

The Rust programming language  
Summer 2024 / 2025

Exercises

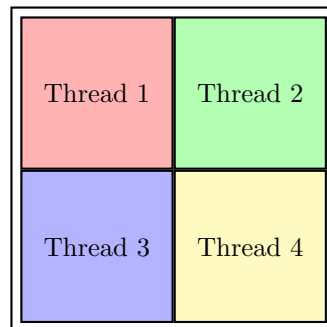
## 1 Matrixes

Let's take two square matrices, A and B, of size  $n \times n$ , each represented as a vector of vectors of f32.

1. Compute the sum of all numbers in a matrix.
2. Make it parallel using rayon.
3. Compute the sum of two matrices.
4. Make it parallel using rayon.
5. Compute the product of two matrices.
6. Make it parallel using rayon.

Here, using rayon in a naive way will run a lot of threads.

7. Write another multiplication algorithm by spawning 4 threads manually. Each thread will compute the result of the multiplication of a quarter of the result matrix.



## 2 Dungeon

Four characters explore a dungeon in parallel. The dungeon is a square grid of rooms, that may or may not contain an object (a naive, single-threaded representation could be a 2D matrix of booleans). The goal of the characters is to explore the dungeon concurrently and collect all the objects.

Each character:

- runs in its own thread
- begins at a corner of the dungeon
- moves randomly (left, right, up or down)
- picks up an object if they is some in the room (the room is then empty)

Use mutexes to safely share and update the dungeon rooms. The program should stop once all objects are collected.

1. Implement the dungeon above using mutexes.
2. Move away from mutexes and use atomics instead.