

SAKET ANAND

Associate Professor

B-410, R&D Block, IIIT-Delhi, Okhla Phase-III, New Delhi, India

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RESEARCH INTERESTS

Computer Vision

Geometric Computer Vision. Visual Recognition and Understanding.

Machine Learning

Representation Learning. Semi-supervised Learning. Unsupervised Learning.

Application Areas

AI for Wildlife Conservation. AI for Agriculture. Road Safety and Autonomous Driving.

RESEARCH EXPERIENCE

Associate Professor, IIIT-Delhi

Aug. 2020 - Present

Head, Infosys Center for Artificial Intelligence, IIIT-Delhi

Dec. 2019 - Dec. 2021

Assistant Professor, IIIT-Delhi

Sep. 2013 - Jul. 2020

- Visual identification of species and individuals in camera trap images.
- Learning disentangled representations in visual data.
- Robust statistical estimation in computer vision.
- Riemannian geometry and deep learning.

Summer Fellow, Center for AI in Society, USC

Jun. 2018-Jul. 2018

Host: [Prof. Milind Tambe](#)

- BIRDSAI: Automatic detection of poachers and animals in aerial Thermal IR videos.

Graduate Assistant, RIUL, Rutgers University

Jan. 2010-Jun. 2013

Adviser: [Prof. Peter Meer](#)

- Semi-supervised methods for kernel mean-shift clustering.
- Robust regression using generalized projection based M-estimator.

Research Engineer, Read-Ink Technologies, Bangalore, India

Oct. 2007–Dec. 2009

Supervisor: Prof. Thomas O. Binford

- Lexical correction for recognition of handwritten characters of the English alphabet.
- Design of empirical probability density functions for classification of handwritten characters.

Graduate Assistant, DIMACS, Rutgers University

Sep. 2005–Jun. 2006

Adviser: Prof. Richard Mammone, Prof. Fred Roberts

- Sequential decision making algorithms for Port of Entry inspection procedures.
- Facial recognition using kernel methods.

FUNDED PROJECTS

IIIT-Delhi

- Graph-Based Statistical Analysis of Entire Scenes by Combining Multi-Sensor, Multi-Perspective Video Streams (2022-2024)
NSF-TIH Grant (iHub-Drishti, IIT Jodhpur)
Amount: ~INR 19.5L (~USD 23K), [role: PI, status: ongoing]
- Artificial Intelligence for Monitoring of Wildlife for Conservation (2021-2024)
Science and Engineering Research Board (SERB), Govt. of India
Amount: ~INR 61.3L (~USD 82K), [role: PI, status: ongoing]
- ALIVE - Autonomous Last mile VEHICLE (2020-2023)
Ministry of Electronics and Information Technology (MeitY), Govt. of India
Amount: ~INR 1.95Cr (~USD 275K), [role: PI, status: completed]
- Smart Driving Using Cooperative Perception Over a Constrained Communications Network (2019-2022)

Interdisciplinary Cyber-Physical Systems, Dept. of Science & Technology, Govt. of India

Amount: ~INR 97L (~USD 137K), [role: Co-PI, status: completed]

- High-resolution Satellite Imagery for Modeling the Impact of Aridification on Crop Production: Paddy Cultivation in the Cauvery Delta (2021-2022)
AI for Social Good workshop, Google Research, India
Amount: ~INR 7.3L (~USD 10K), [role: PI, status: completed]
- Machine Learning on Constrained Devices (May 2018-Jul. 2018)
Unrestricted grant from Microsoft Research, India
Amount: ~INR 1.5L (~USD 2K), [role: PI, status: completed]
- Statistical Machine Learning using Deep Neural Architectures (2018-2019)
Unrestricted grant from Verisk Analytics
Amount: ~INR 6.5L (~USD 10K), [role: PI, status: completed]
- Swarath - Autonomous Last Mile Connectivity for Indian Roads (2016-2019)
Support from IIIT-Delhi for Mahindra Rise Prize - Driverless Car Challenge (National level)
Amount: ~INR 25L (~USD 35K), [role: Co-PI, status: completed]

TEACHING

IIIT-Delhi

Sept. 2013-Present

- Advanced Machine Learning (Monsoon 2020-21)
- Deep Learning (Winter 2017-20)
- Machine Learning (Monsoon 2016-19; Winter 2021)
- Computer Vision (Winter 2014-18)
- Linear Optimization (Monsoon 2014-15)
- Statistical Signal Processing (Winter 2015-17)

Goethe University, Frankfurt am Main, Germany

(Invited Lecturer - 01/12/2016 - 31/12/2016)

- Robust Methods for Geometric Computer Vision
Traditional methods, sampling based, graph based and globally optimal methods.

