

KOUTILYA PNVR

4th year Ph.D. | Computer Vision | University of Maryland, College Park

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I am a 4th year Ph.D. student, advised by **Prof. David Jacobs** at the University of Maryland, College Park. I am broadly interested in computer vision. Some of the areas I am currently working on are: **Domain adaptation, in particular between synthetic and real datasets; GANs; Depth, and Normal estimation;** Inverse Rendering; Video classification; and Inpainting. I am looking to further explore new research areas in computer vision.

🎓 EDUCATION

Current	3.93	Ph.D. Computer Vision, University of Maryland, College Park
2017	-	Deep Learning Nanodegree Foundation, Udacity
2017	3.9	M.S. Electrical and Computer Engineering, University of Maryland, College Park
2015	8.22	B.Tech. Electrical Engineering, Indian Institute of Technology, Delhi, India

📁 RESEARCH EXPERIENCE

Present Aug. 2017	3rd year Ph.D. Computer Vision, UNIVERSITY OF MARYLAND, College Park <ul style="list-style-type: none">➤ Domain Adaptation between synthetic and real datasets for applications such as Monocular Depth Estimation of outdoor scenes and Face Normal Estimation.➤ Violence detection in videos using a Bidirectional ConvLSTM network.➤ Guided Inpainting using Generative Adversarial Networks that can enable the use of different car images as guides to edit cars in street view scenes. <div>Computer Vision Deep Learning Domain Adaptation Depth and Normal Estimation GANs Inverse Rendering Video classification Guided Inpainting</div>
Dec. 2017 Aug. 2016	Graduate Research Assistant Geographical Sciences, UNIVERSITY OF MARYLAND, College Park <ul style="list-style-type: none">➤ Crop yield prediction using EPIC model that utilizes data from the soil, site, remote sensing, daily and monthly weather for different regions in the US.➤ Cropland data layer prediction based on history of crops using a Bidirectional ConvLSTM network.➤ Development of a crop phenology algorithm that accurately predicts the timings of different stages of crop growth ranging from Greenup to Senescence. <div>Satellite Imagery Remote Sensing Crop Modeling High Performance Computing Crop Phenology</div>
May 2015 July 2014	B.Tech. Electrical Engineering, INDIAN INSTITUTE OF TECHNOLOGY, Delhi <i>2-D Surface Potential and Threshold Voltage Modeling of a DMDG Junctionless Field Effect Transistor</i> <ul style="list-style-type: none">➤ Developed an accurate Surface Potential model for Depletion, Partial depletion and Near FB modes.➤ Modeled Drain current and threshold voltage that attained fine correlation with the ATLAS simulator. <div>Device Modeling JLFET</div>

☞ SKILLS

Programming Languages	Python, MATLAB, R, C
Deep Learning frameworks	Pytorch, TensorFlow, TFLearn, Keras
Image Libraries	OpenCV, PIL, Scikit-Image, Matplotlib, Numpy, Lycon
Other technical skills	Tensorboard, OpenMPI, OpenMP, LaTeX, Linux, Visual Studio Code, Git

📄 PUBLICATIONS

- Koutilya PNVR, Hao Zhou, and David Jacobs. “**SharinGAN : Combining Synthetic and Real data for Unsupervised Geometry Estimation.**” In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, 2020.
- Hanson Alex, Koutilya Pnvr, Sanjukta Krishnagopal, and Larry Davis. “**Bidirectional Convolutional LSTM for the Detection of Violence in Videos.**” The European Conference on Computer Vision (ECCV) Workshops, 2018.

