

JOHN ADAMS VILLAMORAN

Physicist & STEM Educator



Personal info

* 10/01/1997
✉ johnadamsv97@gmail.com
📍 No. 17, Ln. 216, Zhongyang Rd., Zhongli Dist., Taoyuan, Taiwan

Links*

🌐 arceon09.github.io
🔄 arceon09
🌐 john-adams-villamoran
🆔 0000-0001-9003-8392

About Me

I am a **dedicated and passionate researcher and science educator** specializing in Physics. Committed to advancing scientific knowledge, I excel at creating a dynamic learning environment that inspires curiosity and critical thinking. My expertise include **theoretical research, data analysis, and STEM teaching** with a strong commitment to continuous learning and academic excellence. My passion for groundbreaking discoveries drives my commitment to pushing the frontiers of knowledge in physics. I bring a deep understanding and enthusiasm for science and mathematics to both my research and teaching roles.

RESEARCH EXPERIENCE

National Central University

Full-time, Research Assistant

CENTER FOR HIGH-ENERGY & HIGH-FIELD PHYSICS - FUNDAMENTAL PHYSICS THEORY GROUP

JANURAY 2024 – SEPTEMBER 2024

- Performed scientific research on Theoretical Physics specializing in gravity, cosmology, and high-energy physics
- **Responsibilities:**
 - Conducting extensive literature reviews.
 - Developing and implementing new theoretical models.
 - Performing complex mathematical calculations through computational methods (using Wolfram Language - Mathematica) and by hand.
 - Preparing research notes and presentations (in LaTeX).
 - Mentoring and teaching undergraduate and graduate students in their research endeavors.
 - Collaborating with colleagues to discuss and refine research ideas.
- **Research Projects:**
 - Finite-size effects in Aharonov-Bohm production of fermions from cosmic strings (gr-qc, hep-th)
 - On the propagation of neutrinos in curved spacetimes (gr-qc, hep-th)
 - Study of gravitational waves from cosmological sources (gr-qc, hep-th)

Part-time, Research Assistant

CENTER FOR HIGH-ENERGY & HIGH-FIELD PHYSICS - EXPERIMENTAL HIGH-ENERGY PHYSICS GROUP








CERN - CMS COLLABORATION

SEPTEMBER 2017 – JANUARY 2024






- Played a pivotal role in the CMS Collaboration at CERN, where I was responsible for conducting comprehensive data analysis to support high-energy physics experiments
- **Responsibilities:**
 - Collecting, processing, and interpreting large datasets from the CMS detector.
 - Developing and implementing algorithms for data analysis (using ROOT/C++, and PyROOT/Python).
 - Preparing research papers, notes, and presentations.
 - Collaborating with international teams to share findings and methodologies.
- **Research Projects:**
 - Search for the rare Higgs Dalitz decays in proton-proton collisions at the LHC during the Run-2 era using the CMS Detector (hep-ex)
 - Data quality monitoring of the CMS Detector Electromagnetic Calorimeter (ECAL) and Preshower (hep-ex)
 - Electron and photon reconstruction and identification with the CMS experiment at the CERN LHC (hep-ex)
 - Muon and Photon trigger efficiency measurements for the CMS Collaboration (hep-ex)

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Skills

-  critical thinking · problem solving · attention to detail · flexible approach · easily adaptable · organization skills
-  analytic skills · reasoning skills · research skills · competitive intelligence
-  collaborative work · oral and written communication · teamwork
-  Physics · Mathematics · STEM Education · Data Science
-  Teaching & tutoring · Academic advising · Mentoring · Constructive feedback
-  C++/ROOT · C · Python/PyROOT · Wolfram Language (Mathematica) · Bash · Git
-  L^AT_EX · Microsoft Office · Adobe Acrobat


Languages

-  English (Native)
-  Filipino (Native)
-  Chinese (Beginner)
-  Japanese (Beginner)
-  Spanish (Beginner)

Selected Publications*

-  CMS Collaboration (2021). "Electron and photon reconstruction and identification with the CMS experiment at the CERN LHC." JINST 16 (2021) P05014.

