



**POLITECNICO**  
MILANO 1863

**MPI**

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# Rules

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- Rename the `ants_simulation_XX.c` file replacing `XX` with the number of your group
- Write in the comment on top of the file your group number and the name of all group members
- Submit only a single c file with your solution
  - Submitted from the contact email provided in the group registration document

# Requirements

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- You are to implement a simple simulator of the behavior of a colony of ants
- Ants move in a one-dimensional space  $x$ 
  - The minimum value of  $x$  is 0 and the maximum is 1000
- In the space, there are 10 sources of food
  - Their positions are stored in the `food_sources` array
- We define the center of the colony as the average value of the positions of all ants in the colony

# Requirements

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- The simulation evolves in discrete rounds for a given number of iterations
  - num\_iterations in the template file
- Before the first iteration
  - Process P0 computes the positions of all ants and distributes them to the other processes
    - Use the init\_ants function to obtain the positions
  - Process P0 computes the positions of food sources and distributes them to the other processes
    - Use the init\_food\_sources function to obtain the positions

# Requirements

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- At each iteration, each ant moves according to two forces  $F1$  and  $F2$ 
  - $F1$  attracts the ant towards the nearest source of food
    - If  $d1$  is the distance between the ant and the nearest source of food, the strength of  $F1$  is  $0.01 \cdot d1$
  - $F2$  attracts the ant towards the center of the colony
    - If  $d2$  is the distance between the ant and the center of the colony, the strength of  $F2$  is  $0.012 \cdot d2$
- The position of the ant at the end of the iteration will be the old position +  $F1$  +  $F2$ 
  - Notice that  $F1$  and  $F2$  may point to opposite directions!

# Requirements

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- At each iteration, you have to compute and print the center of the colony
  - The code for printing is already in the template
- Run the simulation in parallel on multiple processes, minimizing synchronization and communication as much as possible