Houssem **Kihal**,

Computational Physics, Statistical Physics

kihalhoussem@gmail.com houssemkihal.github.io

Paris Area, France

I am a master's student at Cergy-Paris University studying Computational Physics and modeling.

I'm interested in the multidisciplinary field of statistical physics applied to modeling. More specifically, I have been interested in Active matter. I am currently doing my master's internship in LPTM lab in active matter theory.

My internship focuses on computational models for active matter in 3D, supervised by Prof. Peruani Fernando we study the emergence of collective motion and analyze the statistical properties.

INTERN

Computational models for Active Matter in 3D , LPTM lab, Cergy-Paris, France 2021–Present

Currently doing my master's internship at LPTM with Prof. Peruani Fernando, we are studying an active matter model Large-scales patterns in a minimal cognitive flocking model in three dimensions , the goals of the internship are:

- Develop a c++ parallel (OpenMP) code to run on the cluster, using molecular dynamics simulation technique to simulate the active matter model.
- Set up a systematic method to analyze the model using order parameters, and generate phase space.
- Investigate the role of dimensionality.

Skill to acquire : learn about stochastic processes - Langevin equations - molecular dynamics simulationes - active matter.

Projects

Reproduce Active matter Model 4 Weeks– Cergy-Paris, France 2021

- Re-create simulation of the article Large-scales patterns in a minimal cognitive flocking model, with $N = 10^4$ active particles using Julia programming language.
- Analyze the emergent behavior of the system when changing control parameters.

Simulating the Vicsek Model in 3D 8 Weeks – Cergy-Paris, France 2021

- Reproduce Vicsek Model simulation in 3D using Python.
- Visualize this simulation using Blender.

Classifying flocking behavior using-AI 4 Weeks – Cergy-Paris, France 2021

- Design and implement state of the art machine learning algorithm to classify flocking behavior using Deep Neural Network and CNN, with pytorch.

Biological Oscillators - link 4 Weeks – Cergy-Paris, France 2020

- Give a comprehensive review of how we can apply Systems Biology to model biological oscillators (Biological network, a system of partial differential equation, study the dynamics).
- Rebuilt a simple biological oscillator using a biological network and then investigate the dynamics, implemented using Python.

Quantum Random Walk 3 Weeks – Cergy-Paris, France 2020

- Presented a complete review of how we can model discrete quantum walks 1-dimensional lattice.
- Implement Quantum random Walks on a cycle of 8 nodes using IBM-Q simulator Qiskit.

Education

Master in Physics and Modelling, CERGY-PARIS UNIVERSITY, Paris 2019–Present
Bachelor in fundamental Physics, FARHAT ABBES UNIVERSITYS, Setif,Algeria 2014 - 2017

Skills

- **Python** : NumPy- pytorch - Qiskit - Pandas - Matplotlib - SymPy
- **C/C++** : c- c++11- OpenMP- std
- **julia · Matlab · Mathematica · Linux · LaTeX**
- **Version Control** : git - GitHub
- **Computer Graphics** : Blender - Adobe(Ae,Pr,Au,Ps,Ai) - Cinema4D

Courseworks

Statistical Physics, Phase Transitions, Dynamical Systems, Computational Physics, Quantum Mechanics, Quantum Information, Adv Classical Mechanics.

Languages

English: Full professional proficiency

French: Full professional proficiency

Arabic: Native proficiency

Personal interests

Science, Technology, Traveling, Photography, Languages, Communication, Food, Movies, Music.