Matthew I. Miller
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Education

Boston University School of Medicine
 Doctor of Medicine   *Anticipated* 05/2023

Harvard University   2014-2018
AB in Earth and Planetary Sciences, *Cum Laude for the Overall Record*
Secondary Concentration in Global Health and Health Policy
GPA: 3.893/4.0

Honors and Awards

Medical School
- Alpha Omega Alpha Medical Honors Society   2022
- Boston University School of Medicine Radiology Student Research Fellow   2022
- Toffler Charitable Trust Neuroscience Scholar   2021
- Shapiro Internal Medicine Honors Society   2021
- Alpha Omega Alpha Carolyn L. Kuckein Student Research Fellowship   2019
- Boston University Diversity and Inclusion Catalyst Grant Recipient   2019, 2021
- BUSM Medical Student Summer Research Program Scholar   2019

Undergraduate
- Patrick C. Melendez Award for Athletic Achievement and Generosity   2018
- Ed Stowell Award for Fellowship & Sportsmanship: Harvard Track and Field   2015

Professional Associations

- Radiological Society of North America   08/2022-Present
- Society of Interventional Radiology   08/2021-Present

Licensure

- Step 1 – Pass, **266**   06/2020
- Step 2 CK – Pass, **266**   07/2022

Research Experience

- Department of Medicine, Boston University School of Medicine, Boston, MA   11/2018-Present
  - Advisor: Vijaya B. Kolachalama, PhD, FAHA, Assistant Professor of Medicine
  - Conducted computational research developing deep learning and image processing algorithms in neuroradiology and pathology.
  - Developed neural networks for automated dementia diagnosis, whole slide histopathology classification, and prediction of surgical complications.
  - Helped to establish a software pipeline for batch downloads of radiologic studies from the Boston Medical Center (BMC) Picture Archiving and Communication System (PACS).
  - Wrote original machine learning code for large-scale analyses of neuroimaging datasets. Co-led international research teams to published neuroimaging manuscripts in *Brain* and *Nature Communications*.
  - Spent dedicated research year between 3rd and 4th years of medical school completing a Toffler Charitable Trust Neuroscience Fellowship.

- Department of Neurology, Boston Medical Center, Boston, MA   11/2018-Present
  - Advisor: Charlene J. Ong, MD, MHS, Assistant Professor of Neurology
  - Designed and implemented data science workflows for prognostic studies in neurocritical care, including raw ICU time series and free text radiology reports.
  - Primary author of a multi-institutional study on natural language processing (NLP) for analysis of radiology reports after ischemic stroke. Designed original statistical methodologies integrating traditional machine learning, transformer neural networks, and rule-based decision systems.
  - Co-author of additional studies examining electronic phenotyping of ischemic stroke reports and pupillometry characteristics after neurologic injury.
  - Co-author of a forthcoming textbook chapter on the role of artificial intelligence in neurocritical care settings.

Publications

- **Miller, M.I.**, Orfanoudaki A., Cronin, M., Saglam, H., Kim So Yeon. I., Balogun, O., Tzalidi, M., Vasilopoulos, K., Fanaropoulou, G., Fanaropoulou, N.M.., Kalin, J., Hutch, M., Prescott, BR., Brush, B., Benjamin, E.J., Shin, M., Mian, A.Z., Greer, D.M., Smirnakis S.M., Ong C.J. (2022). Natural Language Processing of Radiology Reports to Detect Complications of Ischemic Stroke. *Neurocritical Care*, 1-12.

- Qiu, S.*, **Miller, M.I.*,** Joshi, P.S., Lee, J.C., Xue, C., Ni, Y., Wang, Y., De Anda-Duran, I., Hwang, P.H., Cramer, J.A., Dwyer, B.C., Hao, H., Kaku, M.C., Kedar, S., Lee, P.H., Mian, A.Z., Murman, D.L., O'Shea, S., Paul, A.B., Saint-Hilaire, M.H., Sartor, E.A., Saxena, A.R., Shih, L.C., Small, J.E., Smith, M.J., Swaminathan, A., Takahashi, C.E., Taraschenko, O, You, H., Yuan, J., Zhou, Y., Zhu, S., Alosco, M.L., Mez, J., Stein, T.D., Poston, K.L., Au, R., Kolachalama, V.B. (2022). Multimodal Deep Learning for Alzheimer's Disease Dementia Assessment. *Nature Communications*, *13*(1), 1-17.

- Alabd, A., Alabd, A., **Miller, M.I.**, Walsh, C., Silverman, A., Dabbish, N., Kuoiloi, C. and Miller, S., (2022). New Model for Osteoporosis Risk Screening Using Emergency Department Visits. *Cureus*, *14*(2).

- Ong C.J., **Miller, M.I.** (2022). Frontiers in Neuroprognostication: Artificial Intelligence and Machine Learning. In: Greer, D., Dangayach, N. (Eds) *Neuroprognostication in Critical Care*. Cambridge University Press, London (*In Press*).

