**Philip Saponaro**

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**Education**

**University of Delaware, Newark DE**

PhD Computer Science, Jan 2016

Thesis: Hidden target detection and classification using multiple modalities

Advisor: Dr. Chandra Kambhamettu

Research Topics: machine learning, neural networks, support vector machines, clustering, 3D stereo reconstruction, multimodal fusion, long wave infrared vision, augmented reality

M.S. Computer Science, GPA 3.98

B.S. Computer Science Cum Laude with Distinction, Concentration in Game Design, Minor in Philosophy, GPA 3.82, Major GPA 3.90

**Experience**

**Department of Computer and Information Sciences**

 Newark, DE August 2017 – Present

Postdoctoral Fellow Development of machine learning networks for multi-modal matching, detection, and classification. Results include correctly semantically segmented road scenes with hidden targets identified. Writing conference and journal papers, creating posters, and writing grant proposals. Successfully wrote a $250,000 proposal for funding from NIH. Teaching introduction to Computer Vision. Created lectures, quizzes, exams, labs, and homework, and lectured multiple times a week.

**Department of Plant and Soil Sciences**

 Newark, DE August 2016 – August 2017

Postdoctoral Fellow Development algorithms to automatically segment, skeletonize, and extract high-level information from macroscopic microscopy image stacks of fungal infections in maize. Wrote papers, created posters, presented at conferences, specifically presented at CVPR2016 and a MaizeGDB 2016. Also taught two classes – Introduction to Computer Science and Logic. Created lectures, quizzes, exams, labs, and homework, and lectured multiple times a week.

**Aberdeen Proving Grounds, SED/CECOM**

 Aberdeen, MD March 2016 – August 2016

Computer Scientist Development of software and support for Software Loader Verifier (SLV) to install software to various helicopters. Maintained the SLV software suite and updated it to work on Windows 10.

**Video/Image Modeling and Synthesis Lab**

 Newark, DE January 2012 - March 2016

Research Assistant Calibrated stereo camera setup. Developed software to reconstruct a 3D point cloud of a scene using a calibrated stereo camera setup. Calibrated a monocular camera on a cell phone using automatic methods. Used Microsoft Kinect to reconstruct a 3D scene. Classified materials using novel thermal features. Constructed mounting system and secured camera system on roof of car for data collection. Worked on PhD thesis, which involves stereo reconstruction using long wave infrared cameras for detection and classification of concealed targets.

**Army Research Laboratory**

 Adelphi, MD Summers 2012 - 2015

Research Assistant Developed augmented reality software for use on the SIRE radar to detect hidden/buried objects. Tested system in realistic conditions at the Yuma Proving Grounds in Yuma, AZ. Designed stereo long wave infrared camera system for detection of concealed targets. Fused nonlinear, linear, thermal, and optical using machine learning for detection and classification of concealed targets.

**Computer Science Department, University of Delaware**

 Newark, DE September 2011 - May 2012

Teaching Assistant Graded homework, tutored students in Data Mining, Computer Networking II, and Logic. Improved familiarity with the Weka data analysis and Wireshark packet analysis tools.

**Global Computing Lab, University of Delaware**

 Newark, DE January 2009 - May 2010

Research Assistant Developing an extended-precision library for use on GPU

Integrating the library into Molecular Dynamics code

**Academic Enrichment Center, University of Delaware**

 Newark, DE Spring 2009

Tutor Tutored introductory computer science and logic courses

**Professional Skills**

* Proficient in Java, Matlab, C, C++, C#, Python
* Proficient in Computer Vision techniques such as stereo reconstructions, object classification, object detection, multi-sensor fusion.
* Proficient in Machine Learning techniques such as neural networks, support vector machines, clustering.
* Intermediate knowledge of HTML and PHP
* Experience with both Windows and Linux operating systems
* Experience working with Visual Studio, Netbeans, Eclipse

