NATHAN LOUIS

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EDUCATION

University of Michigan, Ann Arbor, MI — August 2017 - April 2022
Ph.D., Electrical Engineering
Advisor: Dr. Jason J. Corso

Kennesaw State University, Marietta, GA — August 2012 - July 2017
B.S., Electrical Engineering

SKILLS AND INTERESTS

Research Interests	Video object detection & tracking, Video language grounding
Skills	Python, PyTorch, MatLab, Java & Android programming, ControlLogix
Platforms	OS X, Windows, Ubuntu

RESEARCH AND WORK EXPERIENCE

Graduate Research Assistant — September 2017 - Present
COG Lab - University of Michigan — *Ann Arbor, MI*

- Perform Computer Vision research, advised by Dr. Jason J. Corso, primarily in the areas of visual tracking, language grounding, and general video understanding. I've done work in video object grounding, object detection, video object tracking, learning motion models from Kalman filters, and human pose estimation & tracking
- My roles include: Identifying problems in literature, developing new ideas, and carrying out experiments with deep learning models in PyTorch

Summer Undergraduate Research in Engineering/Sciences — May 2016 - Aug 2016
Georgia Institute of Technology — *Atlanta, GA*

- Project titled: Improving the Computer Vision Pipeline Through the Application of a Damped Gradient Energy
- A summer research project conducted with Dr. Patricio Vela. This was a process that aimed to reduce the amount of information necessary to produce feature vectors for some computer vision algorithms that utilize gradients. Our baseline was the Histogram of Oriented Gradients algorithm. We conducted different experiments that compared the baseline feature vectors to the pre-processed feature vectors. This research was presented at the SURE symposium.
- I also designed and programmed a circuit board that performs servo control and GPIO functions. The circuit board uses an Arduino micro and several electric components to operate up to 7 servo motors simultaneously.

Louis Stokes Alliance For Minority Participation Summer Research — May 2013 - August 2013
Kennesaw State University — *Marietta, GA*

- Projected titled: Smart Sensor Design & Development
- A summer research project conducted with Dr. Dan Lo. This was designed to read data from sensors and transmit it over Bluetooth to an Android smartphone device. These sensors included medical device sensors, pulse sensors, and a dust sensor. The data from these peripheral devices were interpreted as graphs or visual data on the Android phone. This research was presented an PLSAMP fall symposium.

RELEVANT PROJECTS

ViP: Video Platform for PyTorch 2019
COG Lab - University of Michigan *Ann Arbor, MI*

· We developed a deep learning-based framework we call the Video Platform for PyTorch (ViP). We designed it as a way to prototype and benchmark computer vision models in the video domain. ViP is built with flexibility and modularity in mind allowing for a single unified interface applicable to all video problem domains, easily reproducible experimental setups, and rapid prototyping of video models.

Learning Motion Models for Robust Visual Object Tracking 2019
COG Lab - University of Michigan *Ann Arbor, MI*

· This is my qualification exams project regarding visual object tracking in computer vision. Here I investigated using state estimation theory in combination with a deep learning framework to produce robust tracking coordinate positions. I used a Siamese CNN to encode my observations followed by recent works with LSTM-KF, using recurrent neural networks to produce a motion model and covariance estimates for Kalman Filter updates.

Weakly-Supervised Video Object Grounding from Text by Loss Weighting and Object Interaction 2018
COG Lab - University of Michigan *Ann Arbor, MI*

· We studied weakly-supervised video object grounding: given a video segment and a corresponding descriptive sentence, the goal is to localize objects that are mentioned from the sentence in the video. During training, no object bounding boxes are available, but the set of possible objects to be grounded is known beforehand. Existing approaches in the image domain that use Multiple Instance Learning (MIL) to ground objects by enforcing matches between visual and semantic features. We introduce a weak supervisory signal from the segment level to frames that likely contain the target object and an alternative penalty loss for frames that are unlikely to contain the target objects. We also leverage the interactions among objects as a textual guide for the grounding. Our model is evaluated on the newly- collected benchmark YouCook2-BoundingBox and show improvements over competitive baselines.

PEER REVIEWED CONFERENCE PUBLICATIONS

L. Zhou, **N. Louis**, J. J. Corso. *Weakly-Supervised Video Object Grounding from Text by Loss Weighting and Object Interaction.* BMVC, 2018

TECHNICAL PRESENTATIONS

Poster Presentations

· Engineering Graduate Symposium (October 2018)

Weakly-Supervised Video Object Grounding from Text by Loss Weighting and Object Interaction

· Michigan AI Symposium (November 2018)

Weakly-Supervised Video Object Grounding from Text by Loss Weighting and Object Interaction

VOLUNTEER SERVICE

AI4ALL July 2019
University of Michigan *Ann Arbor, MI*

· AI4ALL is a nonprofit with a focus on increasing diversity and inclusion in the field of Artificial Intelligence. We invited 30+ high school students to stay at the University of Michigan for a two-week period. During this time, they learned about the basics of Machine Learning, A.I, completed a project. My role was an instructor was to linear and non-linear regression techniques, coding basics, and aid a team in completing a group project.

STEMulation March 2019
University of Michigan *Ann Arbor, MI*

· Graduate Society of Black Engineers and Scientists invited high school students to campus to learn about college, engineering, and to participate in fun engineering/science activities. I participated as one of the volunteers in the planning and execution of this event.

College of Engineering Xplore Workshop June 2018
Lights, Pinholes, and Cameras *Ann Arbor, MI*

· Several engineering workshops held for middle school aged students over the course of two days. I presented on the importance of light and lenses for rudimentary to complex vision systems. The students all took home hand crafted pinhole cameras.

PSLSAMP Outreach Fall 2015
Marietta Middle School *Marietta, GA*

· Twice a week, worked as a classroom assistant and helped students complete various science projects.

AWARDS AND ACHIVEMENTS

Recipient, Rackham Merit Fellowship	Fall 2017
Dean's List, School of Engineering	Fall 2012 - Spring 2017
Awarded PSLSAMP Stipend	Spring 2013, Fall 2013, Spring 2014, Spring 2015, Fall 2015
Recipient, Shaw Industries Scholarship:	Fall 2013, Spring 2014