

# Fakrul Islam Tushar

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PhD candidate at Duke University specializing in medical imaging AI, synthetic data generation, and in silico trials. Seeking full-time opportunities in medical AI or applied machine learning.

## EDUCATION

<b>Duke University</b> PhD, Electrical and Computer Engineering	NC, USA Aug. 2021 to Present
<b>University of Girona</b> MSc, Erasmus Mundus Joint Master in Medical Imaging and Applications, <b>CGPA: 7.9/10.</b>	Girona, Spain Sept. 2017 to 2019
<b>American International University Bangladesh (AIUB)</b> BSc, Electrical and Electronics Engineering, <b>CGPA: 3.82/4.</b>	Dhaka, Bangladesh Jan. 2013 to Feb. 2017

## EXPERIENCE

<b>Duke University Medical Center</b> Research Associate	NC, USA Oct. 2019 to Feb. 2021
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## PROJECTS

<b>Duke University</b> Completed Research Projects	2021 to 2025
<ul style="list-style-type: none"><li>• <b>Weakly Supervised Body CT Classification:</b> Built 3D CNNs for multi-organ disease classification using report-derived labels, enabling large-scale annotation-free learning. [GitHub] [Tushar et al., <i>Radiology: Artificial Intelligence</i> (2021); <i>BMC Med Inform Decis Mak</i> (2022)]</li><li>• <b>Virtual Lung Screening Trial (VLST):</b> Designed an <i>in-silico</i> lung cancer screening trial simulating imaging, scanners, and AI readers; validated against NLST real-world outcomes. [Project-page] [Tushar et al., <i>Medical Image Analysis</i> (2025); <i>RSNA</i> (2024); <i>VITM</i> (2024); <i>SPIE</i> (2024)]</li><li>• <b>AI in Lung Health Benchmarking:</b> Curated the Duke Lung Cancer Screening (DLCS) dataset; proposed SWS++ for task-relevant pretraining; benchmarked across Clinical datasets. [GitHub] [Tushar et al., <i>arxiv</i> (2024); Wang &amp; Tushar et al. <i>Radiology: Artificial Intelligence</i> (2025)]</li><li>• <b>SYN-LUNGS:</b> Developed a 3D anatomy-informed lung nodule dataset to advance detection, segmentation, classification, &amp; synthesis. [Tushar et al., <i>arxiv</i> (2025); <i>MICCAI submitted</i>]</li><li>• <b>ReFINE-Lung:</b> Developed a pseudo-labeling AI framework combining ensemble models, calibration, and unsupervised alignment to curate large clinical CT datasets. [Writing in progress]</li></ul>	

<b>Duke University</b> Ongoing Projects	2025 to Future
<ul style="list-style-type: none"><li>• <b>VLST-2:</b> Creating a 1,000-patient in-silico screening cohort matched to real-world clinical distributions.</li><li>• <b>MASLI:</b> Designing a synthetic image generation AI framework with control over nodule features.</li><li>• <b>FOUND-Lung:</b> A foundational model trained across clinical, simulated, and synthetic domains for downstream lung imaging tasks.</li></ul>	

## AWARDS

- **Best Poster Presentation Award**, at 1st International Summit of Virtual Imaging Trials in Medicine 2024.
- **Conference Travel Grant (\$700)**, at SPIE Medical Imaging Conference 2024.
- **Best Poster Award**, All Pratt Poster Competition 2022, Pratt School of Engineering, Duke University.
- **3rd Position Best Poster Award (\$500)**, Poster Presentation Competition 2022, ECE, Duke University.
- **Erasmus Mundus Joint Master Scholarship (€42,000)**, Covering full tuition fees and monthly stipend.
- **Master Thesis Grant (\$5,000)**, from Duke University Medical Center.
- **Academic Honour “Cum Laude”**, for Academic Excellence at AIUB’s 17th Convocation.
- **Dean’s Award**, for undergraduate final year project (2nd place out of 180 projects for academic year 2016).
- **Merit Scholarship (\$4,500)**, from AIUB to complete the undergraduate degree.

