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I am a research scholar in the Department of Electrical, Electronics, and Communication Engineering at IIT Dharwad. My research is focused on the application of machine learning techniques to cancer research. I have utilized both unsupervised and supervised machine learning algorithms for the development of a machine learning-based pipeline for the identification of precise molecular cancer subtypes using multi-omics data to help in personalized treatment strategies. I am passionate about utilizing data-driven approaches to address challenges in the field of precision medicine. I am actively seeking postdoctoral positions in the fields of machine learning and data science.

EDUCATION

Ph.D. ***January 2018 - Present***

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

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

- Developed a machine learning-based pipeline aimed at the identification of novel molecular subgroups in cancer using multi-omics data.
- 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 unique genetic alterations and features of each subgroup, 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.

M.Tech (Research) ***July 2015 - October 2017***

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

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,
Basaveshwar Engineering College (BEC), Bagalkot, Karnataka, India.

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.

TECHNICAL SKILLS

- **Machine Learning Algorithms**
  - Supervised learning: SVM, RF, FFNN
  - Unsupervised learning: Autoencoders, clustering, PCA, tSNE
- Data Augmentation
- Multi-modal Data Integration
- **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

WORK EXPERIENCE

Research Scholar and Teaching Assistant, *January 2018 - current*
Indian Institute of Technology Dharwad, 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

Project Associate, *August 2017 - December 2017*
Indian Institute of Technology Madras, 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_2, O_3, and particulate matter with microcontroller.

Research Scholar and Teaching Assistant, *July 2015 - June 2017*
National Institute of Technology Karnataka Surathkal, Karnataka, India.
Courses Assisted: Analog Integrated Circuits lab, VLSI design lab

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WORKSHOPS AND CONFERENCES ATTENDED

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

AWARDS AND ACHIEVEMENTS

- Secured 1st 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 1st 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.

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.

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.

REFERENCES

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