Reetish Padhi

Masters in Mathematics
Maths PhD candidate, Virginia Tech

+1-4695142821
reetishp@vt.edu

About Me

I completed my bachelors and masters in mathematics at IISER Pune in May 2024 and am currently pursuing my PhD in mathematics at Virginia Tech. My interests are primarily in the fields of dynamical systems, systems based model reduction and data-driven reduced order modelling.

Education

- **Virginia Tech, Blacksburg** — *Ongoing*
  Math PhD candidate
- **Indian Institute of Science Education and Research, Pune** — *Graduated May 2024*
  BS-MS (math major)

Publications

1. Mahata, Ajit, Reetish Padhi, and Amit Apte. "Variability of echo state network prediction horizon for partially observed dynamical systems." Physical Review E 108.6 (2023): 064209.

Posters and Talks

- **Computational Learning for Model Reduction** — *6-10 Jan 2025*
  Participant (Poster) — Brown University
  – Presented poster on data-driven balancing for linear systems with quadratic output
  – Travel supported by ICERM

- **ANA Seminar** — *16 Sep 2024*
  Participant (Talk) — Virginia Tech
  – Presented extensions of data driven balancing methods to quadratic bilinear systems

- **Model Reduction and Surrogate Modeling (MORe 2024)** — *9-13 Sep 2024*
  Participant (Talk) — UCSD
  – Presented extensions of Balanced truncation for bilinear systems with quadratic output
  – Conference travel supported by NSF grant for Early Career Researchers

- **Young Researchers in Model Order Reduction 2024** — *March 4-8, 2024*
  Participant (Talk) — University of Stuttgart
  – Presented my work on extending QuadBT to quadratic-bilinear systems
  – Conference travel funded by MPI, Magdeburg

- **Industry Conclave** — *August 6, 2023*
  Poster presentation — IISER Pune
  – Presented a poster on prediction of partially observed dynamical systems using ESN

Teaching

- **Integrated Quantitative Science II** — *CMDA 2006*
  Graduate teaching assistant — Fall 2024, Spring 2025

Scholarships

•DST Inspire Fellowship (SHE) *2019–2024*

Scholarship for Higher Education (SHE) is a component of "Innovation in Science Pursuit for Inspired Research (INSPIRE)", which is a flagship programme of the Department of Science and Technology (DST) under the Ministry of Science and Technology, Government of India. (INR 4,00,000)

Relevant Coursework

Undergraduate (BSMS)
Calculus-1, Multivariable calculus, advanced linear algebra, probability and statistics, real analysis 1 & 2, discrete structures, group theory, graph theory, ordinary differential equations, rings and modules, measure theory and integration, algorithms, complex analysis, coding theory, point set topology, probability theory, statistical inference, calculus on manifolds, bayesian theory in practice

Graduate
Functional analysis, model order reduction, numerical linear algebra

Research Experience

Areas of Interest: Dynamical systems, control theory, model order reduction

•Master's Thesis: Model order reduction of non-linear dynamical systems *July 2023 – April 2024*

Supervisor: Dr. Ion Victor Gosea (MPI, Magdeburg)

In my master's thesis, we extended QuadBT, a data-driven model order reduction technique, to linear systems with quadratic output and quadratic-bilinear systems. In addition to this, we also presented balanced truncation algorithm for bilinear systems with quadratic output. The algorithms have shown promising resuls when tested on some benchmark models. I have presented two of these results at conferences in Stuttgart and San Diego.

•Variability of ESN prediction horizon for partially observed dynamical systems *June 2022 – July 2023*

Supervisor: Dr. Amit Apte (IISER Pune)

In this project, I studied the important problem of prediction of partially observed dynamical systems using ESN. My major contributions were in writing the code in python for ESN implementation and in formulating a heuristic explanation to explain the success of these networks. I studied many theoretical papers on ESNs, embedding theorems and universal approximation theorems for neural networks. This project exposed me to functional topological spaces and differential topology. The paper that came out of this project has been accepted in Physical Review E.

Technical Skills and Interests

Languages: English, Hindi
Programming languages: Python, C++, MATLAB
Software: LaTeX