

PremVijay Velmani

SENIOR RESEARCH FELLOW · PHD

Inter-University Centre for Astronomy and Astrophysics, Pune, India, Pin.No- 411007

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Education

Inter University Centre for Astronomy and Astrophysics (IUCAA affiliated to JNU)

Pune, Maharashtra

DOCTOR OF PHILOSOPHY

July 2019 - July 2024(expected)

- Thesis title: Interplay of galaxy formation and the evolution of dark matter haloes in the cosmic web
- Thesis advisor: Prof. Aseem Paranjape

Indian Institute of Science Education and Research (IISER) Bhopal

Bhopal, Madhya Pradesh

BACHELOR OF SCIENCE AND MASTER OF SCIENCE (BS-MS) DUAL DEGREE

August 2014 - May 2019

- Obtained a CPI/CGPA of 9.4 with major in Physics and a minor in Mathematics.
- MS thesis: "Evolution of anisotropic perturbations in bouncing cosmology" under the guidance of Prof. Sukanta Panda.

Tamil Nadu Board of Secondary Education

Chennai, Tamil Nadu

CLASS 12 - PLUS TWO

Graduated March 2014

- **94.58** %, Obtained **96.25** % excluding language subjects.

Tamil Nadu Board of Secondary Education

Chennai, Tamil Nadu

CLASS 10 - SSLC

Graduated April 2012

- **93.6** %, Obtained **99.33** % excluding language subjects and 100 % in science.

Research

PRIMARY EXPERTISE

Cosmology and Large Scale Structure, Dark matter haloes, their distribution in the cosmic web and their evolution, along with their connection to Galaxy formation, Cosmological simulations, Analytical halo formation models such as self-similar collapse.

EXPERIENCES

PhD Research Fellow at IUCAA

Pune, India

PI: PROF. ASEEM PARANJAPE

2020-present

- I have run N-body and hydrodynamics simulations of cosmological volumes using GADGET4 and SWIFT codes including some of the baryon physics.
- Using structure finding codes such as ROCKSTAR and VELOCIRAPTOR, I have made halo catalogues and merger trees.
- I have studied cosmological information such as matter power spectrum and various halo and galaxy properties in simulations.
- Besides my own simulations, I have also worked on simulations produced by large collaborations such as IllustrisTNG and EAGLE.
- I also work on Self-similar models of halo formation and evolution along with galaxy formation.

MS Thesis at IISER Bhopal

Bhopal, India

PI: PROF. SUKANTA PANDA

2018-2019

- I worked on cosmological perturbations in an anisotropic Bianchi type-I background and its evolution in a Bouncing model.

PUBLICATIONS

The quasi-adiabatic relaxation of haloes in the IllustrisTNG and EAGLE cosmological simulations

<https://doi.org/10.1093/mnras/stad297>

PREMVIJAY VELMANI, ASEEM PARANJAPE

Properties beyond mass for unresolved haloes across redshift and cosmology using correlations with local halo environment

<https://doi.org/10.1093/mnras/stac2605>

SUJATHA RAMAKRISHNAN, PREMVIJAY VELMANI

PRESENTATIONS

The Abdus Salam International Centre for Theoretical Physics

Trieste, Italy

SUMMER SCHOOL ON COSMOLOGY 2022

July 2022

- Gave a talk on "Impact Of Galaxy Formation On The Dark Matter Haloes In The Cosmic Web" at ICTP, an UNESCO organisation.

Awards and fellowships

Aug.2021 Senior Research Fellowship , Inter-University Centre for Astronomy and Astrophysics	Pune, India
Aug.2019 Junior Research Fellowship , Inter-University Centre for Astronomy and Astrophysics	Pune, India
Jan.2019 Junior Research Fellowship , Council of Scientific & Industrial Research	New Delhi, India
Aug.2014 INSPIRE Scholarship , IISER, Department of Science & Technology	Bhopal, India
June.2014 Cash Prize Award , Second rank in 12th board exam	Chennai, India
April.2012 SSLC cash prize award , Centum in 10th board exam	Chennai, India

