Stanford

Tauhid (Md Tauhidul) Islam

Assistant Professor of Radiation Oncology (Radiation Physics)

Radiation Oncology - Radiation Physics

Resume available Online

Bio

BIO

Tauhid Islam, PhD is an Assistant Professor in the Department of Radiation Oncology (Medical Physics Division) at Stanford University School of Medicine. He leads the Islam Lab, where he develops next-generation artificial intelligence methods for biomedical data analysis, with a focus on cancer diagnostics and precision oncology. His research program focuses on developing computationally efficient and clinically reliable artificial intelligence (AI) methods for biomedical imaging and high-dimensional molecular data, with the long-term goal of enabling precision diagnosis, prognosis, and treatment selection in cancer and neurological disease. The Islam Lab develops AI foundations that improve performance, robustness, and interpretability in data-constrained biomedical settings. The lab designs representation learning frameworks that reorganize tabular omics data into biologically structured, image-like formats and develop multimodal models that integrate imaging and molecular signals. The lab's work emphasizes computational efficiency, uncertainty quantification, and rigorous statistical validation to ensure reliability across cohorts and institutions. By combining representation learning, multimodal modeling, and clinically grounded evaluation, Islam Lab's goal is to advance biomedical AI and accelerate its translation into patient-centered clinical impact.

ACADEMIC APPOINTMENTS

- Assistant Professor, Radiation Oncology - Radiation Physics
- Member, Bio-X
- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- Amato Giaccia Award for Excellence in the Radiation Sciences, Department of Radiation Oncology (2024)
- NIH Pathway to Independence Award (K99/R00), National Institute of Health (2023)
- International Education Fee Scholarship (IEFS) Award, Texas A&M University (2016)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, AACR (2024 - present)
- Member, AAPM (2024 - present)
- Member, IEEE (2024 - present)

PROFESSIONAL EDUCATION

- PhD, Texas A&M University , Electrical Engineering (2018)
- MSc, Bangladesh University of Engineering and Technology , Electrical Engineering (2014)
- BSc, Bangladesh University of Engineering and Technology , Electrical Engineering (2011)

PATENTS

- Md Tauhidul Islam, Raffaella Righetti. "United States Patent 12539104 Non-invasive assessment of interstitial fluid pressure (ifp), interstitial fluid velocity (ifv) and fluid flow inside tumors", Texas A&M University, Feb 3, 2026
- Md Tauhidul Islam, Raffaella Righetti. "United States Patent 12414758 Non-invasive estimation of material parameters", Texas A&M University, Sep 16, 2025

LINKS

- Islam Lab External Website: https://islamlab.org/
- Islam Lab Website: https://med.stanford.edu/islam-lab.html
- LinkedIn profile: https://www.linkedin.com/in/tauhidstanford/
- Twitter profile: https://x.com/tauhid_stanford
- ResearchGate profile: https://www.researchgate.net/profile/Md-Tauhidul-Islam-3
- Google Scholar: https://scholar.google.com/citations?hl=en&user=32UZde4AAAAJ&view_op=list_works&authuser=1
- ORCID: https://orcid.org/0000-0001-6259-632X

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My research program focuses on developing computationally efficient and clinically reliable artificial intelligence (AI) methods for biomedical imaging and high-dimensional molecular data, with the long-term goal of enabling precision diagnosis, prognosis, and treatment selection in cancer and neurological disease. Modern clinical and translational datasets—including radiology, pathology, ultrasound, cfRNA/ctDNA, and single-cell sequencing—are high-dimensional and heterogeneous, but are often limited in sample size, noisy, and affected by distribution shifts across cohorts and institutions. These challenges create a major barrier to translating deep learning advances into real clinical workflows.

The Islam Lab develops novel AI foundations that improve performance, interpretability, and robustness in data-constrained biomedical settings. A central theme of our work is designing representations and learning frameworks that exploit latent structure in complex biomedical data, rather than relying solely on scaling dataset size or model complexity. We develop methods for spatializing and reorganizing tabular omics features into semantically meaningful image-like representations, enabling convolutional architectures to learn feature neighborhoods and interactions more effectively. In parallel, we develop multi-modal learning strategies that integrate imaging and molecular measurements to improve clinical prediction and biological insight. These frameworks are designed to be computationally efficient and scalable, supporting real-world use in settings where GPU time, labeled data, and prospective cohorts are limited.

