

SANDIPAN BANERJEE

CONTACT INFORMATION

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RESEARCH INTERESTS

Computer Vision - Synthesis, semi-supervised learning, self-supervision, domain invariance.

Deep Learning - CNNs, GANs, autoencoders, siamese nets, LSTMs.

Biometrics - Face (identity/expression/attributes) and iris (segmentation).

WORK EXPERIENCE

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|-------------------|---|
| JUL 2019-PRESENT | Senior Computer Vision Scientist at Affectiva <ul style="list-style-type: none">- Building a universal encoding space that can be used to classify facial expressions, lighting, age, pose and subject identity all at once, invariant to camera type (RGB/NIR) and location (rear view mirror/steering column), inside a car.- Built GAN models, to manipulate facial expressions, pose and directional lighting, using losses driven by human perceptual judgements.- Designed weakly supervised network models for eye gaze/glance prediction in driver videos that are robust to changes in input camera characteristics.- Hallucinating synthetic samples in facial attribute feature space to detect temporal events like drowsiness from driver videos.- Worked on designing static and temporal expression detection models (like yawn). |
| MAY 2014-MAY 2019 | Graduate Research Assistant at University of Notre Dame
Computer Vision Research Laboratory (CVRL) <ul style="list-style-type: none">- Worked on generation of natural looking synthetic face images (2D & 3D) to augment training data for deep neural networks and artificial face image frontalization.- Developed a multi-scale cascaded network of GANs for hallucinating context (forehead, hair, neck, clothes) and background pixels directly from a single face mask.- Developed the Notre Dame Synthetic Face Dataset, containing 2M face images of 12K synthetic identities, that can be used without copyright or privacy concerns.- Previously worked on the PAD Project, detecting counterfeit pharmaceutical drugs. |
| SUMMER 2016 | Research Intern at Xerox Palo Alto Research Center (PARC) <ul style="list-style-type: none">- Keypoint detection in the forehead and cheek regions using texture information.- Artificial aging of face images (CNN, GAN, blending) for predicting skin conditions. |
| AUG 2013-MAY 2014 | Graduate Teaching Assistant at University of Notre Dame <ul style="list-style-type: none">- Graded papers, held office hours and conducted tests for the <i>Computer Networks (CSE 30264)</i>, and <i>Ethical and Professional Issues (CSE 40175)</i> courses. |
| JUL 2012-APR 2013 | Associate Engineer at Unisys Global Services India <ul style="list-style-type: none">- Worked on plug-in development for Unisys' proprietary Clearpath mainframe servers. |

EDUCATION

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| AUG 2013-MAY 2019 | PhD in COMPUTER SCIENCE, UNIVERSITY OF NOTRE DAME, USA
M.S. obtained in May 2017 (GPA: 3.6/4).
ADVISERS: Patrick Flynn & Kevin Bowyer .
DISSERTATION: Exploring the Effects of Frontalization & Data Synthesis on Face Recognition. [PDF] |
| AUG 2008-MAY 2012 | B.Tech in COMPUTER SCIENCE & ENGINEERING, NIT DURGAPUR, India
GPA: 7.89/10. |

PUBLICATIONS (* DENOTES EQUAL CONTRIBUTION)

S. Banerjee, W. Scheirer, K. Bowyer, and P. Flynn, *Analyzing the Impact of Shape & Context on the Face Recognition Performance of Deep Networks*, under review. [\[paper\]](#)

S. Banerjee, A. Joshi, J. Turcot, B. Reimer, and T. Mishra, *Driver Glance Classification In-the-wild: Towards Generalization Across Domains and Subjects*, in IEEE International Conference on Automatic Face and Gesture Recognition (FG), 2021. [\[paper\]](#)

S. Banerjee, A. Joshi, P. Mahajan, S. Bhattacharya, S. Kyal, and T. Mishra, *LEGAN: Disentangled Manipulation of Directional Lighting and Facial Expressions by Leveraging Human Perceptual Judgements*, in IEEE Conference on Computer Vision & Pattern Recognition (CVPR) Workshops, 2021. [\[paper\]](#) (Best Paper Runner Up)

S. Banerjee, A. Joshi, A. Ghoneim, S. Kyal, and T. Mishra, *Synthesize & Learn: Jointly Optimizing Generative and Classifier Networks for Improved Drowsiness Detection*, in IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2021. [\[paper\]](#)

D. Saavedra, S. Banerjee, and D. Mery, *Detection of Threat Objects in Baggage Inspection with X-ray Images using Deep Learning*, in Neural Computing and Applications (NCAA), 2020. [\[paper\]](#)

A. Joshi, S. Kyal, S. Banerjee, and T. Mishra, *In-The-Wild Drowsiness Detection from Facial Expressions*, in IEEE Intelligent Vehicles Symposium (IV) Workshops, 2020. [\[paper\]](#)

S. Banerjee, W. Scheirer, K. Bowyer, and P. Flynn, *On Hallucinating Context and Background Pixels from a Face Mask using Multi-scale GANs*, in IEEE Winter Conference on Applications of Computer Vision (WACV), 2020. [\[paper\]](#)

