Mert Okyay
Curriculum Vitae
Physics PhD Applicant

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BRIEF PROFILE AND RESEARCH INTERESTS

Aspiring experimental/theoretical physicist with interest in modeling quantum systems with the aim of working in the intermediary. Experience ranges from experimental biophysics to theoretical general relativity to educational software development in XR.

EDUCATION

University of Miami — **Coral Gables, Florida**

- *Bachelor of Science in Pure Physics* - ***Major GPA:3.92*** — Graduation May 2022
  Bachelor of Science in Mathematics – Pure Track – ***Major GPA:3.96***
  CGPA: 3.92 with Departmental Honors in Mathematics
  Minor in Philosophy

Physics GRE: **960/990 (92%)** — Sept 2021
TOEFL: **115/120** L**:30/30 R: 28/30 S:27/30 W:30/30** — Nov 2017

SKILLS AND NOTABLE COURSEWORK

- **Technical: Mathematica, Python, C#, Unity, LaTeX, Java**, SQL, MATLAB, HTML, PHP, Verilog, ModelSim
- **Online courses and certificates:**
  - Simulation and modeling of natural processes, University of Geneva – Coursera
  - Machine Learning, Stanford University – Coursera
  - International Winter School on Gravity and Light, University of Erlangen-Nuremberg, Online
  - 25th APCTP Winter School on Fundamental Physics – Online
  - International School on The Interstellar Medium of Galaxies 2021
  - IBM Quantum Challenge 2021 – Advanced Certificate
- **Graduate Level Courses:**
  - **Physics:** Classical Mechanics, Quantum Computing, Mathematical Methods, General Relativity, Astrophysics, Modern Quantum Chemistry
  - **Mathematics:** Abstract Algebra, Real Analysis, Topology

RESEARCH EXPERIENCE

Eastern Mediterranean University **(Remote)**

Summer Research Scholar – General Relativity and Mathematical Physics May 2021 – Sept 2021

- Developed a Mathematica package on accretion discs, currently adopted by **50+** researchers
- Simulated trajectories of 5000+ light rays around various black hole models with **98%** numerical accuracy.
- Paper **published** by Journal of Cosmology and Astroparticle Physics (JCAP) on Jan 4 2021.

University of Miami, Department of Physics **Coral Gables, Florida**

Research Scholar, Nico Cappelluti, X-Ray Cosmology May 2020 – present

- Conducting Bayesian data analysis of datasets of size **7,000,000+** using Python to calculate the environmental density of color-selected Green Pea galaxies using the Pegasus Cluster
- Programmed model fitting pipeline using MCMC methods for dark matter models with **~4%** error
- Developed Python package to compute cosmological correlation functions. Paper **in preparation.**

Research Assistant – Dr Nepomechie, Quantum Information and Computing Aug 2021 – Jan 2022

- Developed prescription for measuring observables in probabilistic algorithms with quantum advantage
- Analyzed plausibility of measuring spin chain correlation functions by deriving exact formulas and upper bounds for success probability, number of shots, amplification iterations and circuit depths
- Paper **submitted** for review.

Research Scholar – Stewart Barnes, Condensed Matter Theory Dec 2021 – present

- Developing a new theoretical framework for understanding and utilizing piezoelectricity in quartz crystals
- Analyzing a classical circuit coupled to a quantum system to understand theory of measurement

Research Assistant, Chaoming Song,Networks and Complexity May 2021 – present

- Conducting data analysis on COVID-19 infection and death statistics.
- Developed a webscraper detecting and explaining outliers in data using news articles

Research Assistant, Quantum Optics Lab August 2019 – May 2020

- Implemented FPGA boards to multiphoton interference experiments for sensor interactions
- Developed on the logic design of a possible FPGA circuit using Verilog through ModelSim simulations for manufacturing.
- Achieved a **3-fold** increase in beam count and **10-fold** increase in pulse separation precision in simulated Michaelson interferometry setups

Research Assistant, Klein Biophysics Lab December 2018 – January 2019

- Performed 20+ experiments in measuring the behavioral response of Drosophila larvae mutants to mechanical stimuli
- Analyzed 20+ hours of visual experiment data with Matlab and LabVIEW
- Maintained 2 experimental equipment setups for speed and accuracy of the experiments
- Maintained 4 mutant fly larvae colonies, responsible of feeding, breeding, monitoring

PUBLICATIONS AND PREPRINTS

- Li, W; Okyay, M; Nepomechie, R.L, *Bethe states on a quantum computer: success probability and correlation functions.*[arXiv:2201.03021 [quant-ph]] Manuscript submitted for review.
- Okyay, M. and Övgün, A., "*Nonlinear electrodynamics effects on the black hole shadow, deflection angle, quasinormal modes and greybody factors,"* [arXiv:2108.07766 [gr-qc]]. Published 4 January 2022 JCAP01(2022)009.
- Berne, Alexander C, et al., *"Mechanical vibration patterns elicit behavioral transitions and habituation in crawling Drosophila larvae",* [bioRxiv 2021.04.26.441415]; doi: https://doi.org/10.1101/2021.04.26.441415

GRANTS AND AWARDS

- Early Career Researcher Award, Institute for Data Science and Computing, 2020.
- Highest Productivity Award (as UM Innovate), UM Information Technologies, 2020.
- Finalist, 8th Global Investment Banking Valuation Olympiad, 2019.
- International Student Grant, University of Miami, 2018.
- Dean's List, Provost's Honor Roll – Every Semester, President's List 2018.

PROJECTS

For a detailed list and descriptions of code projects, please refer to my website.

- Quantum Gravity in the Lab – Qiskit implementation
- Bethe eigenstates and correlation functions on a quantum computer – Qiskit implementation
- Geodesics calculator and accretion intensity plot – Mathematica
- Web scraper for COVID-19 anomalies – Python
- AR Stairs – a real time calculation of static moments using AI and AR – C#
- AR Statics – AR modeling of beams for Mech.Eng education – C#

WORK EXPERIENCE AND LEADERSHIP

University of Miami, UMIT Innovate **Coral Gables, Florida**

Core Programmer, XR Garage April 2020 – present

- Built the **first** app that integrates real time image processing and 5G network connection for education on an XR Device (Magic Leap) at UM
- Achieved **95%** accuracy in image recognition model in TensorFlow with Magic Leap camera
- Delivered two applications that enhanced is used in 10+ classrooms 2+ courses in mechanical engineering, in **half** the allocated development time (6 months/12 months expected)
- Worked in a collaborative team environment with Agile Methodology, with meetings every morning and progress presentations every week

Council of International Students and Organizations (COISO) **Coral Gables, Florida**

Vice Chair for Middle East and Europe Night, International Week 2019 2018 – 2019

- Put together a night on Middle Eastern and European culture to celebrate diversity
- Wrote a script that earned the Best Script Award and recruited people to act in an hour-long play about the struggles of being an immigrant
- Arranged cultural shows from local performers and organized various culture-based attractions
- Managed catering of cultural food from local vendors

MEMBERSHIPS

- APS Member
- SPS Member
- COISO International Representative