Chirag Agarwal

Ph.D. Candidate — Computer Vision & Deep Learning

Chicago, IL, USA

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Biography: Chirag completed his Ph.D. from the Department of Electrical and Computer Engineering at the University of Illinois at Chicago. He has been actively researching in Image processing, Computer Vision, and Deep Learning for the last 7 years. Currently, his research interests are in Deep Neural Networks, specifically developing novel architectures, explaining and improving the robustness performance of deep networks.

EDUCATION

University of Illinois at Chicago, Chicago, IL — 2016-2020
Ph.D. in Electrical & Computer Engg. — Deep Learning — Advisors: Dan Schonfeld and Anh Nguyen
Thesis: *Robustness and Explainability of Deep Neural Networks: Architectures and Applications*

University of Illinois at Chicago, Chicago, IL — 2018
M.S. in Electrical & Computer Engg. — Human Activity Recogntion — Advisor: Jezekiel Ben-Arie

Future Institute of Engg. & Management, Kolkata, India — 2008 - 2012
B.S. in Electronics & Communication Engg.

TECHNICAL STRENGTHS

Computer Languages	Python, MATLAB, R
Libraries	PyTorch, Keras, Tensorflow, NLTK, OpenCV, scikit

RESEARCH EXPERIENCE

University of Illinois at Chicago — Aug 2016 - 2020
Research Assistant under Dr. Dan Schonfeld — *Chicago, IL*

- Conceptualized unstructured Neural Networks, which overcomes the limitations of traditional sequential feed-forward architectures.
- Developed robust deep learning architectures by learning discriminative feature representations of the inputs.
- Developed generative explainable AI algorithms having higher object localization accuracy and robustness across different hyperparameters.
- Developed an LSTM based deep learning framework, for automatically generating beat-to-beat blood pressure using other physiological signals.

Auburn University — May 2019 - Aug 2019
Research Assistant under Dr. Anh Nguyen — *Auburn, AL*

- Integrated a generative inpainter into different explainable AI algorithms to remove salient input features.
- Our generative algorithms resulted in (1) more plausible counterfactual samples under the true data generating process; (2) hyperparameter robustness; and (3) better object localization.
- Performed the first systematic study on the sensitivity of explainable AI algorithms to changes in the input hyper-parameters—a phenomenon previously overlooked in the interpretability field.

WORK EXPERIENCE

Robert Bosch LLC (Supervisor: Dr. Ye Mao) — May 2018 - Aug 2018
Computer Vision / Augmented Reality Intern — *Sunnyvale, CA*

- Developed novel methods for obtaining discriminative representations of images for tasks like recognition and identification.
- Generated a 3-D dataset, using Microsoft Kinect, for developing novel Augmented Reality (AR) applications in Microsoft Hololens.

Tempus labs Inc. (Supervisor: Dr. Stephen Yip) — Jan 2018 - May 2018
Imaging Science Intern — *Chicago, IL*

- Developed unsupervised machine learning algorithms for detecting malignant cells in breast cancer mammogram images.
- Applied state-of-the-art deep learning methods for analyzing pathology images.

Kitware Inc. (Supervisor: Dr. Eran Swears) May 2017 - August 2017
Research and Development Intern *Clifton Park, NY*

- Applied state-of-the-art object detection, motion-tracking and image segmentation algorithms for DARPA projects.
- Benchmarked VIRAT video dataset, comprising both ground and aerial videos, using CNN and LSTM models.

Geisinger Health Systems (Supervisor: Dr. Mohammad Arbabshirani) May 2016 - August 2016
Research Intern *Danville, PA*

- Quantified volume of adipose tissue from abdominal CT scans with 97% accuracy using Greedy Snake's algorithm.
- Created a dynamic tool using MATLAB that automatically segments and calculates volume of adipose tissues.
- Contributed to other research projects resulting in 3 conferences and 1 journal publications.