**Honors and Awards**

* Frank A. Pehrson Outstanding Graduate Student Award, **2016**
* Computer Science Teaching Assistant of the Year, **2011-2012**
* University of Delaware Graduate Fellowship, **2012-2013**
* University of Delaware Graduate Scholars award, **2010**
* Dr. Robert M. Panoff Student Award for Explorations in Science through Computation, **2009**
* UD Summer Scholar, University of Delaware, DE **2009**
* Computer Science Outstanding Undergraduate Student Award, **2009**
* Delaware State Chess Champion, **2008, 2011**
* President of Blue Hen Chess Club, **2008 – 2010**
* Delaware ScIP Scholarship, **2006-2009**
* Dean’s List, Fall 2006 – Spring **2010**
* Michael Ferguson Scholarship, **2005**

**Publications**

**Conference Papers**

1. W. Treible\*, **P. Saponaro\***, Y. Lui, A. Das Gupta, V. Veerendraveer, S. Sorensen, C. Kambhamettu. CATS 2: Color And Thermal Stereo Scenes with Semantic Labels. **Vision for All Seasons: Bad Weather and Nighttime (CVPRW) 2019. \***Equal Contribution
2. **P. Saponaro**, H. Wei, G. Dominick, C. Kambhamettu. Estimating Physical Activity Intensity and Energy Expenditure using Computer Vision on Videos. **IEEE** **International Conference on Image Processing (ICIP) 2019**
3. **W. Treible\*,** P. Saponaro\*, C. Kambhamettu. WILDCAT Compare: In-the-Wild Color-And-Thermal Patch Comparison with Deep Residual Pseudo-Siamese Network. **IEEE** **International Conference on Image Processing (ICIP) 2019. \***Equal Contribution
4. R. Suminski, G. Dominick, **P. Saponaro**, E. Plautz, F. Patterson. Advancing the SOPARC Method through Video Analysis. **Active Living Research Conference 2019**
5. **P. Saponaro**, W. Treible, B. Phelan, K. Sherbondy, C. Kambhamettu. Sensor fusion and augmented reality with the SAFIRE system. 2018, Infrared Imaging Systems: Design, Analysis, Modeling, and Testing XXIX – Proceedings. **SPIE 2018**
6. Y. Liu **,** W. Treible**,** , A. Kolagunda, A. Nedo, **P. Saponaro** , J. Kaplan, C. Kambhamettu. Densely Connected Stacked U-network for Filament Segmentation in Microscopy Images. IEEE 2018 European Conference on Computer Vision Workshop, Bioimaging Computing, **BIC 2018**.
7. A. Kolagunda **,** S. Sorensen**, P. Saponaro**, W. Treible, S. Mehralivand, B. Turkbey, P. Pinto, P. Choyke, C. Kambhamettu. A Mixed Reality Guidance System For Robot Assisted Laparoscopic Radical Prostatectomy. 7th MICCAI 2018 Workshop on Clinical Image-based Procedures: Translational Research in Medical Imaging, **CLIP** **2018**.
8. A. Kolagunda **,** S. Sorensen**, P. Saponaro**, W. Treible, C. Kambhamettu. Robust Shape Registration using Fuzzy Correspondences. IEEE International Conference on 3D Vision, **3DV** **2017**.
9. **P. Saponaro**, W. Treible, A. Kolagunda, S. Rhein, J. Caplan, C. Kambhamettu., R.Wisser. Three-Dimensional Segmentation of Vesicular Networks of Fungal Hyphae in Macroscopic Microscopy Image Stacks. IEEE International Conference for Image Processing, **ICIP** **2017**.
