Bharatesh Chakravarthi

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Summary

Currently, I am Fulton Entrepreneurial PostDoc Research Associate at Active Perception Group, School of Computing and Augmented Intelligence (SCAI), Ira A. Fulton Schools of Engineering, Arizona State University, United States. I continue my research on Human activity recognition, Human movement analysis, Sensors and 3D Tracking, and AR/VR at SCAI Motion capture lab.

Experience

Postdoctoral Research Associate Sep 2022 – Present
Arizona State University *Active Perception Group, SCAI, ASU – Tempe, Arizona, USA*

- Currently working as a postdoctoral researcher at ASU Active Perception Group (APG), under the supervision of **Professor Yezhou Yang.**
- Co-leading and contributing to the traffic perception research projects, demonstrating leadership and collaboration skills.
- Guiding Masters students in their thesis work with APG, showcasing mentorship and teaching skills.
- Conducting and coordinating weekly APG meetings to oversee and monitor the research progress, showcasing organizational and communication skills.
- Contributed to the research proposal "STEPs- Situation awareness Tech Exploratory Pilots and Transferring to TOCs" as a senior personnel and frontline coordinator, showcasing experience in proposal writing and coordination skills.
- Participating in a research proposal to be submitted to the NSF PFI-TT 2023, demonstrating a commitment to ongoing research and grant writing.
- **Teaching Human Interaction Course (SER 594 - Spring 2023)** for graduate students with software engineering major at Poly Campus , demonstrating teaching experience and subject matter expertise.

Guest Faculty Dec 2022 – Present
Birla Institute of Technology and Science ***Remote**, WILP BITS, Bengaluru, Karnataka, India*

- Currently serving as a faculty member for the Master of Technology in Software Engineering program in the Work Integrated Learning Programmes (WILP) Division.
- Designed the curriculum for the Data Visualization and Interpretation course and training corporate professionals to be industry ready data analyst.

Research Scholar Aug 2018 – Aug 2022
Chung Ang University *GSAIM, Seoul, South Korea*

- Defended a PhD dissertation in Computer Graphics and Virtual Reality, demonstrating expertise in the field.
- Contributed to a research project on "proxemics-based pervasive interactions for wide-area and high-speed serial motion recognition", which was supported by a grant from the Institute of Information and Communication Technology Planning and Evaluation, funded by the government of the Republic of Korea.
- Developed an indigenous human motion authoring and editing system, showcasing technical skills in software development and contributing to advancements in the field.
- Made contributions to open-source projects on GitHub, such as the Visualization Toolkit (VTK), demonstrating a commitment to community-based software development and an understanding of best practices in software engineering.
- Actively involved in research article reviews, showing a dedication to keeping up with the latest developments in the field and contributing to the scholarly community.

Assistant Professor June 2015 – Aug 2018
Jyothy Institute of Technology, affiliated to VTU *Bengaluru, Karnataka, India*

- Taught a range of courses to undergraduate students, including Data Structures, Algorithm Design, Computer Networks, Computer Graphics, and Web Programming.
- Designed lab sessions and led student projects to facilitate hands-on learning and encourage critical thinking.
- Secured funding for student projects through successful grant proposals and oversaw project implementation.
- Headed tech clubs to promote extracurricular learning and fostered a sense of community among students.
- Organized faculty development programs to support colleagues in their teaching and research endeavors.
- Chaired a national conference with 250 plus attendees and successfully managed all aspects of event planning and execution.

Assistant Professor Aug 2013 – June 2015
APS College of Engineering,affiliated to VTU *Bengaluru, Karnataka, India*

- Taught undergraduate courses, including Fundamentals of Programming, Software Engineering Principles, and Programming in C, to students in the Information Science Department
- Led and organized the technical forum of the Information Science Department, "Tech-Spark", and successfully coordinated the department's annual technical festival, "SPARKUP-2014", which attracted participants from across the region.
- Worked as a placement co-ordinator at department of placement and training, and gained experience in conducting various on campus and pool campus drives.

