NIKHIL CHERIAN KURIAN

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PROFESSIONAL EXPERIENCE

- **Fujitsu Research of India** — **Bengaluru, IN**
  Applied Researcher- II — ***Sep '22 - Present***
  - **Developed novel multi-variate spatio-temporal graph-based deep learning encoders for dynamic resource allocation in 5G/6G networks - to be patented.**
  - **Present work: Deep learning and artificial intelligence research on healthcare data.**

EDUCATION

Indian Institute of Technology Bombay, ***Mumbai, India*** — **Jan '17 - May '23**
PhD **in Electrical Engineering (Supervisor** ***Prof. Amit Sethi***)
Title of thesis: ***Cautious and Robust Deep Learning Algorithms for Medical Image Analysis.***

Indian Institute of Technology Gandhinagar, ***Gandhinagar, India*** — **July '14 - July '16**
M.Tech **in Signal Processing-Electrical Engineering (Supervisor** ***Prof. Nithin V. George***)
Title of thesis: ***Robust Adaptive Filter Design: An Information Theoretic Learning Approach.***

Govt Rajiv Gandhi Institute of Technology, ***Kottayam, India*** — **July '09 - July '13**
BTech **in Electronics and Communication Engineering**

RESEARCH INTERESTS

Deep Learning, Medical Image Analysis, Machine Learning, Applied Machine Learning Research, Computer Vision, Signal Processing.

RESEARCH THESIS

PhD Thesis — ***(Jan'18 - May'23)***
Title of Thesis: Cautious and Robust Deep Learning Algorithms for Medical Image Analysis

- **Training AI models to be cautious and robust (inexact supervision) by being "aware of their limitations" and identify those cases during clinical use on which their predictions are untrustworthy.**
- **Retrospective investigation of intra-tumour heterogeneity landscape in luminal breast cancer patients on digitized histology data.**
- **Analyzing deep learning model degradation under open-set and closed-set label noise in medical imaging datasets. Proposed robust training loss functions, pipelines for the tasks of classification, image segmentation and for confidence calibrated deployment.**

M.Tech Thesis — ***(Jul'14 - Jul'16)***
Title of Thesis: Robust Adaptive Filter Design: An Information Theoretic Learning Approach.

- **Proposed novel information theoretic adaptive filter algorithms that remains robust in the presence of alpha stable noise. Effectiveness of the algorithms have been tested on various real-time and offline applications including adaptive beamforming, active noise control and DSP based noise cancellations.**
- **Time frequency analysis using S transform exploiting the the ideas of sparse Fourier transforms.**

RELEVANT PUBLICATIONS

- **Nikhil Cherian Kurian, Amit Lohan, Gregory Verghese, et al. "Deep Multi-Scale UNet Architecture and Noise-Robust Training Strategies for Histopathological Image Segmentation."In 2022 IEEE 22nd International Conference on Bioinformatics and Bioengineering (BIBE), pp. 91-96. IEEE, 2022.**

