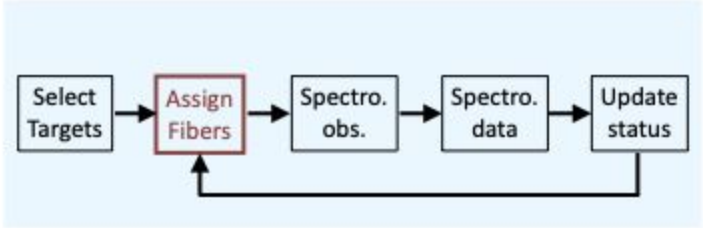
BCCP 2022 group introductions

Anand RAICHOOR (LBL) — DESI

DESI (2021 — 2026)

- *4m-Mayall telescope, 5000 fibers*
- *40M redshifts over 14k deg²*



DESI operations

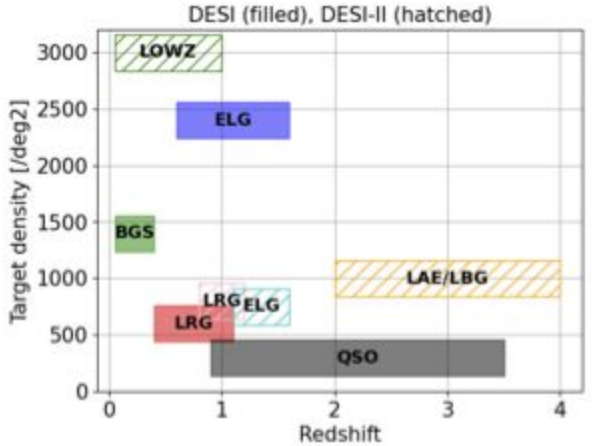
- *fiber assignment*
- *ensure reproducibility for LSS analysis*

DESI science: Emission Line Galaxies (ELG)

- *Target Selection*
- *Photometric & spectroscopic properties*

DESI-II preparation

- *Emission Line Galaxies (ELG)*
- *Lyman Alpha Emitters (LAE)*
- *Lyman Break Galaxies (LBG)*

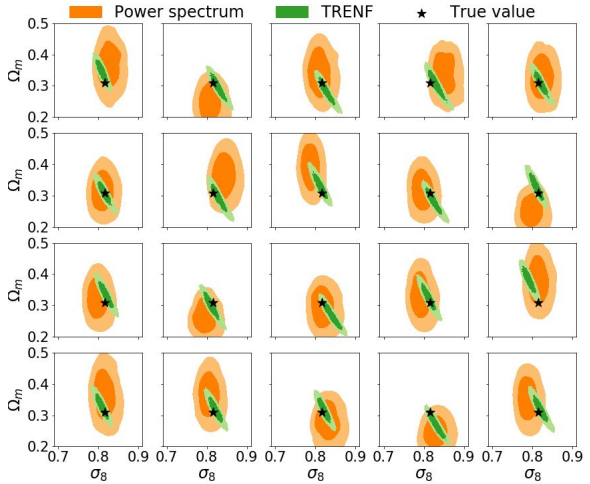


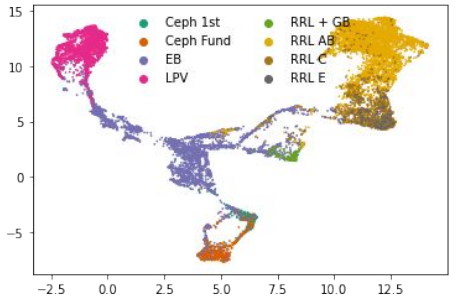
araichoor@lbl.gov

Biwei Dai (5th-year grad student)

Machine Learning X Cosmology

- Current projects:
  - Extracting cosmological information at the field level
    (simulation-based inference / likelihood-free inference with normalizing flows)
  - Learning latent representations of time-series events for novelty discovery
  - (Ising model with variational inference)
- Previous projects:
  - Improve the accuracy of fast simulations
  - Generate hydro outputs from DMO simulations
  - Fast evaluation of gravitational wave likelihood
  - Develop new ML algorithms (normalizing flows)



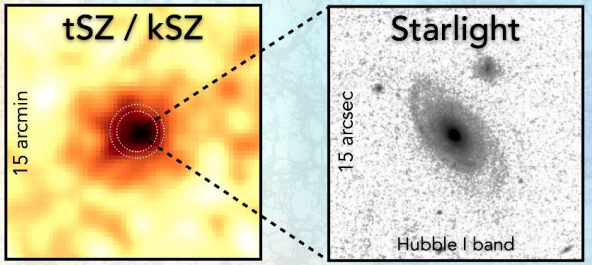


Emmanuel Schaan

emmanuel.schaan@gmail.com

BERKELEY LAB → SLAC

Baryon mapping with the CMB secondary anisotropies

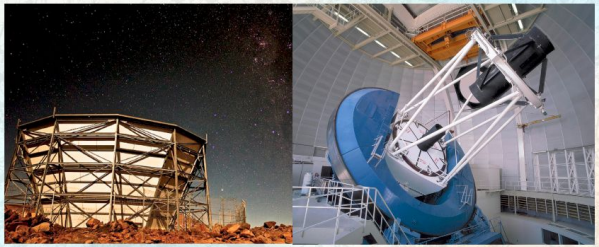


Neutrinos, growth, dark energy

New methods for robust CMB lensing

Calibrating galaxy systematics with the CMB

→ ACT, SO x DESI will be unrivaled

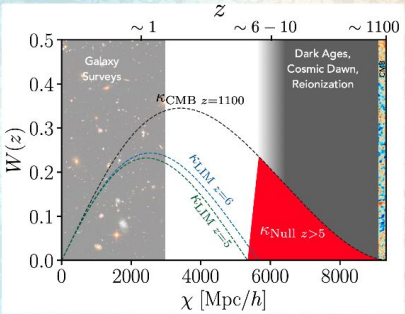


Intensity mapping

Extracting cosmology and astrophysics

Removing foregrounds

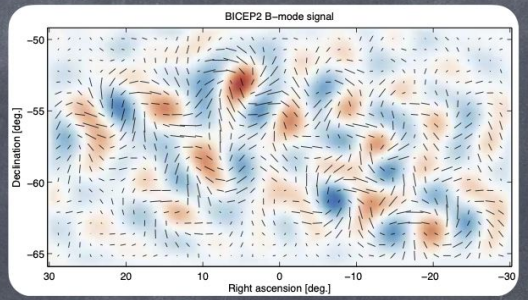
Can the CMB help?



Antón Baleato Lizancos

BCCP postdoctoral fellow

BERKELEY LAB

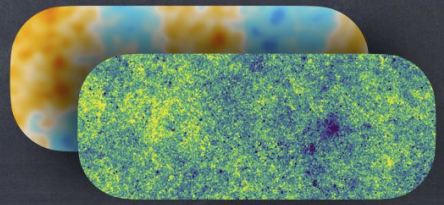


- Background in CMB lensing [member of SO]. In particular, delensing of B-mode polarization.

