Georgia Zachou

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Objective

Driven by a passion for understanding the laws of the universe, I strive to expand my knowledge across various areas of physics while pursuing a deeper understanding for theoretical physics. Guided by my interests in QFT, General Relativity and cosmology, I have chosen to pursue my thesis on "Inflation in string-induced spacetime with Torsion" under the supervision of Prof. Nikolaos Mavromatos.

I have demonstrated the ability to:

- Rapidly adapt and learn new concepts, technologies and methodologies.
- Effectively communicate and collaborate with colleagues.
- Take initiative and lead projects.

I am open to new challenges that will allow me to improve even further academically and lay the foundations for an independent research career.

Education

National Technical University of Athens October 2019 - Present
School of Applied Mathematical and Physical sciences
BSc. with integrated M.S. in Applied Physics (**ECTS: 300**) **GPA: 8.78/10**
Specializations: Theoretical and Computational Physics, Nuclear and Particle Physics
Thesis: Inflation in String-Induced spacetime with Torsion (in progress)
Expected graduation: February 2025

Skills

Technical skills: Python, MatLab, Fortran, C++, HTML
Software tools: KiCad, LTSpice, Arduino IDE
Others: GIT, Latex, Excel, Word, PowerPoint, Gnuplot
Languages: English (C2), French (B2)

Experience

NCSR "Demokritos" Theoretical High Energy Physics Department Athens, Greece
Intern July 2024 - August 2024

Explicit calculations of currents in the context of SMEFT & LO study of top-philic Z'production in HELAC

- Practiced analytical scattering amplitudes calculations using Feynman rules for QED and QCD interactions.
- 1st Project: Performed symbolical calculations within the framework of Standard Model Effective Field Theory. Developed a Python library to compute currents based on three specific SMEFT operators O_{uG}, O_{uH} and O_{HG}. The symbolically calculated currents could be used for recursive computations at a tree-level in HELAC-PHEGAS interface in the framework of SMEFT. The library is accessible via GitHub (link), and the results are accessible through ipynb files.
- 2nd Project: Implemented the top-philic Z' model, as known from the literature: "Probing TeV scale Top-Philic Resonances with Boosted Top-Tagging at the High Luminosity LHC", in the FORTRAN based interface HELAC-PHEGAS and studied a simple resonance decay to two top-antitop pairs at Low-Order (LO) perturbation theory and compared the transverse momenta (pT) and pseudorapidity (η) distributions of this model to the SM.

The full report is accessible on my personal website (material section).

CERN TE-MPE-PE Department Geneva, Switzerland
Technical Student February 2023 - March 2024

Library for LTS & HTS magnet simulations

In the context of the new Muon Collider project, I collaborated with the STEAM team at TE-MPE-PE department.

- Developed a C++ library of material properties with wrappers for integration into interfaces that are based on

other programming languages like MatLab, Python.

- Ensured the compatibility of the library with simulation tools such as COMSOL, FiQuS (through GetDP), LEDET and BBQ. Worked mainly with MatLab, C++ and Python (Jinja2, pandas, numpy).
- Created compilation and unit tests to validate the performance of the newly generated functions against the previously used ones.
- Built and maintained STEAM-Material-library's website using MkDocs on GitLab.
- Set up pipelines on GitLab for automated compilation, testing and website deployment.
- Participated as a Co-author on the paper: An Open-Source 3D FE Quench Simulation Tool for No-Insulation HTS Pancake Coils.

White Noise — Avionics & Payload team — Athens, Greece
Software Engineer — January 2022 - October 2022

KiCad designs

White Noise is NTUA's Rocketry team supported by LSF . Project Cronos is the current project of the team and it is dedicated to the EUROC and IREC contests.

- I got familiar with pcb designing with Kicad and python and C++ applications.
- I built the PCB board for payload. It controls 4 servos and has a magnetometer and accelerometer breakout boards connected.
- I calibrated the magnetometer, and ran tests with the accelerometer and magnetometer. My involvement with the avionics team included an effort to write drivers in C for the accelerometer chips on the data logger PCB.

QSilver — Athens, Greece
Mentor (volunteer) — 21 March 2022 - 3 April 2022

Quantum Computing Seminar

I volunteered as a mentor at QGreece's workshop, QSilver, on quantum computing and programming focusing on complex numbers QFT and Shor's Algorithm.

Workshops

- SUMTRAIC (August 27-September 6, 2024), Institute for Plasma Physics-Czech Republic – Presentation link
- Spring school of gravity and cosmology 2024 (April 24-26, 2024), National Observatory of Athens
- Spring school of gravity and cosmology 2023 (May 20-22, 2023), National Observatory of Athens
- 2nd EPS TIG Hands-on event for sciences, technology & interfaces at CERN (September 30- October 2 2022)
- 57th summer school, National Centre for Scientific Research "Demokritos" (July 11-15, 2022)
- QGreece's workshops, QBronze (February 20-28, 2021) & QSilver (April 11-16, 2022)

Other Activities & Certificates

- 4th position at the Nationals of pentathlon, 2016 (Dedicated athlete for more than 11 years).
- Diploma of Harmony/6 years piano lessons, 2016.
- 7th position at the Nationals of Philosophy, 2018 (University of Patra & Harvard University).
- Molyvoti, Thrace, Archeological Project by Princeton University – Ephorate of Antiquities of Rhodope (Greek Ministry of Culture and Sports), 2019 (volunteer).
- Tenea Archeological Project by the Greek Ministry of Culture and Sports, 2019 (volunteer).
- COSPAR 2022, 44th Scientific Assembly 14-24 July at the post of speak & ready area; attended many lectures.

Awards

"E. Anastasaki & S.D.P. Vlassopoulou" Award of Excellence for the years 2019-2020 & 2020-2021.