DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Biomechanics and Vision Computing Research Center

BIOMECHANICS AND VISION COMPUTING RESEARCH CENTER

OBJECTIVES

1. To develop state-of-the-art algorithms and tools integrating biomechanics and vision computing for applications in healthcare, sports performance analysis, assistive technologies, and human motion understanding.

2. To create a multidisciplinary platform that unites experts from biomechanics, computer vision, and artificial intelligence, facilitating partnerships with academic, industrial, and healthcare organizations to drive impactful research and innovation.

KEY RESEARCH AREAS

1. Biomechanics: Investigating the mechanical behavior of biological systems such as the human body, animals, and plants. Research topics may include the study of muscle function, joint mechanics, gait analysis, and the impact of forces on biological tissues.

2. Vision Computing: Focusing on computer vision, image processing, and machine learning techniques to process, analyze, and interpret visual information. This can include applications like object recognition, image segmentation, and 3D reconstruction.

BIOMECHANICS AND VISION COMPUTING RESEARCH CENTER

ABOUT THE RESEARCH CENTER

The Biomechanics and Vision Computing Research Center is an interdisciplinary research center dedicated to advancing our understanding of biomechanics and vision computing through scientific investigation and technological innovation. The center brings together experts from various fields, including biomechanics, computer science, engineering, and vision sciences, to collaborate on cutting-edge projects that have far-reaching implications for healthcare, robotics, computer vision, and more. This lab was established in 2016 with funding from DST.

VISION

To lead ground-breaking research at the intersection of biomechanics and vision computing, empowering innovative solutions that enhance human well-being, improve healthcare outcomes, and advance technological applications in biomechanics and computer vision.

MISSION

Conduct cutting-edge research in biomechanics and vision computing to address real-world challenges in healthcare, rehabilitation, and human-computer interaction. Foster interdisciplinary collaboration among experts in computer vision, biomechanics, artificial intelligence, and engineering to develop impactful technologies. Promote the translation of research findings into practical applications that benefit society and industry. Build global partnerships to advance knowledge and drive innovation in biomechanics and vision computing.

EQUIPMENT DETAILS

HIGH-PERFORMANCE COMPUTER

- HP super computer, 2016

MOTION CAPTURE TECHNOLOGY

- Vicon Vero v2.2
- 2.2 Megapixel optical camera @ 330 FPS at full frame & featuring avarifocal lens (6 to 12mm) and IR strobe. – 2016
- Vicon Vue video camera
- Colour reference video camera, 60 FPS, 1980 x 1080p (window to 1280 x 720p @ 120FPS) with 6-12mm lens
- Vicon Camera Cable - 30 m
- 30 m Vicon Camera cable with Ferrite For use with Vantage, Vero, Vue & Bonita cameras.
- Vicon Active Wand IR and Vicon Active 5-Point Calibration Wand with IR and VR LEDs for calibration of optical cameras and required for reference video, if applicable
- Dell Precision Tower 5810 CTO Base Dell Precision T5810 685W
- Chassis Intel Xeon Processor E5-1620 v3 (Four Core HT, 3.5 GHz
- Turbo, 10 MB), 16GB (4x4GB) 2133MHz DDR4 ECC RDIMM 2 x 2TB
- 3.5inch Serial ATA (7,200 Rpm) Hard Drive Non RAID 8x Slimline
- DVD+/-RW Drive 2 GB NVIDIA Quadro K620 (DP, DL-DVI-I) (1DP to SL-DVI adapter) Dell Optical (Not Wireless)
- Large PC Monitor
- Dell U2312HM 23″ Monitor with LED UltraSharp VGA,DVI,DP (1920x1080)
- Basic Life Science Accessory KitIncludes 50x 9.5mm hard markers on plastic bases, 50x 14mm hard markers on plastic bases, 2 rolls of double sided tape, 5 rolls of Micropore tape, scissors & Seca measuring tape for circumferences in a black plastic case
- Extended Life Science Accessory Kit Extended Life Science Accessory Kit Consisting of 2 x head bands, 4 x wristbands, 4 x 100mm wrist bars, 8 x base pads for marker wands, 8 x mobile joint packs, 8 x fixed joint pack, 1 x 385mm bar, 8 x threaded inserts for the tubing and a pair of callipers
- Vicon Nexus 2.0 Network