- Currently thinking about cross-correlations of CMB lensing with DESI galaxies

SIMONS OBSERVATORY

- and understanding the impact of SZ/CIB/AGN on CMB lensing (auto- & cross-correlations) and delensing



Noah Sailer

nsailer@berkeley.edu

(4th year physics student)

Large Scale Structure (DESI) and CMB (SO)
working w/ Martin, Simone and Emmanuel

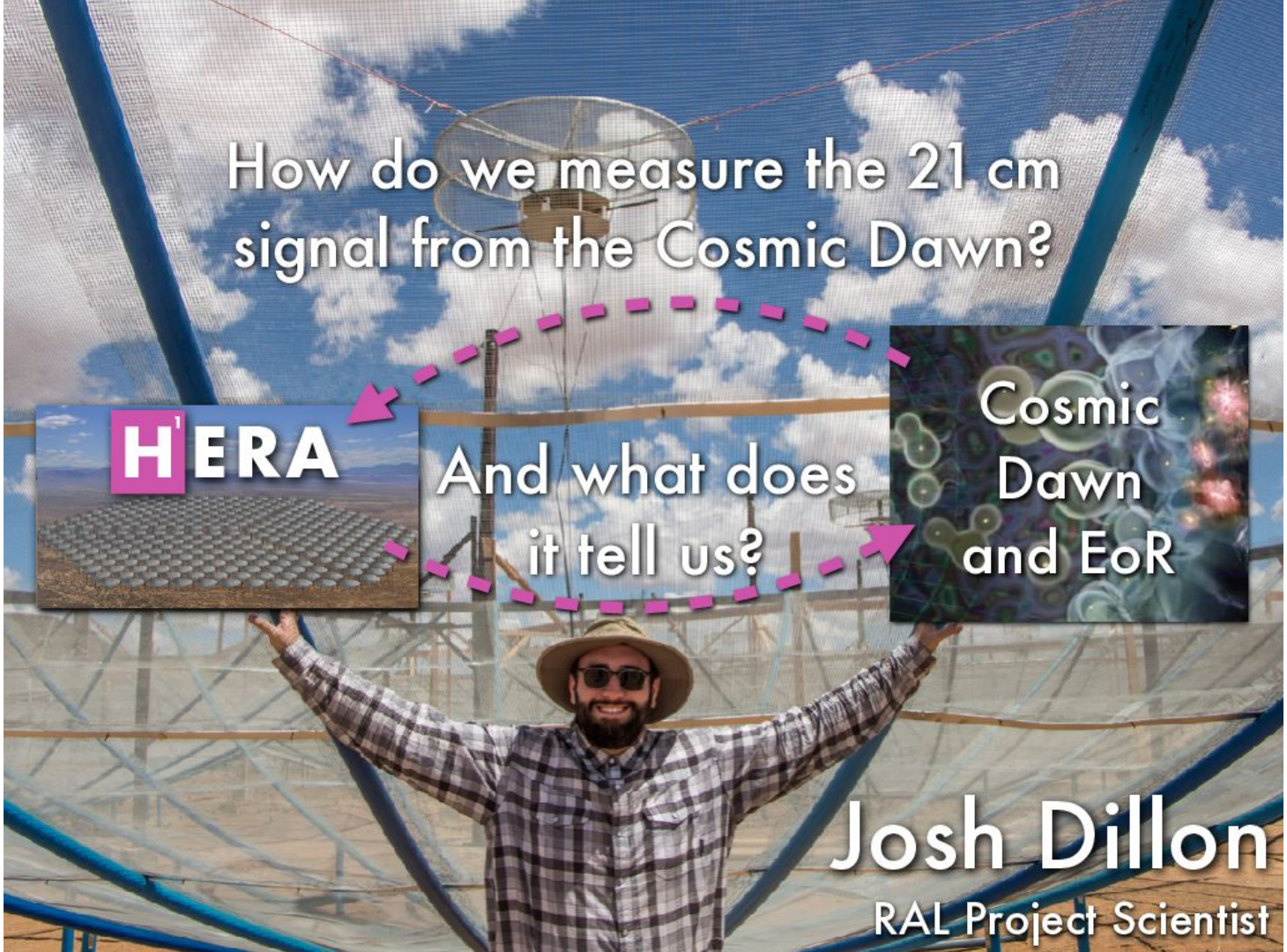
Past:

- CMB lensing estimators
  - biases from extragalactic foregrounds
- Science potential for future high-z (2<z<6) surveys
  - MegaMapper, PUMA, ...

Ongoing:

- DESI LRGs x ACT CMB lensing
- Constraints on DM-DR interactions
- DESI-II

Big fan of random side projects, always happy to chat!


How do we measure the 21 cm signal from the Cosmic Dawn?
HERA
And what does it tell us?
Cosmic Dawn and EoR
Josh Dillon
RAL Project Scientist

Joanne Cohn (jcohn@berkeley.edu)

- Cosmic web–looking for/at
  - simple descriptions of the web and its evolution
  - tracers (and how well they track filaments, approx tidal fields, etc.)
  - effects on galaxies, reionization
  - Mostly using other people's simulations if can't do questions analytically
- Galaxy formation and interplay with structure formation, especially higher z
  - Using simulations
- **Not** working on cluster masses to probe cosmological parameters
  - because correlated mass measurement errors are hard to control, if you want to know more about why one might worry…ask!

Happy to work with people on other things, too :)

Antonella Palmese

NASA Einstein Fellow @ UC Berkeley, LBNL Affiliate
Incoming Assistant Professor @ Carnegie Mellon University
palmese@berkeley.edu, Campbell 251

- ★ **Optical sky surveys**: DES and DESI. Have been running the DESIRT time domain program with DECam
- ★ **Gravitational waves** (GW) sources from LIGO/Virgo/KAGRA, Cosmic Explorer, LISA
- ★ **GW follow-up** (optical to NIR)
- ★ **GW cosmology.** In particular: standard siren measurements with binary black hole mergers
- ★ Transients and **host galaxies**, applications for Supernova and origin of binary systems
- ★ Galaxy evolution
- ★ Machine learning

Can be found playing beach volleyball or lifting heavy stuff.

Other interest: Live music and theater.

Extracting more information from the Lyman-a forest & CMB

Roger de Belsunce (new postdoc @ LBL)

Interests:

- Lyman-a forest:
  - CMB lensing x Lyman-a forest
  - P1D to P3D
  - EFTofLSS for Lyman-a power spectrum
- CMB:
  - Primordial B-modes
  - Foreground removal
- Likelihood approximation / “free” techniques

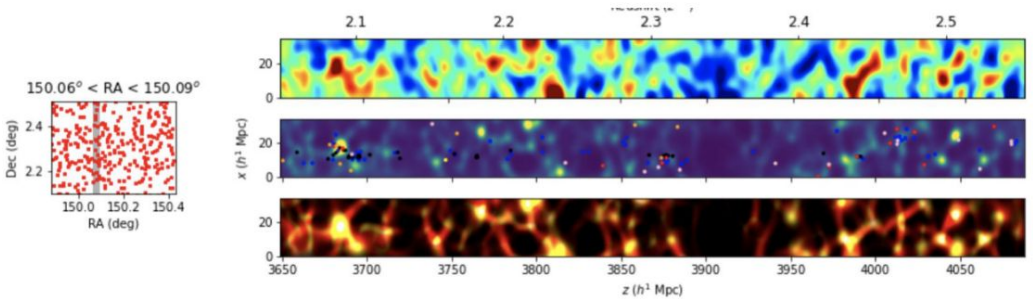
Benjamin Horowitz

Princeton University, LBNL Affiliate, PhD from UC Berkeley (2020 w/ Uros)

