Krishanu Saini

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Objective

Artificial Intelligence and Machine Learning have emerged as indispensable tools, driving innovation across a wide spectrum of multidisciplinary applications. I aim to deepen my expertise and explore the transformative impact of AI in addressing real-world challenges. My current research interests lie in Computer Vision, Autonomous Systems, Medical Imaging, and Generative AI.

Education

- **Indian Institute of Technology Indore** *Jul 2019 - Jun 2023*
  Bachelor of Technology in Computer Science and Engineering (Roll No: 190001029) Indore, India
  - CPI: 9.81/10.00
  - Key courses: Computational Intelligence, Machine Learning, Optimization Algorithms and Techniques, Computer Vision.
  - Bachelors Thesis: Video Anomaly Detection using GAN
- **Delhi Public School R.K Puram** *Jun 2017 - Jun 2019*
  High School, Science (Roll No: 9177168) Delhi, India
  - Percentage: 97.6%
  - Key courses: Mathematics and Computer Science
  - Obtained the Gold Medal for best performance in my school.

Research Experience

- **Anomaly Detection using Generative Adversarial Network** *Jan 2022 - Feb 2024*
  Supervisors: Prof. Aruna Tiwari Indian Institute of Technology Indore, and Dr. Sanjay Singh Council of Scientific & Industrial Research (CSIR)- Central Electronics Engineering Research Institute (CEERI), Pilani IIT Indore

  Automatic detection and interpretation of abnormal events have become crucial tasks in large-scale video surveillance systems. The challenges arise from the lack of a clear definition of abnormality, which restricts the usage of supervised methods. In this work, the main objectives are:

  - **Improved detection accuracy**: Accurately identifies anomalies in video data. [C.1]-[C.2]
  - **Real-time anomaly detection:** Real-time inference of video frames. [J.3]
  - **Model Scalability:** Ability to handle large volumes of video data. [J.4]
  - **Robustness to the Variability:** Robustness to variations in data and transmission noise [J.1].
  - **Reduced False positives:** Reduce the occurrence of unnecessary alerts and alarms. [J.2]

  Apart from training and testing the model on benchmark video anomaly detection datasets, we worked toward its deployment to detect anomalies in real time. Which we are collaborating with the local industry to provide solutions for detecting anomalies on highways and expressways in India, further realizing the model on hardware such as Nvidia Jetson Xavier and Pynq-Z2 (still in the exploring phase).

- **Image-to-Image translation using Generative Adversarial Network** *Jun 2023 - Feb 2024*
  Supervisors: Prof. Aruna Tiwari Indian Institute of Technology Indore, and Dr. Sanjay Singh Council of Scientific & Industrial Research (CSIR)- Central Electronics Engineering Research Institute (CEERI), Pilani IIT Indore

  Image-to-image style translation is a technique that transforms the style of an image while preserving its content. It has various applications in fields like computer graphics, medical imaging, and autonomous driving. In this work, the main objectives are:

  - **Conditional Generation:** Generated images conditioned on specific references or domain labels. [S.1]
  - **Cross-Domain Translation:** Bridged the gap between different visual domains, such as translating images between art styles, architectural designs, and natural landscapes.
  - **Multidomain Style Transfer:** Simultaneously blended multiple styles while preserving the original content.

  This research was started to find answers to questions like – Can image of a vehicle be translated to an completely unrelated domain such as a soccer ball? What is exactly the difference between style and content in an image?

Work Experience

- **Goldman Sachs** *Jul 2023 - present*
  Engineering Analyst Bengaluru, India
  - Functioned as an Engineering Analyst within the Compliance Division, spearheading initiatives to optimize compliance operations and accuracy in monitoring large volume of sensitive data.
  - Developed machine learning models for our content distribution compliance system, leveraging natural language processing (NLP) algorithms to detect regulatory disclosures and flag highrisk content.
- **Goldman Sachs** *May 2022 - Jul 2022*
  Summer Analyst Bengaluru, India
  - Designed and implemented a RESTbased scheduling feature for ETL pipelines on the data streaming platform. Leveraged for reducing 30+ hours on average per month to modify the configurations.
  - Developed user interface in React and Typescript to view the transformed data in a nested tabular format. Integrated CI/CD pipelines and deployed on Kubernetes.
  - Automated setup of 140+ data sources using Minimum AnomalyBased Selection of testing data
- **Newzera Tech Labs Private Limited** *Dec 2020 - Feb 2021*
  Software Internship remote
  - Gained experience in a fast-paced startup environment focused on AI applications in journalism.
  - Acquired proficiency in the AWS cloud platform and developing scalable systems.
  - Developed an Instagram-like conversation system enabling users to share content and create groups.
- **Freelance** *Jan 2023 - Jun 2023*
  AI and Software Strategist remote
  - **Toothlens:** Worked on generative models for predicting stages of orthodontic treatment.
  - **PineGap:** Worked as a consultant in the New York based startup developing an LLM for finance. Worked on knowledge graphs and regression testing of strategies.