Another major direction of the lab is trustworthy and interpretable AI for clinical translation. In medical imaging and liquid biopsy, high accuracy alone is not sufficient; models must provide reliable uncertainty estimates, interpretable feature attribution, and stability across demographic and institutional shifts. We therefore integrate rigorous validation, null-controlled statistical testing, and interpretable learning objectives into our pipelines. Across projects, we emphasize reproducibility and open science through the release of codebases, benchmarking datasets, and deployable toolkits that support community adoption.

Our work is highly interdisciplinary and collaborative, integrating expertise in radiation oncology, medical physics, imaging science, genomics, and machine learning. By combining representation learning, multi-modal modeling, and clinically grounded evaluation, the Islam Lab aims to advance the scientific foundations of biomedical AI and accelerate the translation of AI technologies into patient-centered clinical impact.

PROJECTS

- Deep learning for omics data analysis - Stanford University (January 1, 2025 - present)
- Deciphering deep learning feature space - Stanford University (August 1, 2025 - present)
- Multi-modal data analysis - Stanford University (November 1, 2025 - present)

Teaching

COURSES

2023-24

- AI and Data Driven Methods in Biomedical Imaging and Physics: BMP 254 (Aut)

STANFORD ADVISEES

Postdoctoral Faculty Sponsor

Md Atik Ahamed, Sakib Mostafa, Ucchwas Talukder Utsha

Postdoctoral Research Mentor

Seraphina Shi

Publications

PUBLICATIONS

- **Neural Autoregressive Modeling of Brain Aging.** *Deep generative models : 5th MICCAI workshop, DGM4MICCAI 2025, held in conjunction with MICCAI 2025, Daejeon, South Korea, September 23, 2025, Proceedings. DGM4MICCAI (Workshop) (5th : 2025 : Taejon-si, Korea)*
  Yesiloglu, R., Peng, W., Islam, M. T., Adeli, E.
  2026; 16128: 341-350

- **Advancing In-Context Learning for Efficient and Stable Medical Report Generation** *IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE*
  Li, M., Liu, R., Shi, Z., Han, M., Yao, L., Li, Z., Chang, X., Pohl, K. M., Islam, M., Xing, L.
  2026; 48 (9): 11183-11199

- **Scalable and interpretable multimodal AI: Integrating imaging and genomics via image-based encodingfor cancer and disease classification**
  Mostafa, S., Islam, M.
  AMER ASSOC CANCER RESEARCH.2026

- **A single-cell atlas reveals a tumor microenvironment-dominated ecosystem in breast cancer brain metastasis**
  Zhang, C., Jia, W., Xing, L., Islam, M.
  AMER ASSOC CANCER RESEARCH.2026

- **Integrating intra- and inter-cell gene-gene interactions into deep omics data analysis for enhanced single-cell cancer biology**
  Wei, Q., Liu, S., Zhang, C., Zhou, Z., Wu, W., Islam, M., Xing, L.
  AMER ASSOC CANCER RESEARCH.2026

- **Trajectory-aware spatial transcriptomics deconvolution via image representation of RNA-seq data.**
  Liu, J., Islam, M., Xing, L.
  AMER ASSOC CANCER RESEARCH.2026

- **SOMaC: An interpretable and generalizable framework for integrating and clustering multimodal spatial omics to resolve cell states and immune niches in cancer**
  Shi, J., Islam, M.
  AMER ASSOC CANCER RESEARCH.2026

- **Enhancing Deep Learning Inference of Gene Regulatory Networks via Construction of Image Representation of Cell-Cell Interactions From scRNA-Seq Data.** *IEEE journal of biomedical and health informatics*
  Wei, Q., Islam, M. T., Wu, W. E., Xing, L.
  2026; 30 (4): 3244-3256

