Siddhant A. Deshmukh, PhD

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PROFESSIONAL EXPERIENCE

10/2022 - 10/2023 **Data Analyst**
Max Planck Institute for Astronomy (Heidelberg, Germany)

- Secured over €400,000 in a team of four for an entrepreneurial venture focusing on analyzing customer feedback for large conferences and trade fairs across Europe
- Developed components for online virtual networking tool using React.js
- Collected and analyzed text data applying dimensionality reduction, NLP & clustering with UMAP, MDE, scipy and scikit-learn
- Led social media marketing and targeted sales campaigns increasing customer acquisition by 50%
- Created comprehensive reports for customers and interfaced with LLMs to generate key takeaways, resulting in 70% increase in customer retention

08/2019 - 12/2022 **Astrophysics PhD Researcher**
Heidelberg University (Heidelberg, Germany)

- Improved existing spectroscopic fitting routines and collaborated internationally to develop a rigorous analysis pipeline for determining the solar photospheric silicon abundance (Python)
- Performed comparisons between simulated and observed solar spectroscopic data to assess model quality
- Created codebase for coupling chemical reaction systems to hydrodynamics and radiative transfer models (Python, Julia, Fortran)
- Wrote novel analysis tools utilizing pathfinding algorithms on weighted, directed graphs to find reaction pathways for chemical networks (networkx)
- Trained convolutional neural networks to predict equilibrium chemistry, resulting in a 20x speed-up compared to directly solving the system (TensorFlow/Keras)
- Led 2 independent research projects in computational astrophysics to publication in esteemed, peer-reviewed journals

05/2018 - 08/2018 **Undergraduate Researcher**
University of Exeter (Exeter, UK)

- Analyzed spacecraft observations of the solar wind and created dashboard using numpy, scipy, matplotlib and plotly
- Optimized model parameters using Markov Chain Monte Carlo (MCMC) sampling
- Developed preliminary forecasting method for space weather with LSTM neural networks with TensorFlow/Keras, PyTorch and scikit-learn

EDUCATION

2019 - 2023 **Heidelberg University**
PhD in Astrophysics

- Computational modelling and data analysis for coupling chemical reaction systems to hydrodynamics and radiative transfer models using Fortran, Python, C, Julia

2015 - 2019 **University of Exeter**
Integrated Master's Degree in Physics (First-Class Honours)

- Analysis of stellar magnetic field evolution by solving differential equations in C with data visualization in Python

LEADERSHIP EXPERIENCE

06/2021 - 09/2021 **Undergraduate Research Supervisor**
DAAD RISE Germany (Heidelberg, Germany)

- Won funding for 3 months of supervising an American undergraduate exchange student in the German research environment

2019 - 2023 **PhD Tutor**
Heidelberg University (Heidelberg, Germany)

- Created material and ran tutorials for undergraduate and master's level courses in English and German including "Physics for Non-Physicists" and "Fundamentals of Simulation Methods"

Conference Presentations

- Cambridge Workshop of Cool Stars, Stellar Systems and the Sun. Toulouse, France (July 2022)
- Planetary Transits and Oscillations Stellar Science Workshop. Barcelona, Spain (Sept 2019)

Attended Schools and Workshops

- 47th Heidelberg Physics Graduate Days. Heidelberg, Germany (Oct 2021)
- International Max Planck Research Schools' Summer School on Stellar Ecosystems. Heidelberg, Germany (Sept 2021)
- KROME Summer School Workshop on Astrochemistry. Online (Feb 2021)

PUBLICATIONS

- **Siddhant A. Deshmukh**, Hans-Guenter Ludwig and Guillaume Guiglion (in prep). *Time-Dependent Molecular Chemistry in Red Giant Stellar Atmospheres with Neural Networks.*
- **Siddhant A. Deshmukh** (Oct 2023). *Modelling Non-Equilibrium Molecular Formation and Dissociation for the Spectroscopic Analysis of Cool Stellar Atmospheres*. PhD Thesis.
- **Siddhant A. Deshmukh** and Hans-Guenter Ludwig (July 2023). *Implications of Time-Dependent Chemistry in Metal-Poor Dwarf Stars.* Astronomy & Astrophysics Volume 675, A146.
- **Siddhant A. Deshmukh**, Hans-Guenter Ludwig, Arunas Kučinskas, Matthias Steffen, Paul S. Barklem, Elisabetta Caffau, Vidas Dobrovolskas, and Piercarlo Bonifacio (Dec. 2022). *The Solar Photospheric Silicon Abundance According to CO5BOLD - Investigating Line Broadening, Magnetic Fields, and Model Effects.* Astronomy & Astrophysics Volume 668, A48.
- Adam J. Finley, **Siddhant A. Deshmukh**, Sean P. Matt, Mathew Owens, and ChiJu Wu. (2019). *Solar Angular Momentum Loss over the Past Several Millennia.* The Astrophysical Journal, Volume 883, Number 1.

ADDITIONAL INFORMATION

Programming Languages: Python, R, SQL, Rust, C, Julia, JavaScript, Java
Software: Linux, Git, GitHub, Microsoft Office, LaTeX
Languages: English (fluent), German (intermediate), Hindi (intermediate), Marathi (intermediate)
Work Eligibility: Eligible to work in the U.S. with no restrictions