## KEY PUBLICATIONS

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- Tushar et al., “**Virtual Lung Screening Trial (VLST): An In Silico Study Inspired by the National Lung Screening Trial for Lung Cancer Detection.**” *Medical Image Analysis* (2025). doi:10.1016/j.media.2025.103636; **Project-page:** [fitushar.github.io/VLST.github.io/](https://github.com/fitushar/VLST.github.io/).
- Tushar et al., “**SYN-LUNGS: Towards Simulating Lung Nodules with Anatomy-Informed Digital Twins for AI Training.**” *arXiv* (2025). <https://arxiv.org/abs/2502.21187>; Submitted *MICCAI 2025*.
- Wang, Tushar et al., “**The Duke Lung Cancer Screening (DLCS) Dataset: A Reference Dataset of Annotated Low-dose Screening Thoracic CT.**” *Radiology: Artificial Intelligence* (2025). doi.org/10.1148/ryai.240248; **Dataset:** [zenodo.org/records/13799069](https://zenodo.org/records/13799069).
- Tushar et al., “**AI in Lung Health: Benchmarking Detection and Diagnostic Models Across Multiple CT Scan Datasets.**” *arXiv* (2024). [arxiv.org/abs/2405.04605](https://arxiv.org/abs/2405.04605); **Code:** [github.com/fitushar/AI-in-Lung-Health-Benchmarking-Detection-and-Diagnostic-Models-Across-Multiple-CT-Scan-Datasets](https://github.com/fitushar/AI-in-Lung-Health-Benchmarking-Detection-and-Diagnostic-Models-Across-Multiple-CT-Scan-Datasets).
- Tushar et al., “**Beyond Detection: Bridging the Gap Between Virtual Imaging Trials and Clinical Impact.**” in *Proc. Virtual Imaging Trials in Medicine 2024*, p. 202 (2024). **Poster:** doi.org/10.13140/RG.2.2.26638.78402; **Code:** [github.com/fitushar/VLST-Beyond-Detection](https://github.com/fitushar/VLST-Beyond-Detection).
- Tushar et al. “**Virtual imaging trials improved the transparency and reliability of AI systems in COVID-19 imaging**” *arXiv* (2023). [arxiv.org/abs/2308.09730](https://arxiv.org/abs/2308.09730). Under-review; **Project-page:** [fitushar.github.io/Revi-COVID.github.io/](https://github.com/fitushar/Revi-COVID.github.io/); **Code:** [gitlab.oit.duke.edu/cvit-public/cvit\\_revicovid19](https://gitlab.oit.duke.edu/cvit-public/cvit_revicovid19).
- D’Anniballe, & Tushar et al. “**Multi-Label Annotation of Text Reports from CT Using Deep Learning.**” *BMC Med Inform Decis Mak* (2022). doi.org/10.1186/s12911-022-01843-4; **Code:** [github.com/fitushar/multi-label-annotation-text-reports-body-CT](https://github.com/fitushar/multi-label-annotation-text-reports-body-CT).
- Tushar et al., “**Classification of Multiple Diseases on Body CT Scans Using Weakly Supervised Deep Learning.**” *Radiology: Artificial Intelligence* (2021). doi.org/10.1148/ryai.210026; **Code:** [github.com/fitushar/multi-label-weakly-supervised-classification-of-body-ct](https://github.com/fitushar/multi-label-weakly-supervised-classification-of-body-ct).

## ADDITIONAL PUBLICATIONS AND PRESENTATIONS

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- Wang, Tushar et al., “**Concordance-Based Predictive Uncertainty (CPU)-Index: Proof-of-Concept with Application Towards Improved Specificity of Lung Cancers on Low Dose Screening CT.**” *Artificial Intelligence in Medicine* (2025). doi.org/10.1016/j.artmed.2024.103055
- Dahal, Ghoghnejad, Vancoillie, Ghosh, Bhandari, Kim, Ho, ushar et al. **XCAT 3.0: A Comprehensive Library of Personalized Digital Twins Derived from CT Scans.** *Medical Image Analysis* (2025). doi.org/10.1016/j.media.2025.103636.
- Tushar et al., “**Virtual NLST: Towards Replicating National Lung Screening Trial.**” *Medical Imaging 2024: Physics of Medical Imaging, SPIE* (2024). doi.org/10.1117/12.2613010
- Tushar et al., “**Virtual Human Twins in Lung Health: A Comprehensive In Silico Screening Approach.**” *RSNA Annual Meeting*, Scientific Poster #T5A-SPPH-2, Chicago, IL (2024). **Presentation:** [github.com/fitushar/VLST.github.io/blob/master/static/pdfs/RSNA-2024-VLST.pdf](https://github.com/fitushar/VLST.github.io/blob/master/static/pdfs/RSNA-2024-VLST.pdf)
- Wang, Tushar et al., “**Radiomic-Demographic Data Fusion and Diagnostic Uncertainty Quantification Lead to Improved Specificity of Lung Cancers on Low Dose Screening CT.**” *66th Annual Meeting & Exhibition, AAPM* (2024).
- Garcia-Alcsoer, Michael E., Tushar, Fakrul Islam, et al. “**Multidisease Classification of CT Reports Using Traditional Natural Language Processing and a Lightweight Foundation Model.**” *Medical Imaging 2025: Imaging Informatics, SPIE* (2025). doi.org/10.1117/12.3047690
- Tushar et al., “**Virtual vs. Reality: External Validation of COVID-19 Classifiers Using XCAT Phantoms for Chest CT.**” *Medical Imaging 2022 : CAD, SPIE* (2022). <https://doi.org/10.1117/12.2613010>
- Tushar et al., “**Quality or Quantity: Toward a Unified Approach for Multi-Organ Segmentation in Body CT.**” *Medical Imaging 2022: Physics of Medical Imaging. SPIE* (2022). doi.org/10.1117/12.2613101
- Tushar et al., “**Co-Occurring Diseases Heavily Influence Performance of Weakly Supervised Models for Chest CT.**” *Medical Imaging 2022: Computer-Aided Diagnosis, SPIE* (2022). doi.org/10.1117/12.2612700
- Hasan, M. K., Dahal, L., Tushar et al. “**DSNet: Automatic Dermoscopic Skin Lesion Segmentation.**” *Computers in Biology and Medicine* (2020). doi.org/10.1016/j.combiomed.2020.103738

