



Dr. Puneet Bawa is an academician, presently working as Assistant Professor in the Department of Computer Science and Engineering at IILM University, Gurugram. He has a rich and diverse experience spanning research, industry and academia, including tenures as a CoE Coordinator at the Centre of Excellence for Speech & Multimodal Lab, CURIN, Punjab and as a Software Engineer in the industry. His primary research interests lie in Speech and Multimodal Technologies, Artificial Intelligence, and Low-Resource Language Processing. As a researcher and author, he has published in journals and

conferences indexed in SCI/Scopus and holds numerous patents and copyrights in the domains of assistive technology, healthcare AI and speech and language processing. His work has been recognized with several national and international accolades, including the "Most International Project" Award at Ingenuity Finals '19 (University of Nottingham, Ningbo, China), the Novate+ 2018 win in Himachal Pradesh, the Punjab Innovation Summit win (Government of Punjab), and hackathon and innovation contest wins across ACM Sikkim Manipal University, UPES Dehradun, and the Indian Society for Technical Education, among others.

Educational Qualification

- Ph.D., Computer Science and Engineering, Chitkara University, Punjab (2025)
 - Thesis: Development of Integrative Modelling for Early Identification of Speech and Language Disorders in Low-Resource Settings
- M.E., Computer Science and Engineering, Chitkara University, Punjab (2021)
 - Thesis: Performance Enhancement of Punjabi Mismatch ASR System using Data Augmentation
- B.E., Computer Science and Engineering, Chitkara University, Punjab (2016)

Projects

SANCTIONED AND FUNDED PROJECTS

- Krishi Estra-Kit (2023–2024) — DST NIDHI PRAYAS | Role: PI
 - Integration of biological signal analysis and ML pipelines to detect health markers in livestock through a smart saliva-based detection system.
 - Developed a Python-based data pipeline for signal preprocessing and feature extraction from saliva samples.
 - Implemented model training workflows using TensorFlow and Scikit-learn, with accuracy validation.
 - Prepared milestone reports and collaborated with stakeholders to ensure timely delivery and fund utilization.
- Briltab-Edukit-1 (2019–2021) — NewGen IEDC | Role: Project Lead
 - Developed a braille-powered learning system for visually impaired students, integrating tactile interfaces with educational content.

- o Designed a hardware-software interface using Arduino and Raspberry Pi for braille keypads.
 - o Wrote Python modules to manage input/output and content navigation.
 - o Conducted classroom trials and collected feedback for iterative improvements.
 - o Collaborated with special educators for content customization and tactile learning enhancement.
- Intelligent Urea Spreading Machine (2019–2021) — NewGen IEDC | Role: Project Lead
 - o Designed a smart agriculture tool that uses ML to detect green crop regions and regulate urea dispensing in real time.
 - o Designed an image recognition model using OpenCV and Python to detect healthy green patches in crops.
 - o Integrated image output with a microcontroller-controlled urea distribution system.
 - o Optimized for low-power consumption and cost efficiency for small-scale farmers.
 - o Tested model accuracy in live fields and reported improvements in urea usage efficiency.

Research and Scholarly Publication

JOURNAL ARTICLES

- Rajput, M., Sethi, M., Bawa, P. & Kadyan, V. Automated Advancements and Synergistic Challenges in Multi-Modal Clinical Assessments for Alzheimer's Disease Diagnosis: A Comprehensive Review and Meta-Analysis. Archives of Computational Methods in Engineering, Springer, 2025.
- Bawa, P., Kadyan, V., Chhabra, G., & Chopra, A. Subspace Gaussian Mixture Modeling for Low-Resource Non-Native Punjabi Language Speech Recognition. Procedia Computer Science, 259, 408-415, 2024.
- Rajput, M., Sethi, M., Bawa, P. & Kadyan, V. Dynamic Weighted Fusion for Cross-Patched Interactions for Early Classification of Alzheimer's Disease using Neuroimaging Data. Procedia Computer Science, Elsevier, 2025.
- Bawa, P., Kadyan, V., Mantri, A., Vardhan, H. Investigating Multiclass Autism Spectrum Disorder Classification using Machine Learning Techniques. e-Prime – Advances in Electrical Engineering, Electronics and Energy, 8, 100602, 2024.
- Kadyan, V., Bawa, P., Choudhary, R. Investigating Lattice-Free Acoustic Modeling for Children Automatic Speech Recognition in Low-Resource Settings. SN Computer Science, 5(5), 469, 2024.
- Bawa, P., Kadyan, V., Tripathy, A., Singh, T. P. Developing Sequentially Trained Robust Punjabi Speech Recognition System under Matched and Mismatched Conditions. Complex & Intelligent Systems, 9(1), 1–23, 2023.
- Kadyan, V., Bawa, P., Hasija, T. In-Domain Training Data Augmentation on Noise Robust Punjabi Children Speech Recognition. Journal of Ambient Intelligence and Humanized Computing, 1–17, 2022.

