Carlos Lira

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Education

Universidad Nacional Autónoma de México 2017 – present
BS Data Science *Ciudad de México, México*

Skills

Python Numpy, SciPy, Pandas, Matplotlib, Scikit Learn, Keras, PyTorch
C++ CUDA, OpenFrameworks
Data Bases Postgres
Web Development Heroku, Flask, Bootstrap
Work Flow GitHub, Google Colab, VS Code, Overleaf

Experience

Centro Conjunto de Investigación en Química Sustentable UAEM-UNAM Summer 2016
Intern *Estado de México, México*

- Nanoparticles classification from electron microscope images.
- Nanoparticles sample preparation for electron microscope.

Projects

Covid-19 Tracker

- Web app that provides daily updates about COVID-19 for over 150 countries.
- Several charts available for each country.
- Custom API, data merged from different sources with automatic daily updates by server

Boat detection using satellite images with PyTorch

- Convolutional Neural Network image classification using LeNet-5 architecture.
- More than 40,000 images from San Francisco Bay Area.
- Model with 97% precision on validation data.

Magnetic Pendulum simulation. Paralelization using CUDA

A magnetic pendulum is a chaotic system, one way to describe such a system involves solving a differential equation for every point in a $n \times n$ grid.

- Problem paralelization using two methods: Nvidia's API CUDA (GPU) and C++ threads (CPU)
- Reduced time complexity from $O(n^2)$ in CPU to $O(1)$ in GPU

Schrödinger equation numerical solution. The double slit experiment

The double slit experiment challenges our intuition about how particles behave at a subatomic level. For this project I decided to use Schrödinger equation to simulate such experiment in a $n \times n$ grid.

- Implementation of RK4 Algorithm to solve 2D Schrödinger equation.
- Reduced time complexity from $O(n^6)$ using naive approach to $O(n^3)$.
- Program generated interference pattern similar to experimental one.

Awards

Contestant XXVI Concurso Nacional de Aparatos y Experimentos de Física (2016)
First Place XXVII Olimpiada de Física, Estado de México (2016)