Aaron Sathyanesan, Ph.D.

Laboratory address:
SC321, Department of Biology
University of Dayton
300 College Park
Dayton OH 45469
sathyanesan-lab.github.io

Contact:
SC223F (office)
Department of Biology,
University of Dayton
asathyanesan1@udayton.edu
Phone: 937-229-3637

EDUCATION

University of Maryland, Baltimore County December 2014
Ph.D., Neuroscience & Cognitive Science

School of Engineering & Technology, Bharathidasan University, India April 2007
B. Tech., Biotechnology

RESEARCH EXPERIENCE

Tenure-track Assistant Professor, Department of Biology, College of Arts & Sciences 2022 – present
Joint Appointment, Dept. of Electrical & Computer Engineering, School of Engineering 2023 – present
University of Dayton

- Leading research projects using neuroengineering and computational approaches to identify the mechanistic bases of developmental disorders including Down syndrome, neonatal brain injury, and epilepsy.
- Initiated a collaboration with Dr. Pothitos Pitychoutis, Dept. of Biology, University of Dayton on using systems neuroscience tools to identify Phospholamban-mediated Ca^{2+} signaling abnormalities in the Reticular Thalamic Nucleus.
- Initiated a collaboration with Dr. Bin Gu, Dept. of Neuroscience, College of Medicine, Ohio State University, and Dr. Vijayan Asari, Dept. of Electrical and Computer Engineering, UD, on developing and integrating machine-learning pipelines to define and predict seizure activity in mouse models of epilepsy as well as in patient data.
- Hanley Sustainability Scholar: developing open projects that use frugal engineering or "jugaad" in the area of biomedical research instrumentation and computational tool development (sustainable technologies & sustainable health and nutrition)
- Developing a research project and grant proposal with Dr. Vamsy Chodavarapu, Dept. of Electrical and Computer Engineering, UD, and Dr. Vinaya Gogineni, Resident, Dept. of Family and Community Medicine, Northwestern University Feinberg School of Medicine, on a novel design paradigm for transcranial electrical stimulation and the neural basis of stimulation efficacy.

Research Faculty, Children's National Hospital 2020 - 2022
Center for Neuroscience Research, Children's National Hospital

- Secured independent pilot funding from a disease research foundation to explore neural circuit deficits and motor abnormalities in Down syndrome

Postdoctoral Research Fellow, Children's National Hospital 2015 – 2020
Center for Neuroscience Research, Children's National Research Institute
Advisor: Vittorio Gallo, Ph.D.

- Developed a new automated closed-loop method to correlate neuronal activity to behavior in a cerebellar-dependent locomotor learning task using fiber photometry and identified behavioral and physiological deficits in a clinically relevant mouse model of neonatal brain injury

The above work resulted in a research publication in *Nature Communications*, which was recommended in *Faculty Opinions* as being of special significance in the field. This work also resulted in a research publication in *PNAS*, and a data-review hybrid publication in *Neurobiology of Learning and Memory*.

Graduate student, University of Maryland, Baltimore County 2008 – 2014
Department of Biological Sciences
Advisor: Weihong Lin, Ph.D.

- Developed an automated method to quantify nerve fiber density in tissue samples using computational image feature extraction and signal processing.
- Identified and characterized expression and function of G-protein βγ subunits as signal transduction components in the mouse olfactory system

This work resulted in first author publications in *Frontiers in Cellular Neuroscience* and *Journal of Neuroscience Methods*, and a co-first-author publication in *Neuroscience*.

Junior Research Fellow, AU-KBC Research Center, Tamilnadu, India 2007 – 2008
Optical Nanobiology Group, Life Sciences Department
Advisor: B. M. Jaffar Ali, Ph.D.

- Developed a mathematical method to increase accuracy of measuring biophysical properties of DNA using optical tweezers and contributed to the development of an automated assay to measure cellular recovery following shear stress injury in an endothelial cell culture model

This work provided preliminary feasibility data and contributed to a paper presented at the *IEEE World Congress on Nature & Biologically Inspired Computing (NaBIC 2009)*.