- Kadyan, V., Bala, S., Bawa, P. Training Augmentation with TANDEM Acoustic Modelling in Punjabi Adult Speech Recognition System. *International Journal of Speech Technology*, 24, 473–481, 2021.
- Bawa, P., Kadyan, V. Noise Robust In-Domain Children Speech Enhancement for Automatic Punjabi Recognition System under Mismatched Conditions. *Applied Acoustics*, 175, 107810, 2021.
- Kadyan, V., Bala, S., Bawa, P., Mittal, M. Developing In-Vehicular Noise Robust Children ASR System using Tandem-NN-Based Acoustic Modelling. *International Journal of Vehicle Autonomous Systems*, 15(3–4), 296–306, 2020.

CONFERENCE PROCEEDINGS

- Bawa, P., Kadyan, V., & Babu, K.S. Autoencoder-Driven Latent Representation Learning for Language-Agnostic Speech Disorder Classification with Universal Feature Set. *APSIPA*, 2025.
- Bawa, P., Rajput, M., Kadyan, V., & Sethi, M. A Novel Stacked Regression Method for Telemonitoring Parkinson's Disease Outcome Prediction using Biomedical Voice Features. 8th International Conference on Parallel, Distributed and Grid Computing (PDGC), IEEE, 2024.
- Bawa, P., Kadyan, V., Mantri, A., & Sethi, M. An Ensemble Approach to Multi-Class Classification of Vocal Disorders: Laryngocele and Vox Senilis. *IEEE International Conference on Intelligent Signal Processing and Effective Communication Technologies (INSPECT)*, 2024.
- Bawa, P., Kadyan, V., & Chhabra, G. Generative Adversarial Network-Based Voice Synthesis from Spectrograms for Low-Resource Speech Recognition in Mismatched Conditions. 15th International Conference on Computing Communication and Networking Technologies (ICCCNT), 2024.
- Bawa, P., Kadyan, V., Mantri, A. Impact of Heterogeneous Spectral Features for Enhanced Low-Resource Speech Recognition System under Mismatched Conditions. 11th International Conference on Signal Processing and Integrated Networks (SPIN), pp. 268–273, 2024.
- Bawa, P., Kadyan, V., Chhabra, G. A Multifaceted Feature Extraction Approach for Noise-Robust Punjabi Spoken Digit Recognition System under Low-Resource Conditions. 11th International Conference on Reliability, Infocom Technologies and Optimization (ICRITO), 2024.
- Bawa, P., Kadyan, V., Singh, M. Comprehensive Phonological Analysis for Clinical Implication using Self-Attention Based Grapheme to Phoneme Modeling under Low-Resource Conditions. 31st Irish Conference on Artificial Intelligence and Cognitive Science (AICS), 2023.
- Kadyan, V., Bawa, P., Akhtar, M. M., Singh, M. Speech-Based Alzheimer's Disease Classification System with Noise-Resilient Features Optimization. 31st Irish Conference on Artificial Intelligence and Cognitive Science (AICS), 2023.

- Kadyan, V., Bawa, P., Choudhary, R., Dua, B. Automatic Speaker Verification System Substantiating Children's Dialects in School Settings. 7th International Conference on Parallel, Distributed and Grid Computing (PDGC), pp. 744–748, 2022.
- Sethi, M., Ahuja, S., Bawa, P. Classification of Alzheimer's Disease using Neuroimaging Data by Convolution Neural Network. 6th International Conference on Signal Processing, Computing and Control (ISPCC), pp. 402–406, 2021.

BOOK CHAPTERS

- Bawa, P. & Rajput, M. Emerging Technologies and Innovations in Medical Imaging. In Biomedical Imaging Technology: Signal Processing Strategies and Innovations, pp. 183–204, 2025.
- Sethi, M., Ahuja, S., & Bawa, P. Deep Learning Techniques using Transfer Learning for Classification of Alzheimer's Disease. In Machine Intelligence, Big Data Analytics, and IoT in Image Processing: Practical Applications, pp. 1–21, 2023.
- Bawa, P., Kadyan, V., Singh, A., Ghafoor, K. Z., Singh, P. K. Estimation of Short-Time Forecast for COVID-19 Outbreak in India: State-Wise Prediction and Analysis. In Sustainable Smart Cities: Theoretical Foundations and Practical Considerations, Springer, pp. 323–345, 2022.
- Singh, H., Bhattacharjee, S., Bawa, P. COVID-19 Success Stories of 3D Printing. In Emerging Applications of 3D Printing During COVID-19 Pandemic, Springer, pp. 193–203, 2022.
- Bawa, P., Kadyan, V., Mantri, A., Kumar, V. Optimal Fractal Feature Selection and Estimation for Speech Recognition under Mismatched Conditions. In Deep Learning Approaches for Spoken and Natural Language Processing, Springer, pp. 41–53, 2021.
- Bhalla, G. S., Singh, H., Bawa, P. 3D Printing Incorporated with Supply Chain Management and Associated Waste Production. In Sustainability for 3D Printing, Springer, pp. 159–178, 2021.

