D Bhanu Prakash

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Profile —

I am currently pursuing a Ph.D. in Mathematics at the Sri Sathya Sai Institute of Higher Learning, specializing in Dynamical Systems and Optimal Control Theory with applications in Mathematical Biology. I submitted my doctoral thesis in May 2025. My academic background offers a strong foundation in both theoretical and applied mathematics. Previously, I served for three years as a Research Fellow on a DAE-NBHM funded project, contributing significantly to its progress and outcomes. My research journey has honed my analytical and problem-solving skills and deepened my passion for teaching and mentoring students.

Areas of Expertise

• Mathematical Modeling • Dynamical Systems • Optimal Control Theory • Data Analysis • Mathematical Ecology • Mathematical Epidemiology • Ordinary Differential Equations • Stochastic Differential Equations • Bayesian Statistics

Experience

Senior Research Fellow (SRF) - NBHM Research Project **Oct 2023 – Sep 2024**

Project funded by Department of Atomic Energy-National Board of Higher Mathematics (DAE-NBHM), GoI

- Project Title: "*Time Optimal Control Studies and Bifurcation Analysis of Coupled Nonlinear Dynamical Systems with Applications to Pest Management*"
- Esteemed stipendiary Research Fellowship, granted for one year upon successful attainment of objectives during the initial two years.
- Two Journal papers are communicated and one paper is under preparation. Delivered a talk in an international conference (RAAM-2024) organised by IIT BHU.

Junior Research Fellow (JRF) - NBHM Research Project **Oct 2021 – Sep 2023**

Project funded by Department of Atomic Energy-National Board of Higher Mathematics (DAE-NBHM), GoI

- Project Title: "*Time Optimal Control Studies and Bifurcation Analysis of Coupled Nonlinear Dynamical Systems with Applications to Pest Management*"
- Prestigious stipendiary Research Fellowship for two years, awarded on the basis of outstanding track record and research plans.
- Two Journal papers are published and one paper is communicated. Delivered a talk in an international conference (ICDECP23) organised by IIT Mandi.

Teaching Experience

Teaching Assistant **Dec 2021 – Apr 2025**

Department of Mathematics and Computer Science, Sri Sathya Sai Institute of Higher Learning (SSSIHL) Prasanthi Nilayam - 515 134, India.

- Probability and Statistics — Semester II, 2021-2022
- Mathematical Modeling — Semester II, 2022-2023
- Calculus of Variations and Optimal Control Theory — Semester I, 2023-2024
- Real Analysis — Semester II, 2023-2024
- Linear Algebra — Semester I, 2024-2025
- Methods of Differential Equations — Semester II, 2024-2025

EDUCATION

PhD., Mathematics **Mar 2021 – Ongoing (Thesis Submitted, May 2025)**
Sri Sathya Sai Institute of Higher Learning (SSSIHL) *Prasanthi Nilayam - 515 134, India.*

- Thesis Title: *"Dynamics and Control of Additional Food Provided Prey-Predator Systems: A Deterministic and Stochastic Study with reference to Holling Type-III/IV Responses Incorporating Mutual Interference and Intraspecific Competition"*.
- Research Supervisor: Dr. Krishna Kiran Vamsi Dasu
- Current Status: Two journal papers are published and four papers are communicated. Delivered talks in two international and one national conferences.

M.Sc. Mathematics specialization in Computer Science **2018–2020**
Sri Sathya Sai Institute of Higher Learning (SSSIHL); GPA: 8.3/10 *Prasanthi Nilayam - 515 134, India.*
B.Sc. Mathematics (Hons.) specialization in Computer Science **2015–2018**
Sri Sathya Sai Institute of Higher Learning (SSSIHL); GPA: 7.5/10 *Prasanthi Nilayam - 515 134, India.*
Intermediate **2013–2015**
Sri Chaitanya Junior College; Score: 975/1000 *Machilipatnam - 521 001, India.*
S.S.C **2012–2013**
Sree Balajee Vidyalayam; GPA: 9.7/10 *Machilipatnam - 521 001, India.*

CERTIFICATIONS

Data Analysis with R Specialization by Duke University offered through Coursera **Mar 2025**

- Introduction to Probability and Data with R • Inferential Statistics
- Linear Regression and Modeling • Bayesian Statistics (Certificate)

Stochastic Processes by HSE University and offered through Coursera (Certificate) **Oct 2024**
Machine Learning Specialization by Stanford University and offered through Coursera

