Anjali Purathekandy

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Education

- **Indian Institute of Science (IISc)** — Bangalore, India
  PhD – Computational and Data Science; CGPA: 9.2 — *Oct 2020 – Dec 2025*
- **Indian Institute of Science (IISc)** — Bangalore, India
  Master's Degree – Civil Engineering; CGPA: 8.7 — *Aug 2018 – Jul 2020*
- **Government College of Engineering** — Kannur, India
  Bachelor's Degree – Civil Engineering; score: 79.27/100 — *Jun 2013 – May 2017*

Technical Skills

- **Modeling & Simulation** – Agent-Based Modeling, Reinforcement Learning, Game Theory, Ecological Modelling, Population Modelling.
- **Data Science & Machine Learning** – Deep Learning, Species Distribution Modelling, Numerical Optimization.
- **Geospatial Analysis** – Environmental Data Analytics, GIS, Remote Sensing Applications.
- **Scientific Programming** – Including, but not limited to, proficiency in C, C++, Python, and R for Programming and Data Science; TensorFlow and PyTorch for Deep Learning; NetLogo, mesa, and geo-mesa for Agent-Based Modeling.

Awards and Achievements

- **Best Young Researcher Award**: 8th biennial International Society for Ecological Modelling (2025)
- **Featured Research**: Website and Social Media handles of the Indian Institute of Science (2025) https://iisc.ac.in/code-meets-conservation/
- **Best Student Presentation Award**: Dynamic Data Driven Application Systems Conference (2024)
- **Best Student Presentation Award**: IEEE India Geoscience and Remote Sensing Symposium (2021)
- **Best Student Presentation Award**: Conference on Non-Destructive Evaluation (2019)
- **Scientific Officer (Declined)**: Nuclear Power Corporation of India (2019)
- **All India Rank – 435**: Graduate Aptitude Test in Engineering (2018)
- **University Level Second Rank Holder**: Bachelor of Technology, Kannur University (2017)
- **School Level First Rank Holder**: Indian School Certificate Higher Secondary Board Examination (2013)

Projects

- **Spatially Explicit Agent-Based Modeling for Studying Human-Elephant Conflicts (HECs)**:
  - Traditional models oversimplify conflict drivers, failing to capture micro-scale behavioral nuances like thermoregulation, crop habituation, and risk-taking that lead to crop-raiding.
  - Developed a decision-support system integrating GPS telemetry data and environmental drivers to simulate emergent macro-scale movement patterns of Asian elephants (*Elephas maximus*).

- Successfully identified HEC hotspots and demonstrated that water availability and thermal stress significantly dictate seasonal movement and conflict intensity.

- **Adaptive Guard Policies for Human-Elephant Conflict Mitigation via Green Security Games**:
  - Limited patrol resources are often ineffective against intelligent wildlife due to static allocation and partial observability limitations.
  - Formulated HEC mitigation as Green Security Game and developed the HERDS algorithm, an online learning framework using Follow-the-Perturbed-Leader with Uniform Exploration (FPL-UE).
  - Validated the algorithm against a calibrated prototype ABM, achieving convergence against multiple adversarial models and developing the first of its kind game-theoretic solution for adaptive wildlife conflict.

- **Computational Demographic Forecasting for Saltwater Crocodiles using Population Matrix Models and Agent-Based Models**:
  - Territorial populations of *Crocodylus porosus* are highly sensitive to climate-driven sex-ratio shifts, which traditional matrix models fail to capture due to stochasticity.
  - Engineered a territory-dynamics ABM integrating dominance hierarchies and Temperature-Dependent Sex Determination to simulate climate scenarios through 2100.
  - Predicted a critical male-biased sex ratio shift and identified nesting site bottlenecks, providing a data-driven roadmap for proactive conservation management.

