



# Nhat-Minh Nguyen, PhD

*Cosmologist, Leinweber Research Fellow*

[Webpage](#) [ORCID](#) [GitHub](#) [LinkedIn](#) [Twitter](#)

## Research Interest

Growth of Large-scale Structure in the Universe.

## Scientific Expertise

Field-level, forward-modeling of large-scale galaxy redshift surveys (galaxy clustering, galaxy intrinsic shape alignment); Cosmic microwave background radiation (gravitational lensing, Sunyaev-Zel'dovich effects)

## Domain Knowledge

### Skills

**Bayesian inference with explicit likelihood (hierachical models, advanced sampling methods); Simulation-based inference with implicit likelihood (AI/ML methods for density estimation); Large-scale, high-performance computing; Big-data analysis**

### Experience

**Python [Numpy, Scipy, TensorFlow, JAX, PyTorch, Dask, sbi, optuna, wandb], C++, ROOT [pyROOT], OpenMP Parallel, MPI Distributed & Differentiable Programming (in Python, C++)**

## Affiliation

### Postdoctoral Research Fellow, Leinweber Prize Fellowship

Leinweber Center for Theoretical Physics, Physics Department, University of Michigan

Jan 2022 - now

### Postdoctoral Research Associate

Physical Cosmology Group, Max Planck Institute for Astrophysics

Jul 2020 - Dec 2021

### PhD Candidate

Physical Cosmology Group, Max Planck Institute for Astrophysics

Oct 2016 - Jun 2020

## Education

### International Max Planck Research School on Astrophysics (Magna Cum Laude)

Max Planck Institute for Astrophysics, Garching near Munich  
Ludwig Maximilians University of Munich

2016 - 2020, PhD

### Erasmus Joint Master Degree in Astronomy & Astrophysics (with full-ride Scholarships)

University of Göttingen  
University of Rome, Tor Vergata  
University of Innsbruck

2014 - 2016, MSc

### Physics and Theoretical Physics (with Honors and Scholarships)

Ho Chi Minh University of Science

2008 - 2013, BSc

## Collaboration

Dark Energy Spectroscopic Instrument (DESI), Rubin Observatory Legacy Survey of Space and Time - Dark Energy Science Collaboration (LSST-DESC), SimBIG, Aquila Consortium

## Publications

I have authored 11 publications, excluding big-collaboration papers (citations: 206; h-index: 8) [NASA/ADS]; 14 publications, including big-collaboration papers (citations: 380; h-index: 11) [NASA/ADS] [INSPIRE HEP].

First, co-first<sup>1</sup>, or significant  
contributions

**A parameter-masked mock data challenge for beyond-2pt galaxy clustering statistics.** Beyond-2point Collaboration. arXiv preprint. Submitted to The Astrophysical Journal Supplement Series. [NASA/ADS] 2024

**How much information can be extracted from galaxy clustering at the field level?. Nguyen, Schmidt, Tucci, Reinecke, Kostić.** arXiv preprint. Submitted to PRL. [NASA/ADS] 2024

**Sweeping through Horndeski Canvas: a New Growth-Rate Parameterization for Modified-Gravity Theories.** Wen<sup>1</sup>, **Nguyen<sup>1</sup>**, Huterer. JCAP09(2023)028. [NASA/ADS] 2023

**Evidence for suppression of structure growth in the concordance cosmological model.** **Nguyen**, Huterer, Wen. Phys. Rev. Lett. 131, 111001. **Editor's Suggestion.** [NASA/ADS] [SciAm] [NewScientist] [VICE] [UM press] 2023

**Consistency tests of field level inference with the EFT likelihood.** Kostić, **Nguyen**, Schmidt, Reinecke. JCAP07(2023)063. [NASA/ADS] [MPA Research Highlights] 2022

**Field-level inference of galaxy intrinsic alignment from the SDSS-III BOSS survey.** Tsaprazi<sup>1</sup>, **Nguyen<sup>1</sup>**, et al. JCAP08(2022)003. [NASA/ADS] [MPA Research Highlights] 2021

**Impacts of the physical data model on the forward inference of initial conditions from biased tracers.** **Nguyen** et al. JCAP03(2021)058. [NASA/ADS] 2021