PUBLICATIONS

Preprints

- **D. B. Prakash** and D. K. K. Vamsi, "Deterministic and stochastic studies on additional food provided prey-predator systems with group defence among prey and mutual interference among predators," *arXiv preprint arXiv:2504.21114*, 2025. [Online]. Available: https://www.arxiv.org/abs/2504.21114. Manuscript submitted for review to *Acta Applicandae Mathematicae, Springer Nature*.
- **D. B. Prakash** and D. K. K. Vamsi, "Dynamics and control of additional food provided prey-predator systems exhibiting holling type-iii functional response and intra-specific competition among predators," *arXiv preprint arXiv:2504.18035*, 2025. [Online]. Available: https://arxiv.org/abs/2504.18035. Manuscript submitted for review to *Qualitative Theory of Dynamical Systems, Springer*.
- **D. B. Prakash** and D. K. K. Vamsi, "Role of intra-specific competition and additional food on prey-predator systems exhibiting holling type-iv functional response," *arXiv preprint arXiv:2504.09078*, 2025. [Online]. Available: https://arxiv.org/abs/2504.09078 - Manuscript submitted for review to *Journal of Biological Dynamics, Taylor & Francis*.
- **D. B. Prakash** and D. K. K. Vamsi, "Global dynamics and time-optimal control studies for additional food provided holling type-iii mutually interfering prey-predator systems with applications to pest management," *arXiv preprint arXiv:2406.15458*, 2024. [Online]. Available: https://doi.org/10.48550/arXiv.2406.15458 - Manuscript submitted for review to *Discover Applied Sciences, Springer Nature*.

Journal Articles

- **D. B. Prakash** and D. K. K. Vamsi, "Stochastic time-optimal control and sensitivity studies for additional food provided prey-predator systems involving holling type-iv functional response," *Frontiers in Applied Mathematics and Statistics*, vol. 9, p. 1 122 107, 2023. [Online]. Available: https://doi.org/10.3389/fams.2023.1122107
- **D. B. Prakash** and D. K. K. Vamsi, "Stochastic optimal and time-optimal control studies for additional food provided prey–predator systems involving holling type iii functional response," *Computational and Mathematical Biophysics*, vol. 11, no. 1, p. 20 220 144, 2023. [Online]. Available: https://doi.org/10.1515/cmb-2022-0144
- B. Chhetri, D. K. K. Vamsi, **D. B. Prakash**, S. Balasubramanian, and C. B. Sanjeevi, "Age structured mathematical modeling studies on covid-19 with respect to combined vaccination and medical treatment strategies," *Computational and Mathematical Biophysics*, vol. 10, no. 1, pp. 281–303, 2022. [Online]. Available: https://doi.org/10.1515/cmb-2022-0143
- B. Chhetri, V. M. Bhagat, D. K. K. Vamsi, V. S. Ananth, **D. B. Prakash**, S. Muthusamy, P. Deshmukh, and C. B. Sanjeevi, "Optimal drug regimen and combined drug therapy and its efficacy in the treatment of covid-19: A within-host modeling study," *Acta Biotheoretica*, vol. 70, no. 2, pp. 1–28, 2022. [Online]. Available: https://doi.org/10.1007/s10441-022-09440-8
- D. S. S. M. Kanumoori, **D. B. Prakash**, D. K. K. Vamsi, and C. B. Sanjeevi, "A study of within-host dynamics of dengue infection incorporating both humoral and cellular response with a time delay for production of antibodies," *Computational and Mathematical Biophysics*, vol. 9, no. 1, pp. 66–80, 2021. [Online]. Available: https://doi.org/10.1515/cmb-2020-0118
- **D. B. Prakash**, B. Chhetri, D. K. K. Vamsi, S. Balasubramanian, and C. B. Sanjeevi, "Low temperatures or high isolation delay increases the average covid-19 infections in india: A mathematical modeling approach," *Computational and Mathematical Biophysics*, vol. 9, no. 1, pp. 146–174, 2021. [Online]. Available: https://doi.org/10.1515/cmb-2020-0122
- B. Chhetri, D. K. K. Vamsi, **D. B. Prakash**, and C. B. Sanjeevi, "Combined drug interventions and its efficacy in the reduction of covid-19 burden: A within-host modeling study with reference to hcq and bcg vaccination," *Advances in Dynamical Systems and Applications (ADSA)*, vol. 16, no. 1, pp. 369–403, 2021 Link
- B. Chhetri, V. M. Bhagat, D. K. K. Vamsi, V. S. Ananth, **D. B. Prakash**, R. Mandale, S. Muthusamy, and C. B. Sanjeevi, "Within-host mathematical modeling on crucial inflammatory mediators and drug interventions in covid-19 identifies combination therapy to be most effective and optimal," *Alexandria Engineering Journal*, vol. 60, no. 2, pp. 2491–2512, 2021. [Online]. Available: https://doi.org/10.1016/j.aej.2020.12.011
- **D. B. Prakash**, D. K. K. Vamsi, D. B. Rajesh, and C. B. Sanjeevi, "Control intervention strategies for within-host, between-host and their efficacy in the treatment, spread of covid-19: A multi scale modeling approach," *Computational and Mathematical Biophysics*, vol. 8, no. 1, pp. 198–210, 2020. [Online]. Available: https://doi.org/10.1515/cmb-2020-0111