Selected Talks*

-  Search for $H \rightarrow \gamma^* \gamma \rightarrow \mu \mu \gamma$ using full Run-2 data collected by the CMS detector. TPS (2023) P1-PF-012.

Research Intern

CENTER FOR HIGH-ENERGY & HIGH-FIELD PHYSICS - EXPERIMENTAL HIGH-ENERGY PHYSICS GROUP
JUNE 2016 – JULY 2016

- This internship deepened my analytical skills providing a robust framework for future research endeavors.
- Responsibilities:
 - Collaborated with a multidisciplinary team to analyze data from high-energy physics experiments.
 - Utilized statistical tools and software (e.g., Python, ROOT) to process and visualize large datasets.
 - Developed and implemented algorithms for data filtering and event reconstruction.
 - Assisted in preparing presentations and reports to communicate findings, contributing to team meetings and seminars.
 - Gained hands-on experience with cutting-edge technologies in a fast-paced research environment, reinforcing a strong foundation in data analysis methodologies.

TEACHING EXPERIENCE

Shane English School

Part-time, English as a second language (ESL) Teacher

SEPTEMBER 2024 –PRESENT

- Responsible for teaching English as a second language to students ranging from elementary to high school levels.
- Responsibilities:
 - Facilitating interactive classroom discussions.
 - Providing individualized support to students.
 - Utilizing various teaching methodologies to enhance language proficiency in reading, writing, speaking, and listening.
 - Assessing student progress through assignments, quizzes, and exams.
 - Providing constructive feedback to foster academic growth.
 - Collaborating with colleagues to ensure a supportive and effective educational environment.

National Central University

Part-time, Teaching Assistant for Mathematical Physics

JANUARY 2024 –AUGUST 2024

Part-time, Teaching Assistant for Special Relativity


SEPTEMBER 2021 –JANUARY 2022

- Provided teaching assistance for the Special Relativity and Mathematical Physics III course offered by the university to undergraduate and graduate students of the Department of Physics.
- Responsibilities:
 - Assisting in the preparation and delivery of course materials.
 - Conducting tutorial sessions.
 - Facilitating discussions and clarifying complex concepts.
 - Grading assignments and exams.
 - Coordinating with the lead instructor to enhance the overall learning experience.
 - Organizing study groups.
 - Creating supplementary educational resources.

* Hover over and click on text to access hyperlinks.

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Personal Notes*

 *Notes on Theoretical Physics: Mathematical and Fundamental Physics. On-going. Click here for a preview*.*

Honors & Awards*

2024	<i>Excellent Research Poster.</i>
2017	<i>MOST Taiwan Scholarship.</i>
2017	<i>Cum laude.</i>
2017	<i>Academic Excellence Award.</i>
2017	<i>Albertus Magnus Award.</i>
2017	<i>1st Place in the Applied Physics Thesis Poster Exhibit.</i>
2017	<i>3rd Place in the Physiklaban 2017 Intercollegiate Physics Quiz Bee.</i>
2017	<i>1st Place in the 6th Face the Physics Challenge.</i>
2013-2017	<i>Dean's Lister (7 Times).</i>

Hobbies

-  Reading books and research articles
-  Journal writing
-  Studying and writing notes on math & physics
-  Playing video games
-  Photography

Preply Part-time, Physics Tutor SEPTEMBER 2024 –PRESENT

- Responsible for providing personalized instruction in mathematics and physics subjects to students ranging from middle school to college levels.
- Responsibilities:**
 - Utilizing various teaching methods and tools (such as Desmos and PhET).
 - Monitoring student progress through regular assessments.
 - Providing constructive feedback to foster academic growth and confidence

Freelance Part-time, STEM Tutor MARCH 2013 –PRESENT

- Responsible for providing personalized instruction in mathematics and science subjects (including physics, chemistry, and biology) to students ranging from middle school to college levels.
- Responsibilities:**
 - Utilizing various teaching methods and tools (such as Desmos and PhET).
 - Monitoring student progress through regular assessments.
 - Providing constructive feedback to foster academic growth and confidence.

