Allison (Allie) Del Giorno

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RESEARCH MOTIVATION & OBJECTIVE

I am developing methods in machine learning and signal processing that solve real world applications in computer vision (at the moment, **anomaly detection** and **instance segmentation**). My current project aims to develop an **end-to-end** approach to instance segmentation. The aim is that changes to the loss and model architecture will allow us to directly learn a representation for the rich task. Given the success of end-to-end learning in semantic segmentation and detection, I'm interested in discovering and overcoming principles that have prevented us from achieving similar successes in the richer setting of instance segmentation. This current work has me considering the tradeoff between translation invariance through convolutions and capacity for global computation. Recent work using attention and 'recurrent-free' architectures suggest that these directions may be fruitful.

I am interested in continuing my graduate research through an internship where we can collaborate on projects that aim to further **fundamental machine learning approaches to visual understanding**. In general, I am motivated by work where I can learn and apply machine learning coupled with signal processing. I look forward to gaining new perspectives and tools related to these problems. I am especially interested in attacking complex problems as part of an interdisciplinary team in fields such as basic science or healthcare, where current insights in the machine learning, statistics, and computational communities are likely to have significant impact.

EDUCATION

Ph.D. Candidate, Carnegie Mellon University School of Computer Science   ***Matriculated August 2013***
GPA: 4.0
Advisors: Dr. Martial Hebert (computer vision); Dr. Drew Bagnell (machine learning)
Work in end-to-end instance segmentation; un-/semi-supervised learning for anomaly detection in video

MS Robotics, Carnegie Mellon University (Spring 2016)

Georgia Institute of Technology: President's Scholar   ***Graduated May 2013***
BS Electrical Engineering, Biomedical Engineering Minor | GPA: 4.0/4.0
#1 graduating student from undergraduate class of 2013 (faculty-chosen award: Love Family Scholar)
Georgia Tech Lorraine: Studied abroad during Summer 2011; took core ECE coursework and traveled to 6 countries

Skills and Background:
- Computer Science: machine learning, computer vision, object-oriented programming, parallel computing
- Signal processing: stochastic signals, signal processing, systems and controls
- Math: advanced statistics, convex optimization, numerical optimization methods
- Neurosciences and biology: neuroengineering, neurobiology, physiology, organic chemistry
- Proficient in Python, C/C++, and MATLAB; OS: Linux & Windows; DL libraries: Pytorch (primary), Tensorflow

RESEARCH EXPERIENCE

Graduate research: Machine Learning and Vision   ***Fall 2013 – Present***
- Research objective #1: Unsupervised detection of context-independent anomalies and interesting events in videos
- Research objective #2: Feature selection for invariances related to anomaly detection
- Research objective #3 (current): End-to-end instance segmentation
- Expertise developed: video analytics, outlier detection, non-parametric and semi-supervised learning, supervised deep learning and neural architectures

Undergraduate research: Georgia Tech Center for Signal and Information Processing ***Spring 2011 – Spring 2013***
- Rozell Lab: Studied the visual system using sparse coding principles.
- Implemented an image representation network in MATLAB using learned dictionaries of efficient filters.
- Developing extensive literature background in compressive sensing, Bayesian inference, and human vision.
- Research Option: Completed 12 credit hours of research; published senior thesis on sparse coding V1 models

Undergraduate research: Georgia Tech Neurolab   ***Fall 2009 – Fall 2011***
- Butera Lab: Multi-compartmental modeling using morphological data in MATLAB and XPP.
- Calcium imaging analysis: signal processing methods for extracting bursts from neural activity.

PUBLICATIONS, PRESENTATIONS, & PATENTS

- Del Giorno et al. "A Discriminative Framework for Anomaly Detection." ECCV 2016, Amsterdam.
- Del Giorno et al. "Informative Features for Anomaly Detection." ICML 2016 Workshop on Anomaly Detection.
- Del Giorno et al. "A sparse coding model of V1 produces surround suppression effects in response to natural scenes", BMC Neuroscience 2012. [Presented at the Computational Neuroscience (CNS) Conference)]
- Provisional Patent, Co-inventor: "Automatic Temperature Controller for Household Shower." Filed 7 Dec. 2012.
- Del Giorno et al. "Methodology for extracting activity from functional calcium imaging data," BMC Neuroscience 2012. [Presented at the Computational Neuroscience (CNS) Conference]

- "Multi-compartmental model of bursting in respiratory neurons." GT Research Option proposal, May 2011.
- "Simulated electrophysiology experiments on sparse coding models of sensory processing." Prepared/presented May 2013 as a poster presentation at the Georgia Tech Undergraduate Spring Symposium
- "Modeling respiratory neural circuits in the mammalian brainstem." Prepared/presented in the NIH Summer Internship Program Poster Fair, August 2010.
- "Estimating molecular masses from Atomic Force Microscopy (AFM) topographs." Prepared/presented in the NIH Summer Internship Program Poster Fair, August 2009.

