

# Benjamin D. Killeen

*Ph.D. Student, Johns Hopkins University*

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## Summary

A Ph.D. Student at Johns Hopkins University, I am interested in intelligent surgical systems based on explorative computer vision and deep reinforcement learning that directly improve patient outcomes. I am a member of the Advanced Robotics and Computationally Augmented Environments (ARCADE) research group and the Computational Interaction and Robotics Laboratory (CIRL).

## Education

**Ph.D., Computer Science**, Johns Hopkins University, Baltimore, MD, USA. 08/2019 - present  
With Mathias Unberath and Gregory D. Hager.

**B.A., Computer Science with Honors (Physics Minor)**, University of Chicago, Chicago, IL, USA. 09/2015 - 06/2019  
Thesis: Starting from Scratch: Deep Learning for Novel Scientific Image Analysis  
With Gordon Kindlmann.

## Research Experience

**Research assistant**, Department of Computer Science, Johns Hopkins University, Baltimore, MD, USA. 08/2020 - present  
With Mathias Unberath, Gregory D. Hager.

**Research Assistant**, Laboratory for Computational Sensing and Robotics, Johns Hopkins University, Baltimore, MD, USA. 08/2019 - 06/2020  
With Gregory D. Hager, Mathias Unberath, and Russel Taylor.  
Recipient: LCSR Fellowship for Outstanding Incoming Ph.D. Students.

**Research assistant**, Department of Computer Science, University of Chicago, Chicago, IL, USA. 03/2018 - 08/2019  
With Gordon Kindlmann.

## Professional Experience

**Computer Vision / AI Intern**, Applied Research, Intuitive Surgical Inc., Sunnyvale, CA, USA. 06/2020 - 07/2020  
With Omid Mohareri.

**Software Development Intern**, Cognitive Computing, Epic Systems, Verona, WI, USA. 06/2018 - 08/2018

**Research Intern**, IBM Research - Almaden, San Jose, CA, USA. 06/2017 - 08/2017  
With Geoffrey Burr.

## Selected Honors

**Best Presentation**, Reliable Software Systems course, Johns Hopkins University, USA. 04/2021

**Best Graduate Project Award**, Computer Integrated Surgical Systems and Technology course, Johns Hopkins University, USA. 05/2020

**COVID-19 Dataset Award**, Kaggle. 04/2020  
For our county-level dataset in [M-1].

**Intuitive Surgical Best Project Award**, Deep Learning course, Johns Hopkins University, USA. 12/2019  
Project: Enriching Unsupervised Feature Learning via Intermediate Subtasks.  
With Michael Peven, Shaoyan Pan, and Matthew Pittman.

## Publications

My publication list is also available on Google Scholar. Asterisk (\*) indicates equal contribution.

### Peer-reviewed Journal Articles

A. Hundt, **B. Killeen**, H. Kwon, C. Paxton, GD Hager. "Good Robot!": Efficient Reinforcement Learning for Multi-Step Visual Tasks with Sim to Real Transfer. *IEEE Robotics and Automation Letters*, vol. 5, no. 4, pp. 6724–6731, Oct. 2020. doi: 10.1109/LRA.2020.3015448. J-2

S. Ambrogio, P. Narayanan, H. Tsai, R. M. Shelby, I. Boybat, C. di Nolfo, S. Sidler, M. Giordano, M. Bodini, N. Farinha, **B. Killeen**, C. Cheng, Y. Jaoudi, G. W. Burr. Equivalent-accuracy accelerated neural-network training using analogue memory. *Nature*, vol. 558, no. 7708, p. 60, Jun. 2018. doi: 10.1038/s41586-018-0180-5. J-1

### Peer-reviewed Conference Papers

X. Liu\*, **B. D. Killeen\***, A. Sinha, M. Ishii, G. Hager, R. Taylor, M. Unberath. Neighborhood