- **Machine Learning for Habitat Suitability Analysis**:
  - Fragmenting Asian elephant habitats lacks quantitative metrics to correlate historical habitat deterioration with modern migration shifts and movement patterns.
  - Developed a Random Forest model using satellite-derived metrics (NDVI, LAI, NPP) and topographic data, performing rigorous hyper-parameter tuning and validation.
  - Quantified the correlation between seasonal habitat reduction and migration patterns, establishing a predictive basis for strategic conservation actions.

Publications

- **A Dynamic Data Driven Agent Based Model for Characterizing the Space Utilization of Asian Elephants in Response to Water Availability**: Anjali Purathekandy, Deepak N Subramani. Dynamic Data Driven Applications Systems – DDDAS (Infosymbiotics for Reliable AI). Lecture Notes in Computer Science, Volume 15514 (2025). view publication
- **An Agent-Based Model of Elephant Crop Raid Dynamics in the Periyar-Agasthyamalai Complex, India**: Anjali Purathekandy, Meera Anna Oommen, Martin Wikelski, Deepak N Subramani. Ecological Modelling, Volume 496, 110843, ISSN 0304-3800 (2024). view publication view code
- **Inter and Intra-Annual Spatio-Temporal Variability of Habitat Suitability for Asian Elephants in India: A Random Forest Model-based Analysis**: Anjali Purathekandy, Deepak N Subramani. Published in the Proceedings of the IEEE International India Geoscience and Remote Sensing Symposium – InGARSS (2021). view publication
- **Characteristics of Acoustic Emissions Generated During the Electrochemical Corrosion Process of Steel Reinforcement in Reinforced Concrete Beams**: R Vidya Sagar, Anjali Purathekandy. Indian Journal of Engineering and Materials Sciences – IJEMS, Volume 32 (2025). view publication
- **Characteristics of Acoustic Emissions Generated During Steel Rebar Corrosion in Reinforced Concrete**: Anjali Purathekandy, R Vidya Sagar. Published in the Advances in Non-destructive Evaluation. Lecture Notes in Mechanical Engineering. Springer, Singapore (2021). view publication

Manuscripts Under Review

- **An Agent-Based Model of Saltwater Crocodile Population Dynamics in the Andaman and Nicobar Islands, India**: Anjali Purathekandy, Meera Anna Oommen, Fidha Thayeb, Isha Harish, Deepak N Subramani.
- **Adaptive Guard Policies against Unknown Adversaries: A Security Game Model for Human-Elephant Conflict Mitigation**: Anjali Purathekandy, Deepak N Subramani.

Research Experience

- **Dakshin Foundation** — Bangalore, India
  Consultant — *Oct 2025 - Present*
- **Dakshin Foundation** — Bangalore, India
  Research Affiliate — *Oct 2024 - Sep 2025*
- **QUEST lab** — Department of Computational and Data Sciences, IISc
  Graduate Research Assistant — *Oct 2020 - Sep 2025*

Teaching Experience

- DS 225-0: Deep Learning (*Jan – Jul 2025*)
- DS 211: Numerical Optimization (*Aug – Dec 2023*)
- DA 204-O: Data Science in Practice (*Aug – Dec 2023*)
- DA 224-O: Practical Machine Learning (*Aug – Dec 2022*)
- DA 225-O: Deep Learning (*Aug – Dec 2022*)
- DA 202-O: Introduction to Data Science (*Aug – Dec 2021*)

Other Experiences

- Poster Presentation in International Society for Ecological Modelling Global Conference (*2025*)
- Participant in Winter School on Biodiversity Digital Twins, BioDT School & Hackathon (*2025*)
- Paper Presentation in Electrical, Electronics, and Computer Sciences (EECS) Research Students Symposium at Indian Institute of Science (*2025 & 2022*)
- Poster Presentation in Indo-German Workshop on Hardware-aware Scientific Computing (*2024*)

Academic References

- Deepak N Subramani – deepakns@iisc.ac.in
- Meera Anna Oommen – meera.anna@gmail.com
- Kartik Shanker – kshanker@iisc.ac.in