

Bryan Tseng

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EDUCATION

Johns Hopkins University School of Medicine, Baltimore, MD
Ph.D. in Biomedical Engineering

August 2024 - Current

Boston University College of Arts and Sciences, Boston, MA

September 2016 - May 2020

Bachelor of Science in Mathematics – Specialization in Statistics

Bachelor of Science in Biology — Specialization in Cell Biology, Molecular Biology & Genetics

Minor in Economics

Awards: Dean's List (all-semesters), UROP research award (Fall 2019 and Spring 2020), magna cum laude

RESEARCH EXPERIENCE

Manuscripts under review:

Breault M, Orguc S, Kwon O, Kang G, Tseng B, Gallo S, Schreier D, Brown E (2024). Anesthetics As Treatments For Depression: Clinical Insights and Underlying Mechanisms, *Annual Review of Neuroscience*

Guay C, Agrawal U, Tseng B, Gallo S, Schreier D, Brown E (2024). Clinical Electroencephalography for Anesthesiologists and Intensivists Part II: Physiologic Signatures and Active Management, *Anesthesiology*.

Publication (peer-reviewed):

Subramanian S, Tseng B, Carmen M, Goodman A, Dahl D, Barbieri R, Brown E (2024). Monitoring Surgical Nociception Using Multimodal Physiologic Markers, *Proceedings of National Academy of Sciences*.

Subramanian S, Tseng B, Barbieri R, Brown E (2022). An unsupervised automated paradigm for artifact removal from electrodermal activity in an uncontrolled clinical setting, *Physiological Measurement*.

Marshall A, Joyce C, Tseng B, Gerlowvin H, Yeh G, Sherman K, Saper R, and Roseen E (2021). Changes in Pain Self Efficacy, Coping Skills and Fear Avoidance Beliefs in a Randomized Controlled Trial of Yoga, Physical Therapy, and Education for Chronic Low Back Pain, *Pain Medicine*

Nojiri T., Chen CY., Kim DM, Silva DA, Lee C, Maeno M, McClelland AA, Tseng B, Nagai S, Hatakeyama W, Kondo H, and Nagai M (2019). Establishment of perpendicular protrusion of type I collagen on TiO₂ nanotube surface as a priming site of peri-implant connective fibers, *Journal of Nanobiotechnology* 17(1):34

Conference Papers:

Tseng B, Subramanian S, Barbieri R, Brown E (2022). Tonic Electrodermal Activity is a Robust Marker of Psychological and Physiological Changes during Induction of Anesthesia, *Proc. 44th IEEE International Conf on Eng in Biol and Med (EMBC)*. Glasgow, UK, Jul.

Subramanian S, Tseng B, Barbieri R, Brown E (2021). Unsupervised Machine Learning Methods for Artifact Removal in Electrodermal Activity, *Proc. 43rd IEEE International Conf on Eng in Biol and Med (EMBC)*. Virtual, Oct 31st - Nov 4th

Conference Abstracts:

Tseng B, Subramanian S, Purdon P, Barbieri R, Brown E (2021). Prediction of unconsciousness using clinically available markers. *43rd IEEE International Conf on Eng in Biol and Med (EMBC)*. Virtual, Oct 31st - Nov 4th

Tseng B, Subramanian S, Purdon P, Barbieri R, Brown E (2021). Multimodal brain-heart analysis reveals subject-specific dynamics during propofol anesthesia. *Organization for Human Brain Mapping (OHBM)*. Virtual, Jun 21st - Jun 25th

Provisional Patents:

Combinations of Anesthetics as Therapies for Treatment-Resistant Depression (MIT 25342)

Johns Hopkins University, Baltimore, MD
Kavli Neuroscience Discovery Institute, Department of Biomedical Engineering
Graduate Research Assistant, with Drs. Tim Harris and Adam Charles

- Rotational student

August 2020 - May 2024

Massachusetts Institute of Technology, Cambridge, MA
Neuroscience Statistics Research Laboratory (NSRL), Massachusetts General Hospital
Technical Associate, with Dr. Emery N. Brown
Research projects:

