Robert DiPietro

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Research Interests

I'm primarily interested in machine learning for complex time-series data. Two recent projects are 1) designing recurrent neural networks that can learn extremely long-term dependencies and 2) learning meaningful representations of surgical motion, without supervision, in the context of robot-assisted surgery.

Education

09/13 – current **PhD Candidate, Computer Science**
Johns Hopkins University, Baltimore, MD

09/08 – 05/10 **Master of Science, Electrical Engineering**
Northeastern University, Boston, MA

Thesis: "The Detection of Sub-Pixel Objects and Mitigation of False Alarms in Hyperspectral Imagery"

GPA: 4.0 / 4.0

09/05 – 05/10 **Bachelor of Science, Applied Physics and Engineering**, *summa cum laude*
Northeastern University, Boston, MA

GPA: 4.0 / 4.0

Research and Professional Experience

09/13 – current **Johns Hopkins University**, *Graduate Research Assistant / Teaching Assistant*
Advisors: Prof. Gregory Hager and Prof. Nassir Navab

Focus: Modeling complex time-series data, primarily for robot-assisted surgery

06/10 – 07/13 **MIT Lincoln Laboratory**, *Associate Research Staff*
Advisors: Dr. Dimitris Manolakis and Dr. Gregory Berthiaume

Focus: Detecting chemical warfare agents in long-wave hyperspectral imagery

05/09 – 05/10 **Northeastern University**, *Graduate Research Assistant*
Advisors: Prof. Vinay Ingle and Dr. Dimitris Manolakis

Focus: Detecting spatially-unresolved objects in short-wave hyperspectral imagery

07/08 – 05/09 **Northeastern University**, *Undergraduate Research Assistant*
Advisor: Prof. Donald Heiman

Focus: Obtaining the size distribution of nanoparticles using only magnetic measurements

05/07 – 12/07 **iRobot Corporation**, *Engineering Intern*

Designed, drafted, and machined test fixtures for various robots

Publications

[1] Robert DiPietro, Christian Rupprecht, Nassir Navab, and Gregory D Hager. Analyzing and exploiting NARX recurrent neural networks for long-term dependencies. *arXiv preprint arXiv:1702.07805*, 2017.

[2] Christian Rupprecht, Iro Laina, Robert DiPietro, Maximilian Baust, Federico Tombari, Gregory D Hager, and Nassir Navab. Learning in an uncertain world: Representing ambiguity through multiple hypotheses. *International Conference on Computer Vision (ICCV)*, 2017.

[3] Huseyin Coskun, Felix Achilles, Robert DiPietro, Nassir Navab, and Federico Tombari. Long short-term memory kalman filters: Recurrent neural estimators for pose regularization. *International Conference on Computer Vision (ICCV)*, 2017.

[4] Robert DiPietro, Colin Lea, Anand Malpani, Narges Ahmidi, S Swaroop Vedula, Gyusung I Lee, Mija R Lee, and Gregory D Hager. Recognizing surgical activities with recurrent neural networks. In *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2016.

[5] D. Manolakis, S. Golowich, and R. DiPietro. Long-Wave Infrared Hyperspectral Remote Sensing of Chemical Clouds: A focus on signal processing approaches. *IEEE Signal Processing Magazine*, 31(4), 2014.

[6] C. Brett, R. DiPietro, D. Manolakis, and V. Ingle. Efficient Implementations of Hyperspectral Chemical-Detection Algorithms. *Proceedings of SPIE*, 8897, 2013.

[7] R. DiPietro, E. Truslow, D. Manolakis, S. Golowich, and R. Lockwood. False-Alarm Characterization in Hyperspectral Gas-Detection Applications. *Proceedings of SPIE*, 8515, 2012.

[8] R. DiPietro, D. Manolakis, R. Lockwood, T. Cooley, and J. Jacobson. Hyperspectral Matched Filter with False-Alarm Mitigation. *Optical Engineering*, 51(1), 2012.

[9] B. Plouffe, D. Nagesha, R. DiPietro, S. Sridhar, D. Heiman, S. Murthy, and L. Lewis. Thermomagnetic Determination of Fe_3O_4 Magnetic Nanoparticle Diameters for Biomedical Applications. *Journal of Magnetism and Magnetic Materials*, 323(17), 2011.

[10] B. Jugdersuren, S. Kang, R. DiPietro, D. Heiman, D. McKeown, I. Pegg, and J. Philip. Large Low Field Magnetoresistance in $La_{0.67}Sr_{0.33}MnO_3$ Nanowire Devices. *Journal of Applied Physics*, 109(1), 2011.

[11] R. DiPietro, H. Johnson, S. Bennett, T. Nummy, L. Lewis, and D. Heiman. Determining Magnetic Nanoparticle Size Distributions from Thermomagnetic Measurements. *Applied Physics Letters*, 96(22), 2010.

[12] S. Kang, G. Brewer, B. Jugdersuren, R. DiPietro, D. Heiman, A. Buechele, D. McKeown, I. Pegg, and J. Philip. Magnetotransport Properties of Mn-Si-C Based Nanostructures. *Journal of Applied Physics*, 107(10), 2010.

[13] R. DiPietro, D. Manolakis, R. Lockwood, T. Cooley, and J. Jacobson. Performance Evaluation of Hyperspectral Detection Algorithms for Sub-Pixel Objects. *Proceedings of SPIE*, 7695, 2010.

[14] S. Kang, G. Brewer, J. Battogtokh, R. DiPietro, D. Heiman, A. Buechele, D. McKeown, I. Pegg, and J. Philip. Growth and Characterization of Mn_5SiC Nanowires. *Nanoscience and Nanotechnology Letters*, 1(2), 2009.

Teaching Experience

Johns Hopkins University, Baltimore, MD

2018 Spring	Co-Instructor for EN.601.382, Machine Learning: Deep Learning Lab
2018 Spring	Co-Instructor for EN.601.482/682, Machine Learning: Deep Learning
2017 Fall	Teaching Assistant for EN.601.475/675, Introduction to Machine Learning
2015 Fall	Instructor for EN.500.111, HEART: Machine Learning for Surgical Workflow Analysis
2015 Spring	Teaching Assistant for EN.600.476/676, Machine Learning: Data to Models
2014 Spring	Co-Instructor for EN.600.120, Intermediate Programming
2014 Intersession	Instructor for EN.600.101, MATLAB for Data Analytics

Awards and Honors

2016 **Excellence in Teaching Award, Department of Computer Science, Johns Hopkins University**

2014 **Intuitive Surgical Fellowship (2014–2015), Johns Hopkins University**

2014 **International Exchange Program, Johns Hopkins University and Technical University of Munich**
US-Germany Research Collaboration on Medical Systems Engineering

2013 **Louis M. Brown Engineering Fellowship, Johns Hopkins University**

2012 **Team Award, MIT Lincoln Laboratory**

2009 **Eta Kappa Nu, Northeastern University**
Electrical and Computer Engineering Honor Society

2007 **Sigma Pi Sigma, Northeastern University**
Physics Honor Society