- **CystoDS: a multiclass endoscopy image dataset for artificial intelligence-assisted bladder cancer detection.** *Scientific data*
  Lee, T. J., Qiu, L., Long, J., Mach, K. E., Peterson, D., Yao, Q., Shkolyar, E., Islam, M. T., Xing, L., Liao, J. C.
  2026

- **Noninvasive imaging-based assessment of tumor-associated neutrophils for prognosis and immunotherapy response in gastric cancer: a multicenter study.** *Journal of advanced research*
  Zheng, W., Sun, Z., Wang, W., Han, J. E., Islam, M. T., Li, W., Yuan, Q., Chen, C., Xi, S., Li, Z., Wang, X., Wu, L., Xiong, et al
  2026

- **Deep radiomics for prognostic prediction in locally advanced non-small cell lung cancer by leveraging OmicsMap-based image representation.** *Physics in medicine and biology*
  Hou, R., Xia, W., Islam, M. T., Zhu, X., Shao, Y., Xu, Z. Y., Cai, X., Gu, X., Fu, X., Xing, L.
  2026

- **Neural Autoregressive Modeling of Brain Aging**
  Yesiloglu, R., Peng, W., Islam, M., Adeli, E.
  edited by Mukhopadhyay, A., Oksuz, Engelhardt, S., Mehrof, D., Yuan, Y.
  SPRINGER INTERNATIONAL PUBLISHING AG.2026: 341-350

- **Revealing neurocognitive and behavioral patterns through unsupervised manifold learning of dynamic brain data.** *Nature computational science*
  Zhou, Z., Liu, J., Wu, W. E., Fang, R., Liu, S., Wei, Q., Yan, R., Guo, Y., Tao, Q., Wang, Y., Islam, M. T., Xing, L.
  2025

- **Non-Invasive Assessment of Structural and Mechanical Micro-Environmental Changes During Long Bone Regeneration Using a Multi-Modal and Multi-Parametric Ultrasound Imaging Technique in a Segmental Tibial Defect Sheep Model In Vivo** *IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING*
  Tang, S., Shajudeen, P., Taraballi, F., Haase, C., Cabrera, F., Yang, X., Islam, M., De Rosa, E., Weiner, B., Becker, M., Tasciotti, E., Righetti, R.
  2025; 72 (12): 3546-3557

- **Computational pathology approach for assessment of prognosis and immunotherapy response in pan-gastrointestinal cancer.** *Journal of translational medicine*
  Zhang, T., Sun, Z., Li, Z., Ahmad, M. U., Islam, M. T., Yang, F., Yang, X., Wu, L., Xie, J., Feng, W., Chen, Y., Guo, A. A., Li, et al
  2025; 23 (1): 1088

- **Unveiling tissue heterogeneity through genomic interaction-encoded image representation of RNA-sequencing data.** *American journal of human genetics*
  Liu, J., Zhou, Z., Chen, Y., Islam, M. T., Xing, L.
  2025

- **Restoring mitochondrial quantity and quality to reverse the Warburg effect and drive neuroblastoma differentiation.** *Proceedings of the National Academy of Sciences of the United States of America*
  Jiang, H., Tiche, S. J., He, C. J., Liu, J., Bian, F., Jedoui, M., Forgo, B., Islam, M. T., Zhao, M., Emengo, P., He, B., Li, Y., Li, et al
  2025; 122 (36): e2502483122

- **Multimodal Radiopathomics Signature for Prediction of Response to Immunotherapy-based Combination Therapy in Gastric Cancer Using Interpretable Machine Learning.** *Cancer letters*
  Huang, W., Wang, X., Zhong, R., Li, Z., Zhou, K., Lyu, Q., Han, J. E., Chen, T., Islam, M. T., Yuan, Q., Ahmad, M. U., Chen, S., Chen, et al
  2025: 217930

- **TME-guided deep learning predicts chemotherapy and immunotherapy response in gastric cancer with attention-enhanced residual Swin Transformer.** *Cell reports. Medicine*
  Sang, S., Sun, Z., Zheng, W., Wang, W., Islam, M. T., Chen, Y., Yuan, Q., Cheng, C., Xi, S., Han, Z., Zhang, T., Wu, L., Li, et al
  2025: 102242