Education

Chung Ang University, GSAIM Heukseok-dong, Seoul, South Korea
Ph.D. in Computer Graphics and Virtual Reality *Aug 2018 – Aug 2022*

Visvesvaraya Technological University (VTU) Bengaluru, Karnataka, India
Master of Technology in Computer Networks and Engineering *Aug 2011 – June 2013*

Visvesvaraya Technological University (VTU) Bengaluru, Karnataka, India
Bachelor of Engineering in Information Science *Sep 2007 – May 2011*

Research Interest

Computer Vision-based 3D Object detection, Tracking and Prediction, Human Activity Recognition (HAR), Human Movement Analysis, Motion Capture Systems (MoCap), Virtual Reality (VR), Sensors, and 3D Visualization.

Projects

Real-time Traffic Monitoring and Intelligence using Edge Computing and Vision-based system

- This research project aims to develop an intelligent ecosystem for real-time traffic monitoring using a mono cam and edge computing device. The system includes vehicle detection, tracking, and trajectory prediction along with the detection and tracking of other traffic participants such as pedestrians, wheelchair users, and micro-mobility devices. Vision-based algorithms are used for detection and tracking, while AI models are used to make the system more intelligent and efficient.
- The system is developed using edge computing technology, which enables processing and analysis of data on the edge of the network, reducing latency and improving system performance. The vision-based algorithms are implemented using OpenCV library, while the AI models are developed using TensorFlow and Keras deep learning frameworks. The system is programmed in Python, and the user interface is developed using web technologies such as HTML, CSS, and JavaScript
- Deployed on GitHub pages via GitHub Actions.

Real-time Traffic Monitoring using Event Camera-based Vision

- This research project aims to develop a real-time traffic monitoring system using an event camera-based vision system. The system includes vehicle detection, tracking, and trajectory prediction along with the detection and tracking of other traffic participants such as pedestrians, wheelchair users, and micro-mobility devices. The event camera-based vision system offers several advantages over traditional cameras, including high dynamic range, low latency, and low power consumption. The system is designed to operate in challenging lighting conditions and can capture fast-moving objects with high accuracy.
- The system is developed using an event camera-based vision system, which captures changes in pixel intensity instead of capturing a sequence of frames. The captured data is processed using state-of-the-art computer vision algorithms and machine learning techniques, including deep learning models for object detection, tracking, and trajectory prediction. The system is programmed in Python and is built on top of the PyTorch and TensorFlow frameworks.

IMU Sensor based Human Motion Synthesis Framework

- A GUI-based application system to interactively author realistic human motion, kinetically edit sensed motion data, and motion reconstruction using 3D humanoid models.
- Development Environment: C++, Qt, VTK, Xsens Awinda IMU sensors.
- Deployed on GitHub pages via GitHub Actions.

Design and Development of an Open-Source Tool for HumanMotion Analysis

- A Visual means to represent human motion as trajectory over a 3D-Sphere and human motion decomposition.
- Development Environment: C++, OpenGL, VTK, Xsens Awinda IMU sensors, and Perception Neuron
- Deployed on GitHub pages via GitHub Actions.

Pilot Experiment on Quaternion-Based 3D Gesture Tracking

- An Intuitive means to represent human motion as equirectangular projection over a 2D plane using UV-mapping technique.

- Development Environment: C++, VTK, and Xsens Awinda IMU sensors
- Deployed on GitHub pages via GitHub Actions.

An Open-Source Platform for Human Pose Estimation

- Heterogeneous Multi-Sensor system for pose tracking and estimation.
- Development Environment: C++, VTK, and Xsens Awinda IMU sensors, Ouster OS1 Lidar
- Deployed on GitHub pages via GitHub Actions.