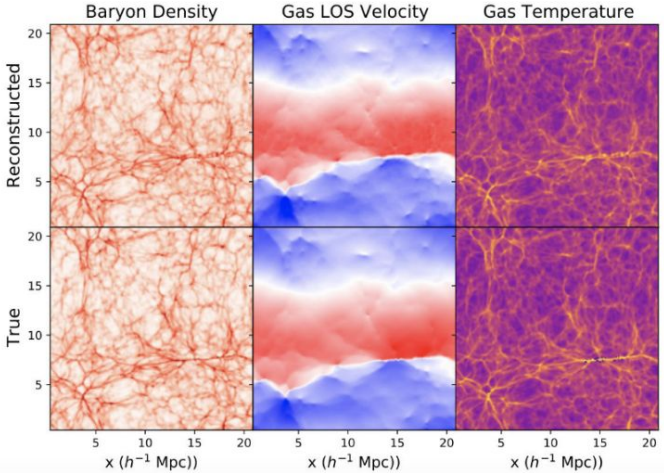
Main current interests:

- Dynamical forward modelling for cosmology and galaxy evolution
- Lyman Alpha forest tomography
- Galaxy - LSS relation (led PFS-Galaxy Evolution LSS WG)
- Connecting hydrodynamical simulations to observations w/ ML

Slice from CLAMATO Survey



Reconstruction from HyPhy



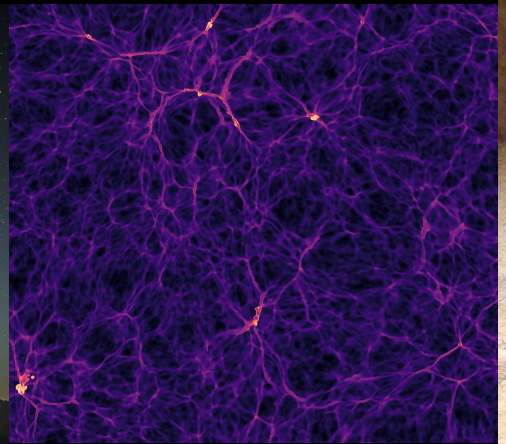
Cooper Jacobus

Computational Physics for Cosmology

- ML as surrogate for numerical simulation (LyAF)
- Foreground modeling (CMB)

TA / UGSI for Astro C10

Undergrad rep for “Climate” Advisory Committee



Boryana Hadzhiyska,
Postdoctoral fellow

Simulations

MTNG: testing HOD model, assembly bias and SZ scaling relations

AbacusSummit: halo finding, light cone octant & full, weak lensing maps

Hybrid Effective Field Theory (HEFT): applications to photometric surveys

Outside hobbies

Cycling, singing, union organizing, audiobooks, eating sweets

Dark Energy Spectroscopic Instrument

Small-scale clustering: light cone mocks

Weak lensing (w/ DES, KiDS): challenge

Lyman-alpha skewers: mocks

xACT: kinematic Sunyaev-Zel'dovich (kSZ) with Bright Galaxy Sample

Cosmic Microwave Background (CMB)

Lensing: reconstruction on small-scales

SZ: constraining baryonic physics

Elisa RUSSIER
Contact : erussier3@gmail.com

BERKELEY LAB

Centre Pierre Binétruy
CNRS • Berkeley

Université Paris Cité

Who am I?

First year PhD candidate under the supervision of Jacques DELABROUILLE at Université Paris-Cité (France) starting October 3rd, 2022

Subject:

Ground-based CMB data analysis in preparation of CMB-S4

PhD goal:

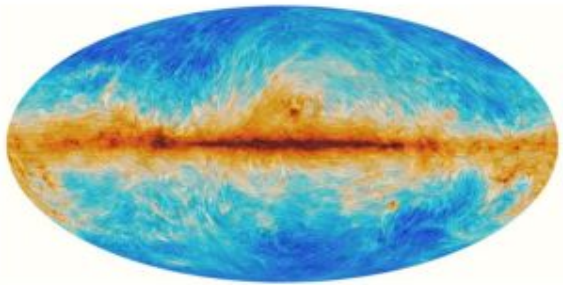
Improve and develop component separation methods specifically for CMB-S4

PhD plan:

1) Improve polarized galactic dust emission map

→ Investigate different existing methods (SMICA, ILC)

→ Create map using correlation between polarization and intensity



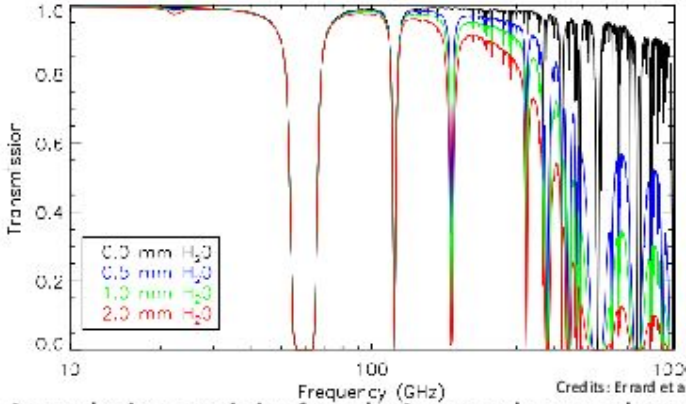
Credits: Planck

Polarized dust emission map (Planck)

2) Develop a multifrequential component separation method

→ Consider atmospheric emission as a component

→ Use of simulations and existing data



Credits: Errard et al 2015

Atmospheric transmission from the Atacama plateau at the zenith for different amounts of precipitable water vapor

Hee-Jong Seo (Ohio University)

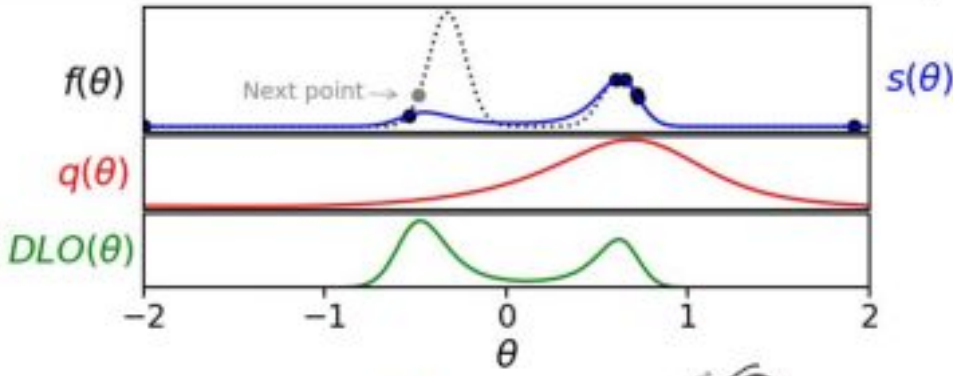
- **Nonstandard reconstruction** (ref: Ota et al. 2021, Seo et al. 2022, Ota et al. prep)
- **Systematics mitigation of imaging and spectroscopic ELGs**. Grad. **Alberto Rosado Marin (OU)** with Mehdi
- **FnI from DESI LRG imaging and SV** - led by **Mehdi Rezaie (KSU)**, collaborating with Ashley Ross, Hui Kong, Anna Poreddon
- **DESI Y1 BAO work** with **David Valcin (OU)**
  - DA0.2 for BAO - We (KP3/4) plan to publish the first DESI BAO detection paper.

