Vishal Asnani

Phone: +1 (517) 505-4249
Email: asnanivi@msu.edu
Website: https://vishal3477.github.io/
LinkedIn: https://linkedin.com/in/vishal-asnani/
GitHub: https://github.com/vishal3477

OBJECTIVE

Innovative and dedicated media forensics professional seeking a dynamic role where my advanced skills in media provenance, analysis, detection, and verification can be utilized to counter misinformation and enhance the trustworthiness of visual information. I am committed to leveraging cutting-edge technologies and collaborating with multidisciplinary teams to develop impactful and reliable solutions.

EDUCATION

Ph.D. In Computer Science and Engineering **| Jan. 2021-Dec. 2024|**
Advisor: Dr. Xiaoming Liu
Michigan State University, East Lansing, USA
GPA: 3.75/4.0, Graduation: December 2024

B.E.(Hons.) Electronics and Instrumentation Engineering (Minor in Finance) **| Aug. 2015- May 2019|**
Birla Institute of Technology and Science, Pilani, India
CGPA: 8.01/10.0

PUBLICATIONS

- **Vishal Asnani**, John Collomosse, Tu Bui, Xiaoming Liu, and Shruti Agarwal. "ProMark: Proactive Diffusion Watermarking for Causal Attribution." In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2024.
- **Vishal Asnani**, Abhinav Kumar, Suya You, and Xiaoming Liu. "PrObeD: Proactive Object Detection Wrapper." *Advances in Neural Information Processing Systems (**NeuRIPS**),* 2023.
- **Vishal Asnani**, Xi Yin, Tal Hassner, Xiaoming Liu, "Reverse Engineering of Generative Models: Inferring Model Hyperparameters from Generated Images", *In IEEE Transactions on Pattern Analysis and Machine Intelligence (**T-PAMI**)* 2023.
- **Vishal Asnani**, Xi Yin, Tal Hassner, Xiaoming Liu, "MaLP: Manipulation Localization Using a Proactive Scheme," *In Proceeding of IEEE Computer Vision and Pattern Recognition (**CVPR**),* 2023.
- **Vishal Asnani**, Xi Yin, Tal Hassner, Sijia Liu, Xiaoming Liu, "Proactive Image Manipulation Detection," *In Proceeding of IEEE Computer Vision and Pattern Recognition (**CVPR**),* 2022.

WORK EXPERIENCE

Adobe, San Jose, USA: Research Scientist Intern **| May. 2025- Present|**
- Research scientist intern in the **Cross-representation learning (XRL) team**.
- Real-time practical scenario of **Causal Training Concept attribution** for the synthetic images generated by a generative model.
- The concepts are watermarked in an **online manner without** any **costly training**.

Adobe, San Jose, USA: Research Scientist Intern **| May. 2023- Nov. 2023 |**
- Research scientist intern in the **Cross-representation learning (XRL) team**.
- Working on the **novel problem** of **Causal Training Concept attribution** for the synthetic images generated by a generative model.
- The problem involves **attributing different artist's** concept images which influenced the generation of the synthetic images.
- We use a **proactive scheme** of embedding different **watermarks** into the images, to later **recover** these watermarks for attribution.

Texas Instruments, Bengaluru, India: Analog design intern **| Jul. 2018- Dec. 2018 |**
- Analog design intern in **Multiphase and Control solutions team**.
- Developed a Perl Script to create vector-based patterns for SWD and PMBus commands used in the test program.
- Patterns were appended to the test program beforehand, thereby saving test time.
- Efficient implementation of **SWD and PMBus patterns** saved approximately **74% execution time**.

PROJECTS

1. **Diffusion Watermarking for Causal Attribution using proactive schemes.** **|May. 2023-Nov. 2023|**
   - Developed ProMark, a causal attribution technique to credit training data concepts like objects, motifs, templates, artists, or styles in synthetic images.
   - Embedded imperceptible watermarks into training images, which diffusion models retain in generated images.
   - Successfully embedded up to 2^{16} unique watermarks, with each training image containing multiple watermarks.
   - ProMark significantly outperforms the prior passive correlation-based works.