📁 INTERNSHIP EXPERIENCE

July 2014 May 2014	Analysis of SSN & Crosstalk across memory buses on a PCB, CADENCE DESIGN SYSTEMS, DESIGN IP, India <ul style="list-style-type: none">➤ Examined the behaviors of DDR and PCI memory buses unified on a PCB in the Cadence Sigrity tool.➤ Proved the presence of SSN & crosstalk by DDR on PCI via a 15% height decrease in the eye diagram. <div>Cadence Sigrity Tool Simultaneous Switching Noise (SSN) Crosstalk Eye diagrams Signal Integrity</div>
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DOMAIN ADAPTATION BETWEEN SYNTHETIC AND REAL DATASETS FOR GEOMETRY ESTIMATION

MAY 2019 - DEC 2019

- Implemented a novel way of utilizing GANs to train deep networks that can minimize the domain gap between synthetic and real images for performance improvement in geometry estimation tasks.
- Demonstrated the performance gain for Monocular Depth Estimation and Face Normal Estimation tasks.
- Reduced the absolute error in testsets of KITTI by 23.77% and Make3D by 6.45% over the state-of-the-art.
- Improved the face normal prediction by 4.3% for $A_{cc} < 20$ deg metric for the Photoface dataset over the state-of-the-art.

Domain Adaptation Monocular Depth Estimation Face Normal Estimation GANs Synthetic and Real datasets Pytorch Tensorboard

VIOLENCE DETECTION IN VIDEOS USING BIDIRECTIONAL CONVLSTM

APRIL 2018 - JUNE 2018

- Developed a novel Bidirectional Convolutional LSTM network followed by an elementwise max-pooling layer to obtain better Spatio-temporal representations for detecting violence in videos.
- Demonstrated the superiority of our method on the Hockey fights, Movies and Violent-Flows datasets over previous state-of-the-art methods.
- Signified the importance of all our modules : BiConvLSTM, elementwise maxpool, temporal encoding via ablation studies.

Violence Detection Bidirectional ConvLSTM Elementwise Max Pool Spatio-temporal encoding Pytorch

POSE CLASSIFICATION FOR HUMAN FACES USING CONVOLUTIONAL NEURAL NETWORKS (CNNs)

MAY 2017 - MAY 2017

- Implemented a CNN similar to LeNet-5 in TensorFlow aimed for pose classification in human faces.
- The architecture includes Convolutions, Max pooling and Fully connected layers with the ReLU activation function.
- Adopted and studied the Dropout technique in the network to prevent overfitting and to generalize well to the testset.
- Initially validated the architecture on CIFAR-10 with a test accuracy of 74% and finally obtained a pose classification accuracy of 95.96% for CMU faces dataset.

CNNs Classification Deep Learning TensorFlow CIFAR CMU Faces LeNet-5

MNIST DATA CLASSIFICATION USING CNNs AND SVMs

MAY. 2017 - MAY. 2017

- Implemented a CNN similar to LeNet-5 in TensorFlow for classifying MNIST with a test accuracy close to 99%.
- Chosen the best model via performance on the validation set by tweaking learning rate and batch size hyperparameters.
- Studied the same by training various kernel SVMs and achieved a best performance of 94.39% using RBF kernel.

CNNs Classification Deep Learning TensorFlow MNIST LeNet-5 SVMs RBF kernel

PARALLEL IMPLEMENTATION OF SMO AND MODEL SELECTION ALGORITHMS FOR SVMs

MAR 2017 - MAY 2017

- Efficiently parallelized the Sequential Minimal Optimization (SMO) and Model Selection (MS) algorithms that define an optimal SVM classifier using OpenMPI, OpenMP and Hybrid frameworks in C++ on deepthought2 cluster.
- Studied the parallel version on several cluster configurations such as nodes and threads/core and over several datasets, such as MNIST, not-MNIST, Cordna, A9a, Splice, etc.
- Model selection is performed on 900 models and the best one is chosen that gives the least validation error.
- A huge speedup of 173 is observed for the Hybrid implementation of MS-SMO on not-MNIST for 16 node configuration.

OpenMP OpenMPI Sequential Minimal Optimization (SMO) Support Vector Machines (SVM) High Performance Computing

“ REFERENCES

David Jacobs

PROFESSOR

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