Alexander Rajan, PhD

Computational biologist, machine learning scientist, and behavioral psychologist with 20 years of biomedical experience; leading teams & innovating technologies to improve the lives of patients and families

- Invented, validated, and launched a novel salivary epigenetic transcriptomics-based bioinformatics & machine learning platform as an RNA-seq biomarker diagnostic for autism spectrum disorder in children
- Launched & managed two multi-year NIH funded ($4.83M combined) multi-site research projects;
- Consulted on & completed a DARPA funded multi-site project
- Demonstrated history of innovating research methods and building teams for successful project completion

Quadrant Biosciences - Vice President of Research and Computational Biology **(2017 - 2020)**

SUMMARY: Managing company-wide research projects while driving innovations in bioinformatics and machine learning for next-generation sequencing biomarker discovery for neuro-developmental, -degenerative, and -traumatic disorders and diseases

- Responsible for 3 concurrent research projects (autism spectrum disorder, ASD; Parkinson's disease, PD; mild traumatic brain injury, mTBI)
- Grew and led 4 multidisciplinary research teams (15 personnel, including 2 doctoral level staff and 6 masters level staff)
- Invented, validated, and launched to market an RNA-seq diagnostic aid for ASD in children through CLIA certification and CAP accreditation
- Expanded above bioinformatics and machine learning platforms for Parkinson's disease and mild traumatic brain injury

MANAGEMENT

- Managed all research functions: multi-site collaborations, clinical research collections, high-throughput RNA-sequencing, bioinformatics pipelines, data organization and management, biostatistics and analytics, and machine learning
- Reorganized research staff into distinct functions (eg, clinical, lab, bioinformatics, analytics) and projects (ASD, PD, mTBI), resulting in faster participant and sample processing, fewer errors, increased data quality, cost savings, and better products
- Integrated the bioengineering team and provided training in bioinformatics and machine learning for molecular biomarker discovery and validation
- Managed weekly internal seminar series and bi-weekly workshops to disseminate scientific knowledge and research updates across research teams and broadly across the company
- Facilitated industry-academic collaborations among 12+ investigators at 7+ academic research institutions
- Primary scientific liaison to the software, design, legal, finance, regulatory, operations, marketing, and sales teams
- Managed the budget for the laboratory team ($500k annually) and the bioinformatics and machine learning teams ($300k annually)

SCIENTIST

- Performed bioinformatics, statistical, and machine learning analysis to assess and validate laboratory procedures, including to reduce batch

8801 Wandering Way
Baldwinsville, NY 13027
(310) 795-3001
alexander.s.rajan@gmail.com
in/alexanderrajan
Google Scholar

EDUCATION

Ph.D. (2016)
University of Chicago
Computational Neuroscience
NSF & NIH funding

B.S. (2006)
University of California, Davis
Psychology and Biology
Deans' Honors List

SKILLS

Computational biology
Machine learning
Bioinformatics
Signal processing
Time series analysis
Data visualization
Shiny dashboards
R, MATLAB, PYTHON, BASIC, HTML/XML, Excel, AWS

Project management
Study design
Reproducible analytics
Scientific writing & editing
git, Jira, Confluence, markdown

LEADERSHIP & OUTREACH

Executive Committee on the Comp Neuro Graduate Program (2013-15)

Brains! (2013) & **Project Exploration** (2011) scientific outreach to Chicago middle and highschool students

Volunteer Ski Patrol & Emergency Medical Technician (2007-08)

effects, discover biomarkers, develop panels/assays, and validate diagnostic tools
- Principal investigator of an NIMH STTR grant ($2M over 3 years; 2R42MH111347-02A1) for validation of a salivary miRNA diagnostic test for autism spectrum disorder, with a supplement of $300k for genotyping
- Performed test-retest analysis on product predictions from real-world samples
- Interpreted the results of internal research studies and external peer reviewed findings and provided discussion of their impact on corporate strategy and products
- Suggested and implemented alternative research strategies to save time and costs while delivering objectives
- Assessed third-party contract research organizations for potential partnerships
- Provided scientific expertise within the company in the fields of psychology, neuroscience, molecular biology, microbiology, bioinformatics, biostatistics, computational biology, and machine learning, including assessing or consulting on external projects:
    - Precision medicine for cardiac pharmacogenetics
    - Investigation of gene editing in primate models of developmental disorders
    - Identification of the neural tissues of origin of miRNAs detected in the mouth
    - Event Related Potential (ERP) markers for the diagnosis and prognosis of mTBI
    - Eye tracking for autism diagnosis
- Advised and consulted third party companies, including DNA Genotek, Illumina, Admera Health

COMMUNICATOR & MENTOR
- Composed automated reports, technical documentation and SOPs, FDA presubmission, grants, provisional and non-provisional patent applications, scientific posters, presentations, and publications
- Advised on the status of research progress and impact to the executive team, medical and clinical scientific advisory board, board of directors, stakeholders, and investors
- Primary investigator on technology transfer and small business grant applications
- Presenting published work to scientific organizations, including the Cleveland Clinic and Simon's Foundation, to promote and explain or diagnostic technologies and research platforms
- Presented published work to patients, families, support groups, caregivers, and special needs educators to drive participant recruitment by providing the context and impact their contributions provide
- Mentored 2 PhD biomedical engineers, 3 masters level engineers and scientists, and 2 bachelors level engineers and scientists