RESEARCH GRANTS AND PROPOSALS

(#) denotes proposals or funding at UD

Proposals submitted since joining UD

Submitted July 15th 2023	*Neural mechanisms underlying connectivity deficits between the cerebellum and the cortex in Down syndrome* (awarded) (#) Trisomy 21 Research Society; Early Investigator Award, $10,000 PI: Aaron Sathyanesan, Ph.D.
Submitted June 25th 2023	*Deciphering the Thalamic Reticular Functions of Phospholamban* (pending) (#) National Institute of Neurological Disorders and Stroke (NINDS); NIH R15 application PI: Pothitos Pitychoutis, Ph.D., Co-I: Aaron Sathyanesan, Ph.D.
Submitted October 28th 2022	*Defining behavioral deficits in rodent models of neurodevelopmental disorders* (budget approved) (#) Ohio Supercomputer Center (OSC); $730 towards compute units PI: Aaron Sathyanesan, Ph.D.
Submitted October 13th 2022	*Abnormal connectivity between the cortex and the cerebellum in Down syndrome* (awarded) (#) UD Research Seed Council Grant; $6,500 PI: Aaron Sathyanesan, Ph.D.

Contributions to Ongoing Funded Research

January 2021 – January 2023; Project extension to June 2024 granted.	*Developing tools to identify mechanisms of locomotor dysfunction in Down syndrome* (#) Principal Investigator: Aaron Sathyanesan, Ph.D. Fondation Jérôme Lejeune Advanced Research Grant, $84,168

Contributions to Prior Funded Research

April 2018 – March 2023	*Mechanisms of white matter development in Down syndrome* Principal Investigators: Tarik F. Haydar, Ph.D.; Vittorio Gallo, Ph.D. National Institute of Neurological Disorders and Stroke (NINDS) R01, $2,248,925 Role: Post-doctoral associate. My behavioral work on the ErasmusLadder was a key aspect of this grant. I provided preliminary data, developed one of the aims, and contributed to writing the grant with Dr. Tarik Haydar and Dr. Vittorio Gallo.
September 2012 – August 2018	*Xenobiotics detection in olfactory epithelium* Principal Investigator: Weihong Lin, Ph.D. National Institute of Deafness and other Communication Disorders (NIDCD) R01, Role: Co-author. My work on cholinergic microvillous cells in the olfactory epithelium formed a key aspect of this grant. I provided preliminary data, developed one of the aims, and wrote the grant with Dr. Weihong Lin.

FELLOWSHIPS, HONORS, AND AWARDS

(#) denotes honors or awards obtained while at UD

Invited Examiner, Special Honors Thesis Event, Honors College and Dept. of Psychology, Arizona State University, Tempe, Arizona (#)	2023
Network Glia Stipend, XIV European Meeting on Glial Cells in Health and Disease	2019
Invited chair, Nanosymposium entitled *Cerebellum: from circuitry to function*, Society for Neuroscience Annual Meeting, Washington DC	2017
Joy Cappel Young Investigator Award, Rockland Immunochemicals Inc.	2016 – 2018
Young Investigator Educational Enhancement Award, American Society for Neurochemistry	2016
Travel Award, 6th Annual Ataxia Investigators Meeting, National Ataxia Foundation, Orlando	2016
Doctoral Dissertation Fellowship, Graduate School, University of Maryland, Baltimore County	2014
Student travel award, 31st Annual Association of Chemoreception Sciences (AChemS) meeting	2010
Junior Research Fellowship, Department of Biotechnology, Government of India	2007 – 2008

BIBLIOGRAPHY

Published and Accepted Manuscripts

1. Kratimenos P*, Vij A, Vidva R, Koutroulis I, Delivoria-Papadopoulos M, Gallo V, & **Sathyanesan A*** (2022) Computational Analysis of Cortical Neuronal Excitotoxicity in a Large Animal Model of Neonatal Brain Injury, *Journal of Neurodevelopmental Disorders* [Link] [PDF] (*Corresponding author)
2. **Sathyanesan A**[#], Kratimenos P, & Gallo V[#] (2021) Disruption of neonatal Purkinje cell function underlies injury-related learning deficits, *Proceedings of the National Academy of Sciences (PNAS)* [[#]Co-corresponding authorship] [Link] [PDF]
3. Vacher CM, O'Reilly JJ, Salzbank J, Lacaille H, Bakalar D, Sebaoui-Illoul S, Liere P, Clarkson-Paredes C, Sasaki T, **Sathyanesan A**, Kawasawa YI, Popratiloff A, Hashimoto-Torii K, Gallo V, Schumacher M, Penn AA (2021) Placental neurosteroids shape cerebellar development and social behavior, *Nature Neuroscience* [Link] [PDF]

4. **Sathyanesan A**[#], Zhou J, Scafidi J, Heck DH, Sillitoe RV, Gallo V[#] (2019) Emerging connections between cerebellar development, behavior, and complex brain disorders, *Nature Reviews Neuroscience* [[#]Co-corresponding authorship] [Link] [PDF]
5. **Sathyanesan A***, Kundu S*, Abbah J, Gallo V (2018) Neonatal brain injury causes cerebellar learning deficits and Purkinje cell dysfunction, *Nature Communications* [*Co-first authorship] [Link] [PDF]

