

# DEEPAK BADARINATH

54, Southfield Road, Oxford, OX4 1NZ

✉ [deepak.badarinath@stats.ox.ac.uk](mailto:deepak.badarinath@stats.ox.ac.uk) ☎ [+447960174419](tel:+447960174419)  [LinkedIn](#)

## Research Experience

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### Statistical Machine Learning at the University of Oxford

Oct. 2022 – Oct. 2026

*Doctoral Student*

*Oxford, United Kingdom*

- PhD thesis title: Reinforcement Learning algorithms for airline revenue management and healthcare
- Design of interpretable offline reinforcement learning approaches for dynamic treatment regimes in healthcare, work done in collaboration with Prof. Sourush Saghafian from the Harvard Kennedy School

### Fraunhofer Institute for Algorithms and Scientific Computing

Sep. 2021 – Sep. 2022

*Student Research Assistant*

*Sankt Augustin, Germany*

- *Master's thesis* student in the **Computational Finance** group. The goal of my thesis was to build an agent that optimizes portfolios in the energy and commodity markets. Built an agent that yields a profit when we have a battery that stores energy, a market to buy/sell energy from, and a grid to supply energy to.

### Institute for Applied Mathematics

Aug. 2021 – Jan. 2022

*Graduate Research Assistant*

*Bonn, Germany*

- Obtained theoretical performance bounds for (un)adjusted Hamiltonian Monte Carlo (algorithms obtained after discretization of a stochastic differential equation) under special cases. Ran computational experiments to verify the performance of the algorithm with dimension and other parameters.

## Education

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### PhD. in Machine Learning [PhD. StatML]

Oct. 2022 – Oct. 2026

*University of Oxford*

*Oxford, United Kingdom*

### Master of Science [M.Sc. Mathematics]

Oct. 2019 – Aug. 2022

*University of Bonn*

*Bonn, Germany*

- Final grade: 1,8

### Bachelor of Mathematics (Honours) [B.Math(Hons.)]

Jul. 2016 – May 2019

*Indian Statistical Institute*

*Bangalore, India*

- Aggregate percentage: 94.4%

## Teaching Experience

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### Statistics Department

Jan. 2024 – March 2024, Oct. 2024 - Jan. 2025

*University of Oxford*

*Oxford, United Kingdom*

- Master's tutor: Advanced topics in statistical machine learning, Stochastic Processes

## Honours

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- **DAAD Stibet Partial Scholarship**, awarded from Aug. 2021 to Jan. 2022 to fund Master's thesis.
- **S.H.Aravind Gold Medal, first rank** holder in *B.Math(Hons.)* batch of 2016-2019.
- **Teacher's Prize**, 6 times in *B.Math(Hons.)*, awarded for top-3 students each semester.

## Publications

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- **Cost of interpretability: Blocked Value Iteration** - Presented at the Interpretable Policies Workshop at the Reinforcement Learning conference at RLC 2024.
- **Value Interpretable Dynamic Treatment Regimes** - We design a greedy model-based interpretable approach to design optimal interpretable policies given by lists. Finally we optimize the algorithm by computing a tight version of the same which leads us to solve the problem of finding the convex envelope.
- Applied data analysis work done for an airline company - employed a variety of ML algorithms to derive predictive factors for airline pricing
- Applied reinforcement learning work done for an airline company - using deep Q learning methods we find ways to price the airline versus the competitor.

## Software Skills

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Python - Numpy, Scipy, Pandas, Matplotlib, L<sup>A</sup>T<sub>E</sub>X, Multithreading, High performance computing