PUBLICATIONS

https://scholar.google.com/citations?user=AFEjd1QAAAAJ&hl=en

Journal papers

- B. Prasad*, C. Agarwal*, E. Schonfeld, D. Schonfeld, and B. Mokhlesi: Deep learning applied to polysomnography to predict blood pressure in obstructive sleep apnea and obesity hypoventilation: A proof-of-concept study, *Journal of Clinical Sleep Medicine, 2020.*
- C. Agarwal, J. Klobusicky, and D. Schonfeld: Convergence of backpropagation with momentum for network architectures with skip connections, *Journal of Computational Mathematics, 2019.*
- E. Cha, Y. Veturi, C. Agarwal, M. Arbabshirani and S. Pendergrass: Using Adipose Measures from Electronic Health Record Imaging Based Data for Discovery, *Journal of Obesity, 2018.*

Conference papers

- C. Agarwal, and A. Nguyen: Explaining image classifiers by removing input features using generative models, *Asian Conference on Computer Vision (ACCV), 2020*; **Poster presentation** (acceptance rate: $\sim 22\%$).
- N. Bansal*, C. Agarwal*, and A. Nguyen*: The Sensitivity of Interpretability Methods to Hyperparameters. *Computer Vision and Pattern Recognition (CVPR), 2020*; **Oral presentation** (acceptance rate: $\sim 5\%$).
- C. Agarwal, S. Khobahi, A. Bose, M. Soltanalian, and D. Schonfeld: Deep-URL: A Model-Aware Approach To Blind Deconvolution Based On Deep Unfolded Richardson-Lucy Network. *IEEE International Conference on Image Processing (ICIP), 2020*; (acceptance rate: $\sim 42\%$).
- C. Agarwal, A. Nguyen, and D. Schonfeld: Improving Adversarial Robustness by Encouraging Discriminative Features. *IEEE International Conference on Image Processing (ICIP), 2019*; **Spotlight paper** (Top 10%).
- C. Agarwal, N. Khobragade. Multi-class segmentation of neuronal electron microscopy images using deep learning, *SPIE Medical Imaging, 2018.*
- C. Agarwal, M. Sharifzadeh, D. Schonfeld. CrossEncoders: A complex neural network compression framework accepted for oral presentation at the Visual Information Processing and Communication Conference, at *IS&T Electronic Imaging 2018*
- M. Sharifzadeh, C. Agarwal, M. Aloraini, D. Schonfeld. Convolutional Neural Network Steganalysis's Application to Steganography, *IEEE Visual Communications and Image Processing (VCIP), 2017.*
- C. Agarwal, A. Dallal, M.R. Arbabshirani, A. Patel, and G. Moore. Unsupervised Quantification of Abdominal Fat from CT images using Greedy Snakes, *SPIE Medical Imaging, 2017.*
- M.R. Arbabshirani, A. Dallal, C. Agarwal, A. Patel, and G. Moore. Accurate Segmentation of Lung fields on Chest Radiographs using Deep Convolutional Networks, *SPIE Medical Imaging, 2017.*

Workshops

- C. Agarwal*, and S. Hooker*: Estimating Example Difficulty using Variance of Gradients *ICML Workshop on Human Interpretability in Machine Learning (WHI), 2020. (Poster presentation)*
- C. Agarwal*, Peijie Chen* and A. Nguyen: Intriguing generalization and simplicity of adversarially trained neural networks *ICML Workshop on Human Interpretability in Machine Learning (WHI), 2020. (Spotlight presentation)*
- N. Bansal*, C. Agarwal*, and A. Nguyen*: How Sensitive are Interpretability Methods to Hyperparameters? *IEEE CVPR Workshop on Fair, Data Efficient and Trusted Computer Vision, 2020.*

E-print articles

- S. Khobahi*, C. Agarwal*, M. Soltanalian: CoroNet: A Deep Network Architecture for Semi-Supervised Task-Based Identification of COVID-19 from Chest X-ray Images, *arXiv preprint, 2020*.
- C. Agarwal, B. Dong, D. Schonfeld, and A. Hoogs: An Explainable Adversarial Robustness Metric for Deep Learning Neural Networks, *arXiv preprint, 2018*.
- C. Agarwal, M. Sharifzadeh, J. Klobusicky, D. Schonfeld. CrossNets: Cross-Information Flow in Deep Learning Architectures, *arXiv preprint, 2018*.

AWARDS

Research Proposal accepted by Google Cloud Platform ($1,000)

ACADEMIC SERVICES

Program Committee: WHI (ICML), 2020; AROW (ECCV), 2020
Reviewer: ICIP (2019, 2020), WHI (2020), AROW (2020)
President of UIC ECE Journal Club

REFERENCES

More available upon requests

Dr. Dan Schonfeld: Professor, University of Illinois at Chicago — dans at uic.edu
Dr. Bharati Prasad: Associate Professor of Medicine, UI Health Sleep Center — bpradsad at uic.edu