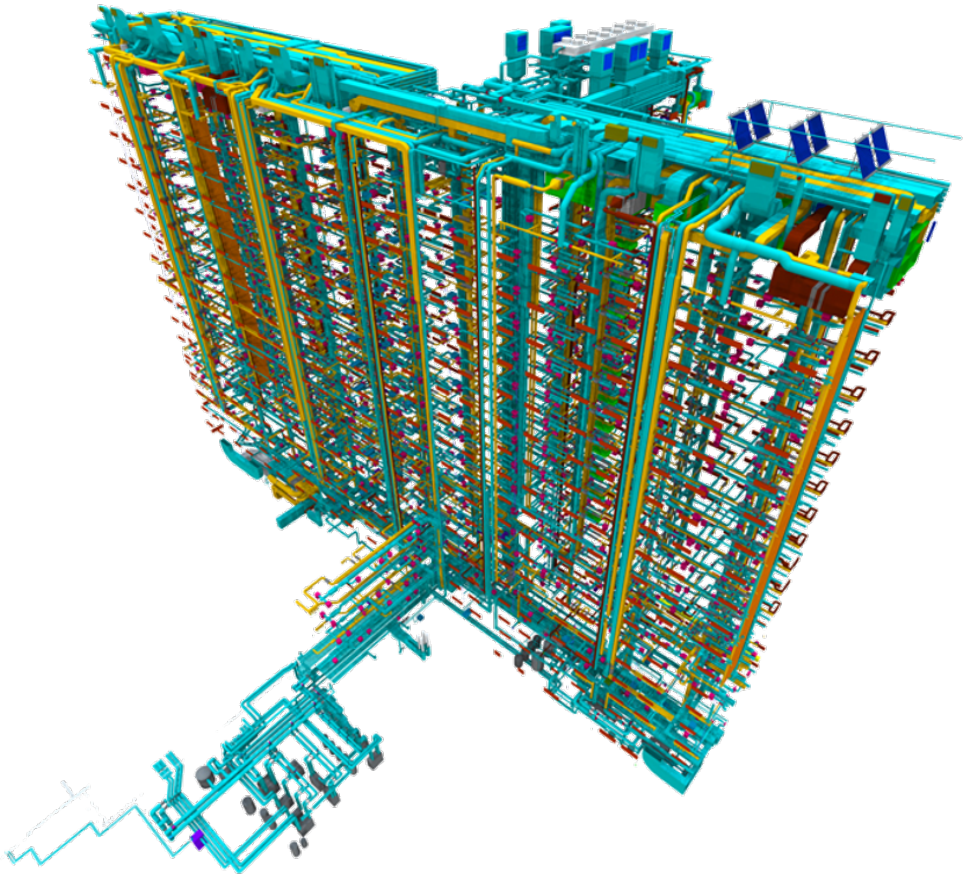

Figure 2: The HVAC systems in the whole building.

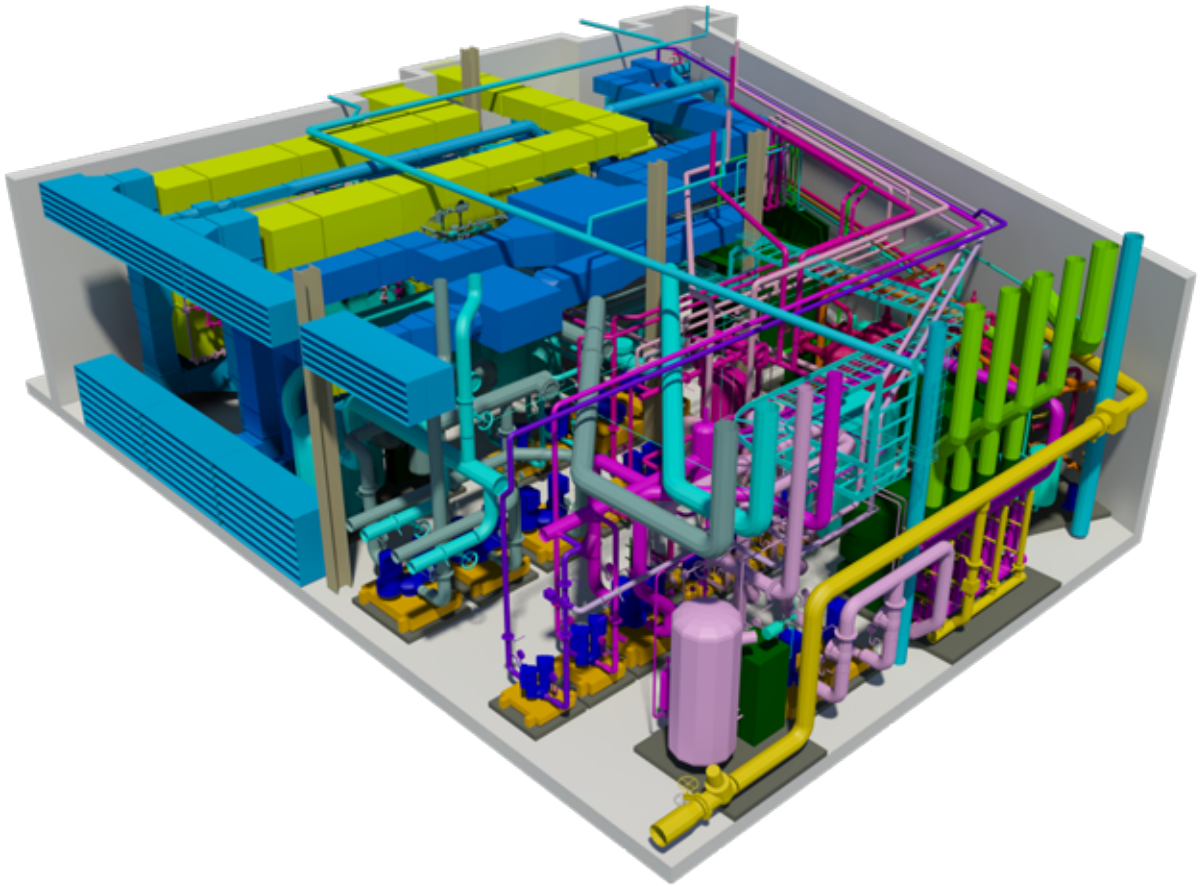

Figure 3: 3D schematic drawing of a technical room.