- **RAFT-USENet: A Unified Network for Accurate Axial and Lateral Motion Estimation in Ultrasound Elastography Imaging** *IEEE JOURNAL OF BIOMEDICAL AND HEALTH INFORMATICS*
  Majumder, S., Islam, M., Righetti, R.
  2025; 29 (7): 5109-5122

- **VISTA immune checkpoint blunts radiotherapy-induced antitumor immune response.** *Cell reports*
  Nambiar, D. K., Maddineni, S., Langthasa, J., Cao, H., Viswanathan, V., Liu, J., Islam, M. T., Mehta, N., Frank, J., Real, A., Cheunkarndee, T., Laseinde, E. E., Dharmadhikari, et al
  2025; 44 (7): 115893

- **Tissue-origin transcriptomic interactions as indicators of inflammatory aging and aging gene discovery.** *Computers in biology and medicine*
  Wu, W. E., Wei, Q., Zhou, Z., Ring, H. Z., Islam, M. T., Xing, L.
  2025; 195: 110534

- **Deep representation learning of protein-protein interaction networks for enhanced pattern discovery.** *Science advances*
  Yan, R., Islam, M. T., Xing, L.
  2024; 10 (51): eadq4324

- **Restoring Mitochondrial Quantity and Quality to Reverse Warburg Effect and Drive Tumor Differentiation.** *Research square*
  Ye, J., Jiang, H., Tiche, S., He, C., Liu, J., Bian, F., Jedoui, M., Forgo, B., Islam, M. T., Zhao, M., Emengo, P., He, B., Li, et al
  2024

- **Localization and recognition of human action in 3D using transformers.** *Communications engineering*
  Sun, J., Huang, L., Wang, H., Zheng, C., Qiu, J., Islam, M. T., Xie, E., Zhou, B., Xing, L., Chandrasekaran, A., Black, M. J.
  2024; 3 (1): 125

- **Deciphering the Feature Representation of Deep Neural Networks for High-Performance AI** *IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE*
  Islam, M., Xing, L.
  2024; 46 (8): 5273-5287

- **Non-Invasive Imaging of Mechanical Properties of Cancers In Vivo Based on Transformations of the Eshelby's Tensor Using Compression Elastography.** *IEEE transactions on medical imaging*
  Majumder, S., Islam, M. T., Taraballi, F., Righetti, R.
  2024; 43 (8): 3027-3043

- **Development and interpretation of a pathomics-driven ensemble model for predicting the response to immunotherapy in gastric cancer.** *Journal for immunotherapy of cancer*
  Han, Z., Zhang, Z., Yang, X., Li, Z., Sang, S., Islam, M. T., Guo, A. A., Li, Z., Wang, X., Wang, J., Zhang, T., Sun, Z., Yu, et al
  2024; 12 (5)

- **Bladder Cancer and Artificial Intelligence: Emerging Applications.** *The Urologic clinics of North America*
  Laurie, M. A., Zhou, S. R., Islam, M. T., Shkolyar, E., Xing, L., Liao, J. C.
  2024; 51 (1): 63-75

- **Self-supervised deep learning of gene-gene interactions for improved gene expression recovery.** *Briefings in bioinformatics*
  Wei, Q., Islam, M. T., Zhou, Y., Xing, L.
  2024; 25 (2)

- **Revealing hidden patterns in deep neural network feature space continuum via manifold learning.** *Nature communications*
  Islam, M. T., Zhou, Z., Ren, H., Khuzani, M. B., Kapp, D., Zou, J., Tian, L., Liao, J. C., Xing, L.
  2023; 14 (1): 8506

- **Biology-aware mutation-based deep learning for outcome prediction of cancer immunotherapy with immune checkpoint inhibitors.** *NPJ precision oncology*
  Liu, J., Islam, M. T., Sang, S., Qiu, L., Xing, L.
  2023; 7 (1): 117

- **Leveraging cell-cell similarity for high-performance spatial and temporal cellular mappings from gene expression data.** *Patterns (New York, N.Y.)*
  Islam, M. T., Xing, L.

