Pragya Singh

Ph.D. Candidate

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Summary

I am a final year Ph.D. candidate at IIIT-Delhi, India. My research lies at the intersection of artificial intelligence, ubiquitous computing, human-computer interaction (HCI), and healthcare. My thesis focuses on developing predictive models for mental health assessment by leveraging physiological signals and other non-invasive data from wearable and mobile devices. Within my research, I aim to understand the emotion data from HCI perspectives to accommodate for complexities in emotion data and further design more generalizable algorithms for emotion recognition in everyday settings.

Research Interest: HCAI, AI for Healthcare, Emotion Recognition, Representation Learning, Multimodal Learning, Data-Centric AI.

Education

2021–Present **Ph.D. in Computer Science and Engineering**, *IIITD*, New Delhi, India
Thesis Focus: Rethinking *"Emotion Data"* from Human-Centric Perspectives for Everyday Emotion Recognition

2021–Present **M.Tech in Computer Science and Engineering (AI Specialization)**, *IIITD*, New Delhi, India, Pursuing alongside PhD. Course-work: Machine Learning, Deep Learning, Bayesian Machine Learning, Reinforcement Learning, Interactive Systems, Algorithms
On-going GPA: 8.48%

2018 – 2019 **Diploma in Embedded Systems Engineering**, *CDAC ACTS*, Pune, India, Coursework: C, C++, Embedded systems, Communication protocols, Android development,
Percentage: 79.29%

2014 – 2018 **B.Tech in Electronics and Communication Engineering**, *IET, Dr. Ram Manohar Lohia, Awadh University*, Uttar Pradesh, India, *Percentage: 78.3%*

Publications

September 2025 **FEEL: Quantifying Heterogeneity in Physiological Signals for Generalizable Emotion Recognition**, **NeurIPS 2025**, Pragya Singh, Somay Jalan, Ankush Gupta, Mohan Kumar, Pushpendra Singh

Emotion recognition from physiological signals has substantial potential for applications in mental health and emotion-aware systems. However, the lack of standardized, large-scale evaluations across heterogeneous datasets limits progress and model generalization. We introduce **FEEL (Framework for Emotion Evaluation)**, the first large-scale benchmarking study of emotion recognition using electrodermal activity (EDA) and photoplethysmography (PPG) signals across **19 publicly available datasets**. We evaluate 16 architectures spanning traditional machine learning, deep learning, and self-supervised pretraining approaches, structured into four representative modeling paradigms. Our study includes both within-dataset and cross-dataset evaluations, analyzing generalization across variations in experimental settings, device types, and labeling strategies. Overall, FEEL provides a unified framework for benchmarking physiological emotion recognition, delivering insights to guide the development of robust, generalizable emotion-aware technologies.

July 2025 **AnnoSense: A Framework for Physiological Emotion Data Collection in Everyday Settings for AI**, *Accepted at* **IMWUT** *February* **2025** *Cycle*, Pragya Singh, Ankush Gupta, Mohan Kumar, Pushpendra Singh

Emotional and mental well-being are vital components of quality of life, and with the rise of smart devices like smartphones, wearables, and artificial intelligence (AI), new opportunities for monitoring emotions in everyday settings have emerged. However, for AI algorithms to be effective, they require high-quality data and accurate annotations. As the focus shifts towards collecting emotion data in real-world environments to capture more authentic emotional experiences, the process of gathering emotion annotations has become increasingly complex. This work explores the challenges of everyday emotion data collection from the perspectives of key stakeholders. We conducted 75 surveys, 32 interviews with the public, and 3 focus group discussions (FGDs) with 12 mental health professionals. The insights gained from these stakeholders informed the development of our framework, *AnnoSense*, designed to support everyday emotion data collection for AI. This framework was then evaluated by 25 emotion AI experts for its clarity, usefulness, and adaptability. Lastly, we discuss the implications of *AnnoSense* for future research in emotion AI, highlighting its potential to enhance the collection and analysis of emotion data in real-world contexts. **Paper Link**

January 2025 **"But I Won't Say That It Was Bad Seeing a Real Vagina": Understanding Perspectives toward Learning Sensitive-Critical Health Topic**, *Accepted at* **CHI 2025**, Sara Moin, Manshul Belani, Pragya Singh, Nishtha Phutela, Pushpendra Singh

In India, topics related to sexual and reproductive health (SRH) are rarely discussed openly due to stigma. Cervical cancer, a part of this SRH sphere, is the second most common cancer among women in India, yet its awareness remains low. To understand the attitudes towards SRH, we designed a Cervical cancer awareness tutorial in Virtual Reality and collected data from 66 participants across genders and life stages (single, married, and married with children) through interviews, self-reported emotions, and physiological sensor data. Our findings revealed an acute lack of knowledge about self-body anatomy and a need for creating health literacy. Further, our participants appreciated receiving detailed information despite the presence of explicit imagery and advocated that critical health information should not be moderated. We offer design recommendations to the HCI community for teaching cervical cancer and suggest extending these approaches to enhance education on similar critical SRH issues in India. **Paper Link**

September 2024 **EEVR: A Dataset of Paired Physiological Signals and Textual Descriptions for Joint Emotion Representation Learning**, **NeurIPS 2024**, Dataset and Benchmark Track, Pragya Singh, Ritvik Budhiraja, Ankush Gupta, Anshul Goswami, Mohan Kumar, Pushpendra Singh