Projects

- **GAN based Anomaly detection** *Jun 2022 - Dec 2022*
  Tools: Python, Tensorflow, Pytorch, Matlab, Matplotlib, OpenCV []
  - Explored optical-flow and RNN-based autoencoder networks to analyze object dynamics in video datasets.
  - Designed a Generative Adversarial Network (GAN) to model spatio-temporal features of normal and abnormal events.
  - Integrated a Channel-Attention (CA) module to enhance focus on foreground objects conditionally.
  - Achieved 4x faster computation by replacing LSTM with the Temporal Shift Module (TSM) in the 2D CNN layer.
  - Improved AUC/EER performance metrics by 3-5%.
  - Documented the methodology in a research paper published in Applied Intelligence (Springer).
- **SEC Filing Analyser for SAAS** *Feb 2022 - Mar 2022*
  Tools: Machine Learning, Data Analytics, GraphQL, ReactJS []
  - Conducted NLP-based sentiment analysis on extensive SEC 10-K/Q and 8-K filings for US-based SaaS firms.
  - Designed scalable data pipelines in Python to process gigabytes of data from the SEC Edgar database.
  - Implemented entity resolution to standardize financial ratios and KPIs across inconsistent schemas and labels.
  - Applied boosted regression models to predict investability scores, achieving 95% similarity with Zacks Rank.
- **Analysis of Data-dependent SVM Kernels** *Jan 2023 - Apr 2023*
  Tools: Machine Learning, classification problem, SVM []
  - Explored SVM kernel functions as part of the CS403 Machine Learning course project.
  - Created a novel two-class clock dataset and compared the performance of RBF, polynomial, and linear kernels.
  - Analyzed isolation kernels, a type of Data Dependent Kernel (DDK) that uses random forest as a distance function for computing the Gram matrix.
  - Investigated the unique properties of DDKs and their potential combination with Laplacian kernels using sampling and semi-supervised training for large datasets.
- **Parallel APSP Algorithm for Sparse Graphs** *Aug 2021 - Sept 2021*
  Tools: C++, Parallel Computing, Data Structures []
  - Developed a homogeneous communication-avoiding implementation of the parallel 2D Floyd-Warshall algorithm for the all-pairs shortest path problem.
  - Used divide and conquer and elimination tree techniques to reduce communication costs by 11.67% in solving sparse linear systems.
  - Achieved an average performance gain of 24% over the Blocked Floyd-Warshall algorithm for sparse graphs.

PUBLICATIONS

C=CONFERENCE, J=JOURNAL, S=ACCEPTED TO BE PUBLISHED

[J.1] Rituraj Singh, Anikeit Sethi, **Krishanu Saini**, et al. (2024). **Attention-guided generator with dual discriminator GAN for real-time video anomaly detection**. *Engineering Applications of Artificial Intelligence*, Vol. 131, pp. 107830. DOI: 10.1016/j.engappai.2023.107830

[J.2] Rituraj Singh, Anikeit Sethi, **Krishanu Saini**, et al. (2024). **CVAD-GAN: Constrained video anomaly detection via generative adversarial network**. *Image and Vision Computing*, Vol. 143, pp. 104950. DOI: 10.1016/j.imavis.2024.104950

[J.3] Rituraj Singh, Anikeit Sethi, **Krishanu Saini**, et al. (2024). **VALD-GAN: Video anomaly detection using latent discriminator augmented GAN**. *Signal, Image and Video Processing*, Vol. 18, pp. 821-831. DOI: 10.1007/s11760-023-02750-5