Technical Skills

Languages	:	C, C++, Java, Python, PHP, HTML, CSS
SDK's/API's	:	Qt, Autodesk, VTK
Tools	:	Tableau, Tableau Prep Builder, 3ds Max Biped Animation
Databases	:	MySQL
Sensing Systems	:	EVK 4 HD event camera, Optitrack MoCAP, Xsens MTw Awinda MoCAP, Perception Neuron MoCAP
Dev Tools	:	Visual Studio, Git, Gitlab, Colab

Publications

Journal Articles

- B. Chakravarthi, A. K. Patil, J. Y. Ryu, A. Balasubramanyam and Y. H. Chai, 2022, "Scenario-based Sensed Human Motion Editing and Validation through the Motion-Sphere," in IEEE Access.
- Ryu, J., Patil, A.K., Chakravarthi, B., Balasubramanyam, A., Park, S. and Chai, Y., 2022. Angular features-based human action recognition system for a real application with subtle unit actions. IEEE Access.
- Ryu, J.Y., Chakravarthi, B., Balasubramanyam, A., Patil, A.K. and Chai, Y.H., 2021. Motion Data Editing and Augmentation Method by Using the Motion-Sphere's Trajectory. Moving Image Technology (MINT), 1(1), pp.10-14.
- Patil, A.K., Balasubramanyam, A., Ryu, J.Y., Chakravarthi, B. and Chai, Y.H., 2021. An Open-Source Platform for Human Pose Estimation and Tracking Using a Heterogeneous Multi - Sensor System. Sensors, 21(7), p.2340.
- Patil, A.K., Balasubramanyam, A., Ryu, J.Y., Chakravarthi, B. and Chai, Y.H., 2020. Fusion of Multiple Lidars and Inertial Sensors for the Real-Time Pose Tracking of Human Motion. Sensors, 20(18), p.5342
- Balasubramanyam, A., Patil, A.K., Chakravarthi, B., Ryu, J.Y. and Chai, Y.H., 2020. Motion-Sphere: Visual Representation of the Subtle Motion of Human Joints. Applied Sciences, 10(18), p.6462.
- Bharatesh Chakravarthi S. B., Prof. D. Jayaramaiah, 2013, Seamless Interoperability Across LTE And WiMAX Using Vertical Handover Mechanism, International Journal of Engineering Research Technology (IJERT) Volume 02, Issue 06 (June 2013)

Conference Proceedings

- Chakravarthi, B., Prasad, B.P., Chethana, B. and Kumar, B.P., 2022, July. Real-time Human Motion Tracking and Reconstruction using IMU Sensors. In 2022 International Conference on Electrical, Computer and Energy Technologies (ICECET) (pp. 1-5). IEEE.
- Balasubramanyam, A., Patil, A.K., Chakravarthi, B., Ryu, J. and Chai, Y.H., 2021, October. Kinematically Admissible Editing of the Measured Sensor Motion Data for Virtual Reconstruction of Plausible Human Movements. In 2021 IEEE International Conference on Systems, Man, and Cybernetics (SMC) (pp. 283-288). IEEE
- Chakravarthi, B., Patil, A.K., Balasubramanyam, A., Ryu, J.Y. and Chai, Y.H., 2020. Sensed Unit Motion based Authoring for the Precise Human Movements. Korean Society of Mechanical Engineers Spring Conference, 2020.12, pp 1242-1247
- Kim, D., Chakravarthi, B., Kim, S.H., Balasubramanyam, A., Chai, Y.H. and Patil, A.K., 2020, March. MotionNote: A Novel Human Pose Representation. In 2020 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW) (pp. 697-698). IEEE
- Young Ho Chai Jae Yeong Ryu, Adithya Balasubramanyam, Ashok Kumar Patil, Bharatesh Chakravarthi, 2020, Dynamic Gesture recognition System for Human-Machine Interface based on the Motion-sphere Trajectory. Spring and Autumn Conference of the Korean Society of Mechanical Engineers.
- Chakravarthi, B, Joseph, M., Shuai, C., Kim, S.H. and Chai, Y.H., 2019. Quaternions Based Intuitive Visualization for Tracking Weightlifting Exercises. The Korean Institute of Information Scientists and Engineers,2019, pp.1052-1054
- Patil, A.K., Chakravarthi, B., Kim, S.H., Balasubramanyam, A., Ryu, J.Y. and Chai, Y.H., 2019. Pilot Experiment of a 2D Trajectory Representation of Quaternion-Based 3D Gesture Tracking
- Lohith, J.J. and Chakravarthi, B., 2015 , June. Intensifying the lifetime of Wireless Sensor Network using a centralized energy accumulator node with RF energy transmission. In 2015 IEEE International Advance Computing Conference (IACC) (pp. 180-184). IEEE