EDUCATION

Rutgers University, NJ, USA,

Ph.D., ECE,

Jan. 2010 - Jun. 2013

Rutgers University, NJ, USA,

M.S., ECE,

Sep. 2004 - Oct. 2006

Pune University, Pune, India,

B.E., Electronics Engineering,

Aug. 1999 - Jul. 2003

REFEREED PUBLICATIONS

Book Chapters

1. **S. Anand**, S. Mittal and P. Meer, *Robust Estimation for Computer Vision using Grassmann Manifolds*, Riemannian Computing in Computer Vision, Co-editors: P.K. Turaga and A. Srivastava, Springer, Chapter 6, 2016.

Journal Papers

1. N. Mehrotra, N. Agarwal, P. Gupta, **S. Anand**, D. Lo, and R. Purandare, *Modeling Functional Similarity in Source Code with Graph-Based Siamese Networks*, IEEE Transactions on Software Engineering, vol. 48, no. 10, pp. 3771-3789, 2022. DOI: 10.1109/TSE.2021.3105556
2. Y. Sun, R. Kaur, S. Gupta, R. Paul, R. Das, S. J. Cho, **S. Anand**, J. J. Boutilier, S. Saria, J. Palma, S. Saluja, R. M. McAdams, A. Kaur, G. Yadav, H. Singh, *Development and validation of high definition phenotype-based mortality prediction in critical care units*, JAMIA Open, Volume 4, Issue 1, January 2021. DOI: 10.1093/jamiaopen/oaab004
3. H. Singh, S. Kusuda, R. M. McAdams, S. Gupta, J. Kalra, R. Kaur, R. Das, **S. Anand**, A. K. Pandey, S. J. Cho, S. Saluja, J. J. Boutilier, S. Saria, J. Palma, A. Kaur, G. Yadav, and Y. Sun, *Machine Learning-Based Automatic Classification of Video Recorded Neonatal Manipulations and Associated Physiological Parameters: A Feasibility Study*, Children, vol. 8, no. 1, 2021. DOI: 10.3390/children8010001

4. A. Sharma, **S. Anand**, and S. K. Kaul, *Intelligent Querying for Target Tracking in Camera Networks using Deep Q-Learning with n-Step Bootstrapping*, Image and Vision Computing, Vol. 103, 104022, 2020. DOI: 10.1016/j.imavis.2020.104022
5. A. Jain, P. Goel, S. Aggarwal, A. Fell and **S. Anand**, *Symmetric k-Means for Deep Neural Network Compression and Hardware Acceleration on FPGAs*, IEEE Journal of Selected Topics in Signal Processing, vol. 14, no. 4, pp. 737-749, 2020, DOI: 10.1109/JSTSP.2020.2968810
6. **S. Anand**, S. Mittal, O. Tuzel and P. Meer, *Semi-Supervised Kernel Mean Shift Clustering*, IEEE Trans. on Pattern Analysis and Machine Intelligence (PAMI), vol. 36, pp. 1201-1215, Jun. 2014. DOI: 10.1109/TPAMI.2013.190
7. S. Mittal, **S. Anand** and P. Meer, *Generalized Projection Based M-Estimator*, IEEE Trans. on Pattern Analysis and Machine Intelligence (PAMI), vol. 34, pp. 2351-2364, Dec. 2012. DOI: 10.1109/TPAMI.2012.52