Ripple Neuro — Technical Sales Lead **(2016 - 2017)**

Stimulation & recording electrophysiological systems for neuroprosthetics, neuromodulation therapeutics, and research
- Initiated and nurtured relationships with new leads and existing customers
- Closed $250k in sales in 6 months
- Oversaw multidisciplinary team of 8, including 2 doctoral level engineers
- Distilled complex technical information into client-friendly white papers
- Contribute to company development and innovation by identifying and research missing product needs
- Collaborate with internal software and mechanical engineers, &industry partners, to fill missing product niches

University of Chicago — Graduate Researcher **(2009 - 2016)**

*Sensorimotor limb representations and their interactions (*NINDS/NIH funded: $2.5M; 1R01NS082865-01*)*
- Partnered with small biotech companies to design, customize, and improve medical-grade neural implants, electrophysiology systems, biomechanical motion-tracking hardware, and musculoskeletal models
- Developed innovative protocols integrating decades of primate behavior, motor control, & neuroanatomy research
- Customized implantable microelectrode array based on anatomical MRI imaging, provided consultation to other research groups

Effects of chronic stimulation on neural tissue and fine motor behavior (DARPA funded)
- Developed strategic 3D reconstruction to overcome lost data & complete project
- Provided neurosurgical expertise and training

UC Davis — Research Technician **(2006 - 2008)**

Comparative mammalian neuroanatomy, electrophysiology, & primate behavior

Functional reorganization of murine & primate sensory cortex

Publications

Goodman, J.M., Tabot, G.A., Lee, A.S., Suresh, A.K., **Rajan, A.T.**, Hatsopoulos, N.G., & Bensmaia, S. (2019). Postural Representations of the Hand in the Primate Sensorimotor Cortex. Neuron, 104(5), 1000-1009.e7.

Alexander Rajan, Daria LaRocca, Qian Du, Christopher Neville, Samantha DeVita, Arianna Montefusco, Rhianna Ericson, Andrew Brindle, Dragos Mihaila, Frank Middleton (2019) Molecular and Functional Characterization of Early-Stage Parkinson's Disease. Journal of Neurochemistry 150, 251-251.

Middleton, F., LaRocca, D., Baser, S., Muniz, C., Espinoza, A., **Rajan, A**., ... & Stoeter, P. (2019). Comparison of early stage Parkinson's disease with pantothenate kinase associated neurodegeneration. Journal of Neurochemistry (Vol. 150, pp. 251-251)

Hicks, S., **Rajan, A.**, Wagner, K., Barns, S., Neville, C., & Middleton, F. (2018). Saliva microRNA Levels Are Associated With Longitudinal Measures of Balance and Cognition Following Traumatic Brain Injury. Journal of Head Trauma Rehabilitation (Vol. 33, No. 3, pp. E82-E83).

Hicks, S.D.*, **Rajan, A.T.***, Wagner, K.E., Barns, S., Carpenter, R.L., & Middleton, F.A. (2018). Validation of a Salivary RNA Test for Childhood Autism Spectrum Disorder. Frontiers in genetics, 9, 534.

Rajan, A.T., Boback, J.L., Dammann, J.F., Tenore, F.V., Wester, B.A., Otto, K.J., ... & Bensmaia, S.J. (2015). The effects of chronic intracortical microstimulation on neural tissue and fine motor behavior. Journal of neural engineering, 12(6), 066018.

Padberg, J., Cerkevich, C., Engle, J., **Rajan, A.T.**, Recanzone, G., Kaas, J., & Krubitzer, L. (2009). Thalamocortical connections of parietal somatosensory cortical fields in macaque monkeys are highly divergent and convergent. Cerebral cortex (New York, N.Y. : 1991), 19(9), 2038-64.

* Co-first authors

Patents

Hicks, Steven; Middleton, Frank; Uhlig, Richard; Rajan, Alexander. Analysis of Autism Spectrum Disorder. WO/2018/175759.

Presentations and Abstracts

Steven Hicks, Kayla Wagner, Cheryl Tierney, **Alexander Rajan**, Jeremy Williams, Frank Middleton (2018). The oral transcriptome: an emerging tool for autism evaluation.

Rajan AT, Tabot GA, Bensmaia SJ, Hatsopoulos NG (2014) Dynamics of functional connectivity in the sensorimotor cortex. AREADNE Conference: Research in Encoding and Decoding of Neural Ensembles.

Rajan AT, Tabot GA, Bensmaia SJ, Hatsopoulos NG (2013) The dynamics of functional connectivity in motor and somatosensory cortices during prehension. Society for Neuroscience Abstracts.

Rajan AT, Tabot GA, Bensmaia SJ, Hatsopoulos NG (2014) Neural correlations in primate sensorimotor cortex during prehension. Society for Neuroscience Abstracts.

Tabot GA, **Rajan AS**, Hatsopoulos NG, Bensmaia SJ (2013) The representation of hand conformation and movements in primary somatosensory cortex. Neural Control of Movement Abstracts.

Olmedo L, Takahashi K, **Rajan A**, Hatsopoulos N (2010) Proximal to distal sequencing behavior and spatiotemporal dynamics of beta oscillations in primary motor cortex during self-paced simulated climbing. Society for Neuroscience Abstracts.