SURVEILLANCE VIDEO SYSTEM

- 2.2 Mega pixel Video cameras with DVR

SERVER CLASS COMPUTER FOR HIGH PERFORMANCE COMPUTING

- 16 GB DDR 4 RAM, 8 GB NVIDIA Graphics Card (A-4000 Series), 512 GB SSD, i7 Intel Processor, 1TB Hard Drive

Biomechanics and Vision Computing Research Center

OUR TEAM

Dr. P.V.V.Kishore,
Professor in ECE, Professor
Incharge – BVCRC

Dr. A.S.C.S.Sastry,
Professor in ECE, Principal
Advisor – BVCRC

Dr. N.Venkatram,
Professor of ECE,
Pro-Vice-chancellor, KLEF

Dr. M.Suman,
Professor of ECE, HOD – ECE

Dr. E.Kiran Kumar,
Associate Professor,
3D Mocap Modelling

Dr. MVD. Prasad
Associate Professor,
Computer Vision

Dr. Ch.Raghava Prasad,
Associate Professor,
Computer Vision

Biomechanics and Vision Computing Research Center

OUR COLLABORATORS

Dr.M.Anil Kumar
Associate Professor of ECE,
PACE Engineering College,
Ongole, AP

Dr.M.Teja Kiran Kumar
Principal Computer Vision
Expert, Grid Dynamics
Pvt. Limited, Hyderabad

Dr. K. Sravya
Assistant Professor,
Fairborn, Ohio, United States

Dr. Srikanth Vasamsetti
Computational Instrumentation,
CSIR-CSIO, Chandigarh, India

Darshika G. Perera
Department of Electrical and
Computer Engineering
Colorado, USA

Hamzah Luqman
Associate professor,
Research Center for AI,
King Fahd University of
Petroleum & Minerals

SCHOLARS INFORMATION

Ph.D's Awarded

Name of the Scholar	Thesis Title
M. V.D. Prasad	Continuous sign language recognition under versitile camera models with machine learning
Ch. Raghava Prasad	Computer Vision Based Train Rolling Stock Examination
K. V.V. Kumar	Human Action Recognition on Unconstrained Indian Classical Dance Videos
G. Anantha Rao	Selfi Sign Language Recognition - A Mobile Based Model
E. Kiran Kumar	Visual Verbal Machine Interpreter Fostering Hearing Impaired and Elderly
N. Sasikala	Train Rolling Stock Examination Assistant: A Computer Vision Approach to Manual Rolling Stock Examination
P. Aparna	Medical Image Watermarking :A Biometric Image Encrypted Security Schema
D. Sri Hari	RGB D Human Action Recogntion An Ensemble of Deep Learning Approaches
M. Teja Kiran Kumar	Human action recognition using 3D Mocap technology and solving 3D geometrical relations
D. Anil Kumar	Graph Matching in 3D domain for Sign Language Recognition.
Asraf Ali	3D multi view sign language recognition with deep networks.
P. Sunita	Multi View Video based SLR with Deep CNN models.
Sunita Ravi	Vision models for Sign language recognition.
K. Krishna Mohan	Deep Networks for Train Rolling stock Examination on video data.

Scholars Working

Regd. No.	Name
2302040004	Vasana Prathyusha
2002041040	Ganta Naga Sandhya Devi
2102041003	Babitha lokula Lokula

Biomechanics and Vision Computing Research Center

HIGHLIGHTS OF RESEARCH CENTRE WORKS

Development of state-of-the-art tools for analyzing human motion, focusing on sports performance optimization, rehabilitation, and injury prevention.

Human-Computer Interaction: Creation of intuitive systems leveraging vision computing and biomechanics for assistive technologies, including gesture recognition and motion-controlled interfaces.

Healthcare Innovations: Research into biomechanical modeling and vision-based diagnostics to improve patient care in areas such as orthopedics, neurology, and physical therapy.

AI-Powered Vision Systems: Integration of artificial intelligence and deep learning with biomechanics to enhance the accuracy of motion tracking and recognition systems.

Partnerships with academic institutions, industry leaders, and healthcare organizations to translate research findings into impactful, real-world solutions.