Peer Reviews

- MDPI - Sensors, Applied Sciences, Sustainability, Applied System Innovation, Vehicles, AI,Processes, Remote Sensing, Electronics, Energies, Machines,
- Elsevier - ISPRS Journal of Photogrammetry and Remote Sensing;
- Springer Nature - BMC Musculoskeletal Disorders
- IEEE - Access, Robotics and Automation
- Taylor Francis - The Imaging Science Journal
- IEEE Conferences - IEEE ICRAIE 2022, IEEE SMC 2022, ICECCME 2021
- ACM Conferences - CHI 2023, VRST 2022, VRST 2021
- AAAI - 23
- ICLR - 23

Invited Talks

- Blockchain IoT Integration - Recent Trends and Futuristic Applications, Collaboration with the Indian Society for Technical Education (ISTE), Department of Computer Science and Engineering,BMS College of Engineering, Bangalore, Karnataka, India on 23rd and 24th March **2023**
- Human Pose Estimation - A Fascinating Aspect of Computer Vision, The Research, Innovation and Consultancy Committee of the IT Department, College of Computing and Information Sciences, University of Technology and Applied Sciences - Ibri Sultanate of Oman on 10th November **2022**
- Blockchain and Internet of Things, AICTE Training and Learning (ATAL) Academy Sponsored Faculty Development Program, organized by Department of Computer Science and Engineering, UIT-RGPV, Bhopal, Madhya Pradesh, India on 31st July **2021**
- Blockchain of Things, AICTE Training and Learning (ATAL) Academy Sponsored Faculty Development Program, organized by Department of Computer Science and Engineering, BNMIT, Bengaluru, Karnataka, India on 18th January **2021**
- Challenges and Research Directions for Blockchains, AICTE Sponsored Faculty Development Program, organized by Department of Computer Science and Engineering, Sona College of Technology, Salem, Tamilnadu, India on 10th February **2021**
- Human Computer Interaction in Virtual Environments, Faculty Development Program, organized by Department of Computer Science and Information Science Engineering, R R Institute of Technology, Bengaluru, Karnataka, India on 17th August **2021**
- Mobile App Development using Android Studio - Hands-on Session, Indian Society For Technical Education sponsored Student Development Program, organized by Department of Computer Science and Engineering, Sri Venkateshwara College of Engineering, Bengaluru, Karnataka, India on 24th Febraury **2018**
- IoT and its Applications, Student Development Program, organized by Department of Computer Applications, Dr. Ambedkar Institute of Technology, Bengaluru, Karnataka, India on 1st March **2017**.
- Opportunities in the field of IoT, Technical Education Quality Improvement Programme of Government of India Sponsored Student Development Program, organized by Department of Computer Science and Engineering, BMS College of Engineering, Bengaluru, Karnataka, India on 6th March **2017**.
- Programming and Application Development using Python, Student Development Program Organized by Department of Computer Applications., Sir MVIT, Bengaluru, Karnataka, India on 11th March **2017**.

Certifications

- Google Data Analytics Professional Certificate, Course certification authorized by Google®and Coursera - 2022
- Python Programming, Course certification authorized by University of michigan and Coursera. - 2021
- First Step korean and learn to Speak korean 1, Course certification authorized by Yonsei University and Coursera - 2021
- Advanced Android Development and Designing Thinking, Certification authorized by Google® - 2018
- Android Fundamentals Faculty Training, Certification authorized by Koenig Solutions Ltd and Google®. - 2018
- IntelHPCCodeModernization, Certification authorized by Center for Development of Advanced Computing®. - 2018
- Faculty Enablement Program (FEP) on Foundation Program 4.0, Certification authorized by Infosys Limited® - 2014
- Microsoft Faculty Fellow, Certification authorized by Microsoft® and CITech - 2014

