PANOS OIKONOMOU

Physics and Math Student
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EDUCATION _____

NEW YORK UNIVERSITY ABU DHABI   *UAE | 2018 – 2022*

Bachelor of Science in Physics and Math (Double Major), Engineering (Minor)

NATIONAL TECHNICAL UNIVERSITY OF ATHENS   *Greece | 2017*

Accelerated program for Advanced Programming Methodologies, for preparation for the IOI.

DOUKAS SCHOOL   *Greece | 2016-2018*

International Baccalaureate Diploma program with Emphasis on Physics, Math, and Computer Science

EXPERIENCE _____

Research Assistant Center for Cosmology and Particle Physics (CCPP) | NYU   *US | 2021 - now*

Theoretical Physics: Dark Matter in the solar basin.
- Developed an analysis framework with Professor Ken Van Tilburg for constraining the coupling constant of Dark Photons and Axions in bound orbits around the sun using Data from Direct dark matter experiments (MUDHI, XENON).
- Used CLs and Power Constraint Limits methods to calculate upper limits.

Research Assistant Astroparticle Physics Laboratory | NYUAD   *UAE | 2018 – now*

Theoretical Physics and Practical Design: Haloscope Dark Matter Detector (Axions, Dark Photons)
- Optics Analysis for Detector design and Simulation with SolidWorks/COMSOL
- Dark photon – photon scattering simulations with Geant4.

Theoretical physics: Acoustic signal of Minimum Ionizing Particles in Noble liquids
- Development of Effective Quantum Field Theory for acoustic signals in strongly damped environments.
- Classical study of strong damping including local Lagrangian symmetries, far field approximation of solutions, and FEM methods for short argument estimation of solutions.

Engineering Design: Compact x-ray Fluorometer (XRF) for ancient artefact elemental analysis
- Analog Adjustable PID for Detector Noise Reduction with Liquid Helium | Circuit/PCB Design, Simulation, Manufacturing, Implementation. CAD/CAM Head Sensor Assembly

Research Assistant Applied Multimedia Laboratory | NYUAD   *UAE | 2018 – 2020*

- Applied Thermoelectric Control Optimization research using TEC. Development of optimum digital feedback control for Peltier Cells applied for Thermovibrotactile Funneling Systems
- Development of vibrotactile actuation, with independent control of frequency and amplitude. Spice Resonance Simulations, Circuit Design and Development

Engineering Teaching Assistant | NYUAD ECE   *UAE | 2019 – 2020*

- Teaching Assistant for Programming for Engineers Course in NYUAD. Topics include C++, MATLAB, Searching, Sorting Algorithms, Data Structures, Dynamic Memory, OOP, Unity.
- Duties include Lab instruction, Recitations, Grading.

Student Council Head of Central & Eastern Europe | Microsoft   *EU | 2016 – 2017*

- Part of globally selected 12-member board for Microsoft's Education Activities coordination.
- Organized Outreach events and Competitions in Russia, Greece, Lithuania. Head Organizer of International STEM outreach conference. Coordinator of Global Student Ambassador Program.

RESEARCH _____

(A list of publications can be found here: https://orcid.org/0000-0003-2296-6415)

Kinetic Mixing Constraint on Dark Photons in the Solar Basin   *US | 2021 - now*

(Project in Progress) Providing upper limits for the coupling of dark photons by fitting for annual and biannual modulation of the dark matter density in the solar basin. Power Constrained Limits (PCL) and Confidence Levels (CLs) are used.

Propagation and Decay of Acoustic Signals due to Minimum Ionizing Particles in Noble Liquids   *UAE | 2019 - now*

(Manuscript in Progress) Classical and Quantum treatment of viscous acoustics sourced by particles passing through large volumes of noble liquids. Applications described in increasing hte resolution of Direct Dark Matter experiments.

Multilayer Dielectric Haloscope for Dark Photon Research   *UAE | 2019 - 2021*

Design and deployment results of a multilayer Haloscope to search for dark photons in the 1.5 eV range. We present the design, theoretical models, and results. No significant excess was observed.

Mathematical Gauge Theory and Applications to Particle Physics   *UAE | 2021*

Directed Study on Gauge Theory with applications to particle physics under the guidance of Professor Hisham SATI (NYUAD). Books: Loring Tu 'Introduction to manifolds' and Mark Hamilton 'Mathematical Gauge Theory'.