SDG GOALS RELATED PUBLICATIONS

Goal	Documents	Goal	Documents
Goal 3: Good health and well-being	2 documents	Goal 11: Sustainable cities and communities	2 documents
Goal 6: Clean water and sanitation	2 documents	Goal 14: Life below water	1 document
Goal 9: Industry, innovation and infrastructure	2 documents	Goal 17: Partnership for the goals	7 documents

PROJECTS – SPONSORED, AGENCIES

Projects Completed

Name of the Project	Sponsoring Agency	Duration	Amount Spent
Creating Indian Classical Dance Gestures in 3D using Mocap	DST/TIDE	3 Years	Rs.62,50000
DeepExtreme: A Deep Learning Model Design for Extreme Weather Prediction	KLEF/Internal Funding	1 Year	Rs.3,93,250

Ongoing Projects

Name of the Project	Sponsoring Agency	Duration	Amount Spent
Investigation of the spatiotemporal variability of thunderstorms from ground-based and geostationary satellite data using Deep-Learning techniques	Science & Engineering Research Board (SERB) CRG/2022/006514	3 Years	Rs.21,23,156

COLLABORATIVE PUBLICATIONS

- P. V. V. Kishore, R. Rahul, K. Sravya and A. S. C. S. Sastry, "Crowd Density Analysis and tracking," 2015 International Conference on Advances in Computing, Communications and Informatics (ICACCI), Kochi, India, 2015, pp. 1209-1213, doi: 10.1109/ICACCI.2015.7275777.

- P. V. V. Kishore, D. G. Perera, M. T. K. Kumar, D. A. Kumar and E. K. Kumar, "A Quad Joint Relational Feature for 3D Skeletal Action Recognition with Circular CNNs," 2020 IEEE International Symposium on Circuits and Systems (ISCAS), Seville, Spain, 2020, pp. 1-5, doi: 10.1109/ISCAS45731.2020.9180732.

- E. N. D. Goutham, S. Vasamsetti, P. V. V. Kishore and H. K. Sardana, "AUTOMATIC LOCALIZATION OF LANDMARKS IN CEPHALOMETRIC IMAGES Via MODIFIED U-Net," 2019 10th International Conference on Computing, Communication and Networking Technologies (ICCCNT), Kanpur, India, 2019, pp. 1-6, doi: 10.1109/ICCCNT45670.2019.8944411.

- P. Rayi, M. V. S. Prasad and P. V. V. Kishore, "Modelling, simulation of multi-user grouping considering channel states in MIMO systems," 2015 International Conference on Signal Processing and Communication Engineering Systems, Guntur, India, 2015, pp. 231-235, doi: 10.1109/SPACES.2015.7058254.

- P. S. Kiran, D. A. Kumar, P. V. V. Kishore, E. K. Kumar, M. T. K. Kumar and A. S. C. S. Sastry, "Investigation of 3-D Relational Geometric Features for Kernel-Based 3-D Sign Language Recognition," 2019 IEEE International Conference on Intelligent Systems and Green Technology (ICISGT), Visakhapatnam, India, 2019, pp. 31-313, doi: 10.1109/ICISGT44072.2019.00022.

- D. A. Kumar, P. V. V. Kishore, G. V. K. Murthy, T. R. Chaitanya and S. Subhani, "View Invariant Human Action Recognition using Surface Maps via convolutional networks," 2023 International Conference on Research Methodologies in Knowledge Management, Artificial Intelligence and Telecommunication Engineering (RMKMATE), Chennai, India, 2023, pp. 1-5, doi: 10.1109/RMKMATE59243.2023.10369954.

PATENTS

- iDance Tutor: A 3D Digital Indian Classical Dance Motion Capture Tool. Patent Application Number: 202241037200. Date of Filing: 02-07-2022.

- VOCALSIGNS: API FOR INDIAN SIGN LANGUAGE TRANSLATION. Patent Application Number: 202441030963. Date of Filing: 26-05-2024.

CONSULTANCY

Name of the Project	Sponsoring Agency	Duration	Amount Spent
Creating Indian Classical Dance Gestures in 3D using Mocap Annotating and Organizing Indian classical dance gestures	PACE engineering College for DST funded SRG Project.	1 Year	Rs.44,100
Data Annotation and Model Development from Video Data	HyperTune Technologies and Yantri Siksha Tech Pvt. Ltd.		Rs.42,000
AI Models for Unstructured Data Analytics	HyperTune Technologies and Yantri Siksha Tech Pvt. Ltd.		Rs.25,000

PROMINENT PUBLICATIONS

- P. V. V. Kishore, D. Anil Kumar, R. C. Tanguturi, K. Srinivasarao, P. Praveen Kumar and D. Srihari, "Corrections to "Joint Motion Affinity Maps (JMAM) and Their Impact on Deep Learning Models for 3D Sign Language Recognition"," in IEEE Access, vol. 12, pp. 162929-162929, 2024, doi: 10.1109/ACCESS.2024.3486412.

