

# SEEMA R. KHADIRNAIKAR

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Department of Electrical, Electronics, and  
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## EDUCATION

### ***Ph.D.***

***January 2018 - Present***

Department of Electrical, Electronics, and Communication Engineering,  
Indian Institute of Technology Dharwad (IITDh), Dharwad, Karnataka, India.

**Thesis:** Machine Learning based Multi-Omics Data Analysis to Identify Subgroups in Cancer for Precision Medicine

- Developed and implemented a machine learning-based pipeline aimed at the identification of novel molecular subgroups in cancer through the integration of multi-omics data.
- Applied the ML-based pipeline to analyze data from non-small cell lung cancer and pan-cancer patients and identified distinct molecular subgroups characterized by significant differences in survival times and genomic features.
- Utilized unsupervised machine learning techniques, such as auto-encoders, PCA, and consensus  $K$ -means clustering, to identify the novel molecular subgroups in cancer.
- Employed supervised learning techniques, including SVM, RF, FFNN, and fusion models (decision-level and feature-level) to categorize patients into identified subgroups.
- Identified and characterized each subgroup's unique genetic alterations and features, providing additional insights for designing tailored and effective treatment strategies.
- Utilized conditional GANs to synthesize synthetic gene expression data.
- Published two peer-reviewed journal articles on machine learning-based subgroup identification.
- Collaborated and actively contributed to implementing statistical and machine learning-based techniques to identify and validate subgroups and their biomarkers in various cancer types. Published ten research papers in international journals highlighting the outcomes of these research works.

### ***M.Tech. (Research)***

***July 2015 - October 2017***

Department of Electronics and Communication Engineering,  
National Institute of Technology Karnataka Surathkal (NITK), Karnataka, India.

**Thesis:** Implementation of Algorithms for Biomedical Applications on PSoC

- Developed efficient and reliable signal processing algorithms for arrhythmia detection and non-invasive haemoglobin count determination.
- Implemented these algorithms PSoC device.
- Published a peer-reviewed conference article.

### ***B.E.***

***June 2011 - May 2015***

Department of Electronics and Communication Engineering,  
Basaveshwar Engineering College (BEC), Bagalkot, Karnataka, India.

**Thesis:** Offline Signature Verification and Forgery Detection using FUZZY

Designed a simple 'Graphical User Interface System' (GUI) to test the signature samples and determine if it was 'Genuine' or 'Forged' with the help of 'Fuzzy Interface System' (FIS) in MATLAB.

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## TECHNICAL SKILLS

- Machine Learning Algorithms
    - Supervised learning: SVM, RF, FFNN
    - Unsupervised learning: Autoencoders, clustering, PCA
  - Data Augmentation
  - Multi-modal Data Integration
  - Hypothesis Testing
  - Data Visualization: Python (matplotlib, seaborn) and R (ggplot2)
  - Frameworks: PyTorch, Keras, Scikit-learn
  - Programming Languages: Python (intermediate) and R (intermediate)
  - Tools: Slurm workload manager, R-Studio, Spyder, MATLAB
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## WORK EXPERIENCE

### **Indian Institute of Technology Dharwad**

*Research Scholar and Teaching Assistant*

**January 2018 - current**

*Dharwad, Karnataka, India*

**Courses Assisted:** Data Analysis, Pattern Recognition and Machine Learning, Artificial neural networks and Deep Learning, Introduction to Analog Circuits, Electronic Devices, Hands-on-Engineering lab, Devices and circuits lab, Analog circuits lab, Electronic Design lab

### **Indian Institute of Technology Madras**

*Project Associate*

**August 2017 - December 2017**

*Chennai, Tamil Nadu, India*

Contributed to a project focused on developing the SENSURAIR system, a Low-cost Semiconductor and Optical Sensors based Urban Air Quality Monitoring Network. My responsibilities focused on calibration and integration of low-cost semiconductor and optical sensors for monitoring CO, NO<sub>2</sub>, O<sub>3</sub>, and particulate matter with microcontroller.

