

Nesar S Ramachandra

CONTACT INFORMATION

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EDUCATION

The University of Kansas, Lawrence, KS.

2013 - Present

Candidate for Doctor of Philosophy in Physics.

- Adviser: Professor Sergei Shandarin
- GPA: 4.00/4.00

Birla Institute of Technology and Science (BITS) Pilani, India. 2008 - 2012

Integrated Master of Science (Hons.) in Physics.

- Thesis title: Dynamics of ellipsoidal collapse in a cosmological setting
 - Adviser: Professor Arun Mangalam, Indian Institute of Astrophysics.
 - Cumulative GPA: 7.75/10
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SELECTED RESEARCH EXPERIENCE

Large scale structures in the Cosmic web.

2013 - Present

Doctoral research, The University of Kansas, Lawrence, KS.

- Formation and properties of cosmic voids, dark matter haloes, caustic surfaces
- Studies using novel cosmic fields emerging from Lagrangian to Eulerian mapping such as multi-stream field, Flip-Flop of dark matter particles, displacement fields etc.
- Analysis of topological and geometrical features of the dark matter distribution in a multi-stream environment.

Machine learning applications in Astrophysical studies.

2017 - Present

Summer research at Argonne National Laboratory, Chicago.

- Deep Neural Networks trained on simulation images were implemented to analyze galaxy-galaxy strong lensing images.
- Project can be accessed here: github.com/hep-cce/ml_classification_studies

Emulation of Cosmological functions.

2016 - Present

Based on a series of workshops at the Statistical and Applied Mathematical Sciences Institute (SAMSI), Research Triangle Park, North Carolina.

- Developed a fast Gaussian Process Emulator as a predictor for the Dark matter halo mass function, replacing expensive cosmological numerical simulations.

Evolution of cosmic density perturbations

2011 - 2013

Master's thesis research at the Indian Institute of Astrophysics, Bangalore

- Analysis of non-linear perturbation theory resulting in formation of structure. The evolution of inhomogeneities using analytical models of spherical and ellipsoidal collapse are compared.

Quantum fields in non-Minkowski spaces.

2011 - 2012

Supervisor: Professor Arun V. Kulkarni, Department of Physics, BITS-Pilani

- Investigation of conformal transformations and Penrose diagrams. Departure from the Minkowskian metric is treated as a perturbation for derivation of general solution for quantization.

PUBLICATIONS

Nesar Ramachandra, Sergei Shandarin *Multi-stream portrait of the Cosmic web*, Monthly Notices of the Royal Astronomical Society, Volume 452, Issue 2, p.1643-1653. (2015)

Nesar Ramachandra, Sergei Shandarin *Topology and geometry of the dark matter web: a multistream view*, Monthly Notices of the Royal Astronomical Society, Volume 467, Issue 2, p.1748-1762. (2017)

Nesar Ramachandra, Sergei Shandarin *Dark matter haloes: a multistream view*, Monthly Notices of the Royal Astronomical Society. Volume 470, Issue 3, p. 3359-3373. (2017)

Noam Libeskind, Rien van de Weygaert, Marius Cautun, *et al.* (incl. **Nesar Ramachandra**), *Tracing the cosmic web*, Monthly Notices of the Royal Astronomical Society, Volume 473, Issue 1, Pages 1195-1217 (2018)

SELECTED TALKS

Deep learning pipelines for lensing analysis, Astrophysics Seminar, University of Kansas. **September 2017**

Strong Lensing analysis using Deep Neural Networks, Young Scientists Symposium, Argonne National Laboratory. **July 2017**

Emulation of the halo mass function, SAMSI, Research Triangle Park, North Carolina. **April 2017**

Cosmic structures, Particle Physics Journal Club, The University of Kansas. **March 2017**

Topology and geometry of the dark matter web, American Physical Society April Meeting 2017 at Washington D.C. **January 2017**

Halo Sub-structures from Flip-flop Fields, Astrophysics, Space & Plasma Astrophysics Seminar, The University of Kansas. **November 2016**

Topology and geometry of the dark matter web, Comprehensive presentation, Department of Physics and Astronomy, The University of Kansas. **September 2016**

The Multi-stream portrait of the cosmic web, American Physical Society April Meeting 2016 at Salt Lake City, Utah. **April 2016**

