
# Himalaya Senapati

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## Work

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|---|---|
| **AVP, HSBC** | Aug 2023 – Present |
| **Associate, Goldman Sachs** | May 2021 – Aug 2023 |
| **Visiting Scientist, ISI Bangalore** | Mar 2021 |
| **Postdoc, IIT Madras** | Feb 2021 – Apr 2021 |
| **Postdoc, CMI** | Aug 2020 – Jan 2021 |

## Education

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| **PhD in Physics, CMI** | Aug 2015 – July 2020 |
| **M.Sc. in Physics, CMI** | Aug 2013 – July 2015 |
| **B.Sc. in Physics, CMI** | Aug 2010 – July 2013 |

## Selected Publications

*Ergodicity, mixing and recurrence in the three rotor problem*, G. S. Krishnaswami and H. Senapati, Chaos, 30 (4), 043112 (2020). [**Editor's pick**].

*Classical three rotor problem: periodic solutions, stability and chaos*, G. S. Krishnaswami and H. Senapati, Chaos, 29 (12), 123121 (2019). [**Editor's pick, Featured article**].

*Curvature and geodesic instabilities in a geometrical approach to the planar three-body problem*, G. S. Krishnaswami and H. Senapati, J. Math. Phys., 57, 102901 (2016). [**Featured Article**].

## Honors and Awards

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| **Best Poster Presentation Award**, *Conference on Nonlinear Systems and Dynamics, IIT Kanpur* | 2019 |
| **Oberwolfach Leibniz Graduate Students Grant**, *Awarded by MFO, Germany* | 2018 |
| **International Travel Support Grant**, *Awarded by SERB, India* | 2017 |
| **Indian National Mathematics Olympiad**, *Selected among top 30 students countrywide* | 2007,'08,'09,'10 |
| **Indian National Astronomy Olympiad**, *Selected among top 30 students countrywide* | 2007,'08,'09,'10 |
| **Zonal Informatics Olympiad**, *Selected among top 229 students countrywide* | 2009 |
| **KVPY Fellowship**, *Awarded to 200 students by Dept. of Science & Technology, Govt. of India* | 2008–2013 |
| **National Child Award for Exceptional Achievement**, *Awarded by Department of Women & Child Development, Govt. of India* | 2008 |
| **XII International Astronomy Olympiad**, *Silver Medal* | 2007 |

## Schools & Conferences

**Statistical Physics of Machine Learning**, Jan 6-10, 2020 (ICTS, Bengaluru)

**Conference on Nonlinear Systems and Dynamics**, Dec 12 - 15, 2019 (IIT Kanpur).

**CIMPA school on Finsler geometry and applications**, Dec 5 - 12, 2019 (BHU, Varanasi).

**Workshop on Data Analysis and Machine Learning**, May 24-28, 2019 (IISER Tirupati).

**Workshop on Topological Dynamics, Number Theory and related areas**, Jan 04 - 13, 2019 (RKMVERI, Belur Math).

**Populations: Interactions and Evolution**, Sep 10-14, 2018 (Institut Henri Poincaré, Paris).

**Recent trends in Teichmuller theory and Mapping class groups**, Sep 2-8, 2018 (MFO, Oberwolfach).

**SERB School on Nonlinear dynamics**, January 02 - 29, 2018 (SPPU, Pune).

**Geometry, Groups and Dynamics**, November 06 - 24, 2017 (ICTS, Bengaluru).

**Probabilistic and statistical methods for networks**, Aug 21 - Sep 1, 2017 (BMS Summer School, Berlin).

## Industry Experience

**Analyzing dispersion trades** with a focus on managing risk (Aug 2023 - present, HSBC).

- Developed a framework to simulate dispersion trades with specified market params such as correlation and volatility surface.
- Investigated first and second order greeks and impact on PnL explain.

**Porting pricing logics from Slang to C++** along with associated debugging and backtesting (May 2021 - Aug 2023, Goldman Sachs).

- Developed parts of the C++ pricing engine for USD vanilla swaps to be called from a Java stack.
- Backtested the flow against existing Slang stack and resolved diffs for correct pricing.
- Developed and implemented curve fitting algorithms in C++ for faster and accurate pricing.

## Academic Projects

**Gaussian Process based understanding of Deep Learning Machines** (with David Saad, unfinished): The goal of the project was to design scalable and interpretable machine learning methods via Deep Gaussian Processes. This would have had application in high-risk areas such as Health and Finance.

**Instabilities, chaos and ergodicity in the three-rotor problem**: Analytical methods along with numerical tools and statistical measures were used to investigate dynamics of a model of coupled Josephson junctions. *Publications* –

- *Ergodicity, mixing and recurrence in the three rotor problem*, G. S. Krishnaswami and H. Senapati, Chaos, 30 (4), 043112 (2020). [Editor's pick].
- *Stability and chaos in the classical three rotor problem*, G. S. Krishnaswami and H. Senapati, Indian Academy of Sciences Conference Series, 2(1), 139-143 (2019).
- *Classical three rotor problem: periodic solutions, stability and chaos*, G. S. Krishnaswami and H. Senapati, Chaos, 29 (12), 123121 (2019). [Editor's pick, Featured article].

**Geometric approach to the planar three-body problem**: Techniques from Riemannian Geometry along with a variational principle was used to analyze instabilities in a generalization of the Sun-Earth-Moon problem. *Publications* –

- *An introduction to the classical three-body problem: From periodic solutions to instabilities and chaos*, G. S. Krishnaswami and H. Senapati, Resonance, 24, 87-114 (2019).
- *Curvature and geodesic instabilities in a geometrical approach to the planar three-body problem*, G. S. Krishnaswami and H. Senapati, J. Math. Phys., 57, 102901 (2016). [Featured Article].

**Non-Euclidean geometry**: Inequalities and monotonicity properties in spherical and hyperbolic geometries were investigated. *Publications* – Three chapters in "Eighteen Essays in Non-Euclidean Geometry", Eds. V. Alberge and A. Papadopoulos, European Mathematical Society Publishing House, Zurich (2019):

- *On a theorem of Lambert: Medians in spherical and hyperbolic geometries*, H. Senapati, pp. 57-65.
- *Inscribing a triangle in a circle in spherical geometry*, H. Senapati, pp. 67-79.
- *Monotonicity in spherical and hyperbolic triangles*, H. Senapati, pp. 81-91.

## Others

Occasional problem setter at Codechef coding contests.

Created a network of about hundred researchers in complex systems and ran a biweekly seminar series from October 2020 to April 2021.

Participated as an organizational member of the Academic team in the $10^{th}$ International Olympiad on Astronomy and Astrophysics, Bhubaneswar, December 2016.

Taught at winter camps for children selected in Rural Mathematics Talent Search, Odisha, 2010,'11,'12.