2023; 4 (10): 100840

- **Super-resolution biomedical imaging via reference-free statistical implicit neural representation.** *Physics in medicine and biology*
  Ye, S., Shen, L., Islam, M. T., Xing, L.
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- **Non-invasive tumor microenvironment evaluation and treatment response prediction in gastric cancer using deep learning radiomics.** *Cell reports. Medicine*
  Jiang, Y., Zhou, K., Sun, Z., Wang, H., Xie, J., Zhang, T., Sang, S., Islam, M. T., Wang, J. Y., Chen, C., Yuan, Q., Xi, S., Li, et al
  2023: 101146
- **Assessment of compression-induced solid stress, fluid pressure and mechanopathological parameters in cancers in vivo using poroelastography.** *Physics in medicine and biology*
  Khan, M. H., Islam, M. T., Taraballi, F., Righetti, R.
  2023
- **Non-invasive imaging of interstitial fluid transport parameters in solid tumors in vivo.** *Scientific reports*
  Majumder, S., Islam, M. T., Righetti, R.
  2023; 13 (1): 7132
- **Learning image representations for content-based image retrieval of radiotherapy treatment plans.** *Physics in medicine and biology*
  Huang, C., Vasudevan, V., Pastor-Serrano, O., Islam, M. T., Nomura, Y., Dubrowski, P., Wang, J. Y., Schulz, J. B., Yang, Y., Xing, L.
  2023
- **Multibranch CNN With MLP-Mixer-Based Feature Exploration for High-Performance Disease Diagnosis** *IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS*
  Zhou, Z., Islam, M., Xing, L.
  2023
- **Cartography of Genomic Interactions Enables Deep Analysis of Single-Cell Expression Data.** *Nature communications*
  Islam, M. T., Xing, L.
  2023; 14 (1): 679
- **Image classification using graph neural network and multiscale wavelet superpixels** *PATTERN RECOGNITION LETTERS*
  Vasudevan, V., Bassenne, M., Islam, M., Xing, L.
  2023; 166: 89-96
- **Bladder Cancer and Artificial Intelligence: Emerging Applications** *Urologic Clinics North America*
  Laurie, M., Zhou, S. R., Islam, M., Shkolyar, E., Xing, L., Liao, J. C.
  2023
- **Flat lesion detection of white light cystoscopy with deep learning**
  Jia, X., Shkolyar, E., Eminaga, O., Laurie, M., Zhou, Z., Lee, T., Islam, M., Meng, M. Q., Liao, J. C., Xing, L.
  2023
- **Sequential modeling for cystoscopic image classification**
  Laurie, M., Eminaga, O., Shkolyar, E., Jia, X., Lee, T., Long, J., Islam, M., Lau, H., Xing, L., Liao, J. C.
  2023
- **Leveraging data-driven self-consistency for high-fidelity gene expression recovery.** *Nature communications*
  Islam, M. T., Wang, J., Ren, H., Li, X., Khuzani, M. B., Sang, S., Yu, L., Shen, L., Zhao, W., Xing, L.
  2022; 13 (1): 7142
- **Small-Object Sensitive Segmentation Using Across Feature Map Attention.** *IEEE transactions on pattern analysis and machine intelligence*
  Sang, S., Zhou, Y., Islam, M. T., Xing, L.
  2022; PP
- **Utilizing differential characteristics of high dimensional data as a mechanism for dimensionality reduction** *PATTERN RECOGNITION LETTERS*
  Xing, S. S., Islam, M.
  2022; 157: 1-7

