

Grigor Aslanyan

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Summary

I am a Computational Data Science Fellow at the Berkeley Center for Cosmological Physics. I develop statistical and numerical methods for analyzing the exponentially growing amount of observational data in modern and future cosmological surveys. I use Bayesian statistics, sampling and optimization methods for very high dimensional parameter spaces, and machine learning. I am an avid C++ programmer and a python enthusiast, with many years of experience in industry and science. I am the author of the powerful numerical library COSMO++.

Experience

[Berkeley Center for Cosmological Physics](#)

BERKELEY, CALIFORNIA

Computational Data Science Fellow

Nov '15 – Present

Theoretical Research in Cosmology and Data Science.

[University of Auckland](#)

AUCKLAND, NEW ZEALAND

Postdoctoral Research Fellow

Sep '12 – Oct '15

Theoretical Research in Early Universe Cosmology.

Ponté Solutions (acquired by [Mentor Graphics](#) in 2008)

YEREVAN, ARMENIA

Software Engineer

Dec '05 – May '07

Worked in the Physical Design department, focusing on geometric algorithms. Developed and implemented a state-of-the-art C++ template library for geometric operations on large scales.

Junior Engineer

Nov '04 – Dec '05

Worked on the implementation and testing of geometric and numerical algorithms.

[Yerevan Physics Institute](#)

YEREVAN, ARMENIA

Research Assistant

Sep '04 – Jun '07

Worked in the [HERMES](#) group. [HERMES](#) was a high energy physics experiment at [DESY](#) in Germany.

Education

[University of California, San Diego](#)

SAN DIEGO, CALIFORNIA

Ph.D. in Physics

2007-2012

[Yerevan State University](#)

YEREVAN, ARMENIA

Master of Science in Physics and Computer Science

2005-2007

[Yerevan State University](#)

YEREVAN, ARMENIA

Bachelor of Science in Physics and Computer Science

2001-2005

Skills

Technical: C++ (advanced knowledge with 3 years of industrial and 8 years of scientific application), **python** (good knowledge, including numpy, scipy, matplotlib, pandas), **git** (good knowledge), **shell scripting** (good knowledge), **html/javascript** (working knowledge), **swift** (working knowledge)

Data Science: Machine Learning, Gaussian Processes, Bayesian Statistics, Sampling Methods (Markov Chain Monte Carlo, Nested Sampling, Hamiltonian Monte Carlo), Optimization Methods (L-BFGS, Conjugate Gradient)

Mathematics: Real and Complex Analysis, Graph Theory, Group Theory, Probability Theory, Algebraic Topology, Differential Geometry.

Languages: Armenian (*native*), English (*fluent*), Russian (*fluent*), French (*working knowledge*) .

Software Released

Cosmo++

Dec '13

Cosmo++ is an object oriented C++ library for scientific computing, focused on cosmology. Mathematical tools include a Markov Chain Monte Carlo sampler, a conjugate gradient solver, special function calculators, curve fitting and interpolation. Cosmological tools include likelihood calculation, sky map simulation, mask apodization, and wrappers to Planck and WMAP likelihood codes, CLASS, and MultiNest. Fully developed and implemented by myself. Latest Version 3.2 released in November, 2015.

Referee/Reviewer

- Referee for *Journal of Cosmology and Astroparticle Physics*, *Physics Letters B*
 - Book Reviewer for *Microsoft Azure Machine Learning*, **Packt Publishing** (2015)
 - Book Reviewer for *Linux Shell Scripting Essentials*, **Packt Publishing** (2015)
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Publications

- N. Canac, **G. Aslanyan**, K. N. Abazajian, R. Easther, L. C. Price, *Testing for New Physics: Neutrinos and the Primordial Power Spectrum* [arXiv:1606.03057](#)
- **G. Aslanyan**, L. C. Price, J. Adams, T. Bringmann, H. A. Clark, R. Easther, G. F. Lewis, P. Scott, *Ultracompact minihalos as probes of inflationary cosmology*, [arXiv:1512.04597](#)
- **G. Aslanyan**, R. Easther, L. C. Price, *Learn-As-You-Go Acceleration of Cosmological Parameter Estimates*, **JCAP 09 (2015) 005**, [arXiv:1506.01079](#)
- **G. Aslanyan**, R. Easther, *Signatures of the Very Early Universe: Inflation, Spatial Curvature and Large Scale Anomalies*, **Phys. Rev. D 91, 123523 (2015)**, [arXiv:1504.03682](#)
- K. N. Abazajian, **G. Aslanyan**, R. Easther, L. C. Price, *The Knotted Sky II: Does BICEP2 require a nontrivial primordial power spectrum?*, **JCAP 08 (2014) 053**, [arXiv:1403.5922](#)
- **G. Aslanyan**, L. C. Price, K. N. Abazajian, R. Easther, *The Knotted Sky I: Planck constraints on the primordial power spectrum*, **JCAP 08 (2014) 052**, [arXiv:1403.5849](#)
- **G. Aslanyan**, *Cosmo++: An Object-Oriented C++ Library for Cosmology*, **Computer Physics Communications 185 (2014), pp. 3215 – 3227**, [arXiv:1312.4961](#)
- **G. Aslanyan**, R. Easther, *Large Scale Anomalies in the Microwave Background: Causation and Correlation*, **Phys. Rev. Lett. 111, 261301 (2013)**, [arXiv:1308.6593](#)

