Aparna Bharati

05-2C Fischer Graduate Residences
Notre Dame, IN 46556

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Email: abharati@nd.edu
Phone: 1-574-340-6661

Education

- **University of Notre Dame**   South Bend, US
  Ph.D. in Computer Science GPA: 4.0/4.0   *June 2020(Expected)*
  - Advisor - Prof. Kevin W. Bowyer
  - Graduate Research Assistant in Computer Vision Research Lab, S'16-Present
  - Graduate Teaching Assistant, Case Studies in Computing-based Entrepreneurship, F'15

- **Indraprastha Institute of Information Technology**   New Delhi, India
  B. Tech. in Computer Science and Engineering GPA: 9.16/10.0   *2015*
  - Specialization in Image Analysis and Machine Intelligence
  - Research Assistant at IAB-Rubric lab. Advisers - *Prof. Mayank Vatsa and Prof. Richa Singh*
  - Teaching Assistant for the Image Analysis and Pattern Recognition courses
  - Student Instructor for Summer Course - Programming in C

Professional Experience

- **Machine Learning Research Intern**
  Adobe Research, Advised by Rajiv Jain, Vlad Morariu   *Jun, 2019 - Sep, 2019*
  - Implemented a workflow that detects and categorizes visual differences between two versions of a document or image using computer vision techniques. Curated datasets for evaluation of the developed approach for use cases from both document and image domain

- **Summer Research Intern**
  Mobile Ubiquitous Computing Group, Advised by Dr. Vinayak Naik   *May, 2013 - Aug, 2013*
  - Developed a website and data distribution system to share location data collected from smartphones. The data was used to understand mobility patterns of people and was also used in a TCS challenge for improved location-based analysis of human mobility trends.

- **Summer Research Intern**
  PreCog Research Group, Advised by Dr. Ponnurangam Kumarguru   *May, 2012 - Aug, 2012*
  - Analyzed user privacy perception using statistical tests and discretized response models on survey questionnaires. The survey contained responses from over 700 social media users.

Major Projects

- **Media Forensics**   Funded by DARPA
  Image Provenance   *July, 2016 - Present*
  - Implemented computer vision algorithms to discover relationships between forged images and produce provenance graphs. Developed a technique to perform provenance analysis based on points of interest in the images. Currently, improving association metrics between images to make them image transformation aware.

- **Document Change Analysis**   Collaboration with Adobe Research
  Change Detection and Classification Between Two Versions   *June, 2019 - Present*
    - Detected, localized and classified changes between two versions of a document or image. Formulated the problem using a feasible set of changes, depending on the domain, and analyzed what changed between two versions. Currently, using techniques from computer vision to create an end-to-end pipeline for the same tasks.

- **Detecting facial retouching based on demographics**   *Ext.* Undergraduate Thesis
  Recognition analysis and algorithms to classify retouched images   *Jan, 2016 - Present*
    - Created retouched faces dataset for multiple demographics. Analyzed the effect on recognition performance and devised deep learning algorithms to detect retouching with $> 90\%$ accuracy across 3 demographies and 2 genders.

- **Reposing face images to improve recognition**
  Frontalization of Non-Frontal Face Images   *Aug, 2015 - June, 2016*
    - Used existing landmarking algorithms to get fiducial points on face images and estimated models to map texture to the displaced configuration to yield frontal faces. Utilized symmetric postprocessing and face embedding to fill in holes and artifacts for qualitative results. Our analysis articulated specific scenarios where frontalization helps towards recognition.

Publications

JOURNALS

- **A. Bharati**, R. Singh, M. Vatsa, K. W. Bowyer, Detecting Facial Retouching Using Supervised Deep Learning, *IEEE Transactions on Information Forensics and Security (T-IFS)*, Vol. 11. Pages(1903 - 1913), Oct. 2016.

- D. Moreira, **A. Bharati**, J. Brogan, A. Pinto, M. Parowski, K. W. Bowyer, P. J. Flynn, A. Rocha and W. J. Scheirer, Image Provenance Analysis at Scale, *IEEE Transactions on Image Processing (T-IP)*, vol. 27, no. 12, pp. 6109-6123, Dec. 2018.

CONFERENCES

- **A. Bharati**, D. Moreira, P. J. Flynn, A. Rocha, K. W. Bowyer, and W. J. Scheirer, Learning Transformation-Aware Embeddings for Image Forensics, Under review, 2019.

- J. Brogan, **A. Bharati**, D. Moreira, K. W. Bowyer, P. J. Flynn, A. Rocha and W. J. Scheirer, Needle in a Haystack: A Framework for Seeking Small Objects in Big Datasets, Under review, 2019.

- **A. Bharati**, D. Moreira, J. Brogan, P. Hale, K. W. Bowyer, P. J. Flynn, A. Rocha and W. J. Scheirer, Beyond Pixels: Image Provenance Analysis Leveraging Metadata, *IEEE Winter Conference on Applications of Computer Vision (WACV)*, 2019.

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

- **A. Bharati**, M. Vatsa, R. Singh, K. W. Bowyer and X. Tong, Demography-based Facial Retouching Detection using Subclass Supervised Sparse Autoencoder, *IEEE International Joint Conference on Biometrics (IJCB)*, 2017.

- **A. Bharati**, D. Moreira, A. Pinto, J. Brogan, K. W. Bowyer, P. J. Flynn, A. Rocha and W. J. Scheirer, U-Phylogeny: Undirected Provenance Graph Consruction in the Wild, *IEEE International Conference on Image Processing (ICIP)*, 2017.

- A. Pinto, ,D. Moreira, **A. Bharati**, J. Brogan, K. J. Bowyer, P. J. Flynn, A. Rocha and W. J. Scheirer, Provenance Filtering for Multimedia Phylogeny, *IEEE International Conference on Image Processing (ICIP)*, 2017.

