BHARATH CHANDRA VADDARAM

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SUMMARY

Biomedical Engineer leveraging nanotechnology and microfluidics expertise alongside human factors research to pioneer life science solutions from cellular therapies to human performance optimization.

PROFESSIONAL EXPERIENCE

Research Assistant (Volunteer), Texas Tech University Health Sciences Center   **MAY 2025 – Present**
- Co-authored a comprehensive review paper on the therapeutic potential of orofacial stem cells, which was published in the Bioengineering journal (DOI 10.3390/bioengineering12090970).
- Initiated research to develop a novel bio-engineered construct for vascularized bone regeneration by embedding gingiva-derived mesenchymal stem cells (GMSCs) within a hydrogel scaffold.
- Preparing to characterize the angiogenic and osteogenic potential of the cell-scaffold system using qRT-PCR, Western blotting, and functional assays (Alizarin Red, Matrigel) to validate its efficacy.

Associate Researcher, Adidas - Center for Engagement Science, Arizona State University   **AUG 2023 – APR 2025**
- Spearheaded the iterative design and execution of human factors research studies (N=20+) evaluating insole prototypes for gait adaptability and cognitive performance, utilizing A/B testing to demonstrate an 8% improvement in cognitive acuity.
- Performed biomechanical assessments using optical motion capture and Shimmer GSR sensors to analyze physical stress and cognitive load, quantifying improvements in gait adaptability and physiological responses across various insole designs.
- Applied user-centered design principles throughout the research life-cycle, from initial design to usability testing and data interpretation, to ensure optimization of insole designs for both performance and user experience.
- Authored a manuscript on the task-dependent effects of textured insoles on static balance, proprioception, and dynamic cognitive-motor performance, and submitted to a peer-reviewed journal.

Graduate Teaching and Laboratory Instruction Assistant, Arizona State University   **AUG 2023 – MAY 2024**
- Fostered an inclusive learning environment by adapting instructional methods to maximize comprehension and achievement for students with diverse learning styles.
- Facilitated hands-on learning of laboratory protocols, developing students' essential technical skills and deepening their understanding of scientific methodologies through experiential practice and constructive feedback.

Research Assistant, ANTs Research Group, SRM Institute of Science and Technology   **JUN 2021 – MAY 2022**
- Cancer Hyperthermia (DOI 10.1088/2057-1976/adaec6):
  - Directed a research team of 3 in the development of Intra-Tumoral Injectable magnetic hydrogels, demonstrating their therapeutic potential with a 26% increase in cancer cell death, contributing to a **publication**.
  - Developed and characterized Injectable magnetic hydrogels for targeted hyperthermia, utilizing analytical techniques including UV-Vis Spectroscopy, DLS, TEM, SEM, XRD, FTIR, and VSM to assess critical material properties.
  - Validated the in vivo efficacy of Injectable magnetic hydrogels through analytical evaluation of temperature changes and material properties in tissue-mimicking phantoms.
- Microfluidics:
  - Collaborated on a cross-functional team to design microfluidic chips, increasing circulating tumor cell capture efficiency by 15%, with potential for significant impact on early cancer detection.
- Bio-imaging Innovation:
  - Engineered a low-cost fluorescence microscopy system delivering image quality comparable to high-end microscopes at a 90% cost reduction, democratizing access to advanced bio-imaging for academic researchers.
  - Cultured and imaged DAPI-stained endothelial cells to validate the capabilities of the low-cost fluorescence microscope, demonstrating swift image acquisition, streamlined analysis, and improved diagnostic potential.