    (1.6% at ~5 sigma detection of LRG pre-recon)
  - **BAO reconstruction and systematics control using overlapping samples**

Jamie Sullivan (PhD student, 307D) (jmsullivan@berkeley.edu)

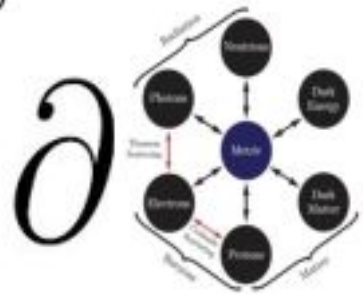
5th-year (w. Uroš)
Computational cosmology & large-scale structure!

- Non-linear structure formation: small-scales, some neutrinos, & (recently) PNG
- Bayesian Inference & ML (optimization & sampling)
- A Boltzmann code for the differentiable age



Other stuff:

- Mount Tamalpais College
- Julia indoctrination



$$\frac{\partial}{\partial x}$$

Raul Monsalve

Associate Research Scientist and Senior Fellow

Space Sciences Laboratory, **UC Berkeley**

Research Interests and Activities

Learning about the **Dark Age**, **Cosmic Dawn**, and **Epoch of Reionization** using 21-cm cosmology.

Designing and deploying **experiments** to measure the high-redshift 21-cm signal from the **ground and space**.

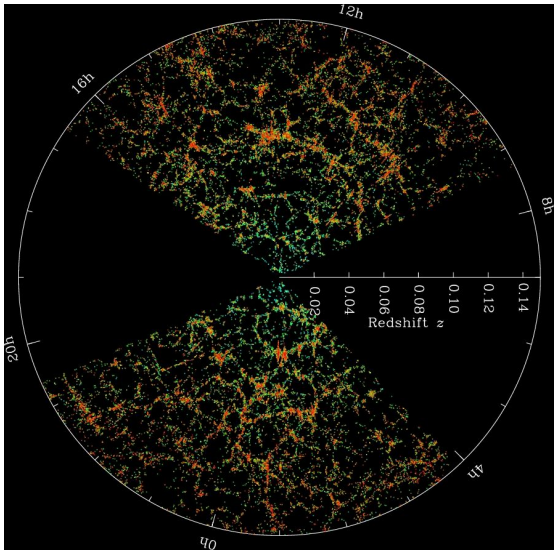
Participating in the **EDGES**, **MIST**, and **LuSEE-Night** global 21-cm experiments.

raul.monsalve@berkeley.edu

Mark Maus

mark.maus@Berkeley.edu
2nd year physics grad student

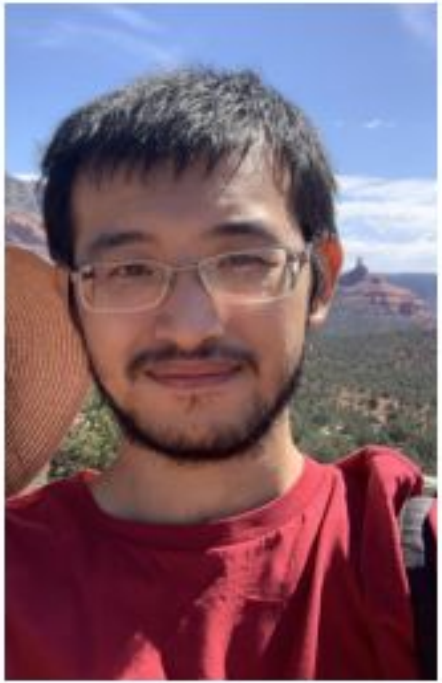
- Large scale structure with Martin White
- Cosmological constraints from galaxy clustering
- Template, ShapeFit, and Full-shape analyses of power spectra in redshift space
- DESI



Nicholas Huang

- CMB observation with SPT (with Bill Holzapfel)
- Galaxy cluster search using the SZ effect
- Reionization constraints from high-ell CMB
- Bikes!

Xiao Fang (postdoc)



Large-Scale Structure:

- Perturbation theory and computational methods for galaxy surveys (e.g. FAST-PT)
- Cross correlations, covariances, and multi-probe analysis
- Have worked on DES, Rubin, Roman

Recent Interest:

Combining data from LSS (lensing/galaxy clustering) and CMB experiments (lensing/tSZ) [with Simone +]

Dynamics:

- Hierarchical stellar systems, Lidov-Kozai
- Primordial black hole observational constraints
- GW source progenitors

Recent Interest:

Possible new LISA sources from few-body dynamics [with Liang + students]

xfang@berkeley.edu
https://xfangcosmo.github.io

Broad interest in astrophysics problems

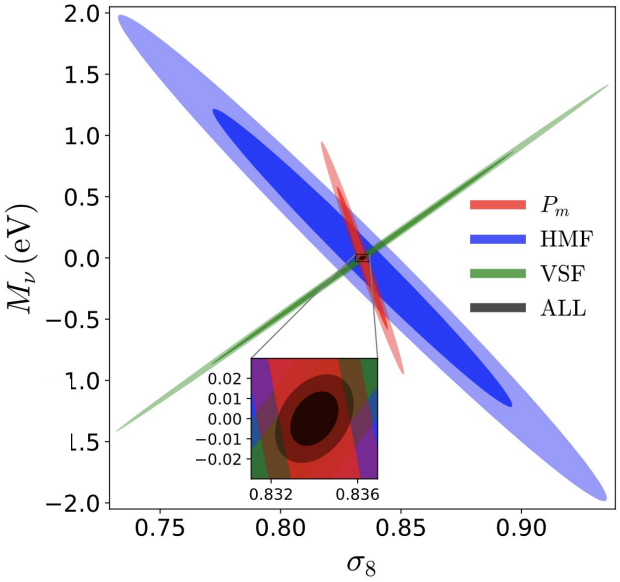
Recent Interest:

Physical modeling of a mysterious high-z source in a strong lensing system [with Liang, C.McKee +]

Adrian Bayer (Campbell 301A)
5th year grad student

abayer@berkeley.edu

- LSS simulations
- Neutrino information content
- Field-level inference and reconstruction
- Bayesian data analysis:
  - Look-elsewhere effect
  - Sampling methods



Martin White (faculty; theory+data)

[Cosmological perturbation theory. Exploiting DESI data. CMB + LSS x-correlation. Preparing for nextGen surveys (what should we have done last time with 20/20 hindsight?). Blue-sky ideas for future surveys.]

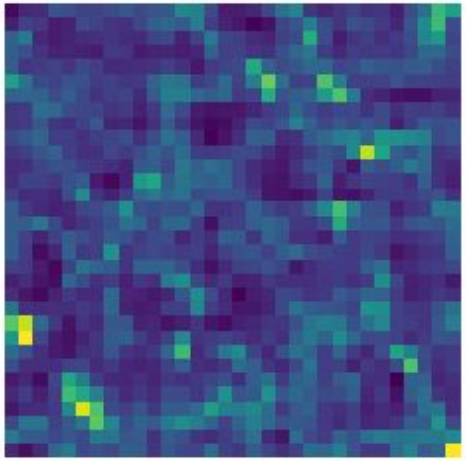
Too many individual projects to try to list, so ...

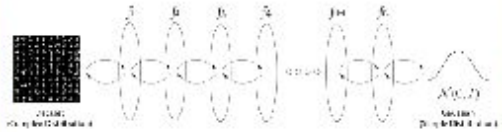
Short term: Science with DESI … modeling P(k,μ), BAO reconstruction, x-correlation with CMB. [DESI]

Medium term: More DESI, prep for DESI-II. What can be learned by combining DESI+LSST+SO? What framework should we use to model and interpret these data? [DESI, LSST, SO, DESI-II, S4]

Long term: Cosmology “before noon”, i.e. large-scale structure above z~2ish. What can we learn from it, how do we map it and how do we analyze it. [DESI-II, MegaMapper, SO/S4].