August 2020 - May 2024

- Implemented **multitaper spectral analysis** and **state-space methods** that track two online metrics that track the patient's level of consciousness based on the EEG
 - Assisted in integrating the online metrics into an existing **closed-loop** anesthesia delivery system
- Implemented **point-process** and **state-space methods** to track patient's nociceptive state using a metric based on the autonomic nervous system (Accuracy of up to 75%)
 - Performed physiology-based ECG data analysis using a history-dependent Inverse Gaussian model
- Investigated the **antidepressant effects** of electroconvulsive therapy and propofol
- Investigated temporal dynamics of brain activity, autonomics, and behavior due to propofol administration
- Investigated using tonic EDA as a marker of physiological changes during anesthesia induction

Clinical responsibilities: (Massachusetts General Hospital)

- Led and initiated EEG data collection efforts in the intensive care unit
- Collected and annotated physiological signals from 100+ patients in the operating room (ECG, EEG, EDA, PPG)
- Performed **artifact correction** using the Pan-Tompkins algorithm and **machine learning** methods
 - Tested isolation forest, K-nearest neighbor distance 1-class support vector machine methods to remove data collected during a surgical operation

Other responsibilities:

- Led the **standardization of NSRL's database and analysis pipeline** to the MIT OpenMind computing cluster
 - Automated EPIC data extraction, data cleaning, and usage of **high-performance computing**
- Led the collaboration between NSRL and the Barbieri lab at Politecnico di Milano
- Investigated the clipping and scaling issues of the Masimo Sedline Root device
- Managed NSRL's data collection IRB protocols and data use agreements at MGH
- Presented a literature review of using fMRI to study the brainstem nuclei relevant to nociception
- Drafted literature reviews
 - Anesthetics for use beyond the operating room
 - Anesthetics as a therapy for treatment-resistant depression

Boston Medical Center, Boston, MA
Research Assistant, with Dr. Robert Saper and Eric Roseen

June 2019 – August 2020
Shadowing Hours: 20 hours

- Investigated psychometric effects of yoga and physical therapy on adults with chronic lower back pain
 - Assessed within and between-group change scores of covariates from the Back to Health study in SAS
 - Performed within-group, between-group, and subset analysis in SAS, and effect size (Cohen's d)
 - Implemented **stochastic regression imputation** of missing data
 - Coordinated with senior authors and organized weekly group meetings
 - Co-authored the manuscript published in the journal Pain Medicine
- Investigated attitudes and beliefs of opioid use disorder patients on non-pharmacologic treatment
 - Drafted the IRB protocol
 - Assisted with the presentation at the American Public Health Association annual meeting
- Performed **Fisher exact analysis** on the effects of nonpharmacologic treatment relative to pain medication usage
- Funded by the Undergraduate Research Opportunities Program (UROP) (Fall 2019 and Spring 2020)

Beth Israel Deaconess Medical Center, Liver Center, Boston, MA
Translator and Visiting Research Assistant, with Dr. Daryl T. Lau

May 2018 - August 2018

- Assisted in developing a new treatment plan for pregnant Hepatitis B virus patients
- Investigated perinatal transmission rates of Hepatitis B patients after immunological and antiviral treatment

- Translated for Chinese patients and assisted the physician in explaining diagnosis and treatment plans

Harvard School of Dental Medicine

Department of Restorative Dentistry and Biomaterials Sciences, Boston, MA

September 2017 – March 2019

Visiting Research Assistant, with Dr. Shigemi Nagai

- Developed a metal surface modification method that would better engraft type I collagen fiber onto a biocompatible titanium oxide surface perpendicularly
 - o Performed simultaneous experiments, daily maintenance procedures, and laboratory organization
 - o Streamlined and optimized the anodization process across voltage and length of the experiment
 - o Certified for Scanning Electron Microscopy usage
- Revised a manuscript currently published in the Journal of Nanobiotechnology

Boston University Department of Chemistry, Boston, MA

December 2016 - May 2017

Undergraduate capstone, with Dr. John Caradonna and Dr. Binyomin Abrams

- Investigated sulfate ligand symmetry in cobalt coordination complexes
- Presented in front of a panel of faculty about the project's significance for undergraduate research and funding

