SRIDHARAN DEVARAJAN

a. General Information

Name	Sridharan Devarajan
Address	Associate Professor Centre for Neuroscience, Old TIFR Building (Rm B-104), Indian Institute of Science (IISc).
Institution's Address	Indian Institute of Science (IISc), C. V. Raman Avenue, Bengaluru, Karnataka 560012.
Contact information	Ph (off.) : +91-80-2293 3434 Ph (res.): +91-80-3550 2244 Mobile : +91-944 857 4681 E-Mail: sridhar@iisc.ac.in sridharan.d@gmail.com Web: http://cns.iisc.ac.in/sridhar

b. Academic Qualifications and Professional experience

Academic qualifications

No.	Degree	University/ Board	Year of passing	Thesis topic/ Subjects studied	Percentage of marks or CGPA
1	B.Tech & M.Tech (Dual-Degree)	Indian Institute of Technology (IIT), Madras, India	2004	Aerospace Engineering Thesis title: Willed action and its disorders: A neuroimaging and computational modeling study of the basal ganglia Thesis Advisors: i) Prof. Srinivasa Chakravarthy, Dept. of Electrical Engg., IIT Madras ii) Dr. E S Krishnamurthy, VHS Hospitals, Chennai	9.86 on a 10-point scale (*Presidential Gold Medalist*)

2	Ph.D.	Stanford University, USA	2011	Neuroscience	4.023 (4-point scale)
				Dissertation title: Neural mechanisms of visual and auditory attention.	
				Thesis Advisors:	
				i) Prof. Eric Knudsen, Department of Neurobiology, Stanford University School of Medicine	
				ii) Prof. Kwabena Boahen, Department of Bioengineering, Stanford University	

Professional training and Research experience

2020 (Nov) – present	Associate Professor, Centre for Neuroscience, Indian Institute of Science (IISc), Bangalore, India
2014 (Nov) – 2020 (Nov)	Assistant Professor, Centre for Neuroscience, Indian Institute of Science (IISc), Bangalore, India
2017 (Jan) – Present	Associate Faculty, Department of Computer Science and Automation, IISc
2016 (Mar) – 2021 (Feb)	DBT Wellcome Trust India Alliance Intermediate Fellow, Centre for Neuroscience, IISc • *"Cortical and subcortical mechanisms of visuospatial selective attention"*
2011 (Jan) – 2014 (Oct)	Stanford University School of Medicine, Department of Neurobiology Post-doctoral Research Fellow, Mentor: Prof. Eric Knudsen, Ph.D. • *"The role of a midbrain network in stimulus selection and visual attention"*
2007 (Sep) – 2010 (Dec)	Stanford University School of Medicine, Departments of Neurobiology and Bioengineering Ph.D. Graduate Student, Mentors: Prof. Eric Knudsen, Ph.D. and Prof. Kwabena Boahen, Ph.D. • *"Neural mechanisms of visual and auditory attention"*
2004 (Sep) – 2007 (Aug)	Stanford University School of Medicine, Program in Neuroscience Stanford Graduate Smith Fellow, Mentor: Prof. Vinod Menon, Ph.D. • *"Computational neuroimaging of functional brain networks"*
2003 (Aug) – 2004 (Jul)	Indian Institute of Technology (IIT) Madras, Department of Electrical Engineering Master's Thesis Project, Mentor: Prof. Srinivasa Chakravarthy, Ph.D. • *"The role of the basal ganglia in exploration in a neural model based on reinforcement learning"*