FastPM

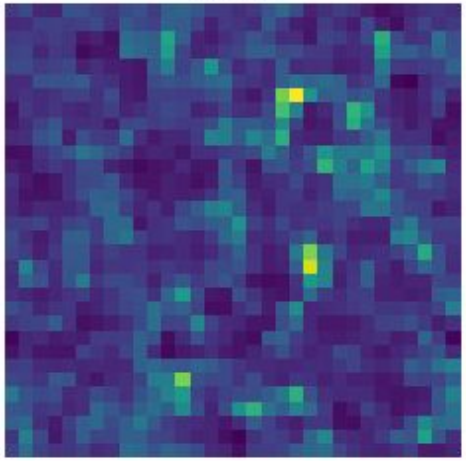




TRENF

Translation and Rotation
Equivariant Normalizing Flows

TRENF



Henry Liu
刘瑞涵

2nd Year grad student working with Uroš Seljak

r.henryliu@berkeley.edu

Interests:

- Computational and Theoretical Cosmology
- Machine Learning/Deep Learning
- Bayesian Statistics/Astrostatistics

Other hobbies:

- Hiking/outdoors
- Photography/Astrophotography
- UAW 2865

Zarija Lukić, Research Scientist at LBL

Computational Cosmology Center
Building 50B, 4th floor, office 4218B
zarija@lbl.gov

Cosmological simulations

All aspects: physical models, algorithms, deployment on HPC platforms
https://amrex-astro.github.io/Nyx/

Large-scale structure

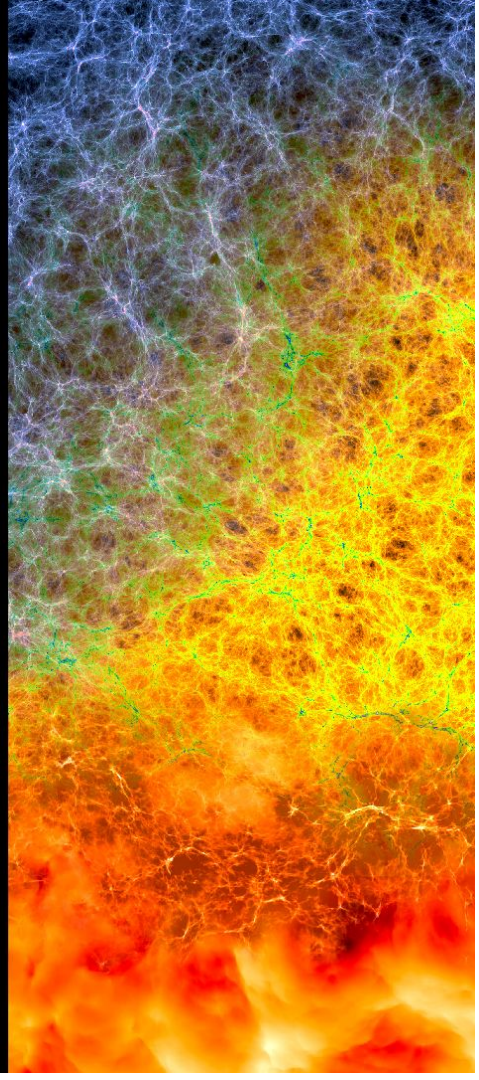
Focused on the Lyman α forest and the intergalactic medium

Inference from simulations and data

Building reliable parameter constraints using minimal number of simulations

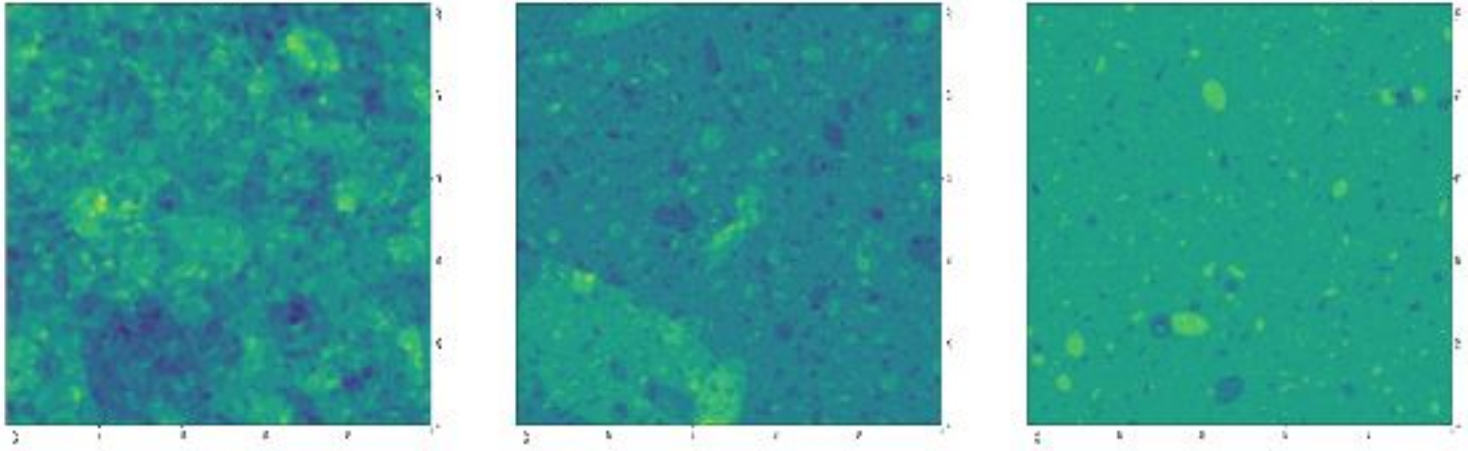
Machine learning for cosmology

Surrogate models in simulations, computationally inexpensive mock skies, etc…



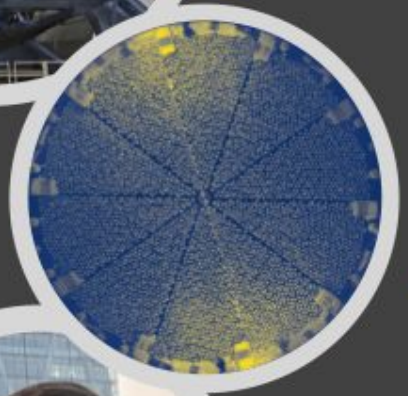
Winston Yin 尹維晨
working with Liang Dai and Simone Ferraro

Discerning cosmic string models through CMB birefringence



Course development for ***Sense & Sensibility & Science*** with Saul Perlmutter

Hobbies:
Playing/singing classical music (audition for UCB Chamber Chorus!)
Formalising mathematics (Lean/mathlib)