Conference Papers

1. Kshitiz, S. Shreshtha, M. Dosi, B. Dutta, M. Vatsa, R. Singh, S. Anand, S. Sarkar, S. M. Parihar, *BirdCollect: A Comprehensive Benchmark for Analyzing Dense Bird Flock Attributes*, in AAAI 2024, AI for Social Impact Track.
2. A. Jindal, V. Goyal, **S. Anand** and C. Arora, *Army of Thieves: Enhancing Black-Box Model Extraction via Ensemble based sample selection*, in IEEE Winter Conference on Applications of Computer Vision (WACV), 2024.
3. D. Sani, S. Mahato, S. Saini, H. Agarwal, C. Devshali, S. Anand, G. Arora, and T. Jayaraman, *SICKLE: A Multi-Sensor Satellite Imagery Dataset Annotated with Key Cropping Parameters*, in IEEE Winter Conference on Applications of Computer Vision (WACV), 2024 (Oral).
4. Kshitiz, S. Shreshtha, R. Mounir, M. Vatsa, R. Singh, **S. Anand**, S. Sarkar, and S. M. Parihar, *Long-term Monitoring of Bird Flocks in the Wild*, in IJCAI 2023, Special Track on AI for Good - Projects.
5. S. Agarwal, **S. Anand**, and C. Arora, *Reducing Annotation Effort by Identifying and Labeling Contextually Diverse Classes for Semantic Segmentation Under Domain Shift*, in IEEE Winter Conference on Applications of Computer Vision (WACV), 2023.
6. A. Garg, D. Sani, and **S. Anand**, *Learning Hierarchy Aware Features for Reducing Mistake Severity*, European Conference on Computer Vision (ECCV), 2022.
7. A. Garg, S. Bagga, Y. Singh, and **S. Anand**, *HIERMATCH: Leveraging Label Hierarchies for Improving Semi-Supervised Learning*, IEEE Winter Conference on Applications of Computer Vision (WACV), 2022.
8. L. Tiwari, A. Madan, **S. Anand** and S. Banerjee, *REGGroup: Rank-aggregating Ensemble of Generative Classifiers for Robust Predictions*, IEEE Winter Conference on Applications of Computer Vision (WACV), 2022.
9. A. Sharma, **S. Anand** and S. K. Kaul, *Intelligent Camera Selection Decisions for Target Tracking in a Camera Network*, IEEE Winter Conference on Applications of Computer Vision (WACV), 2022.
10. S. Agarwal, S. Muku, **S. Anand** and C. Arora, *Does Data Repair Lead to Fair Models? Curating Contextually Fair Data To Reduce Model Bias*, IEEE Winter Conference on Applications of Computer Vision (WACV), 2022.
11. S. Agarwal, H. Arora, **S. Anand** and C. Arora, *Contextual Diversity for Active Learning*, European Conference on Computer Vision (ECCV), 2020.
12. L. Tiwari, P. Ji, Q. Tran, B. Zhuang, **S. Anand** and M. Chandraker, *Pseudo RGB-D for Self-Improving Monocular SLAM and Depth Prediction*, European Conference on Computer Vision (ECCV), 2020.
13. A. Shukla, G. S. Cheema and **S. Anand**, *Semi-Supervised Clustering with Neural Networks*, IEEE Sixth International Conference on Multimedia Big Data (BigMM), 2020, pp. 152-161.
14. A. Sharma, M. K. Pal, **S. Anand**, S. K. Kaul, *Stratified Sampling Based Experience Replay for Efficient Camera Selection Decisions*, IEEE Sixth International Conference on Multimedia Big Data (BigMM), 2020, pp. 144-151.

15. E. Bondi, R. Jain, P. Aggrawal, **S. Anand**, R. Hannaford, A. Kapoor, J. Piavis, S. Shah, L. Joppa, B. Dilkina and M. Tambe, *BIRDSAI: A Dataset for Detection and Tracking in Aerial Thermal Infrared Videos*, IEEE Winter Conference on Applications of Computer Vision (WACV), 2020.
16. A. Shukla, S. Uppal, S. Bhagat, **S. Anand** and P. Turaga, *PrOSe: Product of Orthogonal Spheres Parameterization for Disentangled Representation Learning*, British Machine Vision Conference (BMVC) 2019.
17. A. Shukla, G. S. Cheema **S. Anand**, Q. N. Qureshi, and Y. V. Jhala, *Primate Face Identification in the Wild*, Pacific-Rim International Conference on Artificial Intelligence (PRICAI), 2019.
18. A. Sharma, **S. Anand** and S. K. Kaul, *Reinforcement Learning Based Querying in Camera Networks for Efficient Target Tracking*, International Conference on Automated Planning and Scheduling (ICAPS), 2019.
19. A. Shukla, S. Uppal, S. Bhagat, **S. Anand** and P. Turaga, *Geometry of Deep Generative Models for Disentangled Representations*, Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP), 2018.
20. A. H. Jha, **S. Anand**, M. Singh and V. S. R. Veeravasaru, *Disentangling Factors of Variation with Cycle-Consistent Variational AutoEncoders*, European Conference on Computer Vision (ECCV), 2018.
21. M. K. Pal, R. Bhati, S. K. Kaul, **S. Anand** and P. B. Sujit, *A Reinforcement Learning Approach to Jointly Adapt Vehicular Communications and Planning for Optimized Driving*, IEEE International Conference on Intelligent Transportation Systems (ITSC), 2018.
22. L. Tiwari and **S. Anand**, *DGSAC: Density Guided SAMpling and Consensus*, IEEE Winter Conference on Applications of Computer Vision (WACV) 2018.
23. A. Tripathi, A. Mohan, **S. Anand** and M. Singh, *Adversarial Learning of Raw Speech Features for Domain Invariant Speech Recognition*, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2018.
24. G. S. Cheema and **S. Anand**, *Automatic Detection and Recognition of Individuals in Patterned Species*, European Conference on Machine Learning & Principles and Practice of Knowledge Discovery in Databases (ECML/PKDD), 2017.
25. A. Jain, A. Fell and **S. Anand**, *Parallel Architecture for High Frame Rate Stereo using Semi-Global Matching*, accepted, British Machine Vision Conference (BMVC), 2017.
26. L. Tiwari, **S. Anand** and S. Mittal, *Robust Multi-Model Fitting using Density and Preference Analysis*, Asian Conference on Computer Vision (ACCV), 2016.
27. A. Shukla and **S. Anand**, *Metric Learning Based Automatic Segmentation of Patterned Species*. IEEE International Conference on Image Processing (ICIP), 2016.
28. L. Tiwari and **S. Anand**, *Fast Hypothesis Filtering For Multi-Structure Geometric Model Fitting*. IEEE International Conference on Image Processing (ICIP), 2016.
29. S. Mittal, **S. Anand** and P. Meer, *Generalized Projection based M-Estimator: Theory and Applications*. IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2011.
30. **S. Anand**, D. Madigan, R. Mammone, S. Pathak and F. Roberts, *Experimental Analysis of Sequential Decision Making Algorithms for Port of Entry Inspection Procedures*, in S. Mehrotra, et al (eds.), Proceedings of Intelligence and Security Informatics, LNCS 3975, Springer-Verlag, New York, 2006.