Awards and Honors

2024-2027	Gore Subraya Bhat Chair Associate Professor of Digital Health, Indian Institute of Science (IISc)
2022 – 2027	Swarna Jayanti Fellowship, Department of Science and Technology (DST), Govt. of India.
2017 – 2020	SERB Early Career Award. Science and Education Research Board (SERB), Government of India.
2019	Top 400 Reviewer Award, Advances in Neural Information Processing Systems (NeurIPS), Vancouver, Canada
2017 – 2019	Pratiksha Trust Young Investigator Award, Indian Institute of Science.
2016 – 2021	DBT-WellcomeTrust India Alliance Intermediate Fellowship, Wellcome-Trust, UK and Department of Biotechnology, Government of India.
2015	DBT Ramalingaswami Fellowship, Department of Biotechnology, Government of India.
2012	School of Medicine Dean's Fellowship for Postdoctoral Research, Stanford University
2010	Gatsby-CoSyNe Travel Fellowship
2007	NIH Human Brain Mapping Travel Award and Stanford BioX Travel Award
2004 – 2007	Stanford Graduate Smith Fellowship (SGF), Stanford University.
2004	President of India Gold Medal, Indian Institute of Technology, Madras.

c. Publications List

i) List of journal publications (*in submission*):

1) Sengupta A, & **Sridharan D*** (2024). A double dissociation between neural mechanisms of reward-driven sensory and decisional selection (*in submission*).

2) Gupta S, Raya DV & **Sridharan D*** (2024). Distractors induce space-specific neural biases in visual working memory (*in submission*).

3) Sunder S, Rajendran K, Biswas M, & **Sridharan D*** (2024). Neural mechanisms of attention, not expectation, govern spatial selection by probabilistic cueing (*in submission*).

ii) List of journal publications (*published*):

4) Sengupta A, Banerjee S, Suhas G, Chandrasekaran AN & **Sridharan D*** (2024). The right posterior parietal cortex mediates spatial reorienting of attentional choice bias. *Nature Communications,* 15, 6938.

5) Halder S, Raya DV & **Sridharan D*** (2024). Distinct neural bases of subcomponents of the attentional blink. *eLife* 13:RP97098.

6) Chandrasekaran AN, Vermani A, Gupta P, Steinmetz N, Moore T & **Sridharan D*** (2023). Dissociable components of attention exhibit distinct neuronal signatures in primate visual cortex. *Science Advances* 10, eadio645.

7) Gupta P & **Sridharan D*** (2023). Presaccadic attention does not benefit the detection of changes in the visual field. *PLOS Biology* 22(1): e3002485.

8) Chinchani A, Paliwal S, Ganesh S, Chandrasekharan V, Yu B & **Sridharan D*** (2022). Tracking momentary fluctuations in human attention with a cognitive brain-machine interface. *Communications Biology,* 5:1346.

9) Sawant Y, Kundu JN, Babu RV & **Sridharan D*** (2022). A midbrain-inspired recurrent neural network model for robust change detection. *Journal of Neuroscience.* 42(44):8262-8283

10) Sreenivasan V, Kumar S, Pestilli F, Talukdar P & **Sridharan D*** (2022). GPU accelerated connectome discovery at scale. *Nature Computational Science.* 2, 298-306. Doi: 10.1038/s43588-022-00250-z (*cover article*).

11) Jagatap A, Jain H, Purokayastha S & **Sridharan D*** (2021). Neurally-constrained modeling of human gaze strategies in a change blindness task. *PLOS Computational Biology.* 17(8): e1009322. Doi: 10.1371/journal.pcbi.1009322

12) Ajmera SA, Jain H, Sundaresan M, & **Sridharan D*.** (2020). Decoding task-specific cognitive states with slow, directed functional networks in the human brain. *eNeuro.* 7 (4). Doi: 10.1523/eneuro.0512-19.2019. PMID: 32265196.

13) Sreenivasan V & **Sridharan D*** (2019). Subcortical connectivity correlates selectively with attention's effects on spatial choice bias. *Proceedings of the National Academy of Sciences (PNAS, USA),* 116 (39) 19711-19716. Doi: 10.1073/pnas.1902704116. PMID: 31980530.

14) Sagar V, Sengupta R & **Sridharan D*** (2019). Dissociable sensitivity and bias mechanisms mediate behavioral effects of exogenous attention. *Scientific Reports,* 9(1), 12657. Doi: 10.1038/s41598-019-42759-w. PMID: 31477747.

