

Stavros Klaoudatos

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Education

• California Institute of Technology *B.Sc in Physics*

Pasadena,
California, US
September
2022 – Present
GPA: 4.1

Research: - Higgs-like Cascade Decays in NMSSM under Professor Spiropulu
- Half-Index q-Series Invariants for Plumbed Manifolds under Professor Gukov

Clubs: Strings Club, Physics Club, Math Club, Chess Club, Student Investment Fund

• Athens College - HAEF

Primary and Secondary Education

Did not finish as I was admitted to Caltech one year earlier.

IB1 Grade: 41/42, Music Club, Founder of Chess Club,

Entrepreneurship Club, Math Club, Physics Club

Athens, Greece
September 2012 –
July 2022

Experiences

• Summer Undergraduate Research Fellowship Project on Higgs Physics

Pasadena, USA
June-August 2023

Researcher in Particle Physics

- Worked under Professor Spiropulu from Caltech and Dr. Dutta from Fermilab on the behavior of Higgs-like particles in the Next to Minimally Supersymmetric Standard Model (NMSSM) and created an algorithm to discriminate between signal and background in the Cascade Decay $X \rightarrow HY \rightarrow b\bar{b}\gamma\bar{\gamma}$.

• Summer Undergraduate Research Fellowship Project on the 3D Ising Model and CFTs

Chicago, USA
February-Present
2024

Researcher in Mathematical Physics

- Currently working under Fermilab Senior Scientist Dr. Fleming on understanding the geometry of the manifold on which a 3D Ising model is defined from the perspective of the critical surface. The goal is to use Affine transformations to model how the coupling constants describe the geometry via an induced metric.

• Quantum Mechanics [Book](#)

Athens, Greece
December 2020

Author

- Self-Learning: I used Susskind's and Griffith's books to learn Quantum, and then, I tried to explain the contents in the way I understood them.
- Typesetting: Used LaTeX to typeset the book and then publish it.

• Study of Geodesics and Arc Lengths on Curved 2D Spaces [\[Code\]](#)

Athens, Greece

Independent Learner

October 2021

- Created a program that curves a flat 2-dimensional space based on the parametrization given and proceeds to use extrinsic geometry to compute the Levi-Civita Connection Coefficients. It solves the Geodesic Equation, and can compute the arc length along a path specified.

- Athens College

Athens, Greece

Lecturer (Physics Club)

September 2020 – July 2022

- Classical Mechanics: I gave a series of lectures on Classical Mechanics, specifically on moving from a Newtonian Frame to a Lagrangian and subsequently to a Hamiltonian Formulation. I covered the typical calculus of variations problems and derivations of formulas, Hamilton's equations, Gibbs Liouville Theorem, etc.
- Relativity and Classical Fields: I used Goldstein as my guiding resource; however, I was not allowed to go in-depth on the Lorentz Group and Covariant Lagrangian Formulation
- Quantum Mechanics: Delivered a number of lectures on Superposition and Spin, Composite Systems, Heisenberg and Schrödinger Picture and the Quantum Harmonic Oscillator
- General Relativity: Gave a Lecture on Einstein's Field Equations and some of their consequences: Schwarzschild Solution, Kerr Solution, Newman-Janis algorithm, Gravitational Waves

Publications

Klaoudatos, S. (2021). "Quantum Mechanics for Starters. Amazon."

Projects

- SURF 2024: CFT theory to understand the Critical Surface of 3D Ising on \mathbb{R}^3 and S^3 in order to understand geometry.
- SURF 2023: DNN and BDT to discriminate between signal and background for the $X \rightarrow HY \rightarrow b\bar{b}\gamma\bar{\gamma}$ decay in the NMSSM.
- Debiria: [Website](#) with Lecture Notes on basic Classical and Quantum Mechanics.
- Ising Model Simulation in \mathbb{R}^2 . [[code](#)]
- Virtual Assistant: Helps save time on day-to-day tasks
- Physics Simulations: Drawing orbitals based on Quantum Numbers, and simulating a wavefunction's interaction with a well. [[code](#)]

Courses Taken and Programs Attended

- Ph236a (Graduate): General Relativity, Schwarzschild Black Holes, Kerr Black Holes, Reissner–Nordström Black Holes, Killing Fields, Penrose Diagrams, Penrose Process, Newman Janis Algorithm
- Ph229b (Graduate): Advanced Mathematical Methods in Physics: Clifford Algebras, Spinor Bundles, Characteristic Classes, Chern-Simons Theory, Index Theorems, Hall Conductance
- Ph205abc (Graduate): Relativistic Quantum Field Theory: Second Quantization, Free Field Theory, Dirac Theory, Lorentz Group, QED and Renormalization, Scattering Theory, non-Abelian Gauge Theory, Higgs Physics, Anomalies, Weinberg Salam, Renormalization
- Ma146ab (Graduate): Reidemeister Theorem, Knot Operations, Knot Group, Seifert Surfaces, Alexander Polynomial, Jones Polynomial, Concordance, Colored Polynomial, Knot Homology, R-Matrix, HOMFLY-PT, Categorification of HOMFLY-PT, RT Invariants, MOY Calculus

- Machine Learning Course by Stanford
- Game Theory Course by Stanford
- John Hopkins CTY Program (Data and Chance): Grade: Excellent Activities and societies: High Honours in Verbal and Quantitative Ability, High Honours in Spatial Reasoning, Being among the Highest Scoring Participants
- John Hopkins CTY Program (Sensory Biology): Grade: Excellent Activities and societies: High Honours in Verbal and Quantitative Ability, High Honours in Spatial Reasoning, Being among the Highest Scoring Participants
- John Hopkins CTY Program (Theoretical Physics): I was accepted to the theoretical physics program, but was unable to attend due to covid restrictions
- COSPAR Scientific Assembly: I attended a scientific assembly on space science, where I was exposed to a lot of current research that the AMS team is doing, including a study of antiprotons up to 100GeV, Determining the Origins of Cosmic Electrons and Positrons in the TeV range, and my favorite presentation on the equivalence principle, where a scheme was presented which allows a fully covariant description of a violation of the Equivalence Principle without modifying the underlying space-time geometry, in the context of a Newtonian Potential with Yukawa Corrections.

Awards and Honors

- Academic Excellence Awards (2020-2022): Received two academic excellence award from the Ministry of Education for my performance
- National Math Olympiad Award (2022): I solved 3/4 problems in Greece's National Math Olympiad
- National Math Competition Award(2021): Received an award for getting one of the highest scores in a National Math Competition
- "Kangouro" Math Competition Award(2020): Received an award for getting one of the highest scores in a National Math Competition
- High Honors in Quantitative and Verbal Reasoning: Received this award two times in a row for my performance in the John Hopkins CTY program
- High Honors in Spatial Reasoning: Received this award two times in a row for my performance in the John Hopkins CTY program
- National Physics Competition Award (2020-2022): Received awards for getting one of the highest scores in National Physics competitions
- Recipient Fletcher Jones Foundation Scholarship: I was awarded a scholarship by the Fletcher Jones Foundation for my studies at Caltech
- Music Scholarship from the Athens Conservatory: I received the first-ever scholarship from the Athens Conservatory to continue my guitar studies while studying at Caltech

Languages

- Greek: Native speaker
- German: Native speaker
- English: Full professional proficiency
- Python
- Swift
- Mathematica