### **National Institute of Technology Karnataka**

*Research Scholar and Teaching Assistant*

**July 2015 - June 2017**

*Surathkal, Karnataka, India*

**Courses Assisted:** Analog Integrated Circuits lab, VLSI design lab

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## PUBLICATIONS

**Khadirnaikar, S.**, Shukla, S. & Prasanna, S., “Machine learning based combination of multi-omics data for subgroup identification in non-small cell lung cancer,” in *Scientific Reports*, vol 13, 4636, 2023.

**Khadirnaikar, S.**, Shukla, S. & Prasanna, S., “Integration of Pan-cancer Multi-omics Data for Novel Mixed Subgroup Identification using Machine Learning Methods,” in *Plos One*, 2023.

Kumar, P., **Khadirnaikar, S.**, Bhandari, N., Chatterjee, A. & Shukla, S., “An epithelial-mesenchymal plasticity signature identifies two novel lncRNAs with the opposite regulation,” in *Frontiers In Cell And Developmental Biology*, vol 10, pp 885785, 2022.

Chatterjee, A., **Khadirnaikar, S.** & Shukla, S., “Development and validation of stemness associated LncRNA based prognostic model for lung adenocarcinoma patients,” in *Cancer Biomarkers*, vol 33, pp. 131-142, 2022.

Jagjampi, A., **Khadirnaikar, S.**, Malik, P., Jain, D., MB, N. & Shukla, S., “DeepMPS: Development and validation of a deep learning model for whole slide image base prognostic prediction of low grade Lung adenocarcinoma patients,” in *BioRxiv*, pp. 2022-12, 2022.

**Khadirnaikar, S.**, Chatterjee, A. & Shukla, S., “Genetic and epigenetic landscape of leukocyte infiltration identifies an immune prognosticator in lung adenocarcinoma,” in *Cancer Biomarkers*, vol 32, pp. 505-517, 2021.

Shukla, S. & **Khadirnaikar, S.**, “RNA-sequencing analysis pipeline for prognostic marker identification in cancer,” in *Cancer Cell Signaling: Methods And Protocols*, pp. 119-131, 2021.

**Khadirnaikar, S.**, Chatterjee, A. & Shukla, S., “Identification and characterization of senescence phenotype in lung adenocarcinoma with high drug sensitivity,” in *The American Journal Of Pathology*, vol 191, pp 1966-1973, 2021.

**Khadirnaikar, S.**, Chatterjee, A., Kumar, P. & Shukla, S., “A greedy algorithm-based stem cell LncRNA signature identifies a novel subgroup of lung adenocarcinoma patients with poor prognosis,” in *Frontiers In Oncology*, vol 10, pp. 1203, 2020.

**Khadirnaikar, S.**, Kumar, P. & Shukla, S., “Development and validation of an immune prognostic signature for ovarian carcinoma,” in *Cancer Reports*, vol 3, e1166, 2020.

**Khadirnaikar, S.**, Kumar, P., Pandi, S., Malik, R., Dhanasekaran, S. & Shukla, S., “Immune associated LncRNAs identify novel prognostic subtypes of renal clear cell carcinoma,” in *Molecular Carcinogenesis*, vol 58, pp. 544-553, 2019.

Kumar, P., **Khadirnaikar, S.** & Shukla, S., “A novel LncRNA-based prognostic score reveals TP53-dependent subtype of lung adenocarcinoma with poor survival,” in *Journal Of Cellular Physiology*, vol 234, pp 16021-16031, 2019.

Kumar, P., **Khadirnaikar, S.** & Shukla, S., “PILAR1, a novel prognostic LncRNA, reveals the presence of a unique subtype of lung adenocarcinoma patients with KEAP1 mutations,” in *Gene*, vol 691, pp. 167-175, 2019.