2. **PrObeD: Proactive Object Detection Wrapper.** **|Dec. 2022-May. 2023|**
   - Focused on enhancing 2D object detection, particularly for generic and camouflaged images.
   - Addressed the suboptimal convergence of neural networks in object detection by proposing PrObeD, a proactive wrapper scheme.
   - Developed an encoder-decoder architecture in PrObeD where the encoder generates image-dependent signals (templates) and the decoder recovers these templates from encrypted images.
   - Demonstrated that learning optimum templates improves object detection performance.
   - Achieved improved detection results on MS-COCO, CAMO, COD10K, and NC4K datasets.

3. **Image manipulation Localization using proactive schemes.** **|May. 2022-Nov. 2022|**
   - A novel proactive scheme for image manipulation localization, MaLP, applicable to both face and generic images is proposed.
   - MaLP has a two-branch architecture to use both local and global features to learn templates in an unsupervised manner.
   - MaLP can be used as a plug-and-play discriminator module to fine-tune GMs to improve the quality of the generated images.
   - MaLP outperforms State-of-The-Art (SoTA) methods in manipulation localization and detection.

4. **Proactive scheme for image manipulation detection by adding learnable templates** **|May. 2021-Apr. 2022|**
   - A novel proactive scheme is proposed which encrypts a real image by adding a template from a learnable template set.
   - The added template is later recovered to perform image manipulation detection.
   - The template set is learned using defined constraints which incorporate properties including small magnitude, more high-frequency content, orthogonality, and classification ability.
   - Near-perfect average precision is obtained for unseen Generative Models (GMs) compared to prior works.
   - The proposed framework is more generalizable to different GMs, showing an improvement of 10% average precision averaged across 12 GMs compared to prior works.

5. **Model Parsing: Reverse engineering of hyperparameters of generative models** **|Jul. 2020-Apr. 2022|**
   - A novel problem of Model Parsing is defined to develop a framework for predicting the network architecture and loss functions given a generated image.
   - We estimate the mean and deviation for each GM using two different parsers: cluster parser and instance parser which are then combined as the final predictions.
   - A network architecture super-set with 15 features and a loss function type super-set with 10 features were selected to represent every GM.
   - 1000 images each for 116 generative models were collected to create a new dataset, and the experiments were conducted in the leave-out setting.
   - The method generalizes well to tasks of deepfake detection on the Celeb-DF benchmark and image attribution.

6. **Deepfake video detection model** **|Feb. 2020-Apr. 2020|**
   - Implemented a ML model consisting of Convolution neural networks (CNN) followed by a recurrent neural network (RNN) for deepfake detection.
   - The CNN-RNN model would be able to detect whether a video is fake or real.
   - The frames were extracted using the MTCNN model, which was then passed into the CNN-RNN model, trained on the Face-Forensics++ (FF++) dataset, and tested on the FF++ and Celeb-DF datasets.
   - The model achieves 98.2% AUC on the FF++ dataset and 68.1% AUC on the Celeb-DF dataset.

TECHNICAL PROFICIENCY

Tools, Simulation, and Software Platforms

- TensorFlow, PyTorch, Pytorch Lightning, Keras, NumPy, Scikit-learn, Jupyter, OpenCV, CUDA, MATLAB and Simulink, GCS, Amazon Web Services (AWS), LabVIEW, Linux, CST Microwave studio, Cadence virtuoso, Microsoft-Visual Studio, Excel, Word and PowerPoint, OrCAD PSpice, Labcentre Proteus, Eagle- PCB Design and Schematic Software, Xilinx Vivado Suite and SDK, FluidSim

Languages / Scripts

- Python, MATLAB, R, SQL, Perl, C, C++, Cascading Style Sheets (CSS), JavaScript, HTML, Verilog, VHDL, x86 Assembly Language, Arduino Programming

TALKS GIVEN

1. In-person talk given at Scale-AI headquarters in San Francisco. The talk was focused on our work on reverse engineering of generative models. (Recording available on website)
2. Virtual talk given at Scale-AI. The talk was focused on our work on proactive image manipulation detection. (Recording available on website)

RELEVANT COURSES PURSUED

- Computer Vision: Detectors and Descriptors, Optical Flow, Image segmentation, Tracking and object detection, Epipolar geometry.
- Machine learning: Regression, Classification, Dimensionality reduction, Sparse learning, Ensemble methods, multi-task learning
- Pattern recognition and analysis: Bayesian classification, Estimating gaussian MLE parameters, non-parametric density estimation.
- Deep Learning: Deep Neural Networks, Convolution Neural Networks, Recurrent Neural Networks, Sequence Models.
- Deep Learning specialization- deepleraning.ai by Andrew Ng (Coursera).