Anthony Kremin

Postdoc at LBNL

akremin@lbl.gov

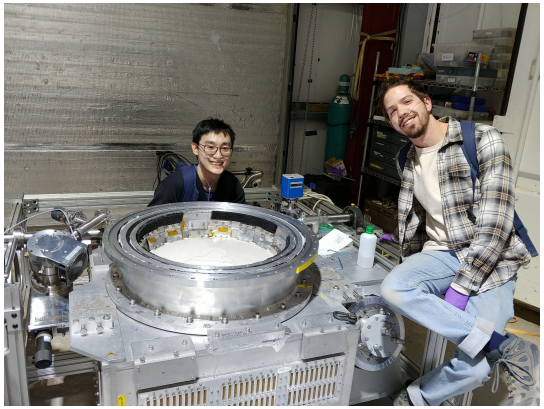
Always happy to chat

- Research Interests:
  - Galaxy Peculiar Velocities
  - Galaxy Clusters and Cluster Dynamics
  - Software Development for Astronomy & Surveys
  - Machine Learning
- Key Roles:
  - LBL/UCB DESI Lunch Organizer
  - DESI Spectroscopic Pipeline Operations Lead
  - DESI Early Career Scientist Committee Member
- Other Interests:
  - Public Outreach
  - Hiking, playing sports, watching football

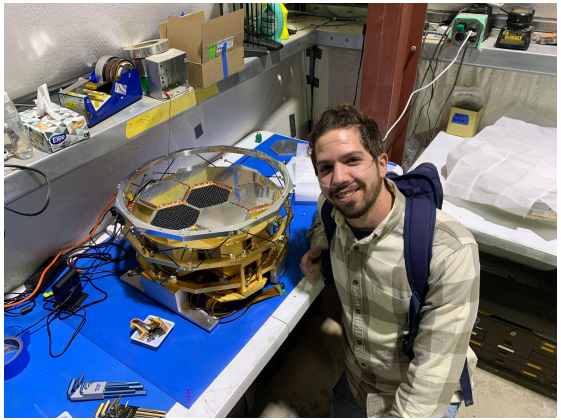
Tylor Adkins

4th Year PhD Student

- I primarily work in the Simons Array collaboration
  - A CMB polarimetry experiment in the Atacama Desert in Chile
  - Main science goals to measure B-mode polarization sourced by inflation and gravitational lensing
- DfMux readout development/analysis for the Simons Array
- Simulation pipeline + data reduction pipeline development for Simons Array data analysis
- Have deployed to Chile for a total of 13 weeks so far
  - Retrofitting hardware
  - Receiver Assembly



Me in Chile working on Simons Array receivers!



Minas Karamanis

PhD (Edinburgh) → PostDoc (BCCP) (starting in mid October)

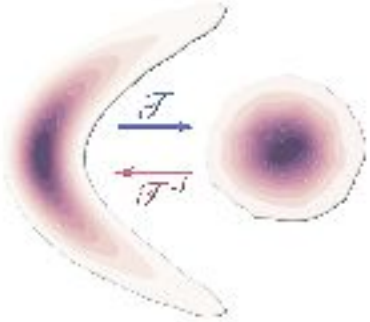
minas.karamanis@ed.ac.uk ♦ GitHub/minaskar ♦ Slack

Research interests

- Bayesian inference and computation
- Development of scientific software
- Cosmology (e.g. LSS, PNG, BAO, etc).
- Model independent approaches (recently: high-z cosmography)
- Statistical challenges in astronomy (e.g. gravitational waves, exoplanets)

Methods and techniques

- Probability and statistics
- Code (mostly Python, but lately also Julia)
- Simulated data
- Analytic approaches
- ML & DL



zeus
Lightning Fast MCMC

pocoMC

Anna Coerver (she/her)

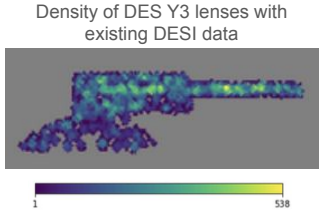
- 3rd year grad student working with Bill Holzapfel on analysis and instrumentation for the South Pole Telescope
- Current project: characterizing polarized noise for SPT-3G low-ell BB powerspectrum analysis
- Outside of physics: you can find me sailing/windsurfing in the bay!

Noah Weaverdyck

Chamberlain Fellow at LBNL

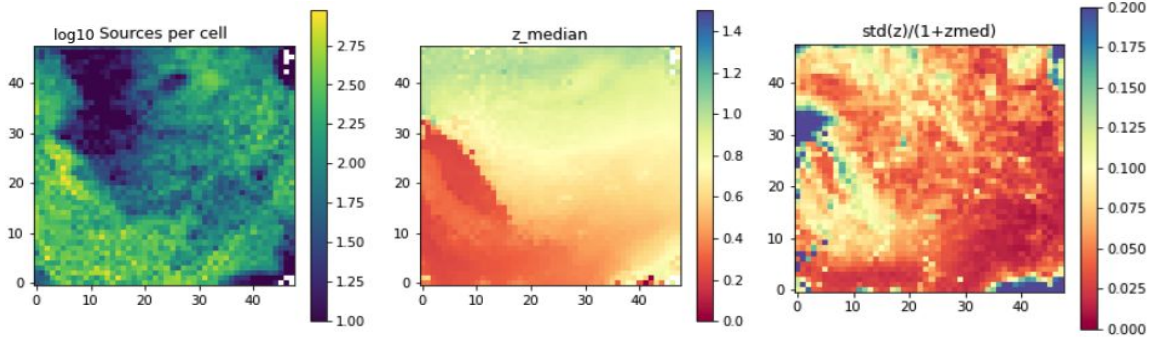
Research interests:

- Mitigating imaging systematics in LSS (primarily in DES)
- Leveraging DESI to characterize, improve photo-z's
- Bayesian stats, model validation and comparison metrics, robust inference
- Machine learning
- Primordial non-Gaussianity with LSS
- Member of Dark Energy Survey (DES), DESI



Other interests:

- Hiking, camping, live music, climate change



Interested in chatting?
NWeaverdyck@lbl.gov,
or swing by #5045 at LBL

David Valcin (visiting from Ohio university)

Main projects: DESI

- Part of DA0.2 group, “First Detection of BAO from Early DESI Data”
- BAO reconstruction using overlapping samples
- BAO iterative reconstruction

Side project:

- Globular clusters as cosmic clocks

Shamik Ghosh

CMB-S4 Postdoc at Berkeley Lab. starting Sept. 1

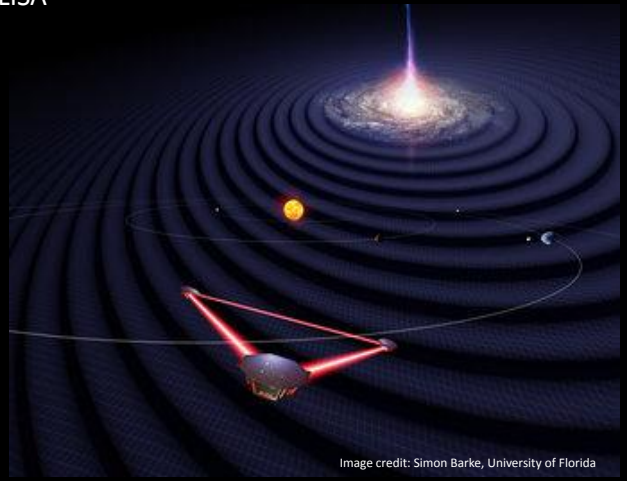
Recent research interests

- Previously worked on the Ali CMB Polarization Telescope data analysis team to develop component separation pipelines for CMB polarization data analysis.
- Worked on mitigating *E-B* leakage systematics arising from incomplete sky coverage and timestream filtering.

Current research objectives

- Will be working on simulating the foreground emissions in 30 to 300 GHz frequency range for CMB-S4.
- Develop models of slow drifts and systematic errors due atmosphere, ground pickup, thermal instabilities etc.