**Taking measurements of the kinematic Sunyaev-Zel'dovich effect forward: including uncertainties from velocity reconstruction with forward modeling.** **Nguyen** et al. JCAP12(2020)011. [NASA/ADS] [MPA Research Highlights] 2020

2020

Co-author

**DESI 2024 VI: Cosmological Constraints from the Measurements of Baryon Acoustic Oscillations.** DESI Collaboration. arXiv preprint. Submitted to JCAP. [NASA/ADS] 2024

2024

<b>DESI 2024 IV: Baryon Acoustic Oscillations from the Lyman Alpha Forest.</b> DESI Collaboration. arXiv preprint. Submitted to JCAP. [NASA/ADS]	2024
<b>DESI 2024 III: Baryon Acoustic Oscillations from Galaxies and Quasars.</b> DESI Collaboration. arXiv preprint. Submitted to JCAP. [NASA/ADS]	2024
<b>Exploring the Growth Index <math>\gamma_L</math>: Insights from Different CMB Dataset Combinations and Approaches.</b> Specogna et al. Phys. Rev. D 109, 043528. [NASA/ADS]	2023
<b>Cosmology Inference from Biased Tracers using the EFT-based Likelihood.</b> Elsner et al. JCAP01(2020)029. [NASA/ADS]	2019
<b>A rigorous EFT-based forward model for large-scale structure.</b> Schmidt et al. JCAP01(2019)042. [NASA/ADS]	2018

## Languages

English (Fluent), Vietnamese (Native)

## Upcoming and Recent Talks

**PASCOS 2024, Plenary Session**, Quy Nhon, Vietnam, July 2024.  
PASCOS 2024, Parallel Session, originally invited for a Plenary, rescheduled to dedicate the Plenary for DESI-Y1 results.  
Cosmology from Home, online conference, Youtube, June 2024.  
DESI Research Forum (remote, slides), June 2024.  
**Aspen workshop, "Fundamental Physics in the Era of Big Data and Machine Learning"**, May-June 2024. (Blackboard talk).  
KIPAC Cosmology Seminar, Stanford (remote, slides), May 2024.  
**Cosmology Talks** (with Beyond-2point Collaboration), Youtube, May 2024.  
Fundamental Physics from Future Spectroscopic Surveys, LBNL, Berkeley (recording, slides), May 2024.  
Columbia Cosmology Group Meeting, Columbia University (slides), New York, April 2024.  
CCA Cosmology Meeting, Flatiron Institute, New York (slides), April 2024.  
**Cosmology Talks** (ft. Beatriz Tucci), Youtube, April 2024.  
Newcastle Cosmology Journal club, Newcastle University, Newcastle (remote, slides), April 2024.  
Perimeter Cosmology Seminar, Perimeter Institute, Waterloo (remote, recording), April 2024.  
Midwest Cosmology Network Meeting, US Midwest (remote), April 2024.  
Cosmolunch, CCAPP, University of Ohio (slides), March 2024.  
HEP-Astro Seminar, University of Michigan, Michigan, January 2024.  
Cosmology from Home, online conference, YouTube (recording), July 2023.  
Future Science with CMB x LSS workshop, YITP (session recording, slides), Kyoto, April 2023.  
**Cosmology Talks**, Youtube, Mar 2023.  
TACOS Seminar, Arizona Cosmology Lab, University of Arizona, February 2023. (During the "Beyond 2-point data challenge" workshop.)  
**Aspen workshop, "Large-Scale Structure Cosmology beyond 2-Point Statistics"**, May-June 2022. (Blackboard talk, picture)  
Astro Lunch Seminar, Kavli IPMU, May 2022.  
KIPAC Cosmology Seminar, Stanford, May 2022.  
Berkeley Cosmology Group Seminar, BCCP, Berkeley, April 2022.  
NYU-CCA Cosmology x Data Science Meeting, New York University-Flatiron Institute (remote), March 2021.  
OPINAS Group Meeting, Max-Planck-Institut für extraterrestrische Physik (remote), March 2021.  
Cosmology & Gravitation Group Meeting, Oskar Klein Centre (remote), February 2021.