- **Nikhil Cherian Kurian, S. Varsha, Akshay Bajpai, Sunil Patel, and Amit Sethi. "Improved Histology Image Classification under Label Noise Via Feature Aggregating Memory Banks." In 2022 IEEE 19th International Symposium on Biomedical Imaging (ISBI), pp. 1-5. IEEE, 2022.**
- **Nikhil Cherian Kurian, Gurparkash Singh, Poorvi Hebbar, Shreekanya Kodate, Swapnil Rane, Amit Sethi. "Robust Classification of Histology Images Exploiting Adversarial Auto Encoders" In 2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC) (pp. 2871-2874). IEEE.**
- **Abhiraj Kanse*, Nikhil Cherian Kurian*, Himanshu Pradeep Aswani, Zakia Khan, Peter H Gann, Swapnil Rane & Amit Sethi," Cautious AI improves outcome and trsut by flagging outlier cases". JCO Clinical Cancer Informatics. (*Equal Contribution) Accepted.**
- **Nikhil Cherian Kurian, Amit Sethi, Anil Reddy Konduru, Abhishek Mahajan, and Swapnil Ulhas Rane. "A 2021 update on cancer image analytics with deep learning." Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery (2021): e1410.**
- **Nikhil Cherian Kurian, Pragati Shuddhodhan Meshram, Abhijeet Patil, Sunil Patel, and Amit Sethi. "Sample Specific Generalized Cross Entropy for Robust Histology Image Classification." In 2021 IEEE 18th International Symposium on Biomedical Imaging (ISBI), *Nice, France* pp. 1934-1938. IEEE, 2021.**
- **Anand, Deepak *, Nikhil Cherian Kurian*, Shubham Dhage, et al. "Deep learning to estimate human epidermal growth factor receptor 2 status from hematoxylin and eosin-stained breast tissue images." Journal of Pathology Informatics 11 (2020).(* Equal Contribution).**
- **Sahar Almahfouz Nasser, Nikhil Cherian Kurian, and Amit Sethi. "Domain Generalisation for Mitosis Detection Exploting Preprocessing Homogenizers." International Conference on Medical Image Computing and Computer-Assisted Intervention. Springer (MICCAI), Cham, 2021.**
- **Anita Grigoriadis, Nikhil Cherian Kurian, Suman, Thomas Hardiman, *et.al*"Assessments of cancer-free lymph nodes for the prediction of disease progression", *ESMO MAP, London*, Sep 2019.**
- **Viraf Patrawala, Nikhil Cherian Kurian, Amit Sethi, "Improving Histopathology Classification using Learnable Preprocessing", *IEEE TENCON*, Jun 2019.**
- **Nikhil Cherian Kurian, Kashyap Patel, Nithin V. George, "Robust active noise control:An information theoretic learning approach.", *Applied Acoustics 117 (2017): 180-184.***
- **Kashyap Patel, Nikhil Cherian Kurian,Nithin V. George, "Time frequency analysis: A sparse S transform approach", *ISPACS 2016, Phuket, Thailand,* Oct. 2016.**
- **Wilson, Bibin, Nikhil Cherian Kurian, Anand Singh, and Amit Sethi. "Satellite-Derived Bathymetry Using Deep Convolutional Neural Network." In IGARSS 2020-2020 IEEE International Geoscience and Remote Sensing Symposium, pp. 2280-2283. IEEE.**
- **Verma, Ruchika, Neeraj Kumar, Abhijeet Patil, Nikhil Cherian Kurian, Swapnil Rane, and Amit Sethi. "Multi-organ nuclei segmentation and classification challenge 2020." IEEE Transactions on Medical Imaging 39 (2020): 1380-1391.**
- **Sahar Almahfouz Nasser, Saketh Chandra, Nikhil Cherian Kurian and Amit Sethi. "Improving Mitosis Detection via UNet-based Adversarial Domain Homogenizer." Bioimaging, 2023. (Accepted)**
- **Ravi Kant Gupta, Shivani Nandgaonkar, Nikhil Cherian Kurian et al. "EGFR Mutation Prediction of Lung Biopsy Images using Deep Learning." Bioimaging, 2023. (Accepted)**
- **Abhijeet Patil, Md. Talha, Aniket Bhatia, Nikhil Cherian Kurian, Sammed Mangale, Sunil Patel, & Amit Sethi Fast, Self Supervised, Fully Convolutional Color Normalization of H&E Stained Images. IEEE ISBI 2021, virtual conference.**
- **Varsha S, Sahar Almahfouz Nasser, Gouranga Bala, Nikhil Cherian Kurian, Amit Sethi "Multi-Modal Information Fusion For Classification Of Kidney Abnormalities". In 2022 IEEE 19th International Symposium on Biomedical Imaging Challenges (ISBIC), pp. 1-4. IEEE, 2022.**
- **Verghese, Gregory, Anita Grigoriadis, Amit Sethi, Amit Lohan, Nikhil Cherian Kurian, Swati Meena, Harry Chinque et al. "Deep learning-based segmentation accurately captures**

histological features in cancer-free lymph nodes of breast cancer patients." (2021): PO-014.

RELEVANT PUBLICATIONS UNDER REVIEW/ UNDER PREPARATION

- Nikhil Cherian Kurian, Neeraj Kumar, Ruchika Verma, Stephanie Mcgregor, Peter H Gann, & Amit Sethi," Deep Learning Estimates Intra Tumor Heterogeneity and Stratifies Risk in Luminal Breast Cancer Patients.". npj Breast Cancer (to be submitted).
- Nikhil Cherian Kurian, Varsha S, Shashikant Khade and Amit Sethi. "Self Supervision Driven OOD Estimation To Address Open-Set Semi Supervision Challenges In Histopathology." IEEE Journal of Biomedical and Health Informatics (to be submitted).
- G. Verghese, M.Li, F Liu, A Lohan, Nikhil Cherian Kurian, S. Meena et.al"Deep learning captures prognostic morphological immune features in breast cancer" patients. Journal of Pathology (Under Review).