- **Implicit neural representation for radiation therapy dose distribution.** *Physics in medicine and biology*
  Vasudevan, V., Shen, L., Huang, C., Chuang, C. F., Islam, M. T., Ren, H., Yang, Y., Dong, P., Xing, L.
  2022
- **Estimation of Mechanical and Transport Parameters in Cancers Using Short Time Poroelastography** *IEEE JOURNAL OF TRANSLATIONAL ENGINEERING IN HEALTH AND MEDICINE*
  Majumder, S., Islam, M., Righetti, R.
  2022; 10
- **Human-level comparable control volume mapping with a deep unsupervised-learning model for image-guided radiation therapy.** *Computers in biology and medicine*
  Liang, X., Bassenne, M., Hristov, D. H., Islam, M. T., Zhao, W., Jia, M., Zhang, Z., Gensheimer, M., Beadle, B., Le, Q., Xing, L.
  1800; 141: 105139
- **Artificial intelligence in image-guided radiotherapy: a review of treatment target localization.** *Quantitative imaging in medicine and surgery*
  Zhao, W., Shen, L., Islam, M. T., Qin, W., Zhang, Z., Liang, X., Zhang, G., Xu, S., Li, X.
  2021; 11 (12): 4881-4894
- **Geometry and statistics-preserving manifold emb e dding for nonlinear dimensionality reduction** *PATTERN RECOGNITION LETTERS*
  Islam, M., Xing, L.
  2021; 151: 155-162
- **Artificial intelligence in image-guided radiotherapy: a review of treatment target localization** *QUANTITATIVE IMAGING IN MEDICINE AND SURGERY*
  Zhao, W., Shen, L., Islam, M., Qin, W., Zhang, Z., Liang, X., Zhang, G., Xu, S., Li, X.
  2021
- **Non-Invasive Assessment of the Spatial and Temporal Distributions of Interstitial Fluid Pressure, Fluid Velocity and Fluid Flow in Cancers In Vivo** *IEEE ACCESS*
  Islam, M., Tang, S., Tasciotti, E., Righetti, R.
  2021; 9: 89222-89233
- **Self-Supervised Feature Learning via Exploiting Multi-Modal Data for Retinal Disease Diagnosis** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
  Li, X., Jia, M., Islam, M., Yu, L., Xing, L.
  2020; 39 (12): 4023–33
- **A data-driven dimensionality-reduction algorithm for the exploration of patterns in biomedical data.** *Nature biomedical engineering*
  Islam, M. T., Xing, L.
  2020
- **Estimation of Vascular Permeability in Irregularly Shaped Cancers Using Ultrasound Poroelastography** *IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING*
  Islam, M., Tasciotti, E., Righetti, R.
  2020; 67 (4): 1083–96
- **Non-invasive imaging of Young's modulus and Poisson's ratio in cancers in vivo.** *Scientific reports*
  Islam, M. T., Tang, S. n., Liverani, C. n., Saha, S. n., Tasciotti, E. n., Righetti, R. n.
  2020; 10 (1): 7266
- **A Robust Method to Estimate the Time Constant of Elastographic Parameters** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
  Islam, M., Chaudhry, A., Righetti, R.
  2019; 38 (6): 1358–70
- **An analytical poroelastic model of a spherical tumor embedded in normal tissue under creep compression** *JOURNAL OF BIOMECHANICS*
  Islam, M., Righetti, R.
  2019; 89: 48–56
- **Non-Invasive Imaging of Normalized Solid Stress in Cancers in Vivo** *IEEE JOURNAL OF TRANSLATIONAL ENGINEERING IN HEALTH AND MEDICINE-JTEHM*
  Islam, M., Tasciotti, E., Righetti, R.

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- **A New Poroelastography Method to Assess the Solid Distribution in Cancers** *IEEE ACCESS*
  Islam, M., Righetti, R.
  2019; 7: 103404–15

- **A Model-Based Approach to Investigate the Effect of a Long Bone Fracture on Ultrasound Strain Elastography** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
  Tang, S., Sabonghy, E. P., Chaudhry, A., Shajudeen, P., Islam, M., Kim, N., Cabrera, F. J., Reddy, J. N., Tasciotti, E., Righetti, R.
  2018; 37 (12): 2704–17

- **A New Method for Estimating the Effective Poisson's Ratio in Ultrasound Poroelastography** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
  Islam, M., Chaudhry, A., Tang, S., Tasciotti, E., Righetti, R.
  2018; 37 (5): 1178–91

- **An analytical poroelastic model for ultrasound elastography imaging of tumors** *PHYSICS IN MEDICINE AND BIOLOGY*
  Islam, M., Chaudhry, A., Unnikrishnan, G., Reddy, J. N., Righetti, R.
  2018; 63 (2): 025031