Workshop and Speaking Engagements

- **Resource Person**, FDP on *"Statistical Process Design using R & Python"*, Mangalore Institute of Technology & Engineering (MITE), Karnataka - May 8-10, 2025. Conducted a 4-hour lecture and hands-on session on **Stochastic Processes and Multivariate Analysis**.
- **Resource Person**, FDP on *"Advances in Mathematical Modeling Techniques, AI/ML & Bioinformatics"*, Sri Sathya Sai Institute of Higher Learning (SSSIHL) and Indian Society for Mathematical Modeling and Computer Simulation (ISMMACS) - April 12-13, 2025. Conducted a 2-hour hands-on session on **A Python primer on Optimal Control Problems**.
- **Resource Person**, Online workshop on *"Mathematical Modelling of Infectious Diseases"*, MedPro, Tamilnadu - February 20, 2025. Organized a two hour hands-on session on the topic: **Mathematical Modeling of Infectious Diseases using Python**.
- **Resource Person**, A 6-day In-person *"National Winter School for Women in AI and Computational Biology - 2024"*, Centre for Excellence in Mathematical Biology (CEMB-SSSIHL) - December 2-7,

2024. Organized a hands-on session for four hours on the topic: **Introduction to Programming and Disease Modeling using Python**. (Report)

- **Resource Person**, FDP on *"Dynamical Systems & Optimal Control Theory, AI/ML, and Bioinformatics with Applications to Healthcare"*, Centre for Excellence in Mathematical Biology (CEMB-SSSIHL) - July 8-15, 2024. Organised a hands-on session for six hours on the topic: **Dynamical Systems and Optimal Control Theory with Python.**
- **Guest Lecture**, A 2-day In-person workshop on *"Infectious Disease Modeling"*, ICMR-National Institute for Research in Tuberculosis (ICMR-NIRT), Department of Health, Chennai, Government of India - March 14-15, 2024. Organised a hands-on session for four hours on the topic: **Introduction to Python Programming and Exploring Basic Disease Models in Python**.

Conference Talks

- *Deterministic and Stochastic Time Optimal Control Studies of Coupled Nonlinear Dynamical Systems with Applications to Pest Management.* **2nd International Conference on Recent Advances in Applied Mathematics** (RAAM 2024) organized by Indian Institute of Technology IIT BHU, Varanasi during July 2024.
- *Deterministic and Stochastic Studies on Additional Food Provided Prey-Predator System involving Holling Type-III and Holling Type-IV Functional Responses.* **National Conference on Recent Trends in Mathematical Biology - Theory, Methods and Applications** organized by Department of Mathematics and Computer Science, Sri Sathya Sai Institute of Higher Learning (SSSIHL) during July 2023.
- *Stochastic Time-Optimal Control Studies for Additional Food Provided Prey-Predator System involving Holling Type-IV Functional Response and Mutually Interfering Predators.* **International Conference on Differential Equations and Control Problems (ICDECP23)** organized by School of Mathematics and Statistical Sciences, Indian Institute of Technology Mandi (IIT Mandi) during June 2023.

Projects

Risk Assessment of Cyberattacks Using Bayesian Networks **Link - Jan 2025**

- Designed and implemented a Bayesian Network model to assess the probabilistic risk of successful cyberattacks on network assets using real-world cybersecurity data.
- Analyzed pre-processed datasets to identify relationships between vulnerabilities, threat actors, attack vectors, and asset exploitation probabilities.
- Computed risk levels for various assets and developed a ranked list with actionable mitigation insights.
- Delivered data-driven strategies for prioritizing cybersecurity defenses.