WORK EXPERIENCE

Internship: Skydio (Redwood City, CA)   *Fall 2016*
  - Developed tools for running and displaying automatic log analysis
  - Contributed to and learned cooperate software development (code review, standards)

Internship: Robotic Research, LLC (Gaithersburg, MD)   *Summer 2013*
  - Wrote an SBIR proposal on vestibular balance disorder rehabilitation
  - Implemented a preliminary pedestrian detection system for street view cameras

Internship: National Institute of Neurological Disorders and Stroke [NIH; Bethesda, MD]   *Summer 2010*
  - Modeled in an ordinary differential equation solver to simulate the respiratory neural network.

Internship: *National Institute of Biomedical Imaging and Bioengineering [NIH; Bethesda, MD]*   *Summer 2009*
  - Worked with the Atomic Force Microscope (AFM) interface Nanoscope; scanned samples for researchers.
  - Image analysis with ImageJ, MATLAB, and Excel for determining systematic error.

Internship: Johns Hopkins Applied Physics Lab [Laurel, MD]   *Summer 2008*
  - Performed statistical simulation in MATLAB with autoregressive models for a classified defense project.

SCHOLARSHIPS

- National Defense Science & Engineering Graduate Fellowship (NDSEG) (April 2013)
- National Science Foundation Graduate Fellowship (NSF GRFP) (April 2013) – Declined in order to accept NDSEG
- Goldwater Scholar (March 2011) – Nationally-competitive undergraduate research scholarship, two-year award
- Georgia Tech President's Scholarship (March 2011) – Most prestigious institutional scholarship awarded to applicants
- Northrop Grumman Engineering Scholar (May 2009) – awarded to 42 college-bound engineering students in the U.S.

PRIZES & HONORS

- Love Family Scholarship (May 2013) – Awarded to the top graduating senior at Georgia Tech
- Outstanding EE Senior Award (May 2013) – Awarded to one graduating senior; selected by faculty vote
- ECE Junior Scholar (May 2012) – awarded to only one Electrical and Computer Engineering student per year
- NIH Computational Neuroscience Training Grant (Fall 2011 – Spring 2013) – Funds six undergraduate and graduate students for two years of research, additional coursework, and method clinics in Computational Neuroscience
- Best ECE Senior Design Award (December 2012) – Awarded to one project per semester by industry judges
- CNS 2012 Best Poster Presentation, Honorable Mention (July 2012) – one of 15 awarded out of 190 posters.
- National Institutes of Health (NIH) Intramural Research Training Awards (IRTAs) (Summer 2009, Summer 2010) – Each funded a summer of research with an NIH mentor on the Bethesda campus

TEACHING AND VOLUNTEER EXPERIENCE

- **Eberly Center Future Faculty Program (2013-present):** Attended 30+ hours of seminars on effective lectures, student attention and learning, and feedback. Certification complete upon supervised teaching experiences and a novel course curriculum (Representation Learning: From Fourier to Forests).
- **Head Teaching Assistant for Graduate Computer Vision, 16-720 (2016):** Managed a team of 4 TAs for a course of 95 students; held office hours, managed assignments, and gave guidance on course projects.
- **Women in SCS panelist (2013-present):** Volunteer for various panels for both high school and undergraduate women interested in academic careers in computer science.
- **Georgia Tech Mentor Jackets (2016-17):** Advised an MS student in machine learning career development.
- **Women In Engineering Mentoring Program (2012-2013):** Met weekly with a sophomore in EE. Helped with adjusting to campus life and working toward measurable goals in academics, internships, and healthy living.
- **ECE Undergraduate Tutoring Program: Co-founder and tutor (Summer 2012-Spring 2013):** Founded and developed a peer-to-peer tutoring program for undergraduates in ECE courses. As part of the first class of tutors, I also held open tutoring hours for Signal Processing, helping 10-15 students 2x/week. The program is still active, and aims to improve community interaction, reduce anxiety, enhance understanding, and increase freshmen retention in the ECE department.
- **Robotics Institute Intramural Sports Coordinator (2014-present):** Organize teams and resources to encourage intradepartment teamwork, networking, and friendships through intramural sports.

Personal interests: computational neuroscience and human perception/learning talks and discussions, the 'quantitative self', jiu jitsu, strategy board games, piano, tennis