   This paper was recommended in *Faculty Opinions* (top 1% in Neuroscience) as having an "Interesting hypothesis", a "novel drug target", and as a "technical advance"; Lu Q and Berry K: Faculty Opinions Recommendation of [Sathyanesan A et al., Nat Commun 2019 9(1:3235)]. In Faculty Opinions, 16 Jan 2019
6. **Sathyanesan A**[#] & Gallo V (2018) Cerebellar contribution to locomotor behavior: A neurodevelopmental perspective, *Neurobiology of Learning and Memory* [[#]Corresponding author] [Link] [PDF]
7. Szebenyi SA, Ogura T, **Sathyanesan A**, Al-Matrouk A, Chang J, Lin W (2014) Increases in intracellular calcium via activation of potentially multiple phospholipase C isozymes in mouse olfactory neurons, *Frontiers in Cellular Neuroscience* [Link] [PDF]
8. **Sathyanesan A**, Feijoo AA, Mehta ST, Nimarko AF, Lin W (2013) Expression profile of G-protein βγ subunit gene transcripts in the mouse olfactory sensory epithelia, *Frontiers in Cellular Neuroscience* [Link] [PDF]
   Highlighted by Boto & Alcorta (2013) in *Frontiers in Cellular Neuroscience*: "Toward identifying specific roles for G-protein β and γ subunit variants in olfactory reception"
9. Krosnowski K*, Ashby S*, **Sathyanesan A***, Luo W, Ogura T, Lin W (2012) Diverse populations of intrinsic cholinergic interneurons in the mouse olfactory bulb, *Neuroscience* [*All three authors contributed equally] [Link] [PDF]
10. **Sathyanesan A**, Ogura T, Lin W (2012) Automated measurement of nerve fiber density using line intensity scan analysis, *Journal of Neuroscience Methods* [Link] [PDF]
11. Ogura T, Szebenyi SA, Krosnowski K, **Sathyanesan A**, Jackson J, Lin W (2011) Cholinergic microvillous cells in the mouse main olfactory epithelium and effect of acetylcholine on olfactory sensory neurons and supporting cells. *Journal of Neurophysiology* [Link] [PDF]

RESEARCH PRODUCTS

(#) denotes products developed after joining UD
*Sathyanesan Lab graduate student developer, ^ Sathyanesan Lab undergraduate student developer

Software and computational products

1. MyVivarium – Cloud-based IoT-enabled database tool for digital lab-animal colony management [https://biologylab.online] (2023) Prabhakaran J^, Raza MA*, Nguyen T, **Sathyanesan A** (#)

RESEARCH PRESENTATIONS

(#) denotes presentations delivered after joining UD

Talks

1. Invited talk, Ohio Miami Valley Chapter of Society for Neuroscience Winter Meeting, 2023, *Uncovering mechanisms of neural circuit dysfunction in developmental disorders* (#)
2. Career Development Seminar, Children's National Research Institute, 2021, *Use of machine-learning tools for tracking animal behavior*
3. Talk delivered as part of Neuromatch 3.0 virtual conference, 2020, *Disruption of neonatal Purkinje cell function underlies injury-related learning deficits*

4. Invited talk, part of symposium entitled *Role of GABAergic neurons in controlling oligodendroglial function and shaping their own myelination*, XIV European Meeting on Glial Cells in Health and Disease, Porto, Portugal, 2019, *Adaptive cerebellar learning deficits and Purkinje cell dysfunction in a mouse model of neonatal brain injury*
5. Invited talk, The George Washington Institute for Neuroscience Symposium, The George Washington University School of Medicine & Health Sciences, Washington DC, 2018, *Neonatal brain injury causes cerebellar learning deficits and Purkinje cell dysfunction*
6. Invited chair; abstract selected for talk, Nanosymposium entitled *Cerebellum: from circuitry to function*, Society for Neuroscience (SfN) 47th Annual Meeting, Washington DC, 2017, *Adaptive cerebellar learning deficits and abnormal in vivo Purkinje cell physiology in a mouse model of premature birth injury*
7. Invited talk, HEAD Talks series, Department of Neurology, Johns Hopkins University School of Medicine, Baltimore, Maryland, May 2017, *What if we could record, rewind, and edit our thoughts? Neurotech advances in measuring and predicting brain activity and behavior*
8. Invited talk, Society for Neuroscience (SfN) 46th Annual Meeting Satellite Symposium, Locomotion Analysis to Examine Motor Function in Mouse Models of Neurological Disease, San Diego, California, 2016, *Cerebellar Learning Deficits in a Mouse Model of Premature Birth Injury*
9. Abstract chosen for Oral presentation, American Society for Neurochemistry (ASN) Annual Meeting, Denver, Colorado, 2016, *An automated behavioral paradigm reveals cerebellar deficits in a mouse model of premature birth injury*
10. Invited talk, Olfaction group (Belluscio, Stopfer & Ryba Labs), National Institutes of Health, 2014, *Heterotrimeric G-protein βγ Subunits in the Peripheral Olfactory System of Mice*
11. Invited talk, Tri-Beta National Biological Honor Society, McDaniel College, 2013, *Smelling the βiγ picture: The Role of Heterotrimeric G-protein βγ subunits in the Peripheral Olfactory System of Mice*

