

ISMAEL MENDOZA

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EDUCATION

University of Michigan

PhD Physics and Scientific Computing, **GPA: 4.00**

Ann Arbor, MI

Expected June 2024

Stanford University

MS Computer Science, **GPA: 3.74**

Stanford, CA

September 2018 - June 2019

- **Research in Statistics and Cosmology:** “Olber’s Paradox Revisited – Effects of Overlapping Sources on Cosmic Shear Estimation: Statistical Sensitivity and Pixel-Noise Bias”

BS Physics with Honors — Minor in Statistics, **GPA: 3.86**

September 2014 - June 2018

- **Honors Thesis:** “No escape: light waves in AdS” (Link: <https://purl.stanford.edu/vf208qp2190>)

RESEARCH EXPERIENCE

Probabilistic Modeling with Machine Learning in Cosmology

University of Michigan, MI

Advisor: Jeffrey Regier (Statistics)

October 2019 – Present

- Developing a probabilistic framework to measure visually overlapping (blended) galaxies in state-of-the-art astronomical surveys like LSST.
- Building a deep generative model to characterize blended galaxies using variational autoencoders.

Computational Cosmology

University of Michigan, MI

Advisor: Camille Avestruz (Cosmology)

September 2019 – Present

- Using dark matter halo catalogs based on N-body simulations and a variety of statistical approaches to tie together dynamical history and snapshot properties of halos.

Observational Cosmology and Data Analysis

Stanford, CA

Advisor: Patricia Burchat (Cosmology)

June 2015 – Present

- Developed a statistical framework for weak gravitational lensing that provides a comprehensive analysis of shape measurement noise bias for blended galaxies.
- Performed large scale galaxy simulations and measurements using Stanford’s High Performance Computing cluster.
- Presented my work in poster fairs and in several of the Dark Energy Science Collaboration’s meetings.
- Currently preparing journal article for submission to the Journal of Cosmology and Astroparticle Physics that assesses the impact of blending on cosmic shear estimation for various astronomical surveys.

Biostatistics

Stanford, CA

Advisor: Julia Palacios (Statistics and Biomedical Data Science)

September 2018 – June 2019

- Implemented efficient algorithms for calculating the likelihood of phylogenetic trees simulated from coalescent models.
- Developed Bayesian statistical framework to calculate the probability of correct classification between two different population size histories for large sample sizes and loci.

Convex Optimization

Lausanne, Switzerland

Advisor: Nisheeth Vishnoi (Theoretical Computer Science)

June 2018 – September 2018

- Participated in Summer@EPFL CS program at the École polytechnique fédérale de Lausanne (EPFL).
- Designed and executed a project at interface of optimization, cosmology, and Riemannian geometry.
- Developed manifold optimization algorithms to measure galaxy shapes from surface brightness profiles.
- Used non-convex optimization techniques to mathematically show the high efficiency of my algorithm.

General Relativity and Field Theory Honors Thesis

Advisor: Eva Silverstein (Cosmology)

Stanford, CA

June 2017 – June 2018

- Developed a framework for understanding scattering processes in manifolds by combining insights from quantum scattering theory, differential geometry, and partial differential equations.
- Applied framework to successfully resolve paradox of light waves traveling in Anti-de Sitter space.
- Simulated complex wave scattering processes using Mathematica.
- Presented work as my undergraduate Honors Thesis to the Stanford Physics Undergraduate Committee and at the Stanford Symposium of Undergraduate Research (SURPS).

TEACHING EXPERIENCE

Statistics Teaching Assistant at the University of Michigan

Ann Arbor, MI

- **Courses:**

- Statistics 507: Data Science and Analytics using Python

August 2020 – Present

Physics Teaching Assistant at the University of Michigan

Ann Arbor, MI

- **Courses:**

- Physics 136: Physics for the Life Sciences Laboratory I
 - Physics 141: Elementary Laboratory I

September 2019 – December 2019

January 2020 – April 2020

- Guided students through a series of physics experiments including analysis of their measurements.

Physics Teaching Assistant at Stanford University

Stanford, CA

- **Courses:**

- Physics 21: Mechanics, Fluids, and Heat
 - Physics 70: Foundations of Modern Physics

September 2018 – December 2018

September 2017 – December 2017

- Designed and graded weekly problem sets, quizzes, and exams.
- Lead weekly problem-solving sessions aimed at reinforcing student's understanding of lecture.

EPASA: Tutored middle school student in math and English.

September 2016 – June 2018

Habla: Tutored Stanford custodial staff in English 3 hours/week.

September 2014 – June 2018

HONORS AND AWARDS

Stanford Undergraduate Advising and Research Major Grant: Grant recipient for research 2017

Large Synoptic Survey Telescope Corporation Enabling Science Award: Grant recipient for research 2016

45th International Physics Olympiad: Bronze Medalist

2014

PROGRAMMING SKILLS

Python, C/C++, L^AT_EX, Mathematica, Unix shell, Git, R

PUBLICATIONS

Javier Sanchez, Ismael Mendoza, David P. Kirkby, and Patricia Burchat, *Olber's Paradox Revisited – Effects of Overlapping Sources on Cosmic Shear Estimation: Statistical Sensitivity and Pixel-Noise Bias*, in collaboration review.

PRESENTATIONS

Blending ToolKit Tutorial, Ismael Mendoza, Dark Energy Science Collaboration (DESC) Summer 2020 Virtual Meeting, Chicago, IL. July 2020 (virtual)

The Blending Problem in Cosmology, Ismael Mendoza, Physics Graduate Student Symposium 2020, Ann Arbor, MI. July 2020 (virtual)

BlendingToolKit: Walkthrough and Future Plans, Ismael Mendoza, DESC Blending Working Group. July 2020 (virtual)