

KRISHNAKANT V. SABOO

PERSONAL INFORMATION

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EDUCATION

2016 – **University of Illinois, Urbana-Champaign**
Doctoral Degree
Advisor: Prof. Ravishankar K. Iyer
Electrical and Computer Engineering (ECE)

2011 – 2016 **Indian Institute of Technology Bombay, Mumbai, India**
Dual Degree (Bachelor of Technology + Master of Technology)
Advisor: Prof. Vivek Borkar
Electrical Engineering (EE) with specialisation in Communication and Signal Processing

AWARDS AND HONORS

2021 Center for Brain, Minds, and Machines Summer School
2021 Elsa and Floyd Dunn Award, UIUC
2020 Mavis Future Faculty Fellowship, UIUC
2020 ISBI Student Travel Grant
2020 Rambus Fellowship in Electrical and Computer Engineering, UIUC
2019 Mayo/Illinois Fellowship 2019-2020, UIUC
2019 Outstanding Teaching Assistant Award, UIUC
2017 Mayo/Illinois Fellowship 2017-2019, UIUC
2016 Undergraduate Research Award for outstanding research contribution, IIT-B
2015 Recognition for outstanding contribution as Institute Student Mentor, IIT-B
2015 Outstanding performance as Coordinator, Dept. Academic Mentorship Program, IIT-B
2015 Institute Academic Prize for ranking 2nd in Dual Degree EE Program, IIT-B
2015 IEEE CIS Student Travel Award
2011 Gold medallist, Indian National Chemistry Olympiad

PUBLICATIONS AND PATENT

(* denotes equal contribution and † denotes alphabetical ordering)

JOURNAL **KVS**, C. Hu, Y. Varatharajah, S. A. Przybelski, R. I. Reid, C. G. Schwarz, J. Graff-Radford, D. S. Knopman, M. M. Machulda, M. M. Mielke, R. C. Petersen, P. M. Arnold, G. A. Worrell, D. T. Jones, C. R. Jack Jr., R. K. Iyer*, P. Vemuri*, “Deep learning identifies brain structures that predict cognition and explain heterogeneity in cognitive aging”, *under review*.

KVS, N. Petrakov, A. Shamsaddini, A. Fagan, E. A. Gavis, M. Sikaroodi, S. McGeorge, P. Gillevet, R. K. Iyer, J. S. Bajaj, “Stool microbiota are superior to saliva in distinguishing cirrhosis and hepatic encephalopathy using machine learning”, *Journal of Hepatology*, 2021 (*accepted*).

V. S. Marks, **KVS**, C. Topcu, T. P. Thayib, P. Nejedly, V. Kremen, G. A. Worrell, M. T. Kucewicz, “Independent dynamics of slow, intermediate, and fast intracranial EEG spectral activities during human memory formation”, *NeuroImage* 2021. [Link]

KVS*, I. Balzekas*, V. Kremen, Y. Varatharajah, M. T. Kucewicz, R. K. Iyer, G. A. Worrell, “Leveraging electrophysiologic correlates of word encoding to map seizure onset zone in focal epilepsy: Task-dependent changes in epileptiform activity, spectral features, and functional connectivity”, *Epilepsia*, 2021. [Link]

C. Hu, V. Anjur, **KVS**, K. R. Reddy, J. O’Leary, P. Tandon, F. Wong, G. Garcia-Tsao, P. S. Kamath, J. C. Lai, S. W. Biggins, M. B. Fallon, P. Thuluvath, R. M. Subramaian, B. Malakkal, H. Vargas, L. R. Thacker, R. K. Iyer, J. S. Bajaj, “Low predictability of Readmissions and Death Using Machine Learning in Cirrhosis”, *American Journal of Gastroenterology*, 2020. [[Link](#)]

KVS^{*}, A. Shamsaddini^{*}, M. V. Iyer, C. Hu, A. Fagan, E. A. Gavis, M. B. White, M. Fuchs, D. M. Heuman, M. Sikaroodi, R. K. Iyer, P. M. Gillevet, J. S. Bajaj, “Sex is associated with differences in gut microbial composition and function in hepatic encephalopathy”, *Journal of Hepatology*, 2020. [[Link](#)]

KVS, Y. Varatharajah, B. M. Berry, V. Kremen, M. R. Sperling, K. A. Davis, B. C. Jobst, R. E. Gross, B. Lega, S. A. Sheth, G. A. Worrell, R. K. Iyer, M. T. Kucewicz, “Unsupervised machine learning classification of electrophysiologically active electrodes during human cognitive task performance”, *Nature Scientific Reports* 9, 2019. [[Link](#)]