STUDENT RESEARCH PRESENTATIONS

(#) presentations delivered after joining UD; *UD graduate student, ^UD undergraduate student

Talks

1. Raza MA* & **Sathyanesan A**, *Using viral tracing methods to identify connectivity deficits between cerebellum and the thalamus in the Ts65Dn mouse model of Down Syndrome*, Stander Symposium, University of Dayton, 2023 (#)
2. Hahn A^ & **Sathyanesan A**, *Seizure Identification and Prediction Using DeepLearning*, Stander Symposium, University of Dayton, 2023 (#)

Posters

1. Raza MA* & **Sathyanesan A**, *Identifying connectivity deficits between cerebellum and thalamus in Down Syndrome*, Ohio Miami Valley Chapter of Society for Neuroscience Summer Meeting, 2023 (#)
2. Moore A*, Kratimenos P, Gallo V, **Sathyanesan A**, *Exploring neural circuits and Purkinje cell changes underlying cerebellum-dependent motor abnormalities in Down Syndrome*, Ohio Miami Valley Chapter of Society for Neuroscience Summer Meeting, 2023 (#)
3. Shen Y, Zelidon J, Rajjoub N, Hahn A^, **Sathyanesan A**, Gu B, *Automated detection and classification of seizure behaviors in Collaborative Cross (CC) mice using deeplearning: DeepLabCut (DLC) and Behavioral Segmentation of Open Fields (B-SOiD)*, Ohio State University Department of Neuroscience Research Day, 2023 (#)

SCIENTIFIC AND SCHOLARLY ACTIVITIES

(#) manuscripts edited or reviewed after joining UD

- Guest editor – Neurodevelopment: Parental Influences, In Utero Exposures, and Genetics, *Frontiers in Neuroscience*, 2022; (#) 5 manuscripts handled as editor
- Member, Review Editorial Board, *Frontiers in Cellular Neuroscience*, 2015-current; (#) 4 manuscripts peer-reviewed
- Member, Reviewing Board of Editors, *Science Matters*, 2016-current
- Co-reviewer (with Dr. Vittorio Gallo), *Nature Neuroscience*
- Reviewer, *Brain and Behavior*, 2020-current
- Reviewer, *Cellular and Molecular Neurobiology*, 2020-current
- Reviewer, *Research in Developmental Disabilities*, 2020-current

TEACHING EXPERIENCE

Assistant Professor, University of Dayton

Course: BIO426/594 – Molecular Biology	Fall 2023
Course: BIO151 – Concepts in Biology I	Spring 2023, Fall 2022
Course: BIO596 – Systems Neuroscience	Spring 2023
Course: BIO299 – Biology Sophomore Seminar	Fall 2023, Spring 2023, Fall 2022

Guest Lecturer, University of Dayton — Spring 2023
Course: BIO416 Neuroscience Seminar
Responsibilities: Invited to give a lecture about the brain and developmental disorders at the Neuroscience Seminar course at the University of Dayton taught by Dr. Pothitos Pitychoutis (#)

Guest Lecturer, University of Maryland, Baltimore County — Fall 2021
Course: FA 2021 Seminar Course on Anatomy and Physiology
Responsibilities: Invited to lecture on my work to graduate and undergraduate students.

Guest Lecturer, University of Maryland, Baltimore County — Fall 2019
Course: BIOL451/651 Neurobiology
Responsibilities: Invited to lecture on my work to graduate and undergraduate students.

Graduate Teaching Assistant, University of Maryland, Baltimore County — 2008 – 2009
Course: BIOL101 (LAB) Introduction to Biology Lab
Responsibilities: Delivered a short lecture at the start of every lab class and supervised lab work for a group of students from diverse backgrounds. Graded assignments and exams. Supervised an undergraduate teaching assistant.