PUBLICATIONS

- **Vaddaram, B. C.**, Shakya, A. K., Zadeh, B. R., Lopez, D. M., Wagner, J., Parco, T., & Kandalam, U. (2025). The Therapeutic Scope of Orofacial Mesenchymal Stem Cells. Bioengineering, 12(9), 970. https://doi.org/10.3390/bioengineering12090970
- Masanam, H. B., Muthuraman, J., **Chandra, B.**, Kottapalli, V. N. S. M., Chandra, S. S., Gupta, P. K., & Narasimhan, A. K. (2025). Investigation on the heating effects of intra-tumoral injectable magnetic hydrogels (IT-MG) for cancer hyperthermia. Biomedical Physics & Engineering Express, 11(2), 025036. https://doi.org/10.1088/2057-1976/adaec6

SKILLS & COMPETENCIES

R&D:	Nanotechnology, Cancer therapeutics, Microfluidics, Cell culture, Surface functionalization techniques, Tissue-mimicking phantom development, Wet lab
Technical Skills:	Python, MATLAB, CAD (SolidWorks, AutoCAD), Statistical Software (Minitab, OriginPro), Micro CT, Fluorescence microscopy, ImageJ AFM, and SEM and TEM analysis

ACADEMIC PROJECTS

Physiological Data Analysis Pipeline & LSTM Cognitive Load Classifier (Python, PyTorch)   MAR 2024 – Present

- Developed a Python pipeline processing physiological signals with sensor-specific sampling rates and advanced signal processing techniques (median filtering, IQR-based outlier removal, interpolation) to ensure data integrity across multi-participant datasets.
- Implemented custom LSTM neural network model in PyTorch for cognitive load classification from biosignals, applying advanced statistical methods including PCA for feature extraction, achieving 82% classification accuracy across diverse participant data
- Created participant-specific evaluation metrics and interactive visualizations, enabling granular analysis of physiological responses and model predictions across participants, with per-individual accuracy, F1-score, and ROC AUC metrics.

Neural Spike Sorting and Analysis using Principal Component Analysis   JAN 2024 – FEB 2024

- Developed a data-driven thresholding method for identifying and analyzing action potentials.
- Implemented PCA-based clustering to differentiate action potential waveforms from noise.
- Visualized results through comprehensive plots of individual spikes, mean waveforms, and PCA projections.

Microfluidic Devices for Studying Organ Transplant Rejection   MAR 2024 – APR 2024

- Designed a novel microfluidic device to simulate the microenvironment of transplanted organs, enabling real-time analysis of immune cell interactions with donor cells to improve understanding of transplant rejection.
- Proposed utilizing the device to investigate the impact of immunosuppressive drugs on immune-mediated rejection processes, potentially leading to the development of more targeted and effective therapies.

Natural Killer Cells Incubated With HA-SPIONs for Prostate Cancer   MAR 2024 – APR 2024

- Developed a novel therapeutic strategy combining natural killer (NK) cell immunotherapy with HA-SPIONs for targeted treatment of prostate cancer.
- Proposed leveraging HA's specific binding to CD44 receptors overexpressed in prostate cancer cells to enhance NK cell delivery, increasing therapeutic efficacy and minimizing off-target effects.

3D-Printed Gold Nanoparticles for Biosensing   OCT 2023 – DEC 2023

- Explored the use of 3D printing technology for fabricating gold nanoparticle-based thin films for biosensing applications, utilizing LSPR sensing for biomolecule detection.

Classification of chest diseases using NIH chest X-ray dataset   FEB 2023 – APR 2023

- Leveraged a Swin Transformer model to identify 14 distinct chest diseases from the NIH-Chest Dataset accurately.
- Utilized pre-trained ImageNet models, achieving a promising AUC score of 0.78 for robust disease classification.

EDUCATION

Master of Science in Biomedical Engineering   DEC 2024
Arizona State University (ASU), Tempe, AZ

Coursework: Wearable Devices, Applied Computational Behavioral Sciences, Biosensing Technologies, Microfluidic devices, Immunoengineering

Bachelor of Technology in Electronics and Communication Engineering - Biomedical Engineering   MAY 2022
SRM Institute of Science and Technology (SRM IST), Chennai, India

Coursework: Biomechanics, Biology: Human Anatomy and Physiology

CERTIFICATIONS

- Human Factors & Usability Engineering: Designing for Humans Specialization - Arizona State University
- GCP for Clinical Trials with Investigational Drugs and Medical Devices (U.S. FDA Focus) - CITI Program