Shahid Shabeer Malik

My Portfolio LinkedIn E-mail: shahid.malik@slu.edu

RESEARCH STATEMENT

My research focuses on event-driven vision systems using neuromorphic sensors for real-time perception in robotics and autonomous systems. I work on 3D reconstruction, Structure from Motion, and SLAM with event cameras, optimizing them for dynamic and low-light environments. I also design neural networks for event-based vision. My work involves sensor fusion, integrating event cameras with RGB cameras, IMUs, and polarization cameras to improve perception and scene understanding. By combining event-based vision with robotics, I aim to develop intelligent, adaptive systems for real-time decision-making in complex environments.

EDUCATION

Saint Louis University, Saint Louis, Missouri, United States of America
Ph.D. Computer Science (September 2023- Present)

Jamia Hamdard University, New Delhi, India
B.Tech. Computer Science and Engineering (August 2020- July 2023)

Jamia Millia Islamia University, New Delhi, India
Diploma in Computer Engineering (August 2017- May 2020)

WORK EXPERIENCE

Department of Computer Science, Saint Louis University
Research Assistant in SLUAIR Lab ***May.2023- Present***

- Extensive experience in 3D Computer Vision, with a focus on event cameras and their applications in space environments and Wide Area Motion Imagery (WAMI). Led projects using Structure from Motion (SfM) techniques for satellite pose estimation with event camera data (SEENIC dataset), combined with Multi-View Stereo (MVS) and Gaussian Splatting for 3D dense reconstruction. Demonstrated the advantages of event cameras in space environments with challenging lighting conditions and explored the role of feature extraction algorithms in SfM using event-to-frame reconstruction methods (E2VID, FireNet, ETNet, HyperE2VID).
- Involved in simulating event cameras and other sensors in Carla, Unreal Engine, with recent work integrating real event data captured via the DOOSAN robotic arm, EVK 4 HD camera, and other sensors in ROS.
- Investigating whether an event camera with a rotating polarization lens can outperform a traditional polarization camera by incorporating an additional dimension of angles to enhance event-based vision systems.

Department of Computer Science, Saint Louis University
Teaching Assistant for Deep Learning and Applied Machine Learning ***Sept.2023- May 2024***

- I served as a teaching assistant for a Deep Learning course, where I guided students in troubleshooting their convolutional neural networks (CNNs) and taught them fundamental deep learning concepts. Additionally, I assisted my professor in designing assignments and grading student work.
- In the Applied Machine Learning course, I provided support to students by troubleshooting their code and teaching key concepts such as regression, classification, and clustering.

Indian Institute of Information Technology Nagpur, Maharashtra, India
Summer Undergraduate Research Intern ***June, 2022- August, 2022***

- Research intern under the guidance of Dr. Jitendra V. Tembhurne, Head of the Department & Assistant Professor of the Department of Computer Science and Engineering, Indian Institute of Information Technology, Nagpur.
- Performed critical analysis of different skin cancer detection models like ABCD algorithm, Federated Machine Learning approach and different Convolutional Neural Networks like InceptionV3 and ResNet50, AlexNet on datasets like ISIC 2020, PH2, and HAM10000.
- Performed skin lesion segmentation using Otsu thresholding, active contour and K-means clustering algorithm on PH2 dataset.
- Concluded that Otsu's method outperformed the other two techniques in terms of Intersection over Union and F1 score of **0.802961371** and **0.884495534** respectively**.**

Evision Technoserve Pvt. Ltd (Noida India)
Summer Intern ***(12 July, 2019- 27 August, 2019)***
Summer Internship Intern in Amazon Web Services Cloud Technology Training from Evision Technoserve Pvt. Ltd.

- Learned concept of AWS cloud, cloud storage, types of cloud services, deployment models, AWS products, AWS management console.
- Deployed websites using AWS and used Auto Scaling and Load Balancer.

PROJECTS

Leveraging Rotating Polarizer Lenses for Event Generation in Event Cameras **(Dec 2024-Present)**

Research focuses on integrating rotating polarizers with event cameras to enhance event-based vision, improving perception of specular, transparent, and texture-less surfaces. Exploring the impact of polarizer rotation on event density, feature extraction, and 3D reconstruction while comparing performance against traditional polarization cameras.