M. T. Kucewicz, **KVS**, B. M. Berry, V. Kremen, L. R. Miller, F. Khadjevand, C. S. Inman, P. Wanda, M. R. Sperling, R. Gorniak, K. A. Davis, B. C. Jobst, B. Lega, S. A. Sheth, D. S. Rizzuto, R. K. Iyer, M. J. Kahana, G. A. Worrell, “Human verbal memory encoding is hierarchically distributed in a continuous processing stream”, *eNeuro* 6.1, 2019. [[Link](#)]

V.S. Borkar[†], R. Karumanchi[†], **KVS**[†], “An index policy for dynamic pricing in cloud computing under price commitments”, *Applicationes Mathematicae Journal*, 2017. [[Link](#)]

CONFERENCE (FULL PAPER) **KVS**, A. Choudhary, Y. Cao, G. A. Worrell, D. T. Jones, R. K. Iyer, “Reinforcement learning-based disease progression model for Alzheimer’s disease”, *Advances in Neural Information Processing Systems*, 2021 (accepted). [[Preprint link](#)]

KVS, C. Hu, Y. Varatharajah, P. Vemuri, R. K. Iyer, “Predicting longitudinal cognitive scores using baseline imaging and clinical variables”, *IEEE International Symposium on Biomedical Imaging*, 2020. ([Oral presentation](#))[[Link](#)]

KVS, Y. Varatharajah, B. M. Berry, M. R. Sperling, R. Gorniak, K. A. Davis, B. C. Jobst, R. E. Gross, B. Lega, S. A. Sheth, M. J. Kahana, M. T. Kucewicz, G. A. Worrell, R. K. Iyer, “A computationally efficient model for predicting successful memory encoding using machine learning-based EEG channel selection”, *International IEEE EMBS Conference on Neural Engineering*, 2019. [[Link](#)]

Y. Varatharajah, M.J. Chong, **KVS**, B. M. Berry, B. Brinkmann, G. A. Worrell, R. K. Iyer, “EEG-GRAPH: A factor graph-based model for capturing spatial, temporal, and observational relationships in electroencephalograms”, *Advances in Neural Information Processing Systems* 2017. [[Link](#)]

C. P. Narisetty^{*}, **KVS**^{*}, and B. Rajendran, “Composer classification based on temporal coding in adaptive spiking neural networks”, *International Joint Conference on Neural Networks* 2015. [[Link](#)]

WORKSHOP Y. Varatharajah, **KVS**, R. K. Iyer, S. Przybelski, C. Schwarz, R. Petersen, C. R. Jack Jr., P. Vemuri, “A joint model for predicting structural and functional brain health in elderly individuals”, *IEEE International Conference on Bioinformatics and Biomedicine*, 2019 Workshop. [[Link](#)]

K. Avrachenkov, V.S. Borkar and **KVS**, “Distributed and asynchronous methods for semi-supervised learning”, *Workshop on Algorithms and Models of the Web Graph*, 2016. [[Link](#)]

PATENT **KVS** and S. Rao, “Gesture recognition using frequency modulated continuous wave radar with low angle resolution”, *U.S. Patent 9,817,109*.

RESEARCH PROJECTS

- AUG 2020 – SEP 2021 **Modelling pathology and recovery processes in Alzheimer's diseases**
Guides: Prof. Ravishankar Iyer, *UIUC*; Drs. Gregory Worrell, David Jones *Mayo Clinic*
Developed a domain knowledge and reinforcement learning-based model that integrates pathological and recovery processes in the brain to improve prognosis of Alzheimer's disease.
- AUG 2018 – PRESENT **Modelling cognitive decline in aging population**
Guides: Prof. Ravishankar Iyer, *UIUC*; Dr. Prashanthi Vemuri, *Mayo Clinic*
Predicted 5-year future cognitive decline in aging and diseased populations from multi-modal imaging data and clinical variables. Ongoing work on model interpretation highlights brain regions important for coping with age-related neuropathologies.
- JUL 2018 – AUG 2021 **Memory task-based biomarker for epilepsy seizure onset zone localization**
Guides: Prof. Ravishankar Iyer, *UIUC*; Dr. Gregory Worrell, *Mayo Clinic*
Studied memory task induced differences in EEG signal spectrum from epileptogenic tissue and normal tissue to define a task-based biomarker for localizing epileptogenic tissue in the brain.
- NOV 2019 – JUL 2020 **Microbiome analyses of liver cirrhosis patients with brain dysfunction**
Guides: Prof. Ravi Iyer, *UIUC*; Dr. Jasmohan Bajaj, *Virginia Commonwealth University*
Developed machine learning and statistical methods to reveal disease mechanism of gut microbiome-driven brain dysfunction in patients with advanced liver cirrhosis.
- JAN 2017 – SEP 2018 **Active electrode selection for understanding verbal memory processing**
Guides: Prof. Ravishankar Iyer, *UIUC*; Dr. Gregory Worrell, Dr. Michal Kucewicz *Mayo Clinic*
Designed fully-automated, machine learning-based methods for identifying a subset of intracranial EEG electrodes measuring memory related activity to reduce computational cost of human memory performance prediction and understanding verbal memory processing.

