Vaisakh Shaj Kumar

Resume

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Date Of Birth: 30 May 1992
Place Of Birth: Kerala, India

Info

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Github: https://github.com/vaisakh-shaj/

Research Interests

Machine Learning: Probabilistic Graphical Models, Deep Sequential Models (RNNs, SSMs, LLMs etc), Decision Making Under Uncertainty, Model-Based Reinforcement Learning, Causal Reasoning and Planning

Neuro and Cognitive Science: Bayesian Brain Hypothesis, Predictive Processing, Bayesian Models for Perception, Cognition and Decision Making

Applications: Science, Medicine, Robotics, Computer Vision etc

Education

2019–2024 **Karlsruhe Institute Of Technology, Germany** ,
Ph.D. in Machine Learning and Robotics
Supervisor Prof Gerhard Neumann ,
Thesis Topic: Learning World Models With Hierarchical Temporal Abstractions: A Probabilisitic Perspective [Link To Summary Of Thesis].

2014–2016 **Indian Institute Of Space Science And Technology**,
M.Tech in Machine Learning and Computing, CGPA: ***8.4/10*** .

- Major: **Machine Learning**; Minor: **Mathematics**
- Key Courses: Pattern Recognition and Machine Learning, Reinforcement Learning, Evolutionary and Natural Computing, Neural Networks, Data Mining, Matrix Computations, Applied Statistics, Optimization Techniques, Computer Modeling and Simulations(Queuing Theory), Discrete Mathematics.

2009–2013 **University Of Kerala.**,
B.Tech in Electrical Engineering, CGPA: ***8.1/10***.

- Major: **Electrical Engineering**; Minor: **Computer Engineering**
- Key Courses: Modern Operating Systems, Computer Networks, Microprocessors, Digital Electronics and Logic Design, Digital Signal Processing, Electrical Machines, Control Theory.

Independent Course Work / MOOCs

2021 Probabilistic Graphical Models (Prof Eric Xing, CMU)

2019 Bayesian Methods In Machine Learning (National Research University, Moscow)[Code]

2017 Deep Reinforcement Learning (UC Berkley Fall 2017)[Code]

2016 Deep Learning(Hugo Larochelle's Course, Udacity)[Code]

2015 Introduction to Mathematical Thinking[Certificate], R Programming[Certificate]

Experience

Industry

2017–2018 **McAfee**,
Role: Data Scientist, Location: Bangalore.

- Adversarial Machine Learning: Analysis of the robustness of large deep learning models in adversarial settings, Network Anomaly Detection.
- **Finalist for CEO's Innovator of the Year Award (top 5 out of 2500 employees)**

2015–2017 **Intel**,
Role: Researcher(2016-17), Graduate Intern(2015-16), Location: Bangalore.

- Developed a Deep Neural Net Based Dynamic Malware Classification Engine for the Advanced Threat Defense Research Team, which is currently in production.
- Developed Sparse Machine Learning Algorithms For Audio Understanding. Applications included Audio Denoising, Source Separation and Classification.

Academia

Sep 2018–Jan 2019 **Indian Institute Of Science (IISc)**,
Role: Research Assistant, Location: Bangalore.

- Computer Vision: Working with Prof Venkatesh Babu and Prof Anirban Chakraborty on Knowledge Distillation and Adversarial Machine Learning On Images.
- **Work resulted in an ICML 2019 and CVPR 2019 Workshop Publications.**

Peer Reviewed Publications

NeurIPS 2023 **"Multi Time Scale World Models"**,
Authors: ***Shaj V.****, Gholam Zadeh S., Demir O., Douat L., Neumann G.* ,
Spotlight (3% **of all submissions)**.

ICLR 2022 **"Hidden Parameter Recurrent State Space Models For Changing Dynamics Scenarios"**,
Authors: ***Shaj V.****, Buchler D., Sonker R., Becker P., Neumann G.* .

RSS 2022 **"End-to-End Learning of Hybrid Inverse Dynamics Models for Precise and Compliant Impedance Control"**,
Authors: Reuss M., van Duijkeren N., Krug R., Becker P., ***Shaj V.****, Neumann G.* .

CoRL 2020 **"Action Conditional Recurrent Kalman Networks For Robot Dynamics Learning"**,
Authors: ***Shaj V.****, Becker P., Buchler D., Pandya H., Hanheide M., Neumann G.* .

ICML 2019 **"Zero-Shot Knowledge Distillation In Deep Networks"** ,
Authors: ***Shaj V.****, Nayak G.*, Reddy K.*, Babu R.V., Chakraborty A.* ,
***Equal contribution**.