**Khadirnaikar, S.**, Narayanan, S. & Shukla, S., “Decoding the LncRNA transcriptome of esophageal cancer: identification of clinically relevant LncRNAs,” in *Biomarkers In Medicine*, vol 12, pp. 1083-1093, 2018.

Shiva Nagendra SM, Yasa P., Narayana M., **Khadirnaikar S.**, & Rani P., “Mobile monitoring of air pollution using low cost sensors to visualize spatio-temporal variation of pollutants at urban hotspots,” in *Sustainable Cities and Society*, vol 44, pp. 520-535, 2019.

**Khadirnaikar S.**, & Aparna P., “A feasible QRS detection algorithm for arrhythmia diagnosis,” in *International Conference on Advances in Electrical, Electronic and Systems Engineering (ICAEES)*, 2016, pp. 32-37, IEEE.

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## WORKSHOPS AND CONFERENCES ATTENDED

- *International Conference on Biomedical and Clinical Research*, 21<sup>st</sup> and 22<sup>nd</sup> November 2022, Shri Dharmasthala Manjunatheshwara University and Association of Pharmaceutical Research, Dharwad, Karnataka, India.
  - *Cognitive Speech Processing*, GIAN 2022, 21<sup>st</sup> February to 25<sup>th</sup> February 2022 (Virtual).
  - *3<sup>rd</sup> IBSE International Symposium*, 1<sup>st</sup> February to 4<sup>th</sup> February 2022 (Virtual).
  - *DSAI-IBSE HPC Symposium on AI and Biology*, 4<sup>th</sup> January to 7<sup>th</sup> January 2022 (Virtual).
  - *Genetic Variant Analysis*, 9<sup>th</sup> March to 12<sup>th</sup> March 2021 (University of Zurich, Virtual).
  - *National Conference on Computer Vision Pattern Recognition Image preprocessing and Graphics (NCVPRIPG 2019)*, 22<sup>nd</sup> December to 24<sup>th</sup> December 2019, KLE Technological University Hubli, Karnataka, India.
  - *3<sup>rd</sup> PAN IIT Biotech Meet 2019 “Cancer Precision Medicine and Personalized Therapeutics”*, 31<sup>st</sup> January to 2<sup>nd</sup> February 2019, IITM, Chennai, Tamil Nadu, India.
  - *OpenACC GPU Application Hackathon (GAH - 2018)*, 17<sup>th</sup> September to 21<sup>st</sup> September 2018, IISER Pune, Maharashtra, India.
  - *Hands-on-workshop on Statistical Data Analysis with R*, 16<sup>th</sup> May to 18<sup>th</sup> May 2018, IBAB Bengaluru, Karnataka, India.
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## AWARDS AND ACHIEVEMENTS

- Secured 1<sup>st</sup> position for oral presentation (Research Scholar) in International Conference on Biomedical and Clinical Research held at Shri Dharmasthala Manjunatheshwara University, Dharwad, Karnataka.
  - Recipient of Gold Medal for scoring highest in BE.
  - Secured 1<sup>st</sup> position for the academic year 2012-13, 2013-14 and 2014-15 in BEC.
  - Awarded ‘The Most Distinguished Girl’ for the academic year 2010-11 by Sukruti P.U Science College, Hubli, Karnataka, India.
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## EXTRACIRRICULAR ACTIVITIES

- Contributed to the organization of “*Vivriti-23*”, the First Annual 3-Minute Research Talk Series at IITDh.
  - Represented student queries to the evaluation committee as a member of PG-APEC for the academic year 2019-20 at IITDh.
  - Coordinated “*Thursday Talks*”, weekly research scholars gathering at IITDh.
  - Held the position of General Secretary of Gymkhana at BEC during the academic year 2014-15.
  - Acted as the Student Representative of Gymkhana at BEC during the academic year 2013-14.
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## REFERENCES

**Prof. S. R. M. Prasanna**

Professor,  
Department of Electrical, Electronics, and  
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