- J. Brogan, P. Bestagini, **A. Bharati**, A. Pinto, D. Moreira, K. W. Bowyer, P. J. Flynn, A. Rocha and W. J. Scheirer, Spotting the Difference: Context Retrieval and Analysis for Improved Forgery Detection and Localization, *IEEE International Conference on Image Processing (ICIP)*, 2017.

- W. J. Scheirer, P. J. Flynn, C. X. Ding, G. Guo, V. Struc, M. Al Jazaery, K. Grm, S. Dobrisek, D. Tao, Y. Zhu, J. Brogan, S. Banerjee, **A. Bharati**, B. RichardWebster, Report on the BTAS 2016 Video Person Recognition Evaluation, *IEEE International Conference on Biometrics Theory, Applications and Systems (BTAS)*, 2016.

- K. Yadav, A. Kumar, **A. Bharati** and V. Naik, Characterizing mobility patterns of people in developing countries using their mobile phone data, International Conference on Communication Systems and Networks (COMSNETS), 2014.

WORKSHOPS

- N. Blanchard, D. Moreira, **A. Bharati**, W. J Scheirer, Getting the subtext without the text: Scalable multimodal sentiment classification from visual and acoustic modalities, First Workshop on Computational Modeling of Human Multimodal Language - ACL, 2018.

Research Mentoring

Joel Castro   Spring'19
Junior, CSE Department, University of Notre Dame, IN

Olivia Wang   Spring'19
Junior, CSE Department, University of Notre Dame, IN

Jillian Ybanez   Fall'18-Spring'19
Sophomore, CSE Department, University of Notre Dame, IN

Patricia Hale*   Spring'18
Senior, CSE Department, St. Mary's College, IN

Michael Parowski*   Fall'17
Senior, CSE Department, University of Notre Dame, IN

Xin Tong*   2016 - 17
Sophomore, CSE Department, University of Notre Dame, IN

Emma Connors   Summer'16
High School Senior, ND Vision Participant

*Indicates co-authorship in publications.

Teaching Experience

Lecture: Detecting Disinformation on the Internet with AI   Fall'19
Course: Artificial Intelligence (CSE40171)

Lecture: Interesting Topics in CSE   Fall'19
Course: CSE Day for First Year Engineering (EG10111)

Lecture: What to expect from a CS major?   Fall'18
Course: CSE Lab Tour (EG10111)

Teaching Assitant	Fall'15

Course: Case Studies in Computing-based Entrepreneurship

Teaching Assitant	Winter'15

Course: Pattern Recognition (CSE342/CSE542)

Teaching Assitant	Monsoon'14

Course: Image Analysis (CSE340/CSE540)

Tutor	Winter'14

Course: Data Structures and Algorithms

Student Instructor	Summer'13

Course: C Refresher Module for Incoming Grads

Positions of Responsibility

- Reviewer, IEEE Access (Journal)
- Reviewer, IEEE Transactions on Information Forensics and Security (Journal)
- Reviewer, IEEE Transactions on Image Processing (Journal)
- Reviewer, IEEE Transactions on Biometrics (Journal)
- Reviewer, Elsevier Computer Vision and Image Understanding (Journal)
- Reviewer, Journal of Visual Communication and Image Representation (Journal)
- Reviewer, Journal of Selected Topics on Signal Processing (Journal)
- Reviewer, IEEE International Conference on Pattern Recognition (Conference)
- Reviewer, IEEE International Conference on Biometrics (Conference)
- Reviewer, IEEE International Joint Conference on Biometrics (Conference)
- Reviewer, IEEE International Conference on Biometrics:Theory, Applications & Systems (Conference)
- Reviewer, IEEE Computer Vision & Pattern Recognition Media Forensics Workshop (Workshop)
- Representative, Notre Dame CSE Recruitment Efforts at Grace Hopper Conference, 2019
- Member, Graduate Student Board 2017-18
- Advisory Member, Graduate Student Board 2018-19
- Member, IEEE Women in Engineering and Graduate Society of Women Engineers
- Mentor, Graduate Student Board's Students' Mentoring Program, 2017-18
- Convenor, Honors Gathering for the Graduating Batch, 2015
- Moderator, Tech Talks at Inter-College Technical Gathering at IIIT-Delhi, 2011
- School Cabinet Head, St. Francis School, 2009
- School Cabinet Member, St. Francis School, 2007-09

Skill Set

- Programming: Python, C, C#, Matlab, R, PHP, MySQL, MIPS (Basic)
- Operating Systems: Mac OS X, Ubuntu, Windows
- Tools: OpenCV, PyTorch, Tensorflow, Keras, Weka, LATEX, Jupyter, Pandas, GraphViz, Apache, HTML, CSS, Android SDK
- Languages: Proficient in English and Hindi

Awards, Grants & Honours

Panelist on *Early Warning AI System for Violence*, Building Sustainable Peace Conference . 2019
CSE Faculty Choice Best Research Poster Award 2019
Invited Talk at the Demographics Workshop in WACV 2019
Selected for Doctoral Consortium at WACV 2019
Upsilon Pi Epsilon (Computer Science Honor Society) 2017-Present
Graduate Service Appreciation Award 2018
Graduate Service Appreciation Award 2017
Travel Grant from the University of Notre Dame to visit BTAS'16, Niagara Falls, NY 2016
Selected to visit CRA-W Grad Cohorts, San Diego, CA 2016
Nominated for Best Undergraduate Thesis - Research Track 2015
Won the Poetry Competition at Odyssey: the inter-college cultural festival of IIIT-Delhi. . 2015