

Our Team

Matthew Dodelson

Research Field: **Theoretical Physics**

Postdoc

My main interests are in black holes, holography, and string theory. In my PhD research at Stanford I focused on aspects of string theory near black holes. Specifically, if a string falls into a black hole, how much does the string stretch out near the horizon? We argued that such nonlocal string effects near the horizon lead to a possible resolution of Hawking's information paradox, where the information can be collected by a late observer

by detecting the spreading of the early infalling string.



Martin Fluder

Research Field: **Theoretical Physics**

Postdoc

The overarching theme of my research is the study of symmetries, dualities and correspondences in quantum field theory and string theory. Ultimately, my goal is to exploit these concepts to improve the understanding of non-perturbative quantum systems, as well as their (hidden) mathematical structures. I am working on a diverse set of topics, ranging from the study of various supersymmetric and superconformal field theories in different dimensions, to concepts in holography

and supergravity.



Wentao Luo

Research Field: **Astronomy**

Postdoc

I am from Shandong Province, China and am now a post-doctoral researcher at the Kavli IPMU. My research interests include accurate galaxy shape measurements, galaxy-galaxy lensing signal measurements, and modeling of galaxy-galaxy lensing signals. I really enjoy the procedure of extracting the weak signal from very noisy data. Isn't it amazing to detect the distribution of dark matter from galaxy images and further constrain cosmology? It is like communicating with Mother Nature using multiple languages, computer



language and mathematical language. For me, there is nothing more interesting than studying language and communicating with people and with Mother Nature.

Oscar Macias

Research Field: **Astronomy**

Postdoc

I'm a Postdoc at Kavli IPMU (Tokyo U.) and GRAPPA (Amsterdam U.). Previously I was a research associate in the Center for Neutrino Physics at Virginia Tech.

My research interests lie at the interface of particle physics and astrophysics. A central theme of my research program is the possibility that Dark Matter particles - which are invisible to optical telescopes - may produce gamma-ray photons as the result of collisions with each other. A clear-



cut detection of this signal in regions where Dark Matter is abundant and the background is well understood would have profound implications for our understanding of the Universe.

Dinakar Muthiah

Research Field: **Mathematics**

Postdoc

I am working in algebro-geometric and combinatorial aspects of representation theory.

One topic I have been investigating is the p-adic theory of Kac-Moody groups. A special case of this is a notion of a double loop group. This is very closely related to the geometry of double affine Schubert varieties. Conjecturally, these double affine Schubert varieties should also be closely related to instanton spaces as well as Coulomb branches for quiver gauge theories.

A closely related topic is the geometric Satake equivalence and Mirković-Vilonen (MV) cycles.



In this area I have been studying both the MV basis as well as MV polytopes and their affine generalizations. Finally, I have been recently thinking about Chern-Mather classes and characteristic cycles for Schubert varieties.

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Youngsoo Park

Research Field: **Theoretical Physics**

Postdoc

The exact nature of cosmic acceleration is a key mystery of modern cosmology. Current and future wide-field surveys provide a number of important probes, such as weak gravitational lensing, the clustering of matter, and the abundance of galaxy clusters, that can shed light on this mystery.

My research interests involve combining these different probes in a unified analysis to maximize the cosmological information we gain from them, as well as to use them for tests of the current-standard



Λ CDM framework. In particular, I am interested in developing analysis techniques that can provide tighter constraints on the cosmological parameters of interest while mitigating critical systematic errors.

Anna Puskás

Research Field: **Mathematics**

Postdoc

My research interests lie on the boundary of Number Theory and Combinatorial Representation Theory. For example, I am interested in questions related to the study of Whittaker functions on metaplectic covers of nonarchimedean groups. Recently with my collaborators we extended the study of Iwahori-Whittaker functions to metaplectic covers of Kac-Moody groups, and studied properties of related correction factors. The main tools of this study are Demazure and Demazure-Lusztig operators, highest weight crystals and other combinatorial devices associated with the representation theory of



finite and infinite-dimensional Lie algebras. Similar devices, related to symmetries and the Bruhat order of a Weyl group appear in the study of a wide range of interesting questions.

Kenneth Wong

Research Field: **Astronomy**

Postdoc

I am primarily interested in studying cosmology and extragalactic astronomy using observational data, particularly at optical/NIR wavelengths. I am involved in a number of observational studies using Hyper Suprime-Cam on the Subaru Telescope, particularly in the field of strong gravitational lensing. I also perform mass modeling of strong lens galaxies using Hubble Space Telescope imaging and combine this information with measurements of the time delay between multiple images of



the background source to constrain cosmological parameters such as the Hubble constant, H_0 .