Tarang Chugh

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Objective Seeking a challenging **Full-time** position in applications of machine learning and computer vision starting May 2020.

Education

		GPA
Michigan State University (2015-Present)	PhD in Computer Science & Engineering Advisor: Prof. Anil K. Jain	4.0 / 4.0
IIIT-Delhi (2009-2013)	B. Tech. (Hons.) in Computer Science & Engineering Graduated with 2nd Rank	9.42 / 10.0

Work Experience

PRIP Lab, MSU (Aug'15 - Present)

Graduate Research Assistant - Pattern Recognition and Image Processing Lab
Advisor: Prof. Anil K. Jain

- Design of an accurate, generalized, and efficient fingerprint spoof detector; one of the best performing algorithms in IARPA ODIN evaluations
- Latent fingerprint value determination: crowd-based learning

NEC Labs, Princeton, NJ (Jun'18 - Aug'18)

Research Intern - Integrated Systems Group

- Know Your Ink: Automated real-time tattoo detection and recognition in the wild

IBM Research, New Delhi (Feb'14 – Aug'15)

Software Engineer - Information Management & Analytics Group

- Mining twitter data to detect law & safety disrupting events in real-time and rank them based on their veracity and impact
- Automating name normalization based on text matching

IIIT Delhi (Dec'13 - Feb'14)

Research Assistant - Image Analysis & Biometrics Lab
Advisors: Dr. Mayank Vatsa and Dr. Richa Singh

- Matching age-separated composite sketches and digital face images using Transfer Learning

INRIA, Nancy, France (May'12 - Nov'12)

Software Engineer Intern - MADYNES Team

- Designed a multi-bridge network interconnecting P2P (BitTorrent) and I2P (Invisible Internet Project); Developed a custom network protocol and cache manager

Publications

Google Scholar: http://bit.do/gs-tarangchugh

Journal Articles:

- **T. Chugh** and A. K. Jain, Fingerprint Spoof Generalization, IEEE Transactions on Information Forensics and Security, 2019 (under-review)
- **T. Chugh**, K. Cao, and Anil K. Jain, Fingerprint Spoof Buster: Use of Minutiae-centered Patches, IEEE Transactions on Information Forensics and Security, Vol. 13, No. 9, pp. 2190-2202, Sept. 2018
- **T. Chugh**, K. Cao, J. Zhou, E. Tabassi and A. K. Jain, Latent Fingerprint Value Prediction: Crowd-based Learning, IEEE Transactions on Information Forensics and Security, Vol. 13, No. 1, pp. 20-34, Jan 2018.

Conference Papers / Technical Reports:

- **T. Chugh** and A. K. Jain, Fingerprint Spoof Detection: Temporal Analysis of Image Sequence, arXiv:1912.08240, 2019
- **T. Chugh** and A. K. Jain, OCT Fingerprints: Resilience to Presentation Attacks, arXiv: 1908.00102, 2019
- **T. Chugh** and A. K. Jain, Fingerprint Presentation Attack Detection: Generalization and Efficiency, *Int'l Conf. on Biometrics (ICB)*, Crete, Greece, 2019
- R. Gajawada, A. Popli, **T. Chugh**, A. Namboodiri, A. K. Jain, Universal Material Translator: Towards Spoof Fingerprint Generalization, *Int'l Conf. on Biometrics (ICB)*, Crete, Greece, 2019
- E. Tabassi, **T. Chugh**, D. Deb, A. K. Jain, Altered Fingerprints: Detection and Localization, *Int'l Conf. on Biometrics: Theory, Applications and Systems (BTAS), Los Angeles, 2018*

- **T. Chugh**, K. Cao, A. K. Jain, Fingerprint Spoof Detection Using Minutiae-based Local Patches, *Int'l Joint Conf. on Biometrics (IJCB)*, Denver, 2017
- **T. Chugh**, S. S. Arora, A. K. Jain, and N. G. Paulter Jr., Benchmarking Fingerprint Minutiae Extractors, in *IEEE Biometrics Special Interest Group (BIOSIG)*, Darmstadt, 2017
- **T. Chugh**, M. Singh, S. Nagpal, R. Singh, and M. Vatsa, Transfer Learning based Evolutionary Algorithm for Composite Face Sketch Recognition, in *IEEE CVPR Workshop (CVPRW) on Biometrics*, Honolulu, 2017
- K. Cao, **T. Chugh**, J. Zhou, E. Tabassi, A. K. Jain, Automatic Latent Value Determination, *Int'l Conf. on Biometrics (ICB)*, Halmstad, Sweden, 2016
- **T. Chugh**, H.S. Bhatt, R. Singh, and M. Vatsa, Matching Age Separated Composite Sketches and Digital Face Images, *Int'l Conf. on Biometrics: Theory, Applications and Systems (BTAS),* Washington D.C. 2013

Software Skills

Languages	Python, C++, C, Java, MATLAB, R, HTML5/CSS3, JavaScript
Tools & Technologies	TensorFlow, Keras, OpenCV, Scikit-learn, Pandas, MySQL, SQLite, Android and Web App Dev., Flask, PyQT5, PyCharm, Latex, Git
Environment	Mac, Linux, Windows

Graduate Courses at MSU

Machine Learning, Computer Vision, Data Mining, Pattern Recognition, Natural Language Processing, Design and Theory of Algorithms, Theory of Prob. and Stats. - I & II, Parallel Computing, Advanced Computer Graphics

Selected Projects

Fingerprint Presentation Attack (Spoof) Detection, PRIP Lab, MSU (Mar'17 – Present) [video]

- Utilized fingerprint domain knowledge and deep learning methods to design a robust fingerprint PA detector
- Improved **generalization** against novel spoofs by developing a style transfer-based data augmentation wrapper
- Improved **interpretability** of CNN models by investigating spoof material characteristics and 3D t-SNE visualizations
- Developed an android application for real-time fingerprint spoof detection on a commodity smartphone (< 100ms)

Learning Latent Fingerprint Value Determination, PRIP Lab, MSU (Aug'15 – Dec'16) [media]

- Designed a crowdsourcing tool, Fingerprint*Mash*, to collect latent value responses from fingerprint experts
- Utilized matrix completion and multidimensional scaling to identify the underlying bases of value determination
- Learned an objective and automatic latent value predictor in terms of latent features that can rank a given set of latent fingerprints saving crucial time of fingerprint experts

Know Your Ink: Automated Tattoo Detection and Recognition, NEC Labs America (Jun'18 – Aug'18)

- Developed a R-CNN based tattoo detector for real-time tattoo detection in unconstrained environment [demo]
- Fixed-length tattoo representation for real-time matching & retrieval (10fps with ~2 tattoos/frame & 300K gallery)

Achievements

- Best performing fingerprint presentation attack detector, IARPA ODIN evaluations (May'18 - Present)
- Recognition for Outstanding Research, Graduate Research Symposium, MSU (Mar'18)
- Research on Latent Value Determination featured in NIST.gov News (Aug'17) [link]
- Code Wars (1st Prize), Programming Competition, IIIT-Delhi (Nov'13)