“The Origin and Evolution of Large-Scale Structure” Science Afternoon, Excellence Cluster ORIGINS (remote), February 2021.  
 CosmoLunch meeting, Institute of Advanced Study, Princeton (remote), January 2021.  
 Universe Journal Club, Institut d’astrophysique de Paris (remote), December 2020.  
 Cosmology Seminar, Max-Planck-Institut für Astrophysik (remote), December 2020..  
 Astroparticle Physics Seminar, SISSA (remote), December 2020.  
 Cosmology Group Meeting, Perimeter Institute (remote), December 2020.

## Mentoring, Advising and Teaching

### Mentoring

**Carter Matties**, Undergraduate student, University of Michigan.  
**Andrja Kostić**, Research Scientist, DeepL, co-mentored with Fabian Schmidt.

### Advising on a research project

**Eleni Tsaprazi** Postdoc, Imperial College London.  
**Andrew Hope**, UROP project, University of Michigan). Otho Lyle Tiffany & Mary Lois Tiffany Fellow 2024.  
**Kyle Lee**, UROP project, University of Michigan.  
**Disha Saxena**, UROP and MRADS project, University of Michigan.  
**Kasey Thai**, UROP project, University of Michigan.

### Teaching

**Michigan Math and Science Scholars**, course lecturer, “Climbing the Distance Ladder to the Big Bang: How astronomers survey the Universe.”  
**Michigan Math and Science Scholars**, guest lecturer.

Summer 2024

Summer 2023

## Popular Science Writings

**Tín hiệu mới từ vũ trụ? DESI và manh mối mới về năng lượng tối**, Tia Sang Magazine.  
**Growing in molasses: Cosmic large-scale structure caught growing slower than expected**, Science X Dialog, Phys.org.  
**Đi tìm những tín hiệu mới từ vũ trụ**, Tia Sang Magazine.

2024

2023

2023

## Activities

### Professional Community Service

**Michigan Cosmology Summer School 2023**, Local Organizing Committee member.  
 Active referee for Astronomy & Astrophysics (A&A, EDP Sciences), Journal of Cosmology and Astroparticle Physics (JCAP, IOP) & Physical Review D (PRD, APS).

2023

2021–now

### Professional Institute and Group Service

	<b>VLLT Joint Astronomy &amp; Physics Seminar Series</b> (for junior graduate and senior undergraduate students in Physics & Astronomy in Vietnam), founder and co-organizer.	2021–2022
	<b>Cosmology Journal Club</b> and <b>Cosmology &amp; Astrophysics Seminar</b> (University of Michigan), founder & main organizer.	2022–now
	<b>Cosmology Book Club</b> (Max Planck Institute for Astrophysics), founder & main organizer.	2020–2021
	<b>Large-scale Structure Journal Club</b> (joint between Max Planck Institute for Astrophysics and Max Planck Institute for Extraterrestrial Physics), co-organizer.	2018–2020
Social & Outreach	<b>Ask-Me-Anything</b> (Reddit), r/askscience and Youtube, Cosmology from Home 2023, panelist.	Summer 2023
	<b>Institute Social Coffee</b> (Leinweber Center for Theoretical Physics), founder & co-organizer.	2022–now
	<b>Skype a Scientist</b> (science outreach and interview with students of all ages and backgrounds in the US), scientist participant.	2022–now
	<b>Physicists To-Go</b> (similar to Skype-a-Scientist and organized by APS), scientist participant.	Fall 2023
	<b>Science Communication Fellows</b> (science outreach demonstrations and presentations at Michigan local museums and libraries), scientist participant.	Fall 2023
References	<b>Dr. Fabian Schmidt, Max Planck Institute for Astrophysics</b> (PhD advisor) Email	
	<b>Prof. Dragan Huterer, University of Michigan</b> (postdoc advisor) Email	
	<b>Prof. Elisabeth Krause, University of Arizona</b> (external collaborator) Email	
	<b>Prof. Jens Jasche, University of Stockholm</b> (external collaborator) Email	
	<b>Prof. Elisa G. M. Ferreira, Kavli IPMU, University of Tokyo</b> (previous colleague) Email	