- P. V. V. Kishore, D. A. Kumar, P. P. Kumar, D. Srihari, N. Sasikala and L. Divyasree, "Machine Interpretation of Ballet Dance: Alternating Wavelet Spatial and Channel Attention Based Learning Model," in IEEE Access, vol. 12, pp. 55264-55280, 2024, doi: 10.1109/ACCESS.2024.3390004.

- Kumar, D.A., Kishore, P.V.V. & Sravani, K. Deep Bharatanatyam pose recognition: a wavelet multi head progressive attention. Pattern Anal Applic 27, 53 (2024). https://doi.org/10.1007/s10044-024-01273-0.

- Kumar, Anil, P. V. V. Kishore, T. R. Chaithanya, and K. Sravani. "Multi frame multi-head attention learning on deep features for recognizing Indian classical dance poses." Journal of Visual Communication and Image Representation 99 (2024): 104091.

- M. T. K. Kumar et al., "Can Skeletal Joint Positional Ordering Influence Action Recognition on Spectrally Graded CNNs: A Perspective on Achieving Joint Order Independent Learning," in IEEE Access, vol. 9, pp. 139611-139626, 2021, doi: 10.1109/ACCESS.2021.3119455.

- D. A. Kumar, A. S. C. S. Sastry, P. V. V. Kishore, E. K. Kumar and M. T. K. Kumar, "S3DRGF: Spatial 3-D Relational Geometric Features for 3-D Sign Language Representation and Recognition," in IEEE Signal Processing Letters, vol. 26, no. 1, pp. 169-173, Jan. 2019, doi: 10.1109/LSP.2018.2883864.

- T. K. K. Maddala, P. V. V. Kishore, K. K. Eepuri and A. K. Dande, "YogaNet: 3-D Yoga Asana Recognition Using Joint Angular Displacement Maps With ConvNets," in IEEE Transactions on Multimedia, vol. 21, no. 10, pp. 2492-2503, Oct. 2019, doi: 10.1109/TMM.2019.2904880.

- E. K. Kumar, P. V. V. Kishore, M. T. K. Kumar, D. A. Kumar and A. S. C. S. Sastry, "Three-Dimensional Sign Language Recognition With Angular Velocity Maps and Connived Feature ResNet," in IEEE Signal Processing Letters, vol. 25, no. 12, pp. 1860-1864, Dec. 2018, doi: 10.1109/LSP.2018.2877891.

- P. V. V. Kishore, D. A. Kumar, A. S. C. S. Sastry and E. K. Kumar, "Motionlets Matching With Adaptive Kernels for 3-D Indian Sign Language Recognition," in IEEE Sensors Journal, vol. 18, no. 8, pp. 3327-3337, 15 April15, 2018, doi: 10.1109/JSEN.2018.2810449.

ANY OTHER INFORMATION

The future of the Biomechanics and Vision Computing Research Center is anchored in driving innovation, fostering interdisciplinary collaboration, and delivering transformative solutions that redefine human-machine interactions and healthcare technologies.

Datasets Available With The Lab

- 3D Sign Language Dataset
- 2D RGB D Sign Language Dataset
- 2D RGB D Human Action Dataset
- 3D Action Dataset
- 3D Yoga Action Dataset
- High Speed Video Train Rolling Dataset
- 2D RGB Video Sign Language Dataset
- 2D Continuous Video Sign Language Dataset.
- 2D Indian Classical Dance Video Dataset.
- 3D RGB D Indian Classical Dance Dataset

22 RANK
AMONG ALL UNIVERSITIES IN INDIA

35 RANK
AMONG ALL ENGINEERING COLLEGES IN INDIA

40 RANK
OVER ALL RANKING IN INDIA

79 RANK
AMONG ALL MANAGEMENT INSTITUTES IN INDIA

KL (DEEMED TO BE UNIVERSITY)

CATEGORY 1 UNIVERSITY BY MHRD, Govt. of India

KL ACCREDITED BY **NAAC** WITH **A++** GRADE

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