National Taiwan University College of Medicine, Taipei, Taiwan

June 2015 - February 2016

Research Assistant

- Performed molecular multiple immunohistochemistry, Western blot, qPCR, rt-PCR, and RNAi assays to assess the effects of *Notch* Gene Suppression on *Aedes aegypti* egg production
- Performed siRNA microinjection on *Aedes aegypti* and observed a 65% decrease in melanization
- Participated in the Taipei American School Off-Campus Research Program

Taipei American School, Taipei, Taiwan

August 2014 - August 2015

Head of Human Practice and Prototype

- Awards: Grand Prize Winner, Best Wiki, Gold Medalist
- Competed in the International Genetic Engineering Machine Competition (iGEM)
- Project: to prevent tissue damage from chronic inflammation by limiting granzyme B activity
- Devised a functional prototype for topical granzyme B delivery via a bandage
- Supervised numerous simultaneous experiments and daily maintenance procedures, inclusive of quantitative molecular biology techniques, laboratory safety, and experimental design

LEADERSHIP EXPERIENCE

Allocation Board of Boston University, Boston, MA

September 2017 – May 2020

Chair

- Worked directly with the Dean of Students to allocate over \$700,000 annually to 300 clubs that request funding
- Led weekly meetings to approve funding requests from student organizations
- Worked with club presidents and treasurers and performed auditing to ensure the proper use of funding
- Rewrote the board constitution, simplified the handbook, created a new poster, and increased transparency
- Facilitated the transition to a new e-finance and event planning platform through workshops and advertisement
- Led interviews and training processes for new members and designed a new recruitment process
- Helped to coordinate large campus-wide events such as the first BU spring concert

Mathematical Association of America, Boston, MA

September 2019 - May 2020

Treasurer

- Transitioned the club into a new category under student activities to be eligible for funding requests
- Helped secure funding for an annual guest speaker panel among other events

Business and Technology Club of Boston University, Boston, MA

October 2017 - May 2019

Director of Projects

- Established the semester project innovation program and connected students to BU IT for project pitches
- Directed the collaboration between InnovationFWD and Biztech to expose students to the college start-up culture

Project head

December 2017 – May 2018

- Used Axure to design a new layout for the BU student central website for registration and other uses
- Led a team of 5 to identify user pain points through user research, student interviews, and questionnaires
- Pitched to the Boston University IT about new designs for the BU student central

Pick and Go, Taipei, Taiwan

October 2015 - January 2017

Co-Founder

- Decreased congestion of the school parking loop during rush hours by leveraging the existing e-tag system
- Established two prototypes for the developed project
- Implemented Design Thinking and Strategic Planning to help the innovation project

Asia Suzuki Organization Student Orchestra, Taipei, Taiwan

June 2013 - May 2016

Founder, First Violin

- Led weekly orchestra practices and organized biannual performances
- Performed at the 2016 Rotary Club of Da-an

Harvard MedScience Program-Harvard Medical School, Boston, MA

July 2015 - August 2015

Student Leader

- Evaluated student progress and led discussions in physiology workshops
- Organized hands-on experience for international students in physical science, engineering, and medicine

National Taiwan Medical University, Taipei, Taiwan

June 2013 - August 2014

Research Assistant

- Awards: Second place
- Competed in the Hong Kong International Invention and Design Competition
- Helped develop a prediction system of gait behavior after clinical surgery

WORK EXPERIENCE

Boston University Educational Resource Center, Boston, MA

September 2018 – May 2020

Peer Tutor

- Tutored 40+ college students in both introductory and higher-level Physics, Chemistry, and Statistics courses in both individual and group settings
- Provided students with weekly learning objectives and tracked their improvements
- Established a positive working relationship with students and advised stress and time-management strategies
- Received Tutor of the Year award

InnovationFWD, Boston, MA

April 2018 – August 2018

Venture Associate

- Contributed weekly to profiling promising startups on the media platform
- Interviewed founders and worked to facilitate their term sheet conversions with investors