10. **P. Saponaro**, W. Treible, A. Kolagunda, T. Chaya, J. Caplan, C. Kambhamettu., R.Wisser. DeepXScope: Segmenting Microscopy Images with a Deep Neural Network. Computer Vision for Microscopy Image Analysis, **CVMI 2017**.
11. W. Treible\*, **P. Saponaro\***, S. Sorensen\*, A. Kolagunda, M. O’Neal, B. Phelan, K. Sherbondy, C. Kambhamettu. CATS: A Color and Thermal Stereo Benchmark. 2017 IEEE Conference on Computer Vision and Pattern Recognition, **CVPR 2017**. (*Acceptance Rate for Spotlight:* ***8%****).* **\***Equal Contribution
12. B. Phelan ; K. Ranney ; M. Ressler ; J. Clark ; K. Sherbondy ; G. Kirose ; A. Harrison ; D. Galanos ; **P. Saponaro** ; W. Treible ; R. Narayanan; System upgrades and performance evaluation of the spectrally agile, frequency incrementing reconfigurable (SAFIRE) radar system. Proc. SPIE 10188, Radar Sensor Technology XXI, 1018812 (May 11, 2017); doi:10.1117/12.2266217. **SPIE 2017**
13. S. Sorensen, **P. Saponaro**, S. Rhein, C. Kambhamettu. Multimodal Stereo Vision For Reconstruction In The Presence Of Reflection. The British Machine Vision Conference, **BMVC 2015** (*Acceptance Rate:* **33%**)
14. **P. Saponaro,** S. Sorensen, S. Rhein, C. Kambhamettu. Improving Calibration of Thermal Stereo Cameras Using Heated Calibration Board. IEEE International Conference on Image Processing, **ICIP 2015**. (*Acceptance Rate:* **45%**)
15. S. Sorensen, A. Kolagunda, **P. Saponaro**, S. Rhein, C. Kambhamettu. Refractive Stereo Ray Tracing for Reconstruction Underwater Structures. IEEE International Conference on Image Processing, **ICIP 2015**. (*Acceptance Rate:* **45%**)
16. **P. Saponaro,** S. Sorensen, A. Kolagunda, C. Kambhamettu. Material Classification with Thermal Imagery. 2015 IEEE Conference on Computer Vision and Pattern Recognition, **CVPR 2015** (*Acceptance Rate:* **28.4%**)
17. **P. Saponaro,** C. Kambhamettu. Concealed Target Detection with Fusion of Visible and Infrared. Springer 10th International Symposium on Visual Computing, **ISVC 2014**.
18. **P. Saponaro,** S. Sorensen, S. Rhein, Andrew R. Mahoney, and Chandra Kambhamettu. Reconstruction of Textureless Regions Using Structure From Motion and Image-Based Interpolation. IEEE International Conference on Image Processing, **ICIP 2014**. (*Acceptance Rate:* **44%**)
19. **P. Saponaro,** C. Kambhamettu. Towards Auto-calibration of Smart Phones Using Orientation Sensors. In Third IEEE International Workshop on Mobile Vision, **CVPRW 2013**.
20. **P. Saponaro,** C. Kambhamettu, K. Ranney, A. Sullivan: Concealed Target Detection Using Augmented Reality with SIRE Radar. SPIE Defense, Security, and Sensing: Radar Sensor Technology XVII, Baltimore, Maryland, **SPIE DSS 2013**.
21. M. Taufer, O. Padron, **P. Saponaro,** S. Patel: Improving Numerical Reproducibility and Stability in Large-Scale Numerical Simulations on GPUs. IEEE/ACM International Parallel and Distributed Processing Symposium**IPDPS2010***,* Atlanta, Georgia. (*Acceptance Rate:* **24%**)