Poster presentation: Components of the Dark matter Universe , Graduate Research competition at The University of Kansas.	March 2016
The Multi-stream portrait of the cosmic web , Canadian-American-Mexican Graduate Students Physics Conference (CAM 2015) at Oaxaca, Oaxaca, Mexico.	September 2015
Dark matter halo statistics , Astrophysics, Space & Plasma Astrophysics Seminar, The University of Kansas.	April 2015
Poster presentation: The dynamical structure of the cosmic web , MidAmerican Regional Astrophysics Conference (MARAC 2015) at The University of Missouri.	April 2015
Poster presentation: The dynamical structure of the cosmic web , Graduate Research competition at The University of Kansas.	April 2015
Multi-Stream Portrait of the Cosmic Web , Astrophysics, Space & Plasma Astrophysics Seminar, The University of Kansas.	December 2014
Dynamics of the Cosmic Web , Astrophysics, Space & Plasma Astrophysics Seminar, The University of Kansas.	April 2014
Evolution of density perturbations in a Cosmological context , Masters thesis defense at the Indian Institute of Astrophysics, Bangalore.	February 2013
Dynamics of ellipsoidal collapse , Visiting internship students' seminar, Indian Institute of Astrophysics, Bangalore.	May 2012

WORKSHOPS

Machine Learning @ Argonne National Laboratory , Argonne Leadership Computational Facility, Chicago.	July 2017
Scaling to Petascale Institute , Argonne National Laboratories, Chicago.	June 2017
Frontier Topics of Large-scale Predictive Analytics , Lawrence, Kansas.	June 2017
ASTRO: Transition workshop on statistical methods in Astronomy , SAMSI, Research Triangle Park, North Carolina.	May 2017
Astrophysical Population Emulation and Uncertainty Quantification , SAMSI, Research Triangle Park, North Carolina.	April 2017
ASTRO: Opening workshop , SAMSI, Research Triangle Park, North Carolina.	August 2016
Summer School in Physics and Astrophysics , Indian Institute of Astrophysics, Kodaikanal, India	May 2011

School on theoretical high energy physics, Science and Engineering Research Council (SERC), Goa, India. **October 2010**

ACADEMIC
EXPERIENCE

Summer internship under supervision of Prof. Salman Habib and Dr. Taylor Childers, Cosmological Physics and Advanced Computing (CPAC) Group, Argonne National Laboratory, Chicago. **2017**

Graduate Research Assistant under the supervision of Prof. Sergei Shandarin, The University of Kansas. **2013 - present**

Head Graduate Teaching Assistant, Department of Physics and Astronomy, The University of Kansas. **2015 - 2016**

Graduate Teaching Assistant - College Physics 1 (PHSX 114), General Physics (PHSX 214 and 216) at The University of Kansas. **2014 - 2015**

Research Scholar at the Tata Institute of Fundamental Research - Centre for Interdisciplinary Science, Hyderabad, India **2013**

Visiting Research scholar at the Indian Institute of Astrophysics, Bangalore, India **2012-2013**

Undergraduate Teaching Assistant, Theory of relativity (PHY C242) at BITS-Pilani, Goa. **2011**

COMPUTER SKILLS

Programming Languages: Python (numpy, scipy, mpi4py, pandas, matplotlib, mayavi, scikit-learn, TensorFlow, Keras), C/C++ (with MPI and CUDA), Fortran, R

Softwares: Mathematica, ParaView, MeshLab

Publishing: \LaTeX

AWARDS, GRANTS
AND FELLOWSHIPS

High Energy Physics - Center for Computational Excellence summer fellowship. **June 2017**

Travel grant by the Statistical and Applied Mathematical Sciences Institute for the Astrophysical population emulation workshop. **April 2017**

Graduate Research travel award from the University of Kansas for the American Physical Society- April 2017 meeting. **January 2017**

Travel grant by the Statistical and Applied Mathematical Sciences Institute for ASTRO opening workshop. **August 2016**

Travel grant from Division of Astrophysics, American Physical Society for the American Physical Society- April 2016 meeting. **April 2016**

Graduate Research Competition Award for the 2015-16 academic year by the University of Kansas. **April 2016**

Combined Travel grant by the National Science Foundation, the American Physical Society and the Sociedad Mexicana de Fisica for the CAM conference. **September 2015**

Junior research fellowship in Physics from the Council for Scientific and Industrial Research, Government of India. **October 2012**

INSPIRE (Innovation in Science Pursuit for Inspired Research) scholarship from the Department of Science and Technology, Government of India. **2008 - 2012**

PROFESSIONAL
SERVICE AND
ACTIVITIES

Referee, Journal of Cosmology and Astroparticle Physics, IOP Publishing. **2016 - Present**

President, Society of Physics Students, The University of Kansas chapter. **2015 - Present**

Member, KUBESat team - a University of Kansas miniature satellite Mission. Our Cosmic Ray Detector design through SPS won the Chapter Research Award by American Institute of Physics. **2016 - Present**

Member, American Physical Society (APS) **2014 - Present**

Chief Organizer, TEDxBITSGoa conference, India. **February 2011**