15) Banerjee S, Grover S, Ganesh S & **Sridharan D*** (2019). Sensory and decisional components of endogenous attention are dissociable. *Journal of Neurophysiology,* 122(4)1538-1554. Doi: 10.1152/jn.00257.2019. PMID: 31268805.

16) Banerjee S, Grover S & **Sridharan D*** (2017). Unraveling causal mechanisms of top-down and bottom-up visuospatial attention with non-invasive brain stimulation. *Journal of the Indian Institute of Science* 1-25. Doi: 10.1007/S41745-017-0046-0. (invited review; *cover article*). PMID: 31231154.

17) Knudsen EI, Schwarz JS, Knudsen PK & **Sridharan D*** (2017). Space-specific deficits in visual orientation discrimination caused by lesions in the midbrain stimulus selection network. *Current Biology* 27(14), 2053-2064.e5. Doi: 10.1016/j.cub.2017.06.011. PMID: 28669762.

18) **Sridharan D**[†], Steinmetz NA, Moore T & Knudsen EI (2017). Does the superior colliculus control perceptual sensitivity or choice bias during attention? Evidence from a multialternative decision framework. *Journal of Neuroscience,* 37(3), 480-511. Doi: 10.1523/jneurosci.4505-14.2017. PMID: 28100734.

19) **Sridharan D**[†], Knudsen EI (2015). Selective disinhibition: A unified mechanism for predictive and *post hoc* attentional selection. *Vision Research*, 116: 194-209 (special issue on Computational Models of Attention). Doi: 10.1016/j.visres.2014.12.010. PMID: 25542276.

20) **Sridharan D**[†], Knudsen EI (2015). Gamma oscillations in the midbrain spatial attention network: Linking circuits to function. *Current Opinion in Neurobiology*, 31C:189-198 (review; special issue on Brain Rhythms). Doi: 10.1016/j.conb.2014.11.006. PMID: 25485519.

21) **Sridharan D**[†], Steinmetz NA, Moore T, Knudsen EI (2014). Distinguishing bias from sensitivity effects in multialternative detection tasks. *Journal of Vision*, 14(9):16, 1-32. Doi: 10.1167/14.9.16. PMID: 25146574.

22) **Sridharan D**[†], Schwarz JS, Knudsen EI. Selective attention in birds (2014). *Current Biology*, 24(11): R510-513 (review). Doi: 10.1016/j.cub.2013.12.046. PMID: 24892907.

23) **Sridharan D**[†], Ramamurthy DL, Schwarz JS, Knudsen EI (2014). Visuospatial selective attention in chickens. *Proceedings of the National Academy of Sciences (PNAS, USA)*, 111(19): E2056-2065. Doi: 10.1073/pnas.1316824111. PMID: 24753566.

24) Schwarz JS[§], **Sridharan D**[§] & Knudsen EI (2013). Magnetic tracking of eye position in freely behaving chickens. *Frontiers in Systems Neuroscience*, 7:91. Doi: 10.3389/fnsys.2013.00091. PMID: 24312023.

25) **Sridharan D**[†], Ramamurthy DL & Knudsen EI (2013). Spatial probability dynamically modulates visual target detection in chickens. *PLOS One,* 8(5):e64136. Doi: 10.1371/journal.pone.0064136. PMID: 23734188.

26) Goddard CA[§], **Sridharan D**[§], Huguenard JH & Knudsen EI (2012). Gamma oscillations are generated locally in an attention-related midbrain network. *Neuron*, 73(3):567-80, 2012 ([§]co-first authors). Doi: 10.1016/j.neuron.2011.11.028. PMID: 22325207.

27) **Sridharan D**[†], Boahen K & Knudsen EI (2011). Space coding by gamma oscillations in the barn owl optic tectum. *Journal of Neurophysiology,* 105:2005-2017 (*cover article*). Doi: 10.1152/jn.00965.2010. PMID: 21325681.

28) **Sridharan D**[†], Levitin DJ & Menon V (2008). A critical role for the right fronto-insular cortex in switching between central-executive and default-mode networks. *Proceedings of the National Academy of Sciences*, 105(34):12569-74. Doi: 10.1073/pnas.0800005105. PMID: 18723676.

