BIOGRAPHICAL SKETCH

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NAME: **ARJUN BALACHANDAR**

eRA COMMONS USER NAME (credential, e.g., agency login): N/A

POSITION TITLE: Movement Disorders Neurology Fellow & PhD student

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
McGill University (Montreal, Canada)	Completed 3/4 years (early acceptance to medical school)	09/2012	05/2015	Bachelor of Science – Honours Neuroscience
Faculty of Medicine, University of Toronto (Toronto, Canada)	MD	09/2015	06/2019	Medicine
Department of Medicine, University of Toronto (Toronto, Canada)	FRCPC	07/2019	06/2024	Adult Neurology Residency
Institute of Medical Science, University of Toronto (Toronto, Canada)	PhD (in-progress)	09/2024	TBD	Neurosciences
Toronto Western Hospital (Toronto, Canada)	/	07/2024	06/2027	Movement Disorders Neurology Fellowship

A. Personal Statement

My goal is to become a clinician-scientist developing neuromodulation interventions for people with Parkinson's disease (PD) and related movement disorders. As a neurologist and scientist-in-training, I am deeply drawn to the ways that understanding and modulating brain networks can alleviate debilitating symptoms. I believe the future of interventions like cortical and deep brain stimulation (DBS) lie at the intersection of clinical neurology, systems neuroscience, and computational methods. My current focus through my concurrent movement disorders fellowship and PhD is in developing novel neuromodulation and brain-computer interface (BCI) interventions to treat brain disorders. This includes smarter adaptive methods of neurostimulation for various undertreated facets of PD such as gait and sleep disorders, new targets for stimulation such as motor cortex stimulation for gait disorders, studying poorly understudied movement disorders such as status dystonicus, and using new neuro-technologies such as high-density cortical arrays to decode behavioural states (e.g. freezing of gait) more accurately to guide adaptive stimulation treatments.

There are numerous previously difficult problems in neurology that combining clinical expertise and computational analysis and machine learning is poised to help us solve. I have seen this first-hand through my clinical and research experiences in projects such as using machine learning to develop tools to detect sleep from deep brain activity in deep brain stimulation (DBS) patients or to diagnose PD, essential tremor and dystonic using smartphone accelerometers, and applying deep learning to diagnose dysphagia in stroke patients using voice recordings alone. I aim to use the increasing amount of data to employ machine learning

methods to develop useful tools to aid clinicians in the diagnosis and treatment of patients. Most importantly, I hope to pioneer neuromodulation therapies guided by neural signals using such techniques to meaningfully improve the lives of people with neurodegenerative diseases and movement disorders.

B. Positions, Scientific Appointments and Honors

Honors & Awards:

- 2026 American Brain Foundation Next Generation Research Grant in Parkinson's Disease: Awarded $150,000USD over 2-years (July 2026 – June 2028), one award-winner per year in North America
- 2025 International Congress Travel Grant: $1000USD grant and complimentary registration to the 2025 International Congress of Parkinson's Disease & Movement Disorders (Honolulu, Hawaii)
- 2024 PGME Research Award - Joseph M. West Family Memorial Fund and Starr Medal: Awarded $13,750CAD for top ranked research project proposal to help pursue medical research
- 2024 Parkinson Canada Clinician-Scientist Research Fellowship: Awarded $150,000CAD over 2-years (July 2024 – June 2026) for graduate research project, one award-winner per year
- 2024 Resident Scholarship to the Annual Meeting: Fully paid scholarship to the AAN annual meeting, one resident per University awarded in North America
- 2024 Department of Medicine Outstanding Resident Researcher Award: awarded to one resident in the Department of Medicine at the University of Toronto per year
- 1st Place: 3-Minute Talks Competition - 2023 CRANIA Conference
- CNS-NSUKI Conference Travel Award – Top 10 oral abstract presentation
- 2023 DBS Think Tank Rising Stars Challenge – Finalist – Top 6 of 50 applicants, chosen to present for panel of 8 top DBS expert researchers
- 2023 T-CAIREM Trainee Rounds Competition Award – Selected as part of 10 top applicants to present artificial intelligence (AI) research to highlight innovative and outstanding research at the intersection of AI and health across Canada.
- 2019 Dr. Harvey Moldofsky Scholarship for Psychiatric/Neuroscience Research, University of Toronto: In recognition of high academic standing and demonstrated interest and aptitude in the field of psychiatric or neuroscience research.