TEACHING ASSISTANT

- SPRING 2021 **Data Science and Analytics**, ECE, UIUC
Head TA for the course with over 60 students; contributing to lecture creation, conducting discussion sessions, and overseeing the preparation of homeworks, exams and mini-projects.
- SPRING 2019 **Data Science and Analytics**, ECE, UIUC
Head TA for the course with over 70 students; contributed to creating lectures, conducted discussion sessions, and oversaw the preparation of homeworks, exams and mini-projects.
- SPRING 2017 **Introduction to Probability**, ECE, UIUC
Prepared homeworks, quizzes, and exams, held office hours and graded answer scripts of over 70 students.
- SPRING 2016 **Introduction to Probability**, EE, IIT Bombay
Prepared quiz questions, and graded answer scripts of over 30 students.
- FALL 2015 **Signals and Systems**, EE, IIT Bombay
Conducted tutorial sessions, prepared quizzes, and graded answer scripts of over 50 students.

INDUSTRY EXPERIENCE

- SUMMER 2017 **Cisco**, San Jose, CA | *Mentor:* Mr. Aparup Banerjee
Deep learning-based anomaly detection in time series networking data

SUMMER 2015	Innovation Labs, Tata Consultancy Services, India <i>Mentor: Dr. R. Karumanchi</i> <i>ML methods for estimation of option combination penetration in vehicle sales</i>
SUMMER 2014	Texas Instruments, India <i>Mentor: Mr. Sandeep Rao</i> <i>Gesture recognition using FMCW radar with low angle resolution</i>

MENTORSHIP AND LEADERSHIP

SEP 2019 – PRESENT	Undergraduate Mentor , CSL, UIUC Mentored two undergraduate students on their research projects.
FEB 2019 – FEB 2020	Session Chair , Coordinated Sciences Lab Student Conference (CSLSC) 2020, UIUC Session chair for Health Informatics and Computational Biology track, CSLSC. Invited a faculty speaker, reviewed student abstract submissions, and organized the session.
APR 2014 – MAR 2015	Coordinator , Department Academic Mentorship Program, EE Dept, IIT Bombay Headed a team of 24 mentors to counsel academically underperforming students through one-on-one mentoring, academic help sessions, faculty-student interaction, and online resources .
APR 2013 – APR 2016	Institute & Department Student Mentor , Student Mentorship Program, IIT Bombay Mentored 24 freshmen in transitioning to university life and coping with academics. Counselling 3 students on a one-to-one basis as department mentor to help improve their academic standing.
APR 2013 – MAR 2014	Manager , Robotics Club, IIT Bombay Led a team of 8 to organise competitions, workshops, and talks on robotics.

TALKS AND PRESENTATIONS

Oct 2021	Reinforcement learning based disease progression model for Alzheimer's disease. <i>CSL Social Hour, UIUC</i> . (Invited talk)
Apr 2021	Long term cognition trajectory prediction using domain knowledge and reinforcement learning. <i>The Center for AI Driven Health Data Systems and Analytics, UIUC</i> . (Invited talk)
Apr 2020	Predicting longitudinal cognitive scores using baseline imaging and clinical variables. <i>IEEE International Symposium on Biomedical Imaging, Iowa</i> . (Conference talk)
Sep 2019	Application of AI in neurology. <i>CSL Social Hour, UIUC</i> . (Invited talk)
Sep 2017	Brain stimulation: When and where? <i>CompGen Student Lightning talk, Institute for Genomic Biology, UIUC</i> . (Invited talk)
May 2017	Template matching for EEG signal classification. <i>DARPA Restoring Active Memory Project update</i> . (Invited talk)

SERVICE

REVIEWER	NeurIPS ML4H Workshop 2020, International Journal of Neural Systems 2020
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