29) **Sridharan D**[†], Levitin DJ, Chafe CH, Berger J, Menon V (2007). Neural dynamics of event segmentation in music: Converging evidence for dissociable ventral and dorsal networks. *Neuron*, 55(3):521-32 (*cover article*). Doi: 10.1016/j.neuron.2007.07.003. PMID: 17678862.

30) **Sridharan D**, Prashanth PS, Chakravarthy VS (2006). The role of the basal ganglia in exploration in a neural model based on reinforcement learning. *International Journal of Neural Systems*. 16(2): 111-24. Doi: 10.1142/S0129065706000548. PMID: 16688851.

Key: †first and corresponding author; §co-first and corresponding author; *senior and corresponding author.

iii) Peer-reviewed, full-length international conference publications:

1) Srivastava A, Patel K, Shenoy P & **Sridharan D*** (2024). Rescuing referral failures during automated diagnosis of domain-shifted medical images. *under review*. doi: 10.48550/arXiv.2311.16766

2) Umapathi BM, Chauhan K, Shenoy P & **Sridharan D*** (2023). Shaken, and Stirred: Long-range dependencies enable robust outlier detection with PixelCNN++. *International Joint Conference on Artificial Intelligence (IJCAI)*.

15% selection rate from >4,500 submissions.

3) Chauhan K, Shenoy P, Gupta M & **Sridharan D*** (2022). Robust outlier detection by debiasing VAE likelihoods. *Computer Vision and Pattern Recognition (CVPR)*.

25% selection rate from >8,000 submissions.

4) Ajmera SA, Rajagopal S, Rehman R & **Sridharan D*** (2019). Infra-slow brain dynamics as a marker for cognitive function and decline. *Advances in Neural Information Processing Systems (NeurIPS) Proceedings* (Spotlight presentation). PMID: 32231426.

Ranked among the top 164 (top 3%) of >6,000 submissions and selected for oral spotlight.

5) Kumar S, Sreenivasan V, Talukdar P, Pestilli, F & **Sridharan D*** (2019). ReAl-LiFE: Accelerating the discovery of individualized brain connectomes on GPUs. *AAAI Conference on Artificial Intelligence Proceedings*, 33(01), 630-638. doi: 10.1609/aaai.v33i01.3301630. PMID: 31355051.

15% selection rate from >7,500 submissions.

6) Sundaresan M, Nabeel A & **Sridharan D*** (2017). Mapping distinct timescales of functional interactions among brain networks. *Advances in Neural Information Processing Systems (NeurIPS) Proceedings*, 4109-4118. PMID: 31285649.

20% selection rate from >3,000 submissions.

7) **Sridharan D**†§, Percival B§, Arthur J & Boahen K (2007). An in-silico model of dynamic routing through neuronal coherence. *Advances in Neural Information Processing Systems (NeurIPS) Proceedings*.

Ranked among the top 10% of ~1,000 submissions and selected for oral spotlight.

8) **Sridharan D**, Prashanth PS & Chakravarthy VS (2004). The role of the basal ganglia in exploratory behavior in a model based on reinforcement learning. *International Conference on Neural Information Processing (ICONIP) Proceedings* 70-77.

Key: †first and corresponding author; §co-first and corresponding author; *senior and corresponding author.

iv) Peer-reviewed international workshop papers, contributed talks and abstracts (selected):

1) Choudhary V & **Sridharan D*** (2024). Generalized attention benefits that outlast neurofeedback training. *Computational and Systems Neuroscience (COSYNE)* (peer-reviewed conference abstract).

2) Srivastava A, Shenoy P, & **Sridharan D*** (2023). Avoiding catastrophic referral failures In medical images under domain shift. *ICLR Workshop on Domain Generalization (ICLR-DG)* (peer-reviewed workshop paper).

Selected for oral presentation.

3) Gupta P, Gupta S & **Sridharan D*** (2023). A common neural mechanism underlies microsaccades and covert spatial attention. *Computational and Systems Neuroscience (COSYNE)* (peer-reviewed conference abstract).