Positions:

2022-2023 Co-lead, Neurology International Residents Videoconference and Exchange (NIRVE), University of Toronto
2022-2025 Lecturer, Temerty Faculty of Medicine, University of Toronto
2024-Present Fellow, Royal College of Physicians and Surgeons of Canada, Canada

C. Contributions to Science

Publications (under review/submitted):

1. Mazzoni A, Gottlieb A, Micera S, Plotnik M, **Balachandar A**. The Future of Treatment. In: Disorders of Gait, Balance and Posture: A Clinical Approach. 2025 (under review)
2. **Balachandar A,** Fasano A, Tinkhauser G. Physiology of the Basal Ganglia. In: Mehanna R, Fernandez H. Deep Brain Stimulation and Advanced Therapies in Movement Disorders. *Demos Medical Publishing.* 2025. (under review)

Publications (accepted/published):

3. **Balachandar A,** Sorrento G, Moraud E, Bonizzato M, Fasano A. Neuromodulation for Gait Disorders. Nature Reviews Bioengineering. (accepted)
4. **Balachandar A,** Hernandez-Guillen A, Dosenbach N, Lang AE, Ganos C. Beyond the homunculus – SCAN-AMN as a shared action-oriented neural substrate across movement disorders. Mov Disord. (accepted)
5. Jung S, Molot-Toker S, Dinger T, **Balachandar A**, et al. Safety, feasibility, and outcomes of deep brain stimulation in young children excluded from the FDA Humanitarian Device Exemption: Analysis of the CHILD-DBS registry. Journal of Neurosurgery: Pediatrics. (accepted)
6. **Balachandar A,** Boogers A, Naghdlou S, Lozano A, Kalia S, Tinkhauser G, Fasano A. Beta-band and aperiodic activity across new and chronic STN DBS in Parkinson's disease. Mov Disord. 2026

7. **Balachandar A,** Vogt L, Mithani K, Coleman S, Ebden M, Fasano A, Gorodestky C, Ibrahim G. Status dystonicus is a distinct state characterized by pallidal beta-band activity. Nature Communications. 2025.
8. **Balachandar A,** Verhey LH, Mithani K, et al. Surgical Complications of Deep Brain Stimulation in Children Across Targets and Indications: Multicenter Analysis of the CHILD-DBS Registry. Neurology. 2025
9. Grippe T, Chen JC, **Balachandar A**, Reyes NGD, Sandor P, Lang AE, Ganos C. Tics and Tic-Like Phenomena as Compulsive Acts. Mov Disord Clin Pract. 2025
10. Yang AZ, Rodrigues T, Kashyap S, Patel Y, **Balachandar A**, Davidson BA, Sarica C, Buongermini RE, Vetkas A, Butt AB, Germann J, Fasano A, Kalia SK, Lozano AM, Slegr M, Boutet A. Cerebellar Dentate Cavernoma Enlargement and Tremor Emergence: Longitudinal Neuroimaging Analysis of Case Report and Literature Review. Mov Disord Clin Pract. 2025.
11. **Balachandar A,** Grippe TC, Lim WK, Malaty IA, Lang AE, Ganos C. Misophonia in Tic Disorders and Their Neuropsychiatric Associations. Mov Disord Clin Pract. 2025.
12. **Balachandar A**, Phokaewvarangkul O, Fasano A. Advances in deep brain stimulation for the treatment of neuropsychiatric disorders. Expert Review of Medical Devices. 2024.
13. **Balachandar A**, Hashim Y, Vaou E, Fasano A. Automated Sleep Detection in Movement Disorders Using Deep Brain Stimulation and Machine Learning. Mov Disord. 2024.
14. **Balachandar A,** Fasano A. Frequency Coding in Essential Tremor – The Olivocerebellar Orchestra Conducts its Own Symphony. Movement Disorders. Mov Disord. 2024.
15. Phokaewvarangkul O, **Balachandar A**, Fasano A. Closed Loop Systems. In: Bhidayasiri R, Maetzler W. Handbook of Digital Technologies in Movement Disorders. *Elsevier.* 2024.
16. Mahdi H, Nashnoush E, Saab R, **Balachandar** A, Dagli R, Perri L, Khosravani H. Tuning In: Analysis of Audio Classifier Performance in Clinical Settings with Limited Data. CHIL 2024.
17. Saab R, **Balachandar A (Co-first author)**, Mahdi H, et al. Machine-learning Assisted Swallowing Assessment: a deep learning-based quality improvement tool to screen for post-stroke dysphagia. Front. Neurosci. 2023.
18. **Balachandar A,** Boutet A, Vetkas A, Germann J, Chan IYM, Mikulis D, Munhoz RP, Fasano A, Kalia SK, Lozano AM. Reply to: Glioblastoma, IDH-Wildtype, CNS WHO Grade 4, Associated with Deep Brain Stimulation in a Patient with Essential Tremor: Report of a Case with Molecular Characterization and Review of the Literature. Mov Disord Clin Pract. 2023 Feb 16;10(3):529-530.
19. **Balachandar A**, et al. The Role of Safe MRI in Diagnosing an Unusual Case of High-Grade Glioma Adjacent to Globus Pallidus Interna DBS Electrode. Mov Disord Clin Pract. 2023 Jan 10.
20. **Balachandar A**, et al. Are smartphones and machine learning enough to diagnose tremor? J Neurol. 2022 Jul 21.
21. **Balachandar A,** Carpani F, Del Campo M, Mandell D. Subdural Hematoma-Induced Cortical Perforator Thrombosis Causing Ischemic Strokes. *Stroke*. 2022 May 26.
22. **Balachandar A**, Matta R, Shetty A, Algarni M, Lozano AM, Fasano A. Effect of Public Interest in Magnetic Resonance Imaging-Guided Focused Ultrasound on Enrolment for Deep Brain Stimulation. Mov Disord. 2022 May;37(5):1103-1104.
23. Malhotra A, Malhotra A, Landry A, **Balachandar A**, Guest W, Bharata A, Marotta A, Witiw C. Calcium Pyrophosphate Dihydrate Crystal Deposition Disease and Retro-odontoid Pseudotumor Rupture Managed via Posterior Occipital Cervical Instrumented Fusion: An Illustrative Case. *Journal of Neurosurgery: Case Lessons*. 2022.
24. **Balachandar A,** Sundaram A. Diagnostic utility of the optical coherence tomography ganglion cell complex in diagnosing Leber's hereditary optic neuropathy masquerading as functional vision loss. *Indian Journal of Ophthalmology*. 2022.
25. **Balachandar A**, Zhabokritsky A, Matukas LM. Disseminated nocardiosis with multisite involvement in an immunocompetent patient. *CMAJ : Canadian Medical Association Journal.* 2020 August 17; 192:e956-e959.
26. **Balachandar A**, Prescott SA. Origin of heterogeneous spiking patterns from continuously distributed ion channel densities: a computational study in spinal dorsal horn neurons. *The Journal of Physiology*. 2018.
27. **Balachandar A**, Fasano A. Characterizing orthostatic tremor using a smartphone application. *Tremor Other Hyperkinet Mov*. 2017; 7.

