

Prashant PATHAK

RESEARCH INTEREST

- Astronomical instrumentation
- High-contrast imaging of Exoplanets
- Adaptive Optics

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CURRENT POSITION

Engineering and Technology Research Fellow at [European Southern Observatory \(ESO\)](#), Garching, Germany.

CURRENT PROJECTS

- **METIS**: Simulating the performance of various High Contrast Imaging (HCI) modes of the instrument. I also co-developed a general purpose HCI simulator called High-contrast End-to-End Performance Simulator ([HEEPS](#)).
- **NEAR**: The work involved packaging (pre-processing) a large amount of science observation and post-processing of the data. The project helped me to gain key insights into working of the mid-IR observation.
- **DM development**: Studying the temporal and spatial dynamics of a deformable mirror at very high-frame rate. The project involved setting of a Shack-Hartmann based wavefront sensor, characterization and data analysis.

EDUCATION

PhD, Astronomy (Instrumentation) 2014-2017
[The Graduate University for Advance Studies \[SOKENDAI\]](#), Japan

Integrated Bachelor & Master of Science (BS-MS) 2008-2013
[Indian Institute of Science Education and Research -Thiruvananthapuram](#), India

RESEARCH EXPERIENCE

OCT 2014-SEPT 2017 | **PhD Research:** On-sky closed-loop correction of atmospheric dispersion for high-contrast coronagraphy and astrometry
Supervisor: [Prof. Olivier Guyon](#)
ABSTRACT: *For direct detection of habitable exoplanets, located at a small angular separation from the host star, it is crucial to employ small inner working angle (IWA) coronagraphs that efficiently suppress starlight. For ground-based telescopes, atmospheric refraction is also an important factor, since it results in a smearing of the PSF, that can no longer be efficiently suppressed by the coronagraph. For a high-contrast instrument like SCExAO system, which employs very small IWA coronagraphs, refraction-induced smearing of the PSF has to be less than 1 mas in the science band for optimum performance. By using an adaptive speckle grid generated using a deformable mirror with sufficiently large number of actuators, I was able to accurately measure the residual atmospheric dispersion and subsequently correct it in a closed-loop manner to < 1 mas in the H-band.* [\[Link to PhD thesis\]](#)

AUG 2012-APR
2013

Masters Thesis: Optoelectronic studies of ZnO nanostructures

Supervisor: **Prof. Joy Mitra**

ABSTRACT: *Major part of the project involved designing and building a custom-made room temperature optoelectronic characterization setup, capable of performing optical as well as electrical characterization, and in combination such as Photoluminescence (PL), Electroluminescence. It was crucial to choose the design and optics carefully, as luminescence from the studied material was low for the detection. Building the setup involved assembling, optically matched spectrometer, detector, lasers, optical components. Subsequently, the setup was optimized such that its excitation/detection performance was at par with any commercial instrument, and standardized using common fluorescent dyes.*

[\[Link to Masters thesis\]](#)

SOFTWARE/PROGRAMMING SKILLS

Languages	Developed extensively in Python, MATLAB and Bash, and intermediate knowledge of Mathematica, C, C++, IRAF, HTML, CSS
Packages	AutoCAD, LabView and Latex

OBSERVING EXPERIENCE

31 Engineering and Science nights with Subaru adaptive optics AO188, SCExAO, Coronagraphic High Angular Resolution Imaging Spectrograph (CHARIS) and high contrast instrument for next generation adaptive optics (HICIAO).

SCHOOLS & WORKSHOPS ATTENDED

- EuroSciPy 2019
Bilbao, Spain. Sept-2019
- Workshop Week @ Durham 2018 on Adaptive Optics
Durham University, UK March-2018
- 17th Annual International Summer School on Adaptive Optics
Center for Adaptive Optics, University of California, Santa Cruz, USA Aug-2017
- Summer School on Introduction to Astronomical Instrumentation
Dunlap Institute for Astronomy, University of Toronto, Canada Aug-2016
- NExSS Arizona Winter School on Consequences of Internal Planet Evolution for the Habitability and Detectability of Life on Extrasolar Planets.
Arizona State University, USA Feb-2016
- Winter school on Ultracold Atoms for fundamental science and enabling technologies
IISER-Pune, India and University of Nottingham, UK Dec-2012
- IndIGO school on Gravitational Waves
University of Delhi, Inter University Centre for Astronomy and Astrophysics (IUCAA), and Tata Institute of Fundamental Research (TIFR), India Dec-2010
- Summer school on Astrophysics
Indian Institute of Astrophysics (IIA) Bangalore, India May-2010
- Winter school on Radio Astronomy
National Centre for Radio Astronomy (NCRA) Pune, India Dec-2009

AWARDS AND FELLOWSHIP

INSPIRE (Innovation in Science Pursuit for Inspired Research) fellow from DST (Department of Science and Technology) India. (<http://online-inspire.gov.in/>)

PRESENTATIONS

Talk	NEAR campaign data reduction. <i>HCI post-processing workshop, Berlin, Germany.</i>	Jan-2020
	A Shack-Hartmann based setup to study deformable mirrors dynamics at very high framerates. <i>Wavefront sensing and control in the VLT/ELT era, Paris, France.</i>	Oct-2018
	HEEPS: High-contrast End-to-end ELT Performance Simulator package <i>VORTEX yearly meeting, Liège, Belgium.</i>	Aug-2018
	Closed-loop correction of atmospheric dispersion to achieve high-Strehl ratio with TMT. <i>Thirty Meter Telescope Science Forum 2017, Mysore, India.</i>	Nov-2017
	Closed-loop correction of residual atmospheric dispersion in high-contrast imaging systems. <i>Institute for Astronomy (IfA), Hilo, Hawaii, USA.</i>	Oct-2016
Poster	A Shack-Hartmann based setup to study deformable mirrors dynamics at very high framerates. <i>AO4ELT6, Quebec, Canada</i>	Jun-2019
	Closed-loop atmospheric dispersion compensation: on-sky demonstration of sub-milliarcsecond residual dispersion across H-band. <i>AO4ELT5, Tenerife, Spain</i>	Jun-2017
	First on-sky closed loop measurement and correction of atmospheric dispersion. <i>SPIE Astronomical Telescopes & Instrumentation, Edinburgh, UK.</i>	Jun-2016

ASTRONOMY OUTREACH

Journey through the Universe educator, a public education program held annually by GEMINI Observatory in Hilo, Hawaii.

EXTRACURRICULAR ACTIVITIES AND HOBBIES

I have participated in organizing various cultural and technical events at my institute and was the leading member of the Photography and the Astronomy club. I have an inherent fascination towards nature and have been part of various bird watching clubs and have gone to several field trips.

REFERENCES

Dr. Markus Kasper

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Dr. Olivier Guyon

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Dr. Nemanja Jovanovic

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