PATENTS

- A Method for Speech Correction and a System Thereof — Inventors: Puneet Bawa, Shirvi Verma, Virender Kadyan. Application No. 202411050299, Published (01/07/2024).
- Non-Invasive Neuro-Stimulation Device for Detecting Cognitive and Neurological Disorders — Inventors: Puneet Bawa, Virender Kadyan, Saurabh Gupta, Sahil Mehta. Application No. 202311055736, Published (15/09/2023).
- Voice Assessment Device for Assessing Speech Articulation and Vocal Fold Function — Inventors: Puneet Bawa, Shirvi Verma, Virender Kadyan. Application No. 202311054442, Published (08/09/2023).
- Mixed Reality-Based Medication Management System and a Method Thereof — Inventors: Puneet Bawa, Manisha, Pulkit Bindlish. Application No. 202311041417, Published (21/07/2023).
- Personalized Non-Invasive Vagus Nerve Stimulation Device for Treatment of Speech and Language Disorders — Inventors: Puneet Bawa, Archana Mantri, Shirvi Verma. Application No. 202311038357, Published (07/07/2023).

- Method and System for Augmented Reality-Based Speech and Language Disorder Assessment — Inventors: Puneet Bawa, Pulkit Bindlish, Archana Mantri. Application No. 202311036372, Published (30/06/2023).
- Equipment for Detecting Emotions, Neurological Dysfunction, and Speech Impairments — Inventors: Puneet Bawa, Archana Mantri, Shirvi Verma. Application No. 202311015765, Published (17/03/2023).
- System for Identification of Neurological Disorders and Speech Impairments — Inventors: Puneet Bawa, Archana Mantri, Virender Kadyan. Application No. 202311006582, Published (10/02/2023).
- Automatic Desludging and Cleaning System for Water Source — Inventors: Puneet Bawa, Sanil Sharma, Pranav Garg, Virender Kadyan. Application No. 202111031678, Published (03/03/2023).
- Multi-Air Reuser — Inventors: Puneet Bawa, Gulshan Dhillon, Pranav, Jashanpreet Kaur. Application No. 202111029659, Published (24/02/2023).
- Ballistic Protection Device — Inventors: Puneet Bawa, Harmanpreet Singh, Pranav Garg, Virender Kadyan. Application No. 202011054101, Published (02/12/2022).
- Device for Currency Identification and Notification using Braille Cells — Inventors: Puneet Bawa, Virender Kadyan, Pranav Garg. Application No. 202011039541, Published (18/03/2022).
- A Marking Device — Inventors: Puneet Bawa, Virender Kadyan, Sachin Ahuja, Pranav Garg. Application No. 202011020278, Published (19/11/2021).
- Height Adjustable Folding Arm Rest Table with Slidable Holders — Inventors: Puneet Bawa, Pranav Garg, Virender Kadyan, Pranav Kumar. Application No. 332371-001, Granted (09/07/2021).
- Portable Ventilated Universal Laptop Stand — Inventors: Puneet Bawa, Pranav Garg, Virender Kadyan, Pranav Kumar. Application No. 332372-001, Granted (05/03/2021).

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- Enhanced Video Classification for Suspicious Activity Detection — Inventors: Puneet Bawa, Virender Kadyan, Ankita Sharma, Samaksh Mittal. Status: Granted.
- Machine Learning-Based Cognitive Effort Prediction with Consumer Wearables — Inventors: Puneet Bawa, Manisha, Virender Kadyan. Status: Granted.
- Advanced Speaker Diarization with Deep Learning — Inventors: Virender Kadyan, Puneet Bawa, Harsh Vardhan Singh Chandel, Mohammad Mujtaba Akhtar. Status: Granted.
- SNR-Based Random Noise Injection for Enhanced Audio Resilience — Inventors: Puneet Bawa, Virender Kadyan. Status: Granted.
- AI-Enhanced Hardware-Controlled Urea Spreading Machine with Green Crop Detection — Inventors: Virender Kadyan, Puneet Bawa. Status: Granted.
- Briltab Edukit-1: Braille-Powered Excellence in Math, English & Hindi — Inventors: Virender Kadyan, Puneet Bawa. Status: Granted.
- DysepNet: A Separable Convolution Network for Dysarthria Detection — Inventors: Puneet Bawa, Virender Kadyan, Harsh Vardhan Singh Chandel. Status: Granted.

- Adaptive Filtering for Speech Enhancement using Gammatone Frequency Domain Sub-Band Spectral Attenuation in Space Domain — Inventors: Puneet Bawa, Virender Kadyan. Status: Granted.
- Schwa Replacement/Insertion in Punjabi Language for Improved Enhanced Pronunciation and Fluency — Inventors: Puneet Bawa, Virender Kadyan, Shirvi Verma. Status: Granted.