- Prescott, B., Saglam, H., Duskin, J., **Miller, M.I.**, Thakur, A., Gholap, E., Hutch, M., Smirnakis, S., Zafar, S., Dupuis, J., Benjamin, E., Greer, D., Ong, C.J., (2022) Anisocoria and Poor Pupil Reactivity by Quantitative Pupillometry in Patients with Neurologic Emergencies. *Critical Care Medicine*, *50*(2), e143-e153.

- Qiu, S.*, Joshi, P.S.*, **Miller, M.I.*,** Xue, C.*, Zhou, X., Karjadi, C., Chang, G.H., Joshi, A.S., Dwyer, B., Zhu, S., Kaku, M., Zhou, Y., Alderazi, Y, Swaminathan, A., Kedar, S., Saint-Hilaire, M.H., Auerbach, S., Yuan, J., Sartor, E.A., Au R., Kolachalama, V.B. (2020). Development and Validation of an Interpretable Deep Learning Framework for Alzheimer's Disease Classification. *Brain*, *143*(6), 1920-1933.

- Neufeld, M.Y., Janeway, M.G., Lee, S.Y., **Miller, M.I.**, Smith, E.A., Kalesan, B., Allee, L., Dechert, T. and Sanchez, S.E. (2020). Utilization of Mental Health Services in Pediatric Patients Surviving Penetrating Trauma Resulting from Interpersonal Violence. *The American Journal of Surgery*, *221*(1), 233-239

- Ong, C.J., Orfanoudaki, A., Zhang, R., Caprasse, F.P.M., Hutch, M., Ma, L., Fard, D., Balogun, O., **Miller, M.I.**, Minnig, M. and Saglam, H. (2020). Machine Learning and Natural Language Processing Methods to Identify Ischemic Stroke, Acuity and Location from Radiology Reports. *PloS one*, *15*(6), p.e0234908.

- Sulibhavi, A., Asokan, S., **Miller, M.I.**, Moreira, P., Daly, B.D., Fernando, H.C., Litle, V.R. and Suzuki, K. (2020). Peripheral Blood Lymphocytes and Platelets are Prognostic in Surgical pT1 Non-Small Cell Lung Cancer. *The Annals of Thoracic Surgery*, *109*(2), 337-342.

- **Miller, M.I.**, Meister, A.C., Litle, V.R. and Suzuki, K. (2020). Delayed Lung Expansion After Decortication in a Case of Trapped Lung Resulting from Catamenial Haemothorax. *Interactive CardioVascular and Thoracic Surgery*, *30*(3), 493-494

* Indicates co-first authorship

Presentations
- **Miller, M.I.**, Mauricio, P., O'Neill-Dee, M., Jean Baptiste, M.L. (2022) Implementation of a Medical Haitian Creole Curriculum for Boston University School of Medicine: Progress Report and Needs Assessment. McCahan Education Day, Boston University School of Medicine, Boston, MA (*Poster*)

- **Miller, M.I.**, Qiu, S., Joshi, P., Lee, J., Au, R., Kolachalama, V.B. (2022) Association of Structural MRI with Braak Staging Using Neural Network-Based Risk Scoring. Alzheimer's Association International Conference. San Diego, CA. (*Abstract*)

- Xue, C., Karjadi, C., **Miller, M.I.**, Paschilidis, I.C., Au, R., Kolachalama, V.B. (2022) Association of Acoustic Perturbation Measures with Dementia Status: A Framingham Heart Study. Alzheimer's Association International Conference, San Diego, CA. (*Abstract*)

- **Miller, M.I.** (2022) Expanding Differential Diagnosis of Dementia with Interpretable Neural Network Approaches. Boston University Computational Biomedicine Seminar Series, Boston, MA (*Oral Presentation*)

- Pavesi, F., **Miller, M.I.**, Singh, S., Asokan, S., Hurlburt, C., Lee, P., Scalera, J., Steiling, K., Suzuki, K. (2022) Analysis of Clinical and Radiologic Factors Associated with Follow Up Scan Results and Subsequent Lung Cancer Diagnosis in a Low-Intermediate Risk Lung Screening Population. Southern Thoracic Surgical Association. Fort Lauderdale, FL. (*Abstract, Accepted*)

- **Miller, M.I.**, Orfanoudaki, A., Brush, B., Saglam H., Balogun, O., Tzalidi, M., Vasilopoulos, K., Fanaropoulou, G., Fanaroupoulou N., Cronin, M., Greer, D., Smirnakis, S., Ong, C.J. (2022) Characterization of Critical Sequelae in Ischemic Stroke Using Natural Language Processing. Society of Vascular and Interventional Neurology. Phoenix, AZ. (*Poster*)

- **Miller, M.I.**, Severe, R., Mauricio, P., Basow, E., Pinardo, H., Lowe, R. (2020) Development and Implementation of a Medical Haitian Creole Curriculum for Boston Medical Center. McCahan Education Day, Boston University School of Medicine, Boston, MA (*Oral Presentation*)

