



## Counting Atoms

Parallel Computing

### Goals

- ★ Design a parallel algorithm in the SROM model.
- ★ Think in groups of 2 or 3 students.

### Exercise 1 – Counting Atoms

We are mapping a 2D space onto a grid, and each atom is situated in a particular point on the grid. The goal is to count, for each point in the grid, the number of atoms in a discretized radius  $r \in \mathbb{Z}$  around the point (you can use Manhattan distance).

Here an example of the data structures involved: **you can extend and modify** those:

```
// 2D Grid, for each point (x,y) in the grid, we want g[x][y] to contains the number of atoms around (x,y).
std::vector<std::vector<int>> g;
// Coordinates of the atoms.
std::vector<size_t> x;
std::vector<size_t> y;
// Radius around which we compute the number of atoms for each point.
int r;
```

Propose a parallel algorithm in the SROM model, and discuss its advantages and drawbacks. Is your algorithm compute-bound or memory-bound?