4) Gupta S & **Sridharan D*** (2023). An attractor model explains space-specific distractor biases in visual working memory. *Computational and Systems Neuroscience (COSYNE)* (peer-reviewed conference abstract).

5) Chauhan K, Shenoy P, Gupta M & **Sridharan D*** (2022). Robust outlier detection by debiasing VAE likelihoods. *NeurIPS Workshop on Bayesian Deep Learning (NeurIPS-BDL)* (peer-reviewed workshop paper).

6) Gupta P & **Sridharan D*** (2022). Saccade preparation does not benefit visual change detection. *Computational and Systems Neuroscience (COSYNE)* (peer-reviewed conference abstract).

7) Chandrasekaran AN, Vermani A, Steinmetz N, Moore T & **Sridharan D*** (2021). Distinct neural codes for attentional choice bias in visual and frontal cortex. *Computational and Systems Neuroscience (COSYNE)* (peer-reviewed conference abstract).

8) Gurusamy G, Sreenivasan V, Ramesh RG, Purokayastha S, Javali M, Rao NP & **Sridharan D*** (2020). Diffusion MRI-based structural connectivity robustly predicts "brain-age". *NeurIPS Workshop on Medical Imaging (Med-NeurIPS)* (peer-reviewed workshop paper)

9) Sreenivasan V & **Sridharan D*** (2019). Subcortical connectivity correlates selectivity with choice bias in a visuospatial attention task. *Computational and Systems Neuroscience (COSYNE),* Lisbon, Portugal (peer-reviewed conference abstract).
35% selection rate from over 1,000 submissions.

10) Chinchani AM, Ganesh S, Yu B & **Sridharan D*** (2019). Tracking attention fluctuations in the human brain with an EEG-based cognitive brain-machine interface. *Computational and Systems Neuroscience (COSYNE)*, Lisbon, Portugal (peer-reviewed conference abstract).
35% selection rate from over 1,000 submissions.

11) Kundu JN, Srinivas K, Babu RV & **Sridharan D*** (2017). A biologically-inspired sparse, topographic recurrent neural network model for robust change detection. *NeurIPS Workshop on Cognitively Informed Artificial Intelligence (CIAI)*, Long Beach, USA (peer-reviewed workshop paper).

12) **Sridharan D†**, et al (2016). Selective attention: Model based approaches for identifying network mechanisms. *Japan Neuroscience Society (JNS)*, Yokohama, Japan (peer-reviewed contributed talk).

13) **Sridharan D†**, Steinmetz NA, Moore T & Knudsen EI (2013). A unified framework for multiple alternative detection in birds and primates. *Vision Sciences Society (VSS)*, Naples, USA (peer-reviewed conference abstract).

14) **Sridharan D†**, Knudsen EI (2011). Towards a mechanistic understanding of the role of gamma oscillations in attention: An avian midbrain model. Nano-symposium on "Functional Mechanisms of Attention by Animal". *Society for Neuroscience (SfN),* Washington DC, USA (peer-reviewed contributed talk).

15) **Sridharan D†**, Millner S, Arthur J & Boahen K (2010). Robust spatial working memory through inhibitory gamma synchrony. *Computational and Systems Neuroscience (COSYNE),* Salt Lake City, USA (peer-reviewed contributed talk).
Ranked among the top 5% of over 400 submissions, and selected for oral presentation.

16) Goddard CA§, **Sridharan D§**, Huguenard J and Knudsen E (2010). Gamma oscillations in the optic tectum in vitro represent top-down drive by a cholinergic nucleus. *Computational and Systems Neuroscience (COSYNE)*, Salt Lake City, USA (peer-reviewed conference abstract).

17) **Sridharan D***, Levitin DJ & Menon, V (2007). A causal role for the right fronto-insular cortex in switching between executive-control and default-mode networks. *Organization for Human Brain Mapping (OHBM),* Chicago, USA (peer-reviewed contributed talk).
Ranked among the top 5% of over 1500 submissions, and selected for oral presentation.