Professional Skills

COMPUTER SKILLS

Programming	Python, Bash, C, C++, IDL, Fortran, R, Wolfram, Matlab/Octave
Python libraries	Includes numpy, scipy, pandas, astropy, cobaya, camb, colossus, casa, h5py, sklearn, matplotlib, seaborn, getdist, pyqtgraph, vispy, vpython, pyopengl, pyopencl, pycuda, conda, mpi4py and PyQt5
Simulation tools	GADGET4, SWIFT, ROCKSTAR, VELOCIRAPTOR, MUSIC2-monofonic
CAS	Mathematica (packages xTensor, xCoba, xPert, xPand), Maple, Python sympy
Operating system	Linux system administration, Bash, distros including Arch Linux, Ubuntu, Fedora, RHEL, SUSE, Centos; HPC clusters with PBS jobs scheduler and NFS storage; Windows administration, Powershell, WSL
Markup Languages	LaTeX, HTML, CSS, Markdown, MS Office/ Libreoffice
Other software	Adobe Creative Cloud apps, DaVinci Resolve, Blender, Poser

TEACHING SKILLS

Physics, Astronomy and Cosmology

Academic Achievements

May 2022 Summer School on Cosmology 2022 , Invited with funds by ICTP, UNESCO	Trieste, Italy
Jun 2018 CSIR UGC NET - Physics , Qualified JRF with a score of 115 and all India rank of 116	India
Aril 2014 JEE MAIN / AIEEE , Qualified with a score 190	India
May 2014 NEET UG / AIPMT , Qualified with a score of 350.	India
June 2014 JEE ADVANCED , Qualified with a rank of 4056 within OBC category.	India
June 2016 SOLOLEARN - Python , Completed with <u>certification</u>	

Hobbies & Interests

A strongly curiosity driven and challenge seeking person.

READING I use the world wide web to explore various topics in both natural science and others such as history, politics, technology and sustainable development, with a rational viewpoint.

EXPLORATION As a foodie, I travel to various places with special focus on trying different food.

SPORTS Primarily football, badminton, table tennis and swimming.

OTHER PERSONALITY I am a foodie, experimental cook, nutritionist, fitness freak, audiophile (also amateur singer), electrical/electronics hobbyist, amateur astronomer and computer gamer.

I enjoy doing lots of home experiments driven by my own curiosity. And I can relate with prof. R Feynman that "Nearly everything is really interesting if you go into it deeply enough". I like challenges and I don't like doing simple things repetitively, so I keep exploring various new things. Trying to comprehend the logic behind complex things is my pleasure.

Extracurricular Activity

IUCAA open science day

Pune, India

PRESENTED A POSTER ON BASICS OF COSMOLOGY

Feb 2023

IUCAA open science day

Pune, India

CREATED A VIDEO EXPLAINING PROBES OF COSMOLOGY

Feb 2021

IUCAA open science day

Pune, India

DEMONSTRATED CREATION OF GRAVITATIONAL WAVES

Feb 2019

Singularity-15, IISER Bhopal

Bhopal, India

BAD AD HOC HYPOTHESIS ON GRAVITY AT THE COSMIC HORIZON

April 2015

Singularity-16, IISER Bhopal

Bhopal, India

SCIENCE EXHIBITION DEMONSTRATION OF A MEGA DOMINO EFFECT SYSTEM

September 2016

IISER Science Council

Bhopal, India

HEAD OF ARTIFICIAL INTELLIGENCE AND ML CLUB; MEMBER OF PHYSICS, MATHEMATICS AND ASTRONOMY CLUB

Aug 2014 - May 2019

Astronomy and Space Technology Awareness Camp

Bhopal, India

WORKSHOP BY SPATS OF IIT KGP

April 2015

Mimamsa 2015 by IISER Pune

Mumbai, India

NATIONAL SCIENCE QUIZ

January 2015

Mimamsa 2016 by IISER Pune

Bhopal, India

NATIONAL SCIENCE QUIZ

January 2016

School level

Chennai, India

COMPETITIONS

- Winner in Science quiz intra school. Got selected in science talent exam conducted by The Hindu Educational Plus.
- Winner in debate about Education System.

References

Prof.Dr. Aseem Paranjape, Associate Professor, IUCAA

Pune, India

Prof.Dr. Sukanta Panda, Associate Professor, Department of Physics, IISER Bhopal

Bhopal, India