Awards, Achievements and Funding

Achievements

- Convener, “Graphics Day 2017”, An Intercollegiate Project Exhibition, Bengaluru, India - 2018
- Co-Convener, Faculty Development Program on “OOP with Java for DAA lab and ARM Programming”, Bengaluru, India. - 2017
- Convener, 5th National Conference on Emerging Trends in Engineering Technologies (ETET-2016), Bengaluru, India - 2016

Student Collaborations and Award

- 1st Place, Project Exhibition, The 10th Annual Conference of Karnataka Science and Technology. Academy held at REVA University - 2018
- 2nd Place, Project Exhibition, State level Engineering Project Exhibition held at BGS Institute of Technology - 2018
- Certificate ofMerit, Project Exhibition, Unisys Cloud 20/20 V8 - 2017
- Best Project, Project Exhibition, “TECH-STORM 2016” organized at GSSSET in association with IETE - 2016
- Certificate ofMerit, Project Exhibition, Unisys Cloud 20/20 V7 - 2016

Funding

- ORKG Curation Grants 2022, Research fund awarded under 2nd ORKG Curation Grant Competition from TIB Leibniz Information Centre for Science and Technology, Hannover, Germany. Fund awarded: 2400 EUR, Duration: June 2022 to November 2022
- VTU, Financial Assistance sanctioned by the Visvesvaraya Technological University (VTU) for a project entitled “An IoT Based Smart Trash Bin and Automated Garbage Monitoring System for Smart Cities in India” - 2018
- KSCST, Project Funding Sanctioned under the 41st series of student project programme: 2017-18 (41st Series of SPP), from Karnataka State Council for Science and Technology. Project Title - “An IoT Based Smart Trash Bin and Automated Garbage Monitoring System for Smart Cities in India” - 2017

Schoarship

- Chung Ang University, Won a scholarship (300,000 KRW) to Chung Ang University, being at Department of Imaging Science and Arts in the Graduate School of Advanced Imaging Science, Multimedia and Film - 2021
- Chung Ang University, Won a scholarship (5,538,000 KRW) to Chung Ang University, being at Department of Imaging Science and Arts in the Graduate School of Advanced Imaging Science, Multimedia and Film - 2020
- Chung Ang University, Won a scholarship (13,252,440 KRW) to Chung Ang University, being at Department of Imaging Science and Arts in the Graduate School of Advanced Imaging Science,Multimedia and Film - 2019
- Chung Ang University, Won a scholarship (7,650,000 KRW) to Chung Ang University, being at Department of Imaging Science and Arts in the Graduate School of Advanced Imaging Science,Multimedia and Film - 2018

Courses of Interest for Teaching

Teaching Porfolio

Programming	:	Data structures using C++, Java, and Python, Web-based languages - JavaScript, PHP, HTML, CSS.
Data Analytics	:	Data Visualization using Tableau, Data Analysis with R Programming
Machine Learning	:	Neural Networks, Support Vector Machines
Virtual Reality	:	3D Models, 3D Interaction, AR/VR/MR/XR Technologies and Applications
Networks/Database		Data Communication, Computer Networks, IoT, WSN, Blockchain, Smart Contracts, Dapps, Blockchain platforms
Computer Graphics	:	Interactive Computer Graphics with WebGL, OpenGL, Visualization Toolkit (VTK)
Software Engineering	:	Data Science for Software Engineering, Software Analysis and Design, HCI Design Principles, Software Enterprise

Professional Body Membership

ISTE	:	International Society for Technology in Education - Lifetime member
CSI	:	Computer Society of India - Lifetime member.

Personal Information

Name	:	Bharatesh Chakravarthi
Date of Birth	:	1989-05-05
Nationality	:	Indian
Passport Status	:	Valid until 2031
Marital Status	:	Married
Languages Status	:	English, Kannada, Korean (elementary)
Current Residence	:	Arizona, USA
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