Numerical Simulation of a Two-Stage Rocket **Link - Dec 2024**

- This project simulates the vertical flight of a two-stage rocket by solving a **system of ordinary differential equations (ODEs)** numerically using scipy.integrate.solve_ivp with the RK45 method. The simulation accounts for quadratic air drag and gravitational forces but does not include parachute deployment during descent.

Workshops/Conferences Participation

Workshop Participation

- **14-day Faculty Development Program (FDP) on Foundations and Applications of Quantum Computing** in *online mode* by the Department of Mathematics and Computer Science, Sri Sathya Sai Institute of Higher Learning (SSSIHL), Andhra Pradesh, India during March 18- April 3, 2024.

- **Certificate Program in Infectious Disease Modeling** in *online mode* by Center for Excellence in Mathematical Biology, Sri Sathya Sai Institute of Higher Learning, India during March - November 2024.
- **5-day International Faculty Development Program (FDP) on Advances in Non-linear Dynamics: Methods and Applications** (ANDMA 2024) in *online mode* by the Department of Mathematics, School of Advanced Sciences, VIT-AP University, Andhra Pradesh, India during June 11-15, 2024.
- **International Workshop on Recent advances on control theory of PDE systems** in **online mode** by the International Centre for Theoretical Sciences (ICTS), Bangalore during February 12-23,2024.
- **Winter School on Games in Evolutionary Dynamics** organized in **completely offline mode** by Department of Mathematics, Shiv Nadar Institute of Eminence (Deemed to be University), Delhi NCR during December 18-23,2023.
- **National Center for Mathematics Workshop on Control Theory for Partial Differential Equations (NCMW-CTPDE)** organized in **completely offline mode** by IISER, Thiruvananthapuram during December 04-16,2023.
- **SERB Sponsored High-End Workshop (KARYASHALA) on Bifurcations and Chaos: Computations and Applications** organized in **completely offline mode** by Department of Mathematics, Indian Institute of Technology Indore (IIT Indore) during July 03-09,2023.

Conference Participation

- *Indo-US Conference-II on the Science of Mathematical Modeling and Decision Making* held at Sri Sathya Sai Institute of Higher Learning (SSSIHL) during October 28-30, 2021.
- *National Workshop on Stochastic Differential Equations & Applications* conducted by Department of Mathematics, Periyar University, Salem during March 10-13, 2021.
- *International Workshop on Modeling Dynamics, Statistical Inference and Prediction of Infectious diseases (MoDSIP-2018)* held at Sri Sathya Sai Institute of Higher Learning (SSSIHL) during August 12-15, 2018.

Membership

- Graduate Student Member - Society for Industrial and Applied Mathematics (SIAM)
- Life Member - Indian Academy of Mathematical Modeling and Simulation (IAMMS)
- Life Member - Forum for Industrial and Applied Mathematics (FIAM)

Honors and Awards

- APSET 2021 - **Qualified** in Mathematics
- AP EAMCET 2015 - **Rank 1939**
- TS EAMCET 2015 - **Rank 2048**
- IIT JEE Main 2015 - **Rank 17003**

Technical Skills

Programming	Python, R, MATLAB, C, C++
Softwares	LaTeX, MS Office
OS	Ubuntu, macOS, Windows

Leadership and Extracurricular Activities

- Lead the team of Audio Control group at the University and Hostel during 2016-2018.
- Lead the team of the Hostel General Stores during 2019-2023.
- Participated in Sri Sathya Sai Village Service Program - Grama Seva, providing food and clothing to over 180 villages in Andhra Pradesh, India.
- An active volunteer in Service programs of Sri Sathya Sai Seva Organisations, India.

Personal Data

- Date of Birth: 23 March, 1998
- Nationality: Indian
- Sex: Male
- Marital Status: Single
- Languages: English, Telugu, Hindi

References

- Dr. Krishna Kiran Vamsi Dasu (Ph.D. Supervisor), Assistant Professor (Academic Level 12), Department of Mathematics and Computer Science, Sri Sathya Sai Institute of Higher Learning, Prasanthi Nilayam, dkkvamsi@sssihl.edu.in
- Dr. N Uday Kiran, Associate Professor & Head of the Department, Department of Mathematics and Computer Science, Sri Sathya Sai Institute of Higher Learning, Prasanthi Nilayam, nudaykiran@sssihl.edu.in
- Prof. Pallav Kumar Baruah, Senior Professor & Dean of Sciences, Department of Mathematics and Computer Science, Sri Sathya Sai Institute of Higher Learning, Prasanthi Nilayam, pkbaruah@sssihl.edu.in