Further publications: (https://pubmed.ncbi.nlm.nih.gov/?term=Arjun+Balachandar)

Presentations:

1. **Balachandar A,** Vogt L, Mithani K, Coleman S, Ebden M, Fasano A, Gorodestky C, Ibrahim G. Status dystonicus is a distinct state characterized by pallidal beta-band activity.
    a. Oral podium presentation, International Congress of Parkinson's Disease and Movement Disorders 2025 (Honolulu, USA)
2. **Balachandar A,** Vogt L, Mithani K, Coleman S, Ebden M, Fasano A, Gorodestky C, Ibrahim G. Excessive Pallidal Beta-band Activity and Functional Connectivity: A Novel Intracranial Biomarker of Status Dystonicus.
    a. Poster presentation, American Academy of Neurology 2025 Annual Meeting (San Diego, USA)
3. **Balachandar A,** Saab R, Mahdi M, Nashnoush E, Khosravani H. Machine-learning Assisted Swallowing Assessment: A Deep Learning-based Quality Improvement Tool to Screen for Post-stroke Dysphagia.
    a. Oral podium presentation, American Academy of Neurology 2024 Annual Meeting (Denver, USA)
4. **Balachandar A**, Hashim Y, Vaou E, Fasano A. Automated sleep detection in Parkinson's disease using deep brain stimulation and machine learning.
    a. Oral podium presentation, 2023 Combined Annual Meeting of the Canadian Neuromodulation Society and the Neuromodulation Society of United Kingdom and Ireland (Niagara-on-the-Lake, Canada)
5. **Balachandar A**, Algarni M, Oliveira L, Jalal H, Fasano A. Diagnosing essential tremor, Parkinson's disease and dystonic tremor using smartphone accelerometers (abstract). *Movement Disorders.* 2018. doi: 10.1002/mds.27433.
    a. Poster presentation, 2nd Pan American Parkinson's Disease and Movement Disorders Congress (Miami USA)
6. **Balachandar A,** Prescott SA. The degenerate basis for excitability: Interpreting the pairwise correlation of parameter values in randomly generated model neurons with equivalent excitability (abstract). *BMC Neuroscience*. 2018. doi: 10.1186/s12868-018-0451-y.
    a. Poster presentation, 27th Annual Computational Neuroscience Meeting (Seattle USA)

D. Research Support

Peer-reviewed Grants:

1. **Title:** Adaptive cortical neuromodulation using a brain-machine interface to treat freezing of gait in Parkinson's disease (Oct 2024 – Sept 2027). **Funding Institution:** Michael J. Fox Foundation. **Role in Project:** Co-primary investigator. **Amount:** $1,668,130.61CAD. **Primary Investigator:** Fasano, Alfonso
2. **Title:** Machine learning Assisted Swallowing Assessment (MASA) (July 2023 – June 2024)**. Funding Institution:** Sunnybrook AFP Innovation Grant. **Role in Project:** Co-investigator. **Amount:** $53,161.50CAD. **Primary Investigator:** Khosravani, Houman