Current Research: Multimessenger astronomy with LISA

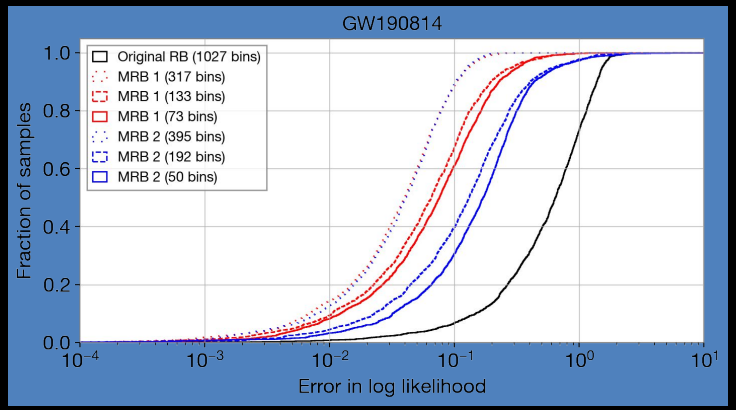


Non-Research Interests: Video games + Music

Nathaniel Leslie

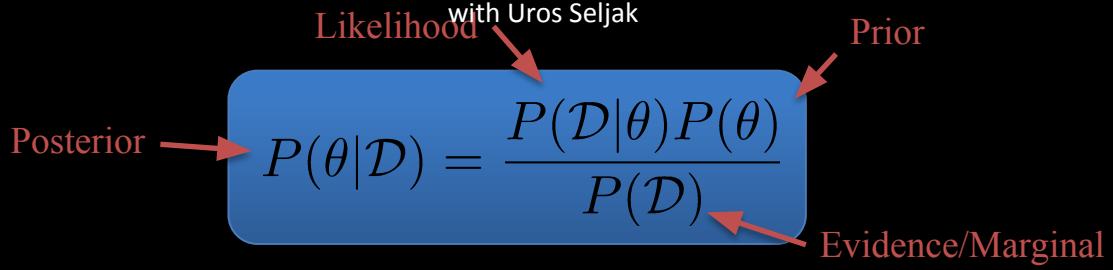
Advisor: Liang Dai

Recent Research: Fast gravitational wave likelihoods



Teaching: Physics 188/288: Bayesian Statistics and Machine Learning for Physical Sciences

with Uros Seljak

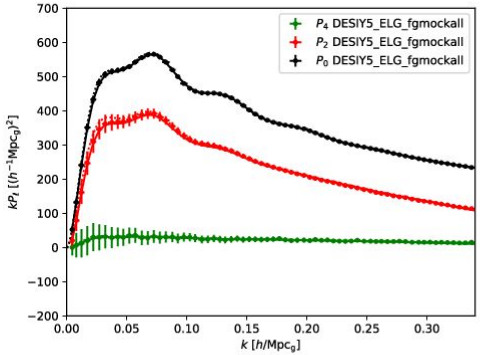


Pat McDonald (LBL)

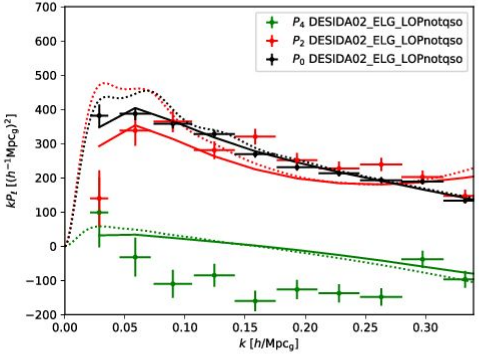
DESI galaxy clustering analysis

- Estimate clustering statistics to high accuracy, considering all details of the observing process.
- Fit models, fully accounting for galaxy biasing, to estimate basic Universe properties (e.g., BAO distance scale, power amplitude)
- Eventually constrain Dark Energy, neutrino mass, etc.

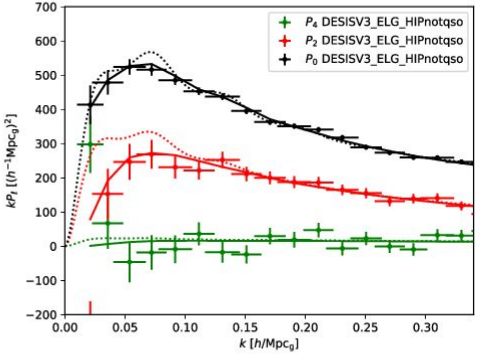
DESI Y5 !! (mock)



Largest non-blind area ?! (real)



smaller densely sampled area (real)

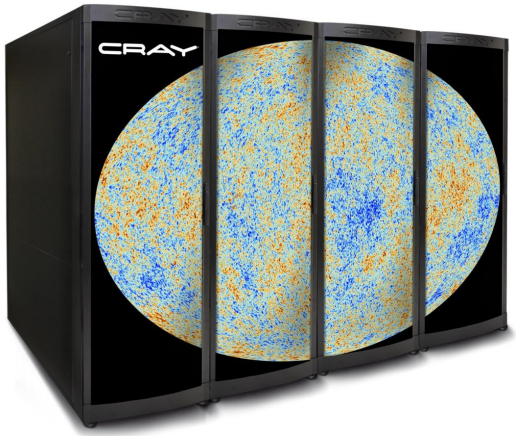


Julian Borrill

Computational Cosmology Center, LBL & Space Sciences Laboratory, UCB

Cosmic Microwave Background

- Data Management
  - (Planck)
  - Simons Observatory
  - CMB-S4
  - High Performance Computing (NERSC)
- Project Management
  - ~~CMB-S4 Collaboration Co-Spokesperson~~
  - CMB-S4 Project Data Scientist



Joe DeRose

Chamberlain Fellow, LBNL
jderose@lbl.gov

Research: cosmology

- How to optimally extract info from lensing and clustering data to probe gravity?
- Galaxy surveys: DESI, DES, LSST
- Recent forays into CMB lensing/SZ

Techniques: Simulations, Statistics and Machine Learning, HPC, Theory

Non-Physics interests: Cycling, Running, Backpacking, Basketball, Bay area pro sports

Satya Gontcho A Gontcho

project scientist on DESI

Get in touch with me: satyagontcho@lbl.gov

DESI Science:

Main interest: **Intergalactic-medium based Cosmology**

- Lyman-alpha BAO analysis
- CIV forest cross-correlations (QSOs, ELGs, ...)
- IGM tomography (*voids & other real-space features, cosmic web...*)

DESI Lunch

DESI/LSS group meeting, Wed@noon

Co-organizing w/ Anthony Kremin

DESI Operations & Other interests

DESI LO; Cosmology from Stage-IV surveys combined, DESI-II / Future Surveys ; Outreach and Mentoring

Radek Stompor (Centre Pierre Binétruy)

General interests (personal):

Data analysis and scientific interpretation of the cosmic microwave background data sets.

including:

- New statisitical and numerical algorithms;
- High performance computing software and tools;
- Robust performance forecasting (including systematic and statistical erorrs due to instrumental, environmental and astrophysical effects) and reliable scientific optimization of future instruments;
- Preparations and analysis of actual data sets (Simons Array, Simons Observatory, CMB-S4 and LiteBIRD).

