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 working under Dr. Dan Schonfeld and Dr. Anh Nguyen. His research focus is Deep Learning, specifically developing novel architectures, explaining and improving the performance of deep networks. He has worked as a research intern at Robert Bosch LLC, Tempus Labs Inc., Kitware Inc., and Geisinger Health Systems. Chirag has published at various computer vision and medical imaging conferences and journals like ICIP, SPIE, VCIP and Journal of Obesity.

EDUCATION

University of Illinois at Chicago, Chicago, IL — Aug 2017 - Present
Ph.D. in Electrical & Computer Engg. — Deep Learning — Advisors: Dan Schonfeld and Anh Nguyen
Thesis: *The robustness and explainability of Deep Neural Networks*

- 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.

University of Illinois at Chicago, Chicago, IL — 2014 - 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.

WORK EXPERIENCE

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.

Robert Bosch LLC — 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. — 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. — 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   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.*

TECHNICAL STRENGTHS

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

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 atauburn.edu