**Journal Papers**

1. G. Lu, Y. Yan, L. Ren, **P. Saponaro**, N. Sebe, C. Kambhamettu, Where am I in the dark: Exploring active transfer learning on the use of indoor localization based on thermal imaging, **Neurocomputing 2016**, ISSN 0925-2312, <http://dx.doi.org/10.1016/j.neucom.2015.07.106>

**Ph.D Thesis**

1. **P. Saponaro,** Hidden Target Detection and Classification using Multiple Modalities, University of Delaware, **UD 2016**, <http://udspace.udel.edu/handle/19716/17746>

**Undergraduate Thesis**

1. **P. Saponaro,** Improving numerical reproducibility and stability in large-scale numerical simulations on GPUS, University of Delaware, **UD 2010**, <http://dspace.udel.edu/handle/19716/5530>

**Under Revew**

1. W. Treible\*, **P. Saponaro\*,** B. Phalen, K. Sherbondy, C. Kambhamettu. WILDCAT Compare: In-the-Wild Color-And-Thermal Patch Comparison with Deep Residual Pseudo-Siamese Networks. Under review for the 2018 11th Indian Conference on Vision, Graphics and Image Processing, **ICVGIP 2018.** \*Equal contribution.

**Presentations**

**Oral Conference Presentations**

1. DeepXScope: Segmenting Microscopy Images with a Deep Neural Network. Accepted at Computer Vision for Microscopy Image Analysis, **CVMI 2017**.
2. Improving Calibration of Thermal Stereo Cameras Using Heated Calibration Board. IEEE International Conference on Image Processing, Quebec City, Canada, **ICIP 2015**.
3. Towards Auto-calibration of Smart Phones Using Orientation Sensors. In Third IEEE International Workshop on Mobile Vision, Portland, Oregon, **CVPRW 2013**
4. Concealed Target Detection Using Augmented Reality with SIRE Radar. SPIE Defense, Security, and Sensing: Radar Sensor Technology XVII, Baltimore, Maryland, **SPIE DSS 2013**.

**Oral Other Presentations**

1. Detection and Classification of Triggering Devices using Multimodal Systems, Army Research Lab, Adelphi, MD, **2015**
2. Introduction to Computer Vision Guest Lecture, Transformations and Homographies, University of Delaware, **2015**
3. Introduction to Computer Science Guest Lecture, Programming with Matlab, University of Delaware, **2015**
4. Stereo Vision on a Vehicle, Army Research Lab Briefing, University of Delaware, **2014**.
5. Augmented Reality with SIRE Radar, PIRT Program Report, Delaware State University, **2012**

**Poster Conference Presentations**

1. DeepXScope: Segmenting biological features of Maize tissue for quantifying disease resistance. **CANR Symposium 2017**
2. Computer vision with macroscopic microscopy: automating the extraction of pathogenesis information for quantitative analysis. **Maize Genetics Conference 2017**
3. Material Classification with Thermal Imagery. 2015 IEEE Conference on Computer Vision and Pattern Recognition, **CVPR 2015**
4. Concealed Target Detection with Fusion of Visible and Infrared. Springer 10th International Symposium on Visual Computing, **ISVC 2014**.
5. Reconstruction of Textureless Regions Using Structure From Motion and Image-Based Interpolation. IEEE International Conference on Image Processing, **ICIP 2014**.

**Professional Activities**

**Peer Reviews**

1. International Workshop on Visual Odometry and Computer Vision Applications Based on Location Clues **VOCVLC 2018**
2. International Workshop on Visual Odometry and Computer Vision Applications Based on Location Clues **VOCVLC 2017**
3. Conference on Computer Vision and Pattern Recognition **CVPR 2017**
4. Quantitative InfraRed Thermography Journal **QIRT** **2016**
5. International Conference on Pattern Recognition **ICPR 2016**
6. International Symposium on Visual Computing **ISVC 2015**
7. International Conference on Bioinformatics and Biomedicine **BIBM 2014**
8. Indian Conference on Computer Vision, Graphics, and Image Processing **ICVGIP 2014**
9. Computer Vision and Image Understanding Journal **CVIU 2014**
10. International Conference on Pattern Recognition **ICPR 2014**
11. International Conference on Bioinformatics and Biomedicine **BIBM 2013**
12. International Workshop on Depth Image Analysis **WDIA 2013**
13. International Conference on Bioinformatics and Biomedicine **BIBM 2012**

**Funded Grant Proposals**

**2019 STTR F19B-001-0011** (PI) Proposal Title: Technical training software platform using machine learning and AR for Air Force maintenance and service operation

**2017 NIH SF 424 R&R** (co-PI).Proposal Title: A cutting edge approach to assessing physical activities occurring on sidewalks/streets