MENTORING EXPERIENCE

UD graduate students

Mir Abbas Raza, B. Tech, M. Tech (Bioengineering); PhD Program in Biology	Spring 2023 - present
Amelia Moore, B.S. (Biology); BPM Program	Fall 2022 - present

UD Undergraduate students

Samaria Brown (Health Sciences); DSF 2023 recipient	Fall 2022 – present
Christopher Fleisher (Pre-Medicine); DSF 2023 recipient	Fall 2022 – present
Oluwayemisi Tayo-Ayorinde (Biology); Hussey Bequest Biomedical Fellow	Fall 2022 - present
Jaswant Prabhakaran (Computer Science); Hussey Bequest Biomedical Fellow	Spring 2023 - present
Samantha Bailey (Pre-Medicine)	Fall 2022 – present
Julia Gill (Health Science & Education, minor: neuroscience)	Fall 2022 – present
Abigayle Hahn (Pre-Medicine)	Fall 2022 – present
Alaina Sharp (Pre-Medicine)	Fall 2022 – present

Graduate students mentored in previous institutions

LaPrecious Haynes *Current status:* LaPrecious is a Ph.D. student (Biology) at Howard University (a leading HBCU) in Washington DC.	Winter 2020 - Fall 2021
Kayla Lemons *Current status:* Pursuing post-doctoral research in the lab of Dr. Kafui Dzirasa, Duke University	Spring 2014
Abdullah Al-Matrouk, PhD *Current status:* Assistant Professor, Kuwait University	2013 – 2014

Undergraduate students mentored in previous institutions

Emmanuel Buckman, Howard University	Winter - Fall 2021
Anvita Anumolu, University of Pittsburgh	Fall 2020
Philip Byron, Scholar, Prison-to-Professionals (P2P) program	Fall 2020
Akua Nimarko, PhD, Stanford University, (mentored as undergrad at UMBC) *Dr. Saloni Mehta and Dr. Akua Nimarko are co-authors on one of my research papers.*	Fall 2012 – Fall 2014
Asante Hatcher, Ph.D., Baylor College of Medicine (mentored as undergrad at UMBC)	Spring-Fall 2013

STUDENT AWARDS AND HONORS

(#) indicates awards and honors after joining UD

Mir Abbas Raza (PhD Student) (#)	Graduate Student Summer Fellowship	Summer 2023
Amelia Moore (M.S. Student) (#)	Graduate Student Summer Fellowship	Summer 2023
Samaria Brown (Undergraduate) (#)	Dean's Summer Fellowship	Summer 2023
Christopher Fleisher (Undergraduate) (#)	Dean's Summer Fellowship	Summer 2023
Jaswant Prabhakaran (Undergraduate) (#)	Hussey Bequest Biomedical Fellowship	Summer 2023
Oluwayemisi Tayo-Ayorinde (Undergraduate) (#)	Hussey Bequest Biomedical Fellowship	Summer 2023

SERVICE

(#) indicates service activities initiated after joining UD

- Advising undergraduate students in the Biology major at UD: Fall 2023 – 15 students; Spring 2023 – 10 students; Fall 2022 – 10 students (#)
- Member of Careers Committee, Department of Biology, UD (#)
- Member of Pre-Health Programs Advising Committee at UD (#)
- Tutor, Prison-to-Professionals (P2P) program, which seeks to "provide mentoring and educational counseling to individuals returning from incarceration and individuals from disadvantaged backgrounds so that they may position themselves to start building their career as opposed to obtaining temporary employment." (from P2P website), April 2020-present.
- Collaborated with the Bioengineering department at Children's National Hospital to design and deploy 3-D printed hands-free door openers to reduce the potential spread of COVID-related surface contagion.
- Invited speaker, "Camp Neuro 2016" – Camp for Washington DC high school students to increase awareness about career opportunities in neuroscience; organized by George Washington University School of Medicine, Washington DC, 2016

TRAINING WORKSHOPS AND CONFERENCES ATTENDED

(#) indicates workshops or conferences attended after joining UD

- Gordon Research Conference on the Cerebellum, Lewiston, Maine, August 6th – 11th, 2023 (#)
- AI EPILEPSY & Neuro 2023 Conference, Breckenridge, Colorado, March 7th – 10th, 2023 (#)
- Miniscope workshop, UCLA, 10 November, 2016
- Fiber Photometry workshop, Host: Dr. Karl Deisseroth, Stanford University, 22-24 April, 2015