[J.4] Rituraj Singh, **Krishanu Saini**, Anikeit Sethi, et al. (2023). **STemGAN: Spatio-temporal generative adversarial network for video anomaly detection**. *Applied Intelligence*, Vol. 53, Issue 23, pp. 107830. DOI: 10.1007/s10489-023-04940-7

[C.1] Anikeit Sethi, **Krishanu Saini**, Rituraj Singh, et al. (2023). **Video Anomaly Latent Training GAN (VALT GAN): Enhancing Anomaly Detection Through Latent Space Mining**. In 2023 IEEE Symposium Series on Computational Intelligence (SSCI), pp. 573-578. IEEE Proceedings. Date: 2023/12/5. Location: Mexico City, Mexico. DOI: 10.1109/SSCI52147.2023.10371992

[C.2] Anikeit Sethi, **Krishanu Saini**, Rituraj Singh, et al. (2023). **MAAD-GAN: Memory-Augmented Attention-Based Discriminator GAN for Video Anomaly Detection**. In CVIP 2023: 8th International Conference on Computer Vision and Image Processing (CVIP 2023), pp. 164-175. Springer Communications in Computer and Information Science. Date: 2023/11/3. Location: IIT Jammu, India. DOI: 10.1007/978-3-031-58535-7_14

[S.1] **Krishanu Saini**, et al. (2024). **Constraining latent space for Unsupervised multi-domain Image-to-Image Translation via Generative Adversarial Network**. Manuscript Accepted for publication in CVIP 2024: 9th International Conference on Computer Vision and Image Processing, 19-21 December 2024. Springer Proceedings, 2024.

SKILLS

- **Programming Languages & frameworks:** Python, C++, Java, JavaScript, SQL, ReactJs, HTML, CSS
- **Database Systems:** MySQL, PostgreSQL, MongoDB
- **Data Science & Machine Learning:** TensorFlow, PyTorch, Scikit-learn, Keras, Pandas, NumPy
- **Specialized Area:** Deep Learning, Computer Vision, AI-driven Applications
- **Other Tools & Technologies:** Matlab, OpenCV, OpenGL, Jupyter, Matlab, AWS, Docker, Kubernetes
- **Research Skills:** Literature Review, Experimental Design, Data Analysis, Model Evaluation, Paper Writing, Proposal Writing

HONORS AND AWARDS

- **Institute Silver Medal** *2023*
  IIT Indore
  - Awarded to the top performer in the Computer Science department for exceptional academic achievements.
  - Recognized for outstanding leadership and contribution to the academic environment at IIT Indore.
- **AP (Advanced Performer) Grade in 7 Courses** *2023*
  IIT Indore
  - Granted to the top 1% of students in a courses for exceptional performance in coursework.
- **Bronze Medal, Inter IIT Tech Meet** *2022*
  IIT Kharagpur
  - Achieved a Bronze Medal in a prestigious technical competition at the Inter IIT Tech Meet 2022.
  - Showcased innovative problem-solving and technical proficiency in a competitive environment.

LEADERSHIP & VOLUNTEER EXPERIENCE

- **Undergraduate Researcher and Project Lead** *2022 - 2023*
  Computational Intelligence and Machine Learning Lab, IIT Indore
  - Conducted pioneering research in the domain of Generative Adversarial Networks (GANs) and machine learning.
  - Mentored undergraduate students, leading them through hands-on project development and research initiatives.

- **Senior Member** *Sept 2019 - Jun 2021*
  The Programming Club, IIT Indore
  - Contributed to the development and maintenance of the club's website, which hosted coding contests and hackathons for the IIT Indore community.
  - Organized and spoke at sessions on essential technical topics, including Version Control, Open Source contributions, and Linux operating system fundamentals.
- **Technical Coordinator** *Apr 2021 - May 2021*
  Euristica, Annual Tech Meet, IIT Indore
  - Led problem-setting and maintenance efforts for the annual tech meet Euristica 2020 & 2021 on CodeChef and Codeforces.
  - Managed an overall participation of 25,000+ individuals globally, ensuring smooth execution of coding challenges and contests.
- **Volunteer** *2020 - 2021*
  Avana - Social Service, IIT Indore
  - Actively volunteered in social service initiatives organized by Avana, including donation drives and community outreach programs.

Additional Information

Languages: English (Fluent), Hindi (Fluent), French (Beginner)
Interests: Gardening, Yoga, Listening to music