The EEVR (Emotion Elicitation in Virtual Reality) dataset is a novel resource created for language-supervision-based pre-training and emotion recognition tasks, such as classifying valence and arousal. It includes high-quality physiological signals paired with qualitative textual descriptions of emotions. We evaluated the dataset using the Contrastive Language Signal Pre-training (CLSP) method, which combines physiological signals with self-reported emotional annotations. This approach significantly improved performance in emotion recognition, with a 20% increase in arousal classification and a 10% increase in valence classification, demonstrating the value of incorporating textual descriptions. **Paper Link Website**

September 2024 **Translating Emotions to Annotations: A Participant's Perspective of Physiological Emotion Data Collection**, *Accepted at* **CSCW 2024**, Pragya Singh, Ritvik Budhiraja, Mohan Kumar, Pushpendra Singh

Physiological signals hold immense potential for ubiquitous emotion monitoring, presenting numerous applications in emotion recognition. However, harnessing this potential is hindered by significant challenges, particularly in the collection of annotations that align with physiological changes since the process hinges heavily on human participants. In this work, we set out to study the perspectives of human participants involved in the emotion data collection procedure. We conducted a lab-based emotion data collection study using 360○ virtual reality video stimulus followed by semi-structured interviews with the study participants. Our qualitative analysis showed that factors like participants' perception, experiment design, and experiment setup (type of sensors, elicitation medium, and data collection environment) could have a significant impact on the quality of emotion data, which is often not considered while designing data collecting experiments for AI. **Paper Link**

June 2024 **Can we say a cat is a cat? Understanding the challenges in annotating physiological signal-based emotion data**, **PhysioCHI**, CHI 2024 Workshop, Pragya Singh, Mohan Kumar, Pushpendra Singh

This paper presents a position discussion on the current technique of annotating physiological signal-based emotion data. Our discourse underscores the importance of adopting a nuanced understanding of annotation processes, paving the way for a more insightful exploration of the intricate relationship between physiological signals and human emotions. **Paper Link**

March 2023 **Generating Tiny Deep Neural Networks for ECG Classification on Micro-Controllers**, *IEEE International Conference on Pervasive Computing*, **PerCom** Industry Track 2023, S. Mukhopadhyay, S. Dey, A. Ghose, Pragya Singh and P. Dasgupta

This paper shows that Neural Architecture Search (NAS) can be used to generate tiny but accurate multi-objective models for classifying ECG signals. Our framework is the first of its kind for automatically generating a DNN for screening Atrial Fibrillation on an MCU. Moreover, our research shows that the proposed NAS finds more accurate tiny models than human-designed ones and is effective in enabling customized solutions for a resource-limited target platform. **Paper Link**

Work Experience

Feb 2022 - July 2022 **Research Intern**, *TCS Research*, Embedded Devices and Intelligent Systems Lab

Worked on Platform-Aware Neural Architecture Search for ECG classification on wearables, as well as on NAS methods for object detection in resource-constrained settings.

2020 – 2021 **Embedded Systems Engineer (R&D)**, *Lohia Mechatronik*

Developed and troubleshooted Baremetal Embedded software. Worked on machine vision and sensor automation for manufacturing facilities. Automated induction motors and temperature-based actuators using CANopen and microcontrollers.

2019 – 2020 **Embedded Software Engineer**, *KPIT Technologies*

Configured complex device drivers, communication stacks, and diagnostic systems for classic AUTOSAR. Derived verification criteria and conducted MIL testing for Software components.

Skills and Competencies

Technologies	TensorFlow, PyTorch, Scikit-learn, Pandas, Numpy
Health Sensing	Physiological Signal Processing - Electrodermal Activity, PPG, ECG, Skin Temperature, EEG, EMG, Activity Data
Languages	Python, C, C++, Embedded C, Java
Tools	VS code, Android Studio, MATLAB, MySQL, Google Collab, Bootstrap, Git, OpenCV, Github
AI Methods	Semi-supervised learning, Self-Supervised Learning, TinyML, Neural Architecture Search, Quantization, Pruning, Domain Adaptation
HCI Methods	Statistical Analysis, Qualitative Analysis (Thematic Analysis), Interviews, Survey, Focus Groups, and Contextual Inquiry

Teaching

Teaching Assistance	Mobile Computing, Computer Networks, Research Methods, Interactive Systems (Best TA award)

Volunteering and Reviewer

Conference	ACM Compass 2024 Organizing Team, CSCW 2025 Student Volunteer, UBICOMP 2025 Student Volunteer, Ubicomp 2025 Poster/Demo Program Committee
Workshops	AutoMLPerSys2025 (Program Co-chairs) and AutoMLPerSys2024 (Steering Committee) co-located with Percom
Reviewer	CHI, NeurIPS, CSCW, IMWUT, UbiComp, Percom, WiML workshop co-located with Neurips
Talks	TinyML India Talks Organizing Team

Awards and Fellowships

August 2025	Gary Marsden Travel Awards for UBICOMP 2025
August 2024	Chanakya Doctoral Fellowship from Ihub Anubhuti
September 2024	Microsoft Conference Travel Grant for Neurips 2024
march 2024	Award Finalists for Poster Presentation at The Machine Learning Summer School in Okinawa 2024