Numerical Simulation of Stern Gerlach Experiment

UAE | 2020

Computational Physics simulation of magnetic fields of arbitrarily shaped conductors given magnetization, and a 2nd order accurate methodology for solving the time dependent Schrödinger equation.

Soft Haptics Physics Literature

UAE | 2020

Theoretical physics analysis of multiple techniques used in the field of soft haptics. The report includes Magneto and Electrostriction, Smart Polymers, Microfluidics, Shape Memory alloys and more.

Decentralized Bioinspired Non-Discrete Model for Autonomous Swarm Aggregation Dynamics

UAE | 2018 – 2019

Algorithmic model developed based on ant movement and aggregation for applications in non-programmable swarm robotic systems. Publication to Applied Sciences.

TEC Control System Development for Thermovibrotactile Funneling Applications

UAE | 2018

Research in the psychophysical Thermovibrotactile funneling illusion. Design, Simulation, Implementation of digital active feedback control system.

Non-Contact Roughness Detection Methodology based on HCSR04 Ultrasonic Artefacts

UAE |2018

Implementation of Artificial Neural Networks learning to analyze artefacts of ultrasonic sensors and determine the roughness (proportional to ultrasonic scattering) of different materials

Design, Simulation & Development of Assistive Technology for Visually Impaired People, based on Echolocation.

Greece | 2015 – 2016

Design of echolocation emulating vibrotactile vest for visually impaired people. Algorithm for real-time ultrasonic environment mapping was developed and applied to development of low-cost assistive device

SKILLS & COURSEWORK _____

Theoretical Physics & Math – Coursework. Quantum Field Theory (Graduate Course), Differential Geometry, General Relativity, Real Analysis, Complex Analysis, Partial Differnetial Equations, Quantum Mechanics II, Honors Abstract Algebra, Numerical Analysis, Computational Physics /

Physics & Engineering – Coursework. Mechanics, Statistical Mechanics, Quantum Mechanics, Electricity and Magnetism, Special Relativity, Advanced Physics Laboratory, Computational Physics, Advanced Circuits, Digital Logic, Programming (C++), Applied Machine Learning |

Programming. C++, C, Python, Geant4, Java, MATLAB, JavaScript, Qiskit. |

Formatting. HTML, CSS, PHP, LaTeX |

Software. Mathematica, SolidWorks, Fusion 360, OnShape, COMSOL, Overleaf, Adobe CC, Eagle, Upverter, Unity, Blender, Conda, Qt, Processing, Davinci Resolve, Cadence, QUCS, LTspice. |

Hardware. Arduino, Raspberry Pi, Circuit Prototyping, 3D Printing, Laser Cutting, CNC, Machining, Electronics

KEYNOTES & WORKSHOPS _____

Proposed TEDx NYUAD Speaker

UAE | 2021

(Event Cancelled due to COVID-19 Pandemic) Why should ants help us design the algorithms of tomorrow.

Workshop Facilitator at WeSTEM Conference

UAE | 2019

Designed the curriculum and conducted a workshop for high school students on the physics and engineering of sound waves through an interactive experiment. More information can be found in the workshop handout.

Invited Speaker at Microsoft Greece's 25-Year Celebration

Greece | 2018

Panel Discussion at Microsoft Greece's 25 - Year Celebration in Greece. Panel speaker alongside with Dr. Dimitri Nanopoulos, about the evolvement and integration of technology in all sectors in everyday and academic life.

Invited Speaker at the Global GeoGebra Gathering

Greece | 2018

Presentation of Research project in Mathematics "Math and Art in Athens". Geometrical patterns around Ancient Greek Monuments were analysed. How do hyperplatonic solids might look like through extrapolation of 3D patterns? International Conference on Mathematics hosted in Linz, Austria.

Workshop in the International e-Life Congress

Greece | 2017

Workshop on Gamification in International Conference. Desined the syllabus and conducted a workshop to teachers presenting how to use Unity 3D and Microsoft's Project Spark to gamify learning experiences by using the idea of including learning opportunities subconsciously throughout the story of the game, rather than the traditional educational game approach.

Technology in Education Workshop organizer

Greece | 2016

Lead the team of Microsoft Student Ambssadors Greece, under Microsoft Education Global, in organising the international conference "STEM from Students... To Students, Parents, and Teachers." The event aimed in increasing awareness for STEM in Greece by inviting speakers from UK, US, Pakistan, Greece, and more. The workshop conducted was on gamification principles and C++ programming.