EDUCATION

Master of Science in Physics Experimental High-Energy Physics National Central University (NCU) TAOYUAN, TAIWAN SEPTEMBER 2017 – JANUARY 2024

- Thesis:** Search for $H \rightarrow \gamma^* \gamma \rightarrow \mu\mu\gamma$ using full Run-2 data collected by the CMS detector.
- Relevant courses:** Classical Mechanics · Classical Electrodynamics · Statistical Mechanics · Quantum Mechanics · Quantum Field Theory · General Relativity · Group Theory and Symmetry in Physics · Modern Cosmology · Special Topics in Gravitation & High-Energy Physics · Special Topics in Teaching Physics











Bachelor of Science in Applied Physics Major in Instrumentation University of Santo Tomas (UST) METRO MANILA, PHILIPPINES AUGUST 2013 – MARCH 2017

- Relevant courses:** Mathematics (College Algebra, Trigonometry, Analytic Geometry, Differential & Integral Calculus, Differential Equations, Linear Algebra, Vector Analysis, Probability & Statistics) · General Physics · Modern Physics · Mathematical Physics · Computational Physics · Electronics · Instrumentation · Photonics · Solid State Physics · Theoretical Mechanics · Electromagnetic Theory · Thermodynamics & Statistical Mechanics · Quantum Mechanics
- General education courses:** Logic · Socio-anthropology · General Biology · General Inorganic Chemistry · General Psychology · Economics & Taxation · Ethics · Art Appreciation · Philosophy of Science

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Mathematics & Physics Knowledge

-  Gravity with applications to Astrophysics & Cosmology
Research level
-  Classical & Quantum Field Theory
Research level
-  High-Energy Physics (Particle Physics, Accelerator Physics)
Research level
-  Mathematical Physics
Graduate level
-  Statistical Data Analysis
Research level
-  Graduate Physics (Classical Mechanics · Quantum Mechanics · Classical Electrodynamics · Thermodynamics & Statistical Mechanics)
Graduate level
-  General & Modern Physics (Mechanics · Waves · Optics · Heat & Thermodynamics · Electromagnetism · Quantum physics · Special Relativity · Solid-state Physics · Photonics)
Graduate level
-  Calculus & Analysis (Real Analysis · Complex Analysis · Vector & Tensor Analysis · Ordinary & Partial Differential Equations · Numerical Analysis)
Graduate level
-  Algebra (Linear Algebra · Group Theory)
Graduate level
-  Geometry (Trigonometry · Analytic Geometry · Riemannian Geometry)
Graduate level

References

Available upon request.

SERVICE & LEADERSHIP

- President of the UST Applied Physics Society (2016 – 2017)
 - Innaugurated the annual **Astronomy Night - Telescope Viewing Event** of the University of Santo Tomas, in partnership with the UST College of Science Student Council. Featured in an article in the **Vol. LXXXIX, No. 9 issue of The Varsitarian** (*Science, Applied Physics Society collaborate for a 'night full of stars'**) on May 4, 2017.
- Board Member of the UST College of Science Activities Coordinating Board (2016 – 2017)
- Board Member of the Philippine Union of Student Organizations for Astronomy (2016 – 2017)
- Assistant Treasurer of the UST Applied Physics Society (2015 – 2016)
- Member of the UST Applied Physics Society (2013 – 2017)
- Member of EARTH-UST (2013 – 2017)
- Member of Samahang Mag-aaral sa pagpapaunlad ng Pisika (SMPP) (2016 – 2017)
- Member of the UST Mechatronics and Robotics Circle (2015 – 2017)
- Member of the UST College of Science COMELEC (2013 – 2014)