18) Kaufman M§, **Sridharan D§** & Litchfield J (2006). Action potential backpropagation failure: All-or-none rescue by synaptic input in CA1 obliques. *Computational Neuroscience Meeting (CNS),* Edinburgh, UK, 2006 (peer-reviewed conference abstract).

Key: †first and corresponding author; §co-first and corresponding author; *senior and corresponding author.

d. Patents List
Nil

e. List of Projects Undertaken (completed and ongoing)

1 **Title:** Neural mechanisms that causally mediate visuospatial attention
Funding agency: DST Swarna Jayanti Fellowship
Role: PI
Project duration: 1-8-2022 to 31-7-2027 *(ongoing)*
Cost: INR 199.82 lakhs (budgeted)

2 **Title:** Unraveling mechanisms of distracter filtering with functional connectivity mapping and non-invasive brain stimulation
Funding agency: India Trento Programme for Advanced Research (ITPAR); DST, Govt. of India and University of Trento, Italy
Role: Co-PI
Project duration: 25-3-2019 to 24-3-2022 *(completed)*
Cost: INR 71.48 lakhs

3 **Title:** Cortical and subcortical mechanisms of visuospatial attention
   Funding agency: DBT-Wellcome Trust India Alliance (IA) Intermediate Fellowship; DBT, Govt. of India and Wellcome Trust, UK
   Role: PI
   Project duration: 1-3-2016 to 28-2-2022 *(completed, with 1.5 year no-cost extension)*
   Cost: INR 323.35 lakhs

4 **Title:** Fronto-parietal mechanisms of top-down and bottom-up visual attention.
   Funding agency: SERB Early Career Award; SERB, Govt. of India.
   Role: PI
   Project duration: 15-3-2017 to 14-3-2020 *(completed)*
   Cost: INR 36.47 lakhs

5 **Title:** Causal inference for human brain networks.
   Funding agency: Sonata Software.
   Role: Co-PI
   Project duration: 15-3-2017 to 14-3-2020 *(completed)*
   Cost: INR 17.75 lakhs

6 **Title:** A cognitive neurofeedback controller for a mechanistic understanding of attention.
   Funding agency: IISc-CMU (Carnegie Mellon University) BrainHub grant
   Role: Co-PI
   Project duration: 01-01-2017 to 30-06-2019 *(completed)*
   Cost: INR 38.80 lakhs

7 **Title:** A unified neurocognitive framework for selective attention.
   Funding agency: DBT Ramalingaswami Fellowship, DBT, Govt. of India
   Role: PI
   Project duration: 1-3-2015 to 28-2-2020 (*resigned in 2016 due to IA award*)
   Cost: INR 88 lakhs

f. Teaching
- Fundamentals of systems and cognitive neuroscience (NS201, Fall). Instructor, 2015-.
- Topics in systems and cognitive neuroscience (NS301, Spring). Instructor, 2015-.
- Introductory Biology III: Neuroscience lectures (UB201, Fall). Instructor, 2016-.
- Experiments in Neurobiology (UB304L, Spring). Joint co-ordinator and Instructor, 2016-.
- Computational Cognitive Neuroscience (E0304, Spring). Instructor, 2018-.

g. Peer-review
Journal and conference reviewer:

Archives of General Psychiatry, Brain, Brain Connectivity, Brain Research, Cerebral Cortex, COSYNE, Expert Systems with Applications, Frontiers in Neuroscience, IEEE Transactions on Signal Processing, International Conference on Machine Learning (ICML), iScience, Nature Communications Neural Information Processing Systems (NeurIPS; top 400 reviewer), Neuropsychologia, PLoS One, Proceedings of the National Academy of Sciences, Scientific Reports.

Grant reviewer:
- FWF Austrian Science Fund/Der Wissenschaftsfonds
- British Council: BIRAX, Britain-Israel Research and Academic Exchange
- Agency for Science Technology and Research (A*STAR), Singapore
- Indo-French Centre for the Promotion of Advanced Research (CEFIPRA)