S. Banerjee, W. Scheirer, K. Bowyer, and P. Flynn, *Fast Face Image Synthesis with Minimal Training*, in IEEE Winter Conference on Applications of Computer Vision (WACV), 2019. [\[paper\]](#)

S. Banerjee*, J. Brogan*, J. Krizaj, A. Bharati, B. RichardWebster, V. Struc, P. Flynn, and W. Scheirer, *To Frontalize or Not To Frontalize: Do We Really Need Elaborate Pre-processing To Improve Face Recognition?*, in IEEE Winter Conference on Applications of Computer Vision (WACV), 2018. [\[paper\]](#)

D. Mery, and S. Banerjee, *Recognition of Faces and Facial Attributes using Accumulative Local Sparse Representations*, in IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2018. [\[paper\]](#)

S. Banerjee*, J. Bernhard*, W. Scheirer, K. Bowyer, and P. Flynn, *SREFI: Synthesis of Realistic Example Face Images*, in IAPR/IEEE International Joint Conference on Biometrics (IJCB), 2017. [\[paper\]](#)

D. Mery, E. Svec, M. Arias, V. Rizzo, J. Saavedra, and S. Banerjee, *Modern Computer Vision Techniques for X-ray Testing in Baggage Inspection*, in IEEE Trans. on Systems, Man, and Cybernetics: Systems (SMC), 47 (4), pp. 682 - 692, 2017. [\[paper\]](#)

W. Scheirer, et al., *Report on the BTAS 2016 Video Person Recognition Evaluation*, in IEEE International Conference on Biometrics Theory, Applications and Systems (BTAS), 2016. [\[paper\]](#)

S. Banerjee, J. Sweet, C. Sweet, and M. Lieberman, *Visual Recognition of Paper Analytical Device Images for Detection of Falsified Pharmaceuticals*, in IEEE Winter Conference on Applications of Computer Vision (WACV), 2016. [\[paper\]](#)

S. Banerjee, and D. Mery, *Iris Segmentation using Geodesic Active Contours and GrabCut*, PSIVT Workshop on 2D & 3D Geometric Properties from Incomplete Data, 2015. [\[paper\]](#)

PATENTS

T. Mishra, **S. Banerjee**, and A. Joshi, *Neural Network Synthesis Architecture using Encoder-Decoder Models*, U.S. Provisional Patent Application Serial No. 63/071,401.

S. Banerjee, R. el Kaliouby, A. Joshi, S. Kyal, and T. Mishra, *Synthetic Data for Neural Network Training Using Vectors*, U.S. Provisional Patent Application Serial No. 17/136,083.

SKILL SET

PROGRAMMING LANGUAGES: Python, Matlab

APPLICATIONS: OpenCV, Keras, Tensorflow, Caffe, Dlib, pyOpenGL

PLATFORMS: Ubuntu, Windows, EC2

OTHER RELEVANT INFORMATION

OUTSTANDING REVIEWER AWARD:

- IEEE Conference on Computer Vision & Pattern Recognition ([CVPR](#)) 2021.

PROGRAM COMMITTEE MEMBER:

- Human Behavior Understanding ([HBU](#)) Workshop at IEEE WACV 2021.

JOURNAL REVIEWER:

- IEEE Trans. on Pattern Analysis & Machine Intelligence ([TPAMI](#))
- IEEE Trans. on Image Processing ([TIP](#))
- IEEE Trans. on Information Forensics & Security ([TIFS](#))
- IEEE Trans. on Biometrics, Behavior, and Identity Science ([TBIOM](#))
- IEEE Journal of Selected Topics in Signal Processing ([JSTSP](#))
- IEEE Transactions on Human-Machine Systems ([SMC](#))
- The Visual Computer Journal ([TVC](#)).

CONFERENCE REVIEWER:

- IEEE Conference on Computer Vision & Pattern Recognition ([CVPR](#)) 2020, 2021, 2022
- IEEE International Conference on Computer Vision ([ICCV](#)) 2021
- European Conference on Computer Vision ([ECCV](#)) 2022
- IEEE Winter Conference on Applications of Computer Vision ([WACV](#)) 2020, 2021, 2022
- International Conference on Pattern Recognition ([ICPR](#)) 2022
- Asian Conference on Computer Vision ([ACCV](#)) 2020
- IEEE/IAPR International Joint Conference on Biometrics ([IJCB](#)) 2020, 2021
- IEEE Conference on Biometrics: Theory, Application & Systems ([BTAS](#)) 2019
- IAPR International Conference on Biometrics ([ICB](#)) 2019.

INVITED TALKS:

- Dept. of Computer Science, Colorado State University (04/2021)
- The MIT AgeLab/Advanced Vehicle Technology ([AVT](#)) Consortium (01/2021)
- Doctoral Consortium at [IEEE WACV 2019](#)
- [Midwest Vision Workshop 2018](#)
- Amazon Graduate Research Symposium 2017
- NSF Data Science Workshop 2016.

MENTORING: Puja Roy (CUNY), Kunjal Panchal (UMass Amherst), Prashant Mahajan (Amazon), Sneha Bhattacharya (Silver Spoon Animation).

REFERENCES

Available upon request.