Centre Pierre Binétruy (CNRS/UCB International Research Laboratory)

(across the passarelle on the right in the Physics building within the N3AS area)

Centre Pierre Binétruy
CNRS • Berkeley

- hosting of long and short term visitors (predominantly from France but also Europe)
  - 18 since March 2022 (from France, Sweden, Spain, Italy);
  - two semi-permanent visitors – Jacques Delabrouille and myself (more to come !);
- supporting and motivating common projects in diverse areas of astrophysics and cosmology.

Hello! My name is **Lingyuan Ji.**

Previously @ **J**ohns **H**opkins **U**niversity

Advisor: **Marc Kamionkowski**

Gravitational Lensing

of transient sources
(FRB, GRB, GW…)

21cm line,
Pulsar timing array

beyond intensity signal
(linear/circular pol.)

More numerical stuff…

Hierarchy-less
cosmological perturbation
Solver

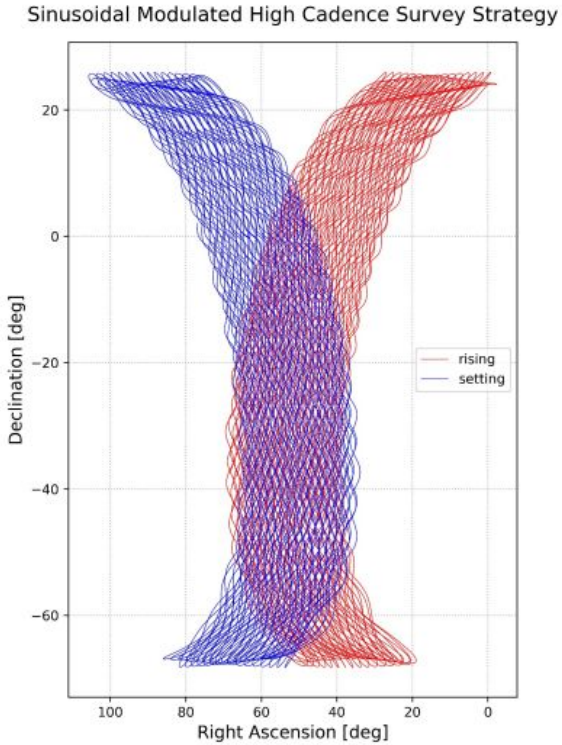
More theoretical stuff…

Dark matter/energy models
Inflationary models

Haruki Ebina

First year graduate student, interested in data-oriented theory

Formerly working on survey strategy analysis and detector testing for Chilean CMB experiments (CMB-S4, SO, CCAT-prime) at Cornell in the Niemack Group



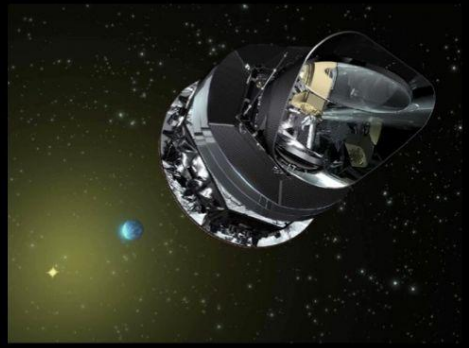
Rongpu Zhou

DESI postdoc at LBL

- DESI imaging surveys, target selections and clustering analysis
  - DESI cross-correlations with other observables, e.g., CMB lensing
- Forward modeling imaging systematics of galaxy surveys
  - Do we understand observational systematics well enough for fNL?
- Photometric redshifts for next-generation surveys

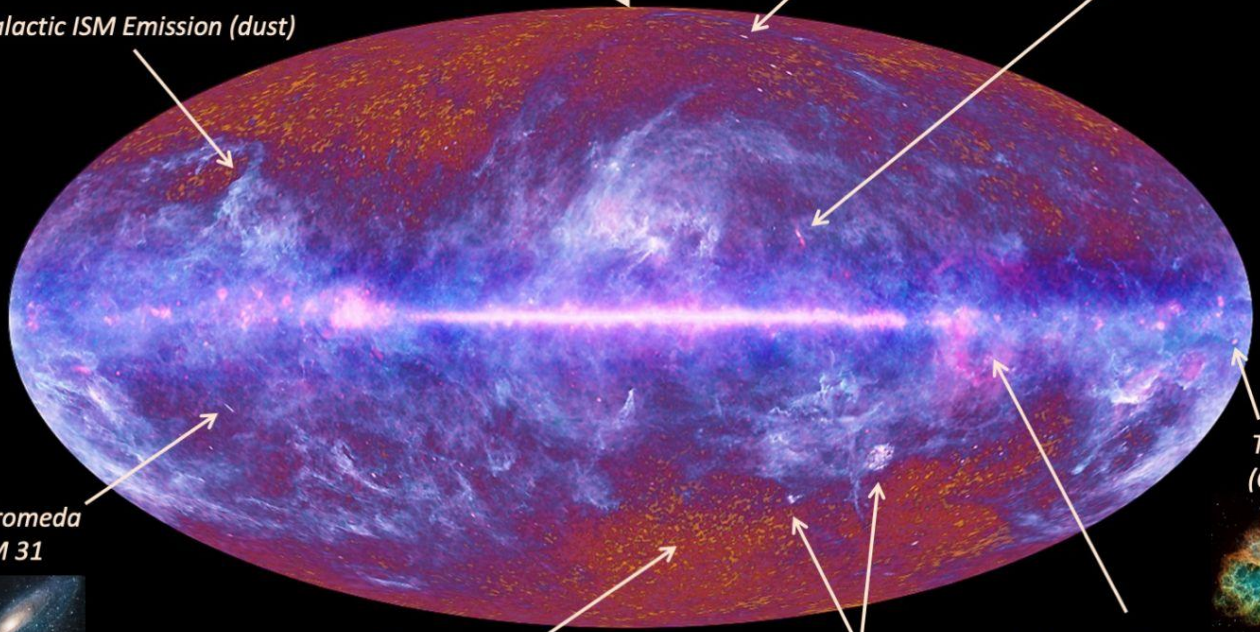
Jacques Delabrouille

Centre Pierre Binétruy (CNRS)



Keywords:

CMB
CMB foregrounds
Planck space mission
Future CMB missions
Simulations
Data processing
CMB-S4



Abby Bault

abault@uci.edu

Education

- 5th year PhD candidate at UC Irvine
- Advisor: David Kirkby
- At LBNL for the SCGSR program until December

DESI Activities

- Current projects:
  - LYɑ Forest: Impact of redshift errors on the Lyɑ Forest & Quasar cross-correlation
  - Instrumentation: Studying mitigation strategies for bad fiber positioners
- Regularly observe as a Support Observer
- DESI Mentor/Mentee

Other Activities

- Originally from Michigan, now live in sunny socal
- I like to hangout with my cat, crochet, hike, watch hockey games, build puzzles, etc.
- Volunteer at a kitten nursery in Long Beach, CA since October ‘21

BERKELEY LAB
LAWRENCE BERKELEY NATIONAL LABORATORY

Simone Ferraro

Scientist @ LBNL

Research: cosmology (theory and analysis)

- CMB: secondary anisotropies (kSZ, tSZ, …) and lensing
- Inflation: primordial gravitational waves, non-Gaussianity
- Reionization: imprint of the first stars and galaxies
- Galaxy formation and evolution
- Galaxy surveys: DESI, LSST
- Statistics and Machine Learning

Berkeley Astro Postdoc (Miller Fellow) → LBNL (tenure track)

Interested in a research project? Contact me at sferraro@lbl.gov