Dr. Rong-Jang Wu Dental Clinic, Stoneham, MA

May 2018 - August 2018

Shadowing Student

Specialties: prosthodontist, periodontist, and endodontist

- Observed operations including scaling, root planing, root canal, implant surgery, flap surgery
- Discussed with physicians about dental treatments post-operation
- Ensured all instruments and machinery were properly sterilized prior to use
- Prepared the patients for dental check-ups under proper etiquette after examining patients' medical history

Dr. Wells Weiyu Dental Clinic, Taipei Taiwan

December 2016 - January 2017

Dental Assistant

July 2017 - August 2017

Hours: 416 hours

Specialties: GP, implant surgeon, orthodontist, and prosthodontist

- Assisted operations including alveoloplasty, coronectomy, crown lengthening, sinus lifting, extraction, gingivectomy, GBR, GTR, and common restorative dental procedures
- Ensured all instruments and machinery were properly sterilized before use
- Prepared the patients for dental check-ups under proper etiquette

AventaCell Biomedical Corporation, Taipei Taiwan; Atlanta, GA

June 2016 - August 2016

Intern and Assistant Manufacturer

- Assisted in the research, development, and quality control of research-grade stem-cell culture supplement
- Manufactured GMP-grade stem-cell culture supplements at the Global Center for Medical Innovation (GCMI)
- Cooperated with the Taipei research sector which focuses in research and development
- Performed multiple ELISA analyses, immunofluorescence assays, flow cytometry assays, and qPCR runs

VOLUNTEER EXPERIENCE

Boston University Department of Mathematics and Statistics, Boston, MA

September 2019 – Present

Peer mentor

- Managed and served as a role model for Freshman mathematics students through one-on-one mentorship to help them navigate the major and get acquainted with the department
- Host and participate in department-sponsored events
- Discussed social, academic, and cultural dimensions of student life at Boston University to adjust to college life

Big Brothers and Big Sisters of Mass Bay - Boston University, Boston, MA

September 2017 - May 2019

Volunteer

Hours: 98 hours

- Mentored a young boy from Roxbury, Boston for 3 semesters and taught him how striving for higher education has benefitted my career.
- Facilitated group activities and reflections in a biweekly camp from a low socioeconomic background

First Year Student Outreach Project (FYSOP) - Boston University, Boston, MA

August 2016 - September 2016

Volunteer

Hours: 42 hours

- Performed firsthand support to local sustainable farms such as weeding, harvesting,
- Helped prepare fresh produce and ready-to-cook prepared meals at affordable prices at Daily Table

Friday Impaired Vision English, Taipei, Taiwan

September 2012 - May 2015

Tutor

- Prepared and delivered weekly comprehensive lesson plans
- Adapted a tactile approach toward teaching while instructing students in English reading and writing

SKILLS

- Technical: Python, R, MATLAB, SAS, Java, STATA, Axure (wireframe design), Excel, Keynote Presentation
- Language: English and Mandarin (Chinese)
- Data cleaning, presentation, and regression analysis
- Scientific literature review, Scientific exhibits processing, Scientific writing, Clinical protocol drafting
- Clean room GMP manufacturing techniques, Stereoscopic dissection, Scanning Electron Microscopy
- Cell culture techniques (E. coli, ES/iPSC cells, mesenchymal stromal cells)
- Quantitative glassware techniques (Titration, gravimetry, solution preparation)
- Molecular biology techniques (PCR, gel electrophoresis, recombinant DNA cloning, ELISA, SDS-PAGE)
- Organic laboratory techniques (Rotovap, GC/MS, LC/MS, NMR, IR, general organic synthesis)
- Other instrumentation: UV-Vis, Atomic spectroscopy (AA, AE), Immunofluorescent staining microscopy

AWARDS

- Fall 2019 and Spring 2020 UROP Research Award
- Boston University Dean's List (all-semesters)
- 2015 International Genetic Engineering Machine (iGEM) competition
 - Grand Prize Winner
 - Best Wiki
 - Gold Medalist