Slepian Research Group at University of Florida

Z. Slepian

Cosmology from Home—July 2023

The Group

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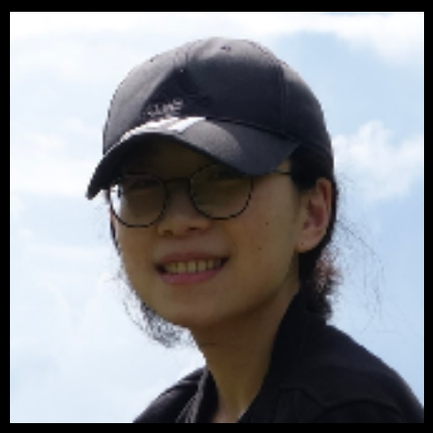
Victoria Williamson

Ben Sherwin

Oscar Rodas

Nina Brown

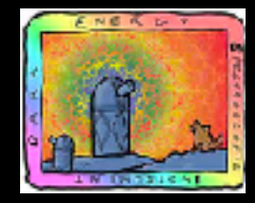


Jiamin Hou

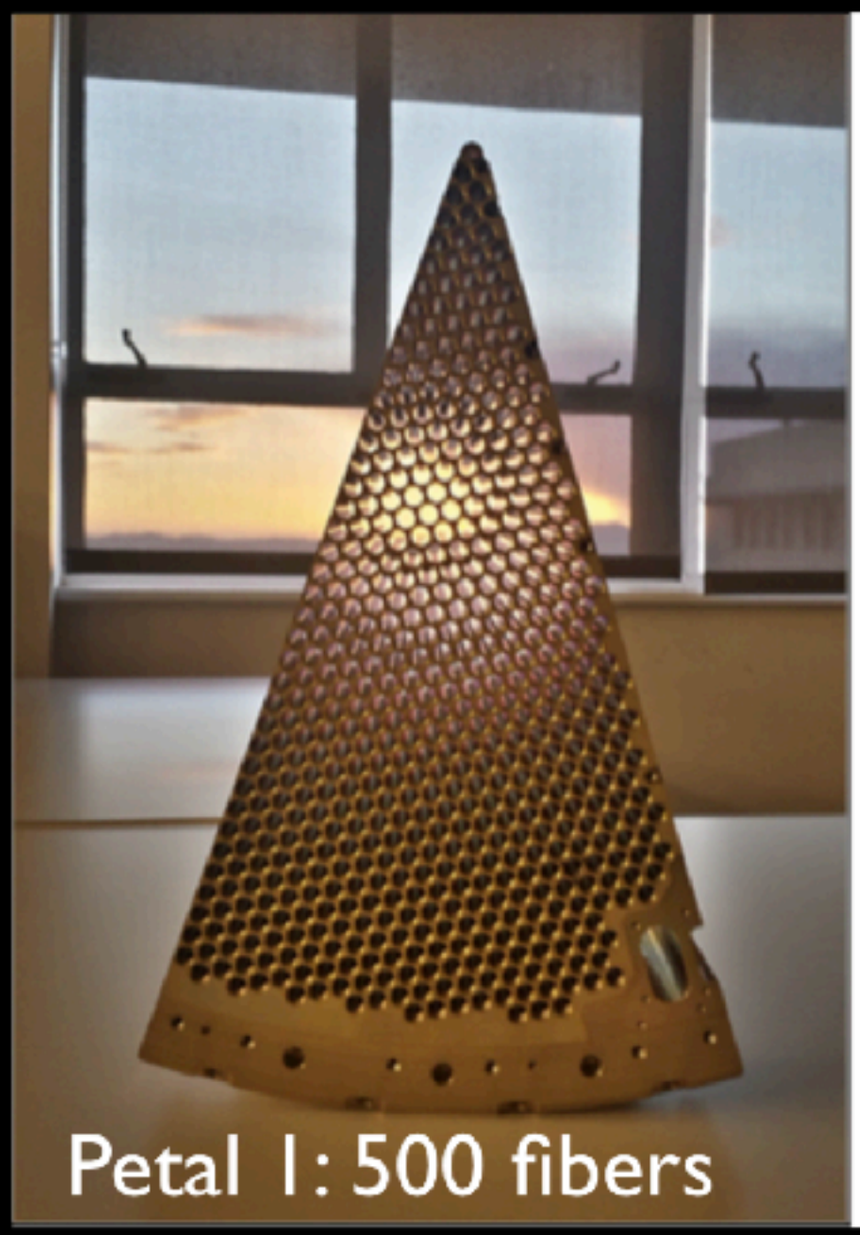
Bob Cahn

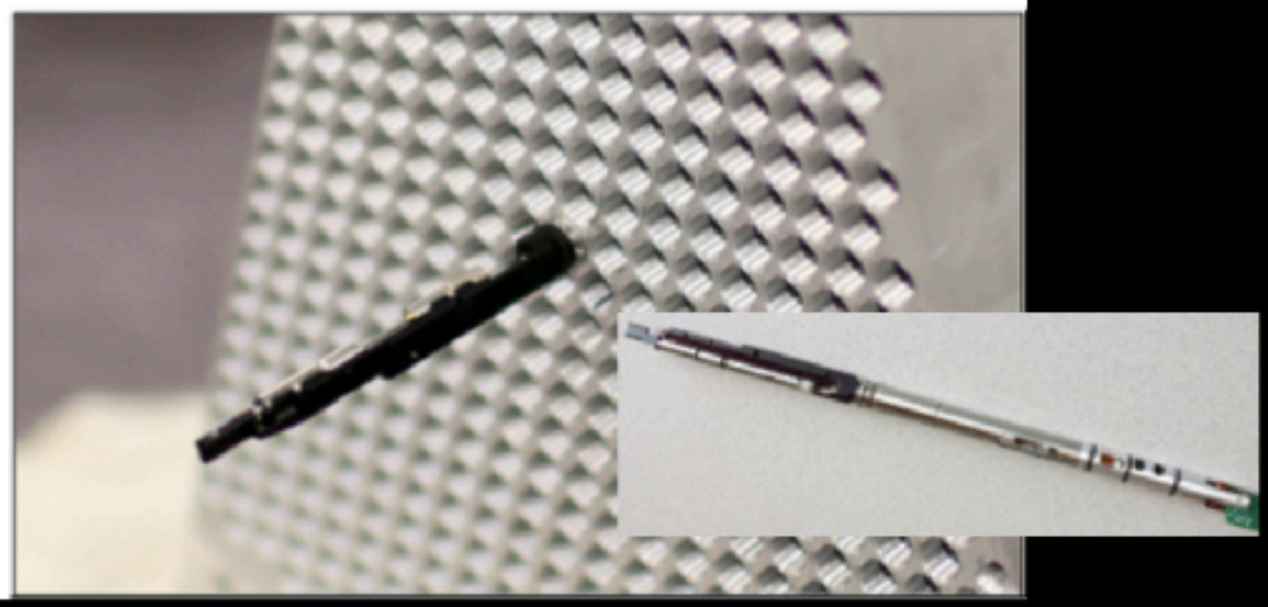
Ehsan Mahdavi

SDSS BOSS: ~1 M galaxies (to 2016)



DESI: ~30 M galaxies, quasars (2021-2025)





5k robotic positioners: reconfigure in ~1 minute

Parity Violation via the Galaxy 4PCF

A Test for Cosmological Parity Violation Using the 3D Distribution of Galaxies

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(Dated: October 26, 2021)

We show that the galaxy 4-Point Correlation Function (4PCF) can test for cosmological parity violation. The detection of cosmological parity violation would reflect previously unknown forces present at the earliest moments of the Universe. Recent developments both in rapidly evaluating galaxy N-Point Correlation Functions (NPCFs) and in determining the corresponding covariance matrices make the search for parity violation in the 4PCF possible in current and upcoming surveys such as those undertaken by Dark Energy Spectroscopic Instrument (DESI), the *Euclid* satellite, and the Vera C. Rubin Observatory (VRO).

