Rahul-Vigneswaran K

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Research Interests

I seek to solve theoretical machine learning problems using ideas from optimization and statistics.

Major Interests	Machine Learning, Generative Adversarial Networks (GANs)
Others	Computer Vision, Data-driven approaches (DMD), Computational Design

Education

Amrita University Kerala, India
Bachelor of Technology in Mechanical Engineering - CGPA(Till 7th Semester): (8.19/10) *Jul'15 - Jul'19*

Work Experience

Centre for Computational Engineering & Networking (CEN) - Research Intern India
Advisors : Dr Soman KP & Dr Gopalakrishnan EA *Jun'18 - Present*

- Explored applications of Generative Adversarial Nets (GANs) like de-blurring, super resolution, sound to image translation and pix2pix architecture.
- Explored Reinforcement Learning algorithms and several Deep learning techniques.
- Worked on data-driven solvers, control systems, model order reduction techniques and Dynamic Mode Decomposition (DMD).

Amrita Center for Cyber Security Systems & Networks - Research Intern India
Advisor : Dr Prabharan Poornachandran *Jun'17 - Apr'18*

Mechatronics & Intelligent Systems Research (MISR) Lab - Research Intern India
Advisors : Dr Pramod Sreedharan & Dr Ganesha Udupa *Aug'16 - Nov'16*

Ammachi labs - Research Intern India
Advisors : Mr Vishnu Rajendran S & Mr Akshay Nagarajan *Apr'16 - Aug'16*

Publications

1. **Rahul-Vigneswaran K**, Neethu Mohan, Soman KP. **Data-driven Computing for Elasticity via Chebyshev function**. In *2019 International Conference on Intelligent Computing and Control Systems (ICCS)* (pp. 1-5). IEEE. (Accepted) [Code] [arXiv]

2. Geena Prasad, **Rahul-Vigneswaran K**, Jewel Yoko Kentilitisca and Maneesha Vinodini Ramesh. **Trace metal analysis of Pre-flood and Post-flood drinking water at Alappuzha district, Southern Kerala, India**. (pp. 1-6). (Under Review)

3. **Rahul-Vigneswaran K**, Prabhaharan Poornachandran and Soman KP. **A Compendium on Network and Host Based Intrusion Detection Systems**. In *2019 International Conference on Data Science, Machine learning & Applications (ICDSMLA)* (pp. 1-8). Springer. (Accepted) [arXiv]

4. **Rahul-Vigneswaran K**, Vinayakumar R, Soman KP and Prabaharan Poornachandran. **Evaluating Shallow and Deep Neural Networks for Network Intrusion Detection Systems in Cyber Security**. In *2018 9th International Conference on Computing, Communication and Networking Technologies (ICCCNT)* (pp. 1-6). IEEE. [Code] [Paper]

Research Projects

Data-Driven Computing for Elasticity via Chebyshev function *Dec'18 - Apr'19*
Advisor : Dr Soman KP, CEN [Code] [arXiv]

- Leveraged the relation between Chebyshev polynomial of the first kind and approximation theory to develop a data-driven solver for nonlinearly elastic materials.
- Benchmarked the results with several state-of-the-art approaches which include Kernal Regression, Nonlinear Programming (NLP) approach, Mixed-Integer programming (MIP) approach.

Shape Optimization using DMD and POD *Dec'18 - Jun'19*
Advisors : Dr Soman KP & Dr Gopalakrishnan EA, CEN

- Explored the idea of Data-driven shape optimization, especially in ship hulls.
- Used Proper Orthogonal Decomposition based model order reduction approach and Dynamic Mode Decomposition to reduce the simulation time of turbulent flow.

Data-driven Control Systems for Quadrotors *Dec'18 - Jan'19*
Advisor : Dr Soman KP, CEN [arXiv]

- Studied the complex dynamics of an ideal quadrotor and explored the idea of data-driven control systems in them.

Intrusion Detection Systems *Jun'18 - Aug'18*
Advisors : Dr Soman KP & Dr Prabaharan Poornachandran, CEN [Code] [Paper]

- Implemented and analyzed Deep and Shallow Neural Nets in the Cybersecurity use case of Intrusion Detection Systems (IDS).
- Analyzed and studied various state-of-art implementations of Host and Network-based Intrusion Detection Systems (IDS).

Academic Projects

Learning with limited labelled Data *Dec'18 - Jun'19*
Advisors : Dr Soman KP & Mr Sachin Kumar S, CEN

- Conducted a detailed study on the existing techniques used for learning with limited labelled data.
- Explored non-conventional techniques for efficiently learning a distribution with low-resource.
- Used Dynamic Mode Decomposition (DMD) to extract the dominant features of images for classifying with limited labelled data.

Trace metal analysis of Pre-flood and Post-flood drinking water in Kerala *Oct'18 - Dec'18*
Advisor : Ms Geena Prasad, Amrita University

- Conducted a detailed study on various contents of the water samples, especially trace metals, which were collected Pre and post to a Flood in the state of Kerala.

Relevant MOOCs Audited

Optimization	Convex Optimization: Stanford (Stephen P. Boyd)
Machine Learning	Machine Learning: Standford (Andrew Ng), CNN: Stanford (Fei-Fei Li)
Others	Linear Algebra: MIT (Gilbert Strang)

References

1. *Dr Soman KP*, Head, Centre for Computational Engineering and Networking (CEN) - India
2. *Dr Gopalakrishnan EA*, Asst. Prof., Centre for Computational Engineering and Networking (CEN) - India