Workshop Papers

1. S. Bhagat, V. Udandarao, S. Uppal, **S. Anand**, *DisCont: Self-Supervised Visual Attribute Disentanglement Using Context Vectors*, ECCV Workshops, Lecture Notes in Computer Science, vol. 12540, 2020.
2. S. Sinha, M. Agarwal, M. Vatsa, R. Singh, **S. Anand**, *Exploring Bias in Primate Face Detection and Recognition*, ECCV Workshops, 2018.

3. A. Shukla, C. Anderson, G. S. Cheema, P. Guo, S. Onda, D. Anshumaan, **S. Anand**, and R. Farrell, *A Hybrid Approach for Tiger Re-Identification*, accepted, ICCV workshop on Computer Vision for Wildlife Conservation (CVWC), 2019.
4. D. Kimothi, A. Shukla, P. Biyani, **S. Anand** and J. Hogan, *Metric Learning on Biological Sequence Embeddings*, SPAWC, 2017.
5. A. Shukla and **S. Anand**, *Distance Metric Learning by Optimization on the Stiefel Manifold*, In H. Drira, S. Kurtek, and P. Turaga, editors, Proc. of the 1st Int. Workshop on DIFF-CV 2015, pages 7.1-7.10. BMVA Press, 2015 (**Best Student Paper**).
6. C. Podilchuk, A. Patel, A. Harthattu, **S. Anand** and R. Mammone, *A New Face Recognition Algorithm based on Bijective Mappings*, IEEE CVPR Workshop on FRGC Experiments, 2005.

PATENT APPLICATIONS

1. A. H. Jha, **S. Anand**, M. K. Singh, V. S. Veeravarasapu, *Systems and Methods for Disentangling Factors of Variation in Computer Vision Systems Using Cycle-Consistent Variational Auto-Encoders*, U.S. Patent App. No. 17/152,424, 2021.
2. M. K. Singh, A. Tripathi, **S. Anand**, *Systems and Methods for Automatic Speech Recognition Using Domain Adaptation Techniques*, U. S. Patent App. No. 16/387,644, 2019.

PROFESSIONAL SERVICE

- Area Chair for IEEE WACV 2023, 2024.
- Program Co-Chair for IEEE WACV 2022.
- Area Chair and Contest Chair for ICVGIP 2021.
- Area Chair for IEEE WACV 2020.
- Organizer, First Workshop on Visual Wildlife Monitoring, co-located with ICCV 2017.
- Regular reviewer for CVPR, ECCV, ICCV, WACV.
- Regular reviewer for IEEE TPAMI, IEEE TIP, IEEE TKDE, Elsevier Pattern Recognition.
- Member, IEEE.

AWARDS AND RECOGNITION

- 2020: Collaborator in a team led by Wildlife Institute of India (WII), which entered the Guinness World Records for “Largest Camera Trap Wildlife Survey”.
- 2019: Invited short talk on AI for Social Good at MSR India-ACM Academic Research Summit, IIT Madras, Jan. 2019.
- 2018: Invited Microsoft AI for Earth Summer Fellow at the Center for AI in Society, University of Southern California.
- 2018: Keynote speaker at Workshop on Computer Vision Applications co-located with the Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP), Dec. 2018.
- 2017: One of the first co-awardees of AI for Earth grants from Microsoft.
- 2015: Best student paper at the DIFF-CV 2015 workshop, co-located with BMVC 2015.
- 2015: Part of the IIIT-Delhi team (Swarath) that was one amongst 13 teams to be selected from ~ 250 applicants for the prototype stage of the Mahindra Rise Driverless Car Challenge.