- Saha & Tushar et al., “Weakly supervised 3D classification of chest CT using aggregated multi-resolution deep segmentation features.” *Medical Imaging 2020: Computer-Aided Diagnosis, SPIE* (2020).
- Tushar et al., “Brain tissue segmentation using neuronet with different pre-processing techniques.” *8th ICIEV and 3rd icIVPR, IEEE* (2019). doi:10.1109/ICIEV.2019.8858515

## KEY OPEN-SOURCE CODES

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- **In-Silico Trial Resources:** <https://fitushar.github.io/VLST.github.io/>
- **AI in Lung Health Benchmarking:** <https://github.com/fitushar/AI-in-Lung-Health-Benchmarking-Detection-and-Diagnostic-Models-Across-Multiple-CT-Scan-Datasets>
- **Weak Supervision & Rule-Based Algorithms for Radiology text:** <https://github.com/fitushar/multi-label-weakly-supervised-classification-of-body-ct>
- **COVID-19 Classifier Diversity Study (ReviCOVID19):** [https://gitlab.oit.duke.edu/cvit-public/cvit\\_revicovid19](https://gitlab.oit.duke.edu/cvit-public/cvit_revicovid19)
- **Basic Medical Imaging Pre-Processing:** <https://github.com/fitushar/3D-Medical-Imaging-Preprocessing-All-you-need>

## KEY OPEN-SOURCE DATASETS & ANNOTATIONS

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- **The Duke Lung Cancer Screening (DLCS) Dataset:** <https://doi.org/10.5281/zenodo.13799069>
- **National Lungs Screening Trial 3D annotation:** <https://zenodo.org/records/15320923>
- **U-10: United-10 COVID-19 CT Dataset** <https://zenodo.org/records/14064172>

## SKILLS

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- **ML Libraries** - PyTorch, MONAI, TensorFlow.
- **Containerization Tools** - Docker, Singularity.
- **Programming Languages** - Python, MATLAB.
- **Workflow Tools** - Git, Linux shell scripting.

## TEACHING EXPERIENCE

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- **Teaching Assistant, Duke University (Spring 2025):** Graduate-level course **Introduction to Machine Learning (ECE 580)**. Responsibilities included developing assignments and solutions, and holding office hours to support student learning.
- **Teaching Assistant, Duke University (Spring 2023):** Graduate-level course **Human-Centered Computing (ECE/COMPSCI 653)**. Responsibilities included conducting consulting hours to provide personalized student guidance and grading assignments and exams.
- **Thesis Mentor, Duke University:** Co-Supervised 4 Master’s theses relating AI and medical imaging.
- **Youth Leader, Instructor (2016):** at Literacy Through Leadership (LTL), in collaboration with Teach For Bangladesh; contributed 78 hours over 13 weeks (6 hours/week) to improve English reading and writing skills of 40 underprivileged primary school students.

## INVITED TALKS

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- **Unlocking the Power of AI & In-Silico Trials in Chest Radiology**, Invited Speaker, CVIT Research Forum, Duke University, June 2024. *Talk:* <https://cvit.duke.edu/forum/june-21-2024-unlocking-the-power-of-ai-in-silico-trials-in-chest-radiology/>

## CO-CURRICULAR ACTIVITIES

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<b>IEEE AIUB Student Branch</b>	Dhaka, Bangladesh
<i>Chair, Chapters and AG Development</i>	<i>Feb. 2016 to Feb. 2017</i>
<b>IEEE Industry Application Society, Microwave Theory and Techniques Society</b>	Dhaka, Bangladesh
<i>AIUB SB Chapter, Vice-Chairperson</i>	<i>Feb. 2016 to Feb. 2017</i>
<b>IEEE</b>	Dhaka, Bangladesh
<i>IEEE Day Section Ambassador</i>	<i>2015, 2016</i>

## REFERENCES

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- **Joseph Y. Lo**, Professor and Vice Chair for Research of Radiology, Duke University; joseph.lo@duke.edu
- **Ehsan Samei**, Professor of Radiology, Physics, BME, and ECE, Duke University; esi.samei@duke.edu