ACPR 2017 **"Learning Sparse Adversarial Dictionaries for Multi-Class Audio Classification"**,
Authors: ***Shaj V.****, Bhattacharya P.* .

ICACCI 2016 **"Edge-PSO: A recombination operator based PSO algorithm for solving TSP"**,
Authors: ***Shaj V.****, Akhil P.M., Asharaf S.* ,
(Best Paper Award).

CVPR Workshops 2020 **"Adversarial Fooling Beyond 'Flipping the Label'"**,
Authors: ***Shaj V.******, Mopuri K.R.*, Babu R.V.* ,
***Equal contribution**.

Under Review / Preprint

TMLR 2024 **"Towards Measuring Predictability: To which extent data-driven approaches can extract deterministic relations from data exemplified with time series prediction and classification"**,
Authors: Gholam Zadeh S., ***Shaj V.****, Jahnke P., Neumann G., Breitenbach T.* .

Preprint 2023 **"Episode Transformer: Model-based Episodic Reinforcement Learning"**,
Authors: Jacob R., ***Shaj V.****, Becker P., Neumann G.* .

Patents

2017 **"Methods, Systems, And Media For Detecting Anomalous Network Activity " (US Patent Filed- 1303010.216-US1)**,
Inventors: Sherin Mathews , Vaisakh Shaj , Kanteti Kumar, Carl Woodward .

Reviewer

Reviewer for ICLR, ICLR AGI Workshop, CoRL, IROS, NeurIPS, IEEE RAL, ICRA, ACML

Scholastic Achievements

2018 Top 5 Finalist from among 2500 Employees for **McAfee CEO's Innovator Of The Year Award 2018**.

2013 Qualified 2013 Graduate Aptitude Test In Engineering(**GATE**) and was placed at **98 percentile** amongst 152381 candidates.

2017 Received **Graduate Fellowship** from **Department of Space**, Government of India for pursuing graduate studies at IIST.

Teaching

Winter 2022, 2023 **Fundamentals of Artificial Intelligence (B.Sc CS, KIT)**,
Contributed to the creation of coding assignments for modules on Bayesian Networks, MDPs, and Reinforcement Learning. Conducted tutorial sessions and assisted with exam grading. .

Summer 2021, 2022 **Reinforcement Learning (M.Sc CS, KIT)**,
Developed coding assignments for Model-Based Reinforcement Learning modules. Delivered tutorial sessions and participated in exam preparation and grading. .

Supervision

MSc. Thesis Boltres, A. (2021). "Variational Learning of Dynamics Models with Spatial Latent Variables"

MSc. Thesis Herault, M. (2021). "Meta-Learning Time Series Classification With Application To Video Games"

MSc. Thesis Reuss, M. B. (2021). "Hybrid Inverse Dynamics Models for Robot Impedance Control". Co-supervisors: Philipp Becker, Niels van Duijkeren, Robert Krug

MSc. Thesis Baumann, M. (2022). "Development of a Hydraulic Excavator Arm Control Using Reinforcement Learning". Co-supervisors: Demir Ozan, Luiz Douat

MSc. Thesis Yuan, Y. (2022). "Reinforcement Learning based Robot Waypoints Tracking Error Optimization". Co-supervisors: Chenwei Sun, Moritz Reuss

MSc. Thesis Geyer, S. (2022). "Model-Based Deep Reinforcement Learning Under Life-Long Non-Stationarity"

MSc. Thesis Gospodinov, E. (2023). "Model-based Deep RL for Non-Stationary Environments"

MSc. Thesis Jacob, R. (2023). "Model-Based Episodic Reinforcement Learning with Transformer World Models". Co-supervisor: Philipp Becker

MSc. Thesis Zhang, S. (2024). "Role of Hierarchy in Learning World Models"

BSc. Thesis Braun, N. (2023). "Benchmarking Transformer Models for Time Series Forecasting". Co-supervisor: Saleh Zadeh

BSc. Thesis Mahler, S. (2023). "Multi Scale Architectures for Time Series Forecasting Tasks". Co-supervisor: Saleh Zadeh

BSc. Thesis Colmes, T. (2023). "Benchmarking Transformer World Models". Co-supervisor: Saleh Zadeh

BSc. Thesis Bach, J. (2023). "World Modelling with Structured State Space Models". Co-supervisor: Saleh Zadeh

Computer skills

Programming Languages Python, MATLAB, Java, R, C

Libraries Pytorch, TensorFlow, Scikit-Learn, OpenAI Gym

Writing Tools LaTeX, Open Office, MS Office

Languages

English Advanced ***IELTS Score: 8.0/9.0***

Malayalam Advanced

Hindi Intermediate