Fakrul Islam Tushar

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CAREER SUMMARY

PhD Candidate in AI with **8+** years of experience applying ML, computer vision, and image processing to healthcare. Focused on large-scale data curation and weak supervision, data-efficient training, and simulation/generative AI—evidenced by **380+** Google Scholar citations & **580+** GitHub stars.

EDUCATION

PhD in Electrical and Computer Engineering (ML track), **Duke University**, NC, USA — Aug. 2021 – Present

MSc in Medical Imaging and Applications (Erasmus+), **University of Girona**, Spain — Sept. 2017 – 2019

BSc in Electrical and Electronics Engineering, **AIUB**, Dhaka, Bangladesh — Jan. 2013 – Feb. 2017

EXPERIENCE

Duke University

PhD Candidate & Graduate Research Assistant — Health AI & GenAI — *Aug. 2021 to Present*

- **Virtual Lungs Screening Trials:** Reproducible in-silico screening; compressed years → hours; reproduced clinical outcomes. *MedIA* (2025);RSNA (2024);VITM (2024). fitushar.github.io/VLST.github.io/.
- **Task-Aware Pretraining:** Domain/task pretraining (no extra data) beat foundations to AUC ≈ 0.90.
  AI–Human Data Curation: Delivered benchmark dataset via human–AI curation.
  Benchmarking: Standardized multi-cohort CT benchmark with CI/DeLong; reproducible external validation. ***Dataset:*** zenodo.org/records/13799069; ***Code:*** *https://shorturl.at/Xh2uO*.
- **PiNS:** Point-driven nodule segmentation; faster masks, scalable QA. github.com/fitushar/PiNS
- **CaNA:** Context-aware augmentation, boosts low-data generalization. github.com/fitushar/CaNA
- **NoMAISI:** Nodule-Oriented Medical AI for Synthetic Imaging. It integrates flow-based generation with ControlNet conditioning, extends our earlier toolkits: PiNS and CaNA. github.com/fitushar/NoMAISI
- **TriAnnot:** Tri-stage AI-Based Annotation Consensus Framework for Lung Cancer Screening; fewer expert minutes, cleaner labels. github.com/fitushar/TriAnnot

Duke University Medical Center

Research Associate — Health AI — *Oct. 2019 to Feb. 2021*

- Automated **400k** radiology reports (rule-based NLP) → structured labels; weakly supervised multiple diseases classifier across Body (13k scans, 19k labels), achieving AUCs up to 0.97.
- **first-author papers** (RadAI 21; BMC MIDM 22), ***open-source code*** https://shorturl.at/M2epv;
  RSNA News coverage: www.rsna.org/news/2022/may/Body-CT-To-Classify-Diseases.

KEY PUBLICATIONS

- **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);
- **Tushar** et al., **"AI in Lung Health: Benchmarking Detection and Diagnostic Models Across Multiple CT Scan Datasets."** *arXiv*; [Under-review RadAI]. ***Code:*** *https://shorturl.at/Xh2uO*.
- **Tushar** et al. **"The Utility of the Virtual Imaging Trials Methodology for Objective Characterization of AI Systems and Training Data"**.*arXiv*. [Under-review JMI]; *fitushar.github.io/ReviCOVID.github.io/*.
- Wang, **Tushar** et al., **"The Duke Lung Cancer Screening (DLCS) Dataset: A Reference Dataset of Annotated Low-dose Screening Thoracic CT."** *Radiology: AI* (2025).
- **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).
- D'Anniballe, & **Tushar** et al. **"Multi-Label Annotation of Text Reports from CT Using Deep Learning."**. *BMC MIDM* (2022); 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: AI*(2021). github.com/fitushar/multi-label-weakly-supervised-classification-of-body-ct.

ADDITIONAL PUBLICATIONS AND PRESENTATIONS

- **Tushar** et al., **"SYN-LUNGS: Towards Simulating Lung Nodules with Anatomy-Informed Digital Twins for AI Training."** *arXiv* (2025).
- Dahal, Ghojoghnejad, Vancoillie, Ghosh, Bhandari, Kim, Ho, **Tushar** et al. **XCAT 3.0: A Comprehensive Library of Personalized Digital Twins Derived from CT Scans**. *Medical Image Analysis* (2025).
- **Tushar** et al., **"Virtual NLST: Towards Replicating National Lung Screening Trial."** *Medical Imaging 2024: Physics of Medical Imaging, SPIE*.
- **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).*
- Michael E., **Tushar** et al. **"Multidisease Classification of CT Reports Using Traditional Natural Language Processing and a Lightweight Foundation Model."** *Med. Imaging 2025: Imaging Informatics, SPIE*.
- **Tushar** et al., **"Virtual vs. Reality: External Validation of COVID-19 Classifiers Using XCAT Phantoms for Chest CT."** *Medical Imaging 2022 : CAD, SPIE*.
- **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*.
- **Tushar** et al., **"Co-Occurring Diseases Heavily Influence Performance of Weakly Supervised Models for Chest CT."** . *Medical Imaging 2022: Computer-Aided Diagnosis, SPIE*.
- Hasan, M. K., Dahal, L., **Tushar** et al.**"DSNet: Automatic Dermoscopic Skin Lesion Segmentation."** *Computers in Biology and Medicine* (2020).
- Saha & **Tushar** et al., **"Weakly supervised 3D classification of chest CT using aggregated multi-resolution deep segmentation features."** . *Medical Imaging 2020: CAD, SPIE*.
- **Tushar** et al., **"Brain tissue segmentation using neuronet with different pre-processing techniques."** *8th ICIEV and 3rd icIVPR, IEEE (2019)*.

SKILLS

Healthcare AI: Weak supervision, pseudo-labeling, consensus/QA, calibration/uncertainty, clinical eval, experiment design; **Modeling & LLMs:** PyTorch, MONAI, TensorFlow; Transformers, LoRA/QLoRA (PEFT), embeddings; HF APIs; **3D CV & GenAI:** 3D CNNs, diffusion (ControlNet), augmentation; **Data/Imaging:** NumPy, pandas, OpenCV, SimpleITK, nibabel, DICOM/CT; **ML Systems:** DDP/Slurm, Docker, Linux (bash).

OPEN-SOURCE TOOLKITS (CREATOR & MAINTAINER)

- ***In-Silico* Trial Resources:** *https://fitushar.github.io/VLST.github.io/*.
- **AI in Lung Health Benchmarking:** *https://shorturl.at/Xh2uO*.
- **PiNS:** Point-driven Nodule Segmentation. github.com/fitushar/PiNS
- **CaNA:** Context-Aware Augmentation. github.com/fitushar/CaNA
- **NoMAISI:** Nodule-Oriented Medical AI for Synthetic Imaging. github.com/fitushar/NoMAISI
- **TriAnnot:** Tri-stage AI-Based Annotation Consensus Framework. github.com/fitushar/TriAnnot
- **Weak-Supervision & NLP for Radiology text:** *https://github.com/fitushar/multi-label-weakly-supervised-classification-of-body-ct*.
- **Medical Imaging Pre-Processing:** *https://github.com/fitushar/3D-Medical-Imaging-Preprocessing-All-you-need*.
- **DLCS24:** *https://doi.org/10.5281/zenodo.13799069*; **NLST-3D:** *https://zenodo.org/records/15320923*; **U-10 COVID-19 CTs:** *https://zenodo.org/records/14064172*.

AWARDS

Best Poster Presentation (International Summit of Virtual Imaging Trials in Medicine, 2024); **Best Poster** (All Pratt Poster Competition, Duke, 2022); **Erasmus Mundus Joint Master Scholarship** (€42,000; full tuition + stipend); **Master Thesis Grant** ($5,000; Duke University Medical Center); Academic Honour **"Cum Laude"** (AIUB); **Dean's Award** (UG final project, 2nd of 180, 2016); **Merit Scholarship** ($4,500; AIUB).

REFERENCES

- **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