-ph.CO] 20 Oct 2021

I. INTRODUCTION

Among the known fundamental forces, only the weak interaction violates parity [1–3]. Since the weak interaction played no role in the evolution of the large scale

In this work, we present a novel means of testing parity invariance in 3D large-scale structure, relying on the same principle as Pasteur's original separation: in general, in 3D a tetrahedron and its mirror image cannot be superimposed.

Parity Violation via the Galaxy 4PCF

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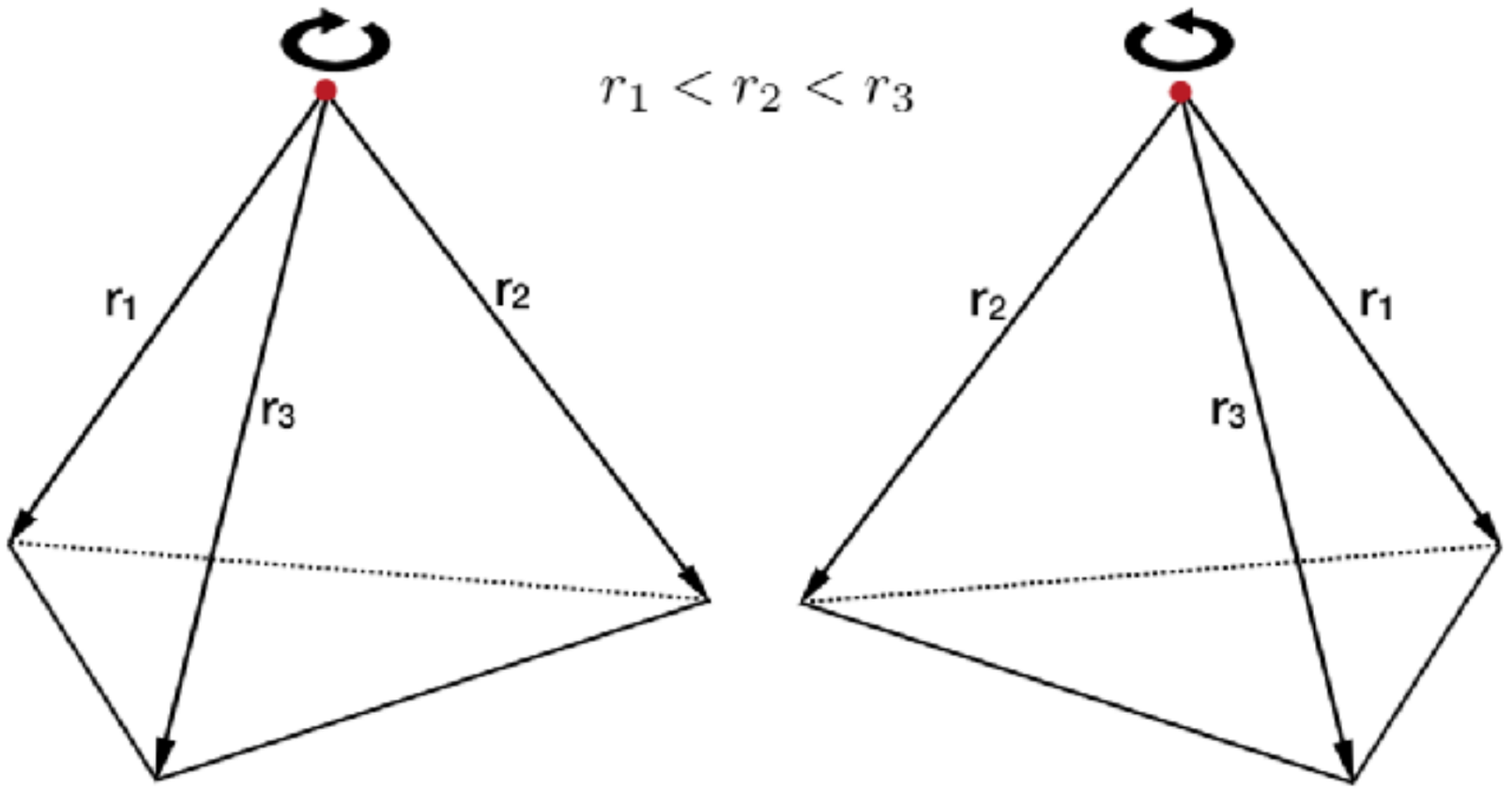