- **G. Aslanyan**, A. V. Manohar, A. P. S. Yadav, *The topology and size of the universe from CMB temperature and polarization data*, **JCAP 08 (2013) 009**, [arXiv:1304.1811](#)
- **G. Aslanyan**, A. V. Manohar, A. P. S. Yadav, *Limits on semiclassical fluctuations in the primordial universe*, **JCAP 02 (2013) 040**, [arXiv:1301.5641](#)
- C. Feng, **G. Aslanyan**, A. V. Manohar, B. Keating, H. P. Paar, O. Zahn, *Measuring Gravitational Lensing of the Cosmic Microwave Background using cross-correlation with large scale structure*, **Phys. Rev. D 86, 063519 (2012)**, [arXiv:1207.3326](#)
- **G. Aslanyan**, A. V. Manohar, *Constraints on the global topology and size of the universe from the cosmic microwave background*, **JCAP 06 (2012) 003**, [arXiv:1104.0015](#)
- N. Akopov, Z. Akopov, **G. Aslanyan**, L. Grigoryan, *A-dependence of coherent electroproduction of ρ^0 mesons on nuclei in forward direction*, [arXiv:0707.3530](#) (2007)

Conference and Seminar Presentations

Sampling Versus Optimization in Very High Dimensional Parameter Spaces Statistical Challenges in Modern Astronomy VI, Carnegie Mellon University	Jun '16
Constraining the Primordial Power Spectrum from Large to Very Small Scales The McWilliams Center for Cosmology, Carnegie Mellon University	Apr '16
Center for Cosmology and Astro Particle Physics, Ohio State University	Apr '16
Constraining the Primordial Power Spectrum and Cosmological Parameters Lawrence Berkeley National Laboratory	Mar '16
Learn-As-You-Go Acceleration of Parameter Estimation Sampling and Non-Sampling Methods in Cosmology Workshop, UC Berkeley	Jan '16
COSMO++ and Constraints on Inflation Lawrence Berkeley National Laboratory	Dec '15
Parameter Space Sampling, Constraints on Inflation UC Irvine	Nov '15
Signatures of the Very Early Universe: Inflation, Spatial Curvature and Large Scale Anomalies CosPA 2014 Conference, Auckland, New Zealand	Dec '14
Machine Learning and Gaussian Processes Mathematics and Physics PhD Lecture, University of Auckland	Sep '14
Primordial Power Spectrum pre – and post – BICEP CFA, Harvard University	Apr '14
Tufts/MIT Joint Cosmology Seminar	Apr '14
Institute for Advanced Study	Apr '14
Yale University	Apr '14
Stony Brook/Brookhaven Joint Cosmology Seminar	Apr '14
UC San Diego	May '14

Cosmic Microwave Background Anomalies and the Physics of the Early Universe University of Canterbury	Feb '14
From Classical to Quantum Computing Mathematics and Physics PhD Lecture, University of Auckland	Jul '13
Probing the Large Scale Anisotropies of the Universe from the CMB Temperature and Polarization Data TAPIR Seminar, California Institute of Technology	Mar '13
UC Irvine	Apr '13
UC Santa Cruz	Apr '13
The Topology and Size of the Universe from the Cosmic Microwave Background UC San Diego	Apr '11

Grants and Fellowships

Microsoft Azure for Research Grant Microsoft Azure cloud computing resources for the project "Studying Very Early Universe Physics with Cosmic Microwave Background Anomalies".	Jan '14 – Jan '15
Summer Graduate Teaching Scholarship UC San Diego, San Diego, CA	Jul '11

Awards and Honors

Presidential Award in the Field of Information Technologies Prize of the President of Armenia as best student in Computer Science.	Sep '05
Yerevan State University Best Student Yerevan, Armenia	May '05
Bronze Medal in International Mathematics Olympiad Washington DC, USA.	Jul '01
Honorable Mention in International Physics Olympiad Antalya, Turkey.	Jun '01

Summer Training

Cosmology Summer School ICTP, Trieste, Italy	Jul '10
Particle Physics and Astronomy International Summer School University of Sheffield, Sheffield, UK. Got the Best Presentation prize for the project "Solitons: The method of inverse scattering for the KdV equation".	Jun '06
DESY Summer School DESY, Hamburg, Germany. Performed the project "Search for the Θ^+ pentaquark in the missing mass spectrum of the reaction $\gamma^* D \rightarrow \Lambda(1520) X$ at HERMES".	Jul '05 – Sep '05