- Qiu, S., Heydari, M.S., **Miller, M.I.**, Joshi, P.S., Wong, B.C., Au, R. and Kolachalama, V.B. (2019) Enhancing Deep Learning Model Performance for AD Diagnosis Using ROI-Based Selection. Alzheimer's Association International Conference, Los Angeles, CA. (*Abstract*)

- **Miller, M.I.**, Lin, C., Huang, B., Kolachalama, V.B., Burks, E., Suzuki, K. (2020) Development of a Deep Learning Framework for the Rapid Characterization of Immune Cell Microenvironments in Stage 1 Lung Adenocarcinoma. Medical Student Research Symposium, Boston University School of Medicine, Boston, MA. (*Poster*)

- Neufeld, M.Y., Lee, S.Y., Janeway, M., **Miller, M.I.**, Smith, E.A., Poulson, M., Kalesan, B., Allee, L., Dechert, T., Sanchez, S.E. (2020) Utilization of Psychosocial Services Among Pediatric Patients with Penetrating Trauma. 15th Annual Academic Surgical Congress, Orlando, FL (*Oral Presentation*)

- **Miller, M.I.*[+],** H.T. Brydges*[+] (2019) The Ethical Imperative of Artificial Intelligence Education for Medical Students. 4th Annual Medical Student Ethics Conference. Icahn School of Medicine at Mount Sinai, New York, NY. (*Oral Presentation*)

*Indicates co-first authorship.
+Indicates invited podium presentation.

Leadership Experience
Boston University School of Medicine: Haitian Health Alliance   01/2020-Present
- Founder and leader of a student group at Boston University School of Medicine to advocate for the needs of Haitian patients at Boston Medical Center and to connect students with volunteer opportunities in the Haitian community.
- Designed and implemented a course in medical Haitian Creole in collaboration with community partners in Somerville, MA and l'Université Notre Dame d'Haïti. Course was offered virtually to BUSM students between January-March 2022, with plans to repeat annually.
- Two-time recipient of Diversity and Inclusion Catalyst grant from Boston University, awarded in a university-wide application process.
- Created original website for efficient access to teaching materials (www.bumedkreyol.com).

Boston University School of Medicine: Medical Spanish Course   12/2018-12/2019
- Student leader of BUSM's Medical Spanish course.
- Responsible for coordinating weekly meetings and instruction in medical Spanish for first- and second-year medical students, as well as PA students.

Volunteer Experience:
UDH Health Coach   11/2021-Present
- Student volunteer for UDHHC, a community organization in Somerville, MA dedicated to engaging the Haitian community of greater Boston in health care initiatives.
- Organized fundraising efforts totaling >$1500 to benefit UDHHC's ongoing community health efforts in the city of Somerville.

Boston Center for Refugee Health and Human Rights: Winter Clothing Drive   11/ 2021-12/2021
- Student co-leader of a wintertime clothing drive to support refugees arriving to Boston from Afghanistan.
- Met with BCRHHR staff to understand the Center's needs for supporting refugee populations.
- Designed flyers to advertise initiative, set up donation bins, and delivered materials to BCRHHR during the 2021 holiday season.

Teaching Experience
Boston University School of Medicine Peer Advising Program   09/2019-05/2020

- Advised a group of first year medical students at Boston University School of Medicine, offering guidance on coursework and extracurriculars, as well as organizing small group social events for class bonding.

Harvard College Pre-Medical Advising Program   03/2020-Present
- While at BUSM, acted as pre-medical advisor for undergraduate students at Harvard College.
- Responsible for helping students craft application materials, counseling on admissions strategies, and writing committee letters summarizing student performance.
- Maintained consistent record of successful medical school acceptance with all advisees.

Course Assistant, Harvard University Department of Mathematics   09/2015-12/2017
- Course assistant in Math 19a (Mathematical Models in the Life Sciences) and Math 21a (Multivariable Calculus)
- Responsible for conducting weekly office hours, grading student assignments, and monitoring student progress.
- Course methods included: ordinary and partial differential equations, vector calculus, linear algebra, and bifurcation theory with explicit focus on applications to the life sciences.

Work Experience
Content Designer, MRI Online   08/2021-05/2022
- Created original educational content for MRI Online, a continuing medical education (CME) platform available to practicing radiologists.
- Led development of multimedia modules in interventional radiology under the guidance of Dr. Mikhail Higgins, MD, MPH (Boston Medical Center/BUSM). Worked with external design team to prepare anonymized procedural walkthrough videos with original illustrations.
- Module topics included image-guided abscess drainage and biopsies of lung, bone, and intra-abdominal sites. Abscess and lung modules currently available as part of MRI Online subscription service, totaling 5.75 "AMA PRA Category 1" CME credits.

Languages
- Spanish-Fluent (spoken, reading, writing, interpreting)
- French-Advanced (spoken, reading, writing, interpreting)
- Portuguese-Proficient (spoken, reading, writing)
- Haitian Creole-Beginner

Interests
- Professional: Image processing, machine learning, causal inference, and Bayesian statistics in neuroradiology.
- Personal: Woodworking, backcountry camping, XC skiing, homebrewing, gardening.