arXiv:2110.10179v1 [astro-ph.CO] 20 Oct 2021

I. INTRODUCTION

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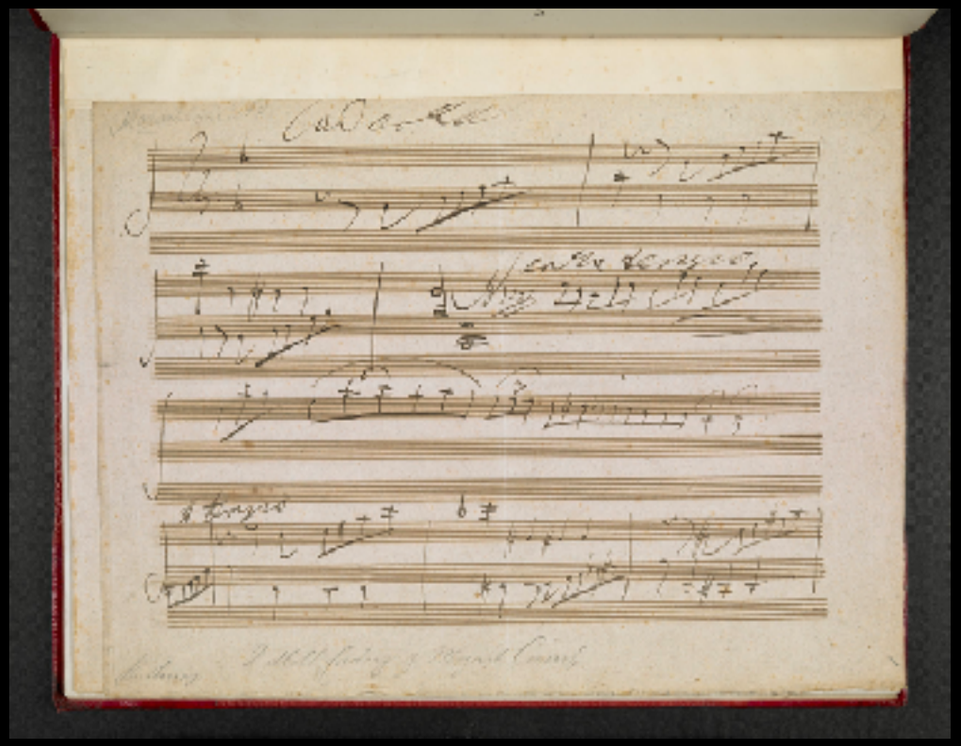
CADENZA GPU NPCF Code



Code for 2-6PCF optimized for NVIDIA A100s

Timings on single A100 GPU for BOSS

4PCF 1 minute // 5PCF: 30 minutes //6PCF: 2 hours

7.5 M CPU hours -> 50k GPU hours

CADENZA: Slepian, Warner, Hou, Cahn

Please check out my students' talks!

Jess Chellino—3 & 4PCF covariance matrix

Matthew Reinhard—axion inflation + parity violation

William Ortola Leonard—perturbation theory even-parity 4PCF (flash talk)