THEODOROS PANAGIOTAKOPOULOS

Ph.D Computational Physicist ~ Researcher

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SUMMARY

Experienced **Ph.D.** Physicist/Material Scientist expert in **pre-silicon processes** and **modeling optimization**, adept at collecting, analyzing, and processing data, seeking a role to drive impactful solutions.

SKILLS

Languages: Python, Julia, R, C/C++, SQL, Bash, HTML.
Tools: Machine Learning, Data Handling, Data Analysis, Data Visualization
Technologies: Linux, Mac OS, Windows.

EDUCATION

08/2019 - present **Ph.D Physics** — **University of Central Florida**
GPA: 4.0/4.0

10/2017 - 07/2019 **M.S. Physics** — **National and Kapodistrian University of Athens**
Grade: **9.2/10**, **Valedictorian**

10/2011 - 07/2017 **B.S. Physics** — **National and Kapodistrian University of Athens**

INDUSTRY EXPERIENCE

5/2024 – 8/2024 **Modeling Product Engineer Intern** — **ASML, Silicon Valley, CA**

- Designed **EUV** computational lithography simulations for geometrical corner rounding optimization, enhancing **pre-silicon design efficiency**.Reducing simulation run time by **5%**, memory usage by **10%**, and rounding time by **70%**. This optimization was integrated into the latest **Tachyon** release and proposed to several clients.
- Led Rigorous M3D simulations, to optimize the Transition Cross Coefficient (TCC) for high and low **Numerical Aperture masks**, achieving a **9%** reduction in simulation run time and a **34%** reduction in memory usage. This enhancement, incorporated into the latest Tachyon release and presented to multiple clients, significantly advanced **pre-silicon platform capabilities** by improving mask design and lithography simulation efficiency.
- **Engineered** a **custom Python library** for analyzing **large simulation datasets** and automating pattern recognition and correlation with existing datasets across various system configurations.
- **Identified and resolved bugs** in the Tachyon **API**, updating the library to significantly enhance performance and reliability for large-scale FEM+ simulations, thus improving **pre-silicon pattern design** and verification.
- Participated in discussions with the modeling and optics team, proposing suggestions to **increase the efficiency** of computational lithography models for mask optimization.

EXPERIENCE

8/2019 – present **Research Assistant** — **University of Central Florida**
DOE Funded

- Utilized a systematic **design of experiments** by varying lattice parameters and crystal orientations to optimize energy minimization for training data, and implemented a **Deep Learning** model to simulate the **growth** of **metals** on **semiconductors**, significantly surpassing Density Functional Theory (**DFT**) in speed and enhancing **pre-silicon** processes.
- Developed and trained a novel **Machine Learning classifier** to predict **metal-semiconductor interactions** by modeling long-range charge transfer effects, **enhancing pre-silicon simulations** by significantly improving computational efficiency, addressing limitations of previous methods, and advancing the understanding of semiconductor physics.
- Engineered state-of-the-art **numerical methods** and designed **cutting-edge algorithms** for chemical potential calculations of **metal-semiconductor junctions**
- Investigated **Graph Convolutional Neural Networks** to improve deleted data retrieval accuracy and integrated this into **metal-on-semiconductor simulations**, boosting pre-silicon process speeds.
- Designed **algorithms** to maintain constant voltage in electrochemical simulations and **integrated** it into the **simulation** tool, demonstrating the superior effectiveness of non-metallic cations compared to metallic counterparts in the CO_2 reduction reaction.
- Engineered **Machine Learning Algorithms** to predict CO_2 reduction to formate and CO. Designing algorithms to create small physical systems and use them as training data for the classifier.
- Developed novel **numerical methods** and **algorithms** for CO_2 adsorption energy calculations, achieving higher precision in revealing cation effects
- Created a centralized **SQL database** by collecting and organizing existing group member data from the server, Enhancing accessibility and facilitating result validation
- **Developed three custom Python libraries**: **two** of which enhance the ability **to create models** that accurately represent complex systems in material design and electrochemistry, and **one** for **rendering** and **visualizing** data **from 3D simulations to 2D images.** Additionally, optimized the research group's data science library, improving its speed and performance.

10/2017 – 7/2019
NKUA Funded

Machine Learning for Detection of Dark Mater **National and Kapodistrian University of Athens**

- Designed simulations and engaged in the development of a sophisticated **Machine Learning Approach** for Dark-Matter Particle Identification, navigating the challenges presented by extremely low temperatures with **precision and ingenuity.**
- Conducted Physics labs for undergraduates, immersing students in the intricacies of **statistical data analysis** and the art of data preparation for the application of **machine learning algorithms**.

TECHNICAL SKILLS

- Exemplary knowledge of **data structures**, consistently designing and implementing efficient and optimized solutions for complex data-related challenges.
- Master **data integration** techniques with SQL, loading, extracting, and transforming data to ensure seamless and efficient processes.
- Expertise in **algorithm design** and **data science software architecture** for streamlined data workflows.
- Proficient in **high-performance computing cluster management**, specializing in **Slurm** for job scheduling, resource allocation, and **performance optimization**.
- Demonstrated **Git** expertise, maintaining organized code repositories for collaborative, data-driven projects.
- Proficiently creates compelling data visualizations with **Tableau, Matplotlib, and gnuplot** for clear communication of complex insights.

MANAGEMENT SKILLS

- **Supervising and independently completing projects**, consistently meeting budget and deadline goals with top-tier execution.
- Proficient in **conceptualizing, planning, and executing** end-to-end data science initiative aimed at solving critical business challenges.
- Thriving in **diverse teams**, **fostering collaboration** and energizing **collective success**.
- Exceptional **communication and presentation skills**, bridging knowledge gaps and **ensuring clarity**.
- Excelled in **problem solving** and **analytical thinking** in dynamic evolving environments.
- **Excels in both written and verbal communication**, proficiently acquires knowledge and imparts insights with clarity.

SELECTED - PUBLICATIONS

Electronic structure of cobalt valence tautomeric molecules in different environments

Theodoros Panagiotakopoulos, Esha Mishra, Thilini K Ekanayaka, Duy Le, Talat Shahnaz Rahman, Ping Wang, Kayleigh McElveen, Jared Paul Phillips, Zaid Zaz, Saeed Yazdani, Alpha T. N'Diaye, Rebecca Y. Lai, Robert Streubel, Ruihua Cheng, Michael Shatruk and Peter A. Dowben

2022 Nanoscale link

Exploring Simulated Residential Spending Dynamics in Relation to Income Equality with the Entropy Trace of the Schelling Model

Theodoros Panagiotakopoulos,George-Rafael Domenikos , Alexander V. Mantzaris

2022 MDPI link

Direct and indirect detection of dark matter

Theodoros Panagiotakopoulos, Vasilios Spanos

2019 Pergamos library, National and Kapodistrian University of Athens link

Description of the method development for separating the Daliz from the normal π^0 in the CDF detector

Theodoros Panagiotakopoulos, Arkadios Manousakis

2017 Pergamos library, National and Kapodistrian University of Athens link