Chirag Agarwal

Ph.D. Candidate — Computer Vision & Deep Learning

Chicago, IL, USA

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Biography: Chirag is a Ph.D. Candidate 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 — Aug 2014 - Present
Ph.D. in Electrical & Computer Engg. — Deep Learning — Advisors: Dan Schonfeld and Anh Nguyen
Thesis: *The robustness and explainability of Deep Neural Networks*

University of Illinois at Chicago, Chicago, IL — 2017
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 - Present
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 TreatNet, a LSTM based deep learning framework, for automatically generating beat-to-beat blood pressure using othe 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 conference and 1 journal publications.

PUBLICATIONS

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

Journal papers

- C. Agarwal, J. Klobusicky, and D. Schonfeld: Convergence of backpropagation with momentum for network architectures with skip connections, *Journal of Computational Mathematics (under review), 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, N. Bansal, and A. Nguyen: The Sensitivity of Interpretability Methods to Hyperparameters. (Under review)
- C. Agarwal, D. Schonfeld, and A. Nguyen: Removing input features via a generative model to explain their attributions to classifier's decisions. (Under review)
- C. Agarwal, A. Nguyen, and D. Schonfeld: Improving Adversarial Robustness by Encouraging Discriminative Features, *ICIP 2019.*
- 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.*

E-print articles

- 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.*

ACADEMIC SERVICES

Reviewing Conference papers:: ICIP, ICLR
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. Anh Nguyen: Assistant Professor, Auburn University, anhnguyen at auburn.edu