Satellite Pose Estimation using event camera **(Jan 2024-Dec 2024)*)***

I have led research on satellite pose estimation using event cameras, developing novel 3D reconstruction methods optimized for space environments with challenging lighting conditions. By leveraging Structure from Motion (SfM) with event data, we integrated Multi-View Stereo (MVS) and Gaussian Splatting for dense 3D reconstruction. Our approach also evaluates feature extraction techniques within SfM for satellite images reconstructed from event data using models like E2VID, FireNet, ETNet, and HyperE2VID, demonstrating the advantages of event cameras for precise pose estimation and 3D modeling in space.

Flower petal count prediction using different pretrained CNNS like ResNet 50, VGGNet, etc. ***(Sep. 2023 – Nov 2023)***

I worked in the Computer Vision lab under the direction of Prof. Abby Stylianou on a project focused on counting the petals of flowers from raw images captured by an iPhone. I employed multiple pretrained CNNs to perform regression on the provided dataset, which included images and annotations of petal tip pixel locations. The models utilized basic CNN architectures with ReLU and Linear activations in the last two dense layers. ResNet50 yielded the best result.

Roomate4U ***(November 2021)***

- Founded Roomate4U, an online platform that acts as an interface between room owners and college students and provides accommodation services to students.
- Designed and developed this platform, after observing that students were facing a lot of problems while searching for rooms and roommates.
- Created using HTML5, CSS3, Java Script, Bootstrap, jQuery, Media- query, Ajax, PHP, and SQL.
- It provides services to hundreds of students of two universities: Jamia Millia Islamia and Jamia Hamdard University and has solved the problems of students by a great percentage.

PulseCheck

(Fall 2024)

Developed a web-based feedback platform using React, TypeScript and CSS as part of a Software Engineering course. The platform enables students to provide peer feedback while allowing instructors to monitor and assess the feedback process. Designed an intuitive UI and integrated real-time data handling to enhance collaboration and learning outcomes.

PUBLICATIONS

- **Shahid Shabeer Malik**, Maryam Moshrefizadeh, Omar Tahri, Xiaoli Bai, Erik Blasch, Vasit Sagan, Hadi AliAkbarpour. *"EvSat3D: Satellite Pose Estimation and 3D Reconstruction with Event Camera."* IEEE Access (In submission).
- **S.S. Malik**, A. Khan, Dr. Sapna Jain, "Roomate4U- An online platform that provides accommodation facilities to college students".
  I presented this research paper in the International Conference on ICT for sustainable development in Goa, India.

published in the book series "ICT Systems and Sustainability" of Springer Nature.

- **Shahid Shabeer Malik**, "Skin Lesion Segmentation using Active Contour, Otsu's Thresholding and K-Means Clustering: A comparative Analysis" (Conditionally accepted for publication in IEEE Xplore).
- **Shahid Shabeer Malik**, Aneeque Khan, "Anxiety, Depression and Stress prediction among college students using Machine Learning Algorithms" (Published at IEEE Xplore).

PRESENTATION

Presented a poster titled *"3D Satellite Pose Estimation and Reconstruction with Neuromorphic Cameras."* Midwest Computer Vision Workshop, Indiana University Bloomington, September 16-17, 2024. *(Poster Presentation)*

LANGUAGES & TECHNOLOGIES

ROS, PyTorch, C++, Python, Java, OpenCv, TensorFlow, Keras, scikit-learn, OpenCV, Linux, Docker C, HTML5, CSS3, PHP, JavaScript, React, NodeJs, SQL, jQuery, Bootstrap3, MATLAB, UNREAL Engine, Carla Simulation.

AWARDS AND CERTIFICATES

- Best creative presentation award in Principles of Software Development Course in Saint Louis University (Spring 2024).

SERVICES & ACTIVITES

- Wrote articles and write-ups to national and international magazines and newspapers like Greater Kashmir, Brighter Kashmir, Inverse Journal, Asnaav, Rather Quiet and Daily Country News.
- Worked as a Joint Secretary of Computer Society of India, Jamia Hamdard Student branch, member of ECO Club.