TALKS AND PEDAGOGICAL ACTIVITIES

- Speaker at *Nvidia GTC 2021* on the topic "Robust loss functions on deep histopathology image classification".
- Co-organizer of Mult-organ nuclei segmentation and classification challenge , *MoNuSAC 2020*, organized as an official satellite event of ISBI 2020.
- Co-Instructor and Co-Organizer at *Shala2020:* Online summer school on Data Sciences and Machine learning.
- Co-organizer and Co-instructor "Hands-on Analysis of Healthcare Data" , workshop organized by Koita Centre for Digital Health, IIT Bombay, April 2022.
- Speaker at 2nd Indo-UK Cancer informatics workshop at Tata Memorial Centre Advanced Centre for Treatment, Research and Education in Cancer (ACTREC), Navi-Mumbai, India, November 2019.
- Finalist of the IEEE ISBI Knight Challenge: Kidney clinical Notes and Imaging to Guide and Help personalize Treatment and biomarkers discovery.
- Reviewer for IEEE International symposium for biomedical images (ISBI) 2021,2022; National Conference on communication (NCC) 2022, Elsevier Journals - Applied Acoustics.
- Invited speaker at "Applications of AI in Healthcare" workshop, Faculty Development Program (FDP), AICTE,on the topic "The confluence of deep learning in histopathology images", Virtual Program 2021.
- Teaching Assistantship
  - Excellence in teaching assistantship for EE 782: Advanced Machine Learning, 2020-21, EE 769: Introduction to Machine Learning, 2020-21, and EE 610: Image Processing, 2021-22, from the Department of Electrical Engineering, IIT Bombay.
  - Teaching Assistantship (TA) Experience :
    * Advanced Machine learning * Advanced Signal Processing * Information Theory * Introduction to Machine Learning * Image Processing * Digital Signal Processing Lab * Artificial Neural Networks
- Collaboratory Research
  - University of Illinois, Chicago (Dr. Peter Gann)
  - University of Wisconsin Madison (Dr Stephanie McGregor)
  - Case Western Reserve University, Ohio (Dr Ruchika Verma)
  - King's College, London (Dr. Dr
  - University of Alberta (Dr Neera
  - Tata Memorial Centre, Mumbai
  - University of Illinois, Chicago (Dr. Peter Gann) * King's College, London (Dr. Dr Anita Grigoriadis) * University of Wisconsin Madison (Dr Stephanie McGregor) * University of Alberta (Dr Neeraj Kumar)* Case Western Reserve University, Ohio (Dr Ruchika Verma) * Tata Memorial Centre, Mumbai (Dr Swapnil Rane) * Nvidia Systems (Sunil Patel)

POSITIONS OF RESPONSIBILITY

- P.G. Core Member Electrical Department at IIT Bombay, 2018-19.

- **System Administrator: Medical Imaging, Deep learning and Artificial intelligence Lab (MeDAL), Department of Electrical Engineering, IIT Bombay, 2018-Present.**
- **Secretary, IEEE RIT Student Chapter, Kerala Section, 2012-13.**
- **Technical Coordinator, IEEE RIT Student Chapter, Kerala Section, 2011-12.**

TECHNICAL SKILLS

- **Languages: Python ∗ C ∗ C++ ∗ Java ∗ Matlab ∗ Octave**
- **Libraries and Tools: ∗ PyTorch ∗ TensorFlow ∗ Keras ∗ Scikit-Learn ∗ Pandas ∗ ITK ∗ OpenCV**
- **Miscellaneous: ∗ Shell Scripting ∗ Containerization (Dockers, Singularity, Enroot) ∗ Git ∗ Slurm-Pyxis**
- **Organisational: Various technical programs, Secretary IEEE RIT Student Chapter, Kerala Section**

RELEVANT COURSE WORK

Relevant Courses from IIT Bombay:

- **EE 708: Information Theory**
- **EE 610: Image Processing**
- **CS 754: Advacned Image Processing**
- **CS 736: Medical Image Computing**
- **EE 678: Wavelets**
- **EE 608: Adaptive Signal Processing**
- **CS 726: Advacned Machine Learning**
- **EE 769: Introduction to Machine Learning**

Relevant Courses from IIT Gandhinagar:

- **EE 612: Artificial Intelligence**
- **EE 609: Advanced Signal processing**
- **EE 615: Nature Inspired Computing**
- **EE 623: Fundamentals of Artificial Neural Network**
- **CS 645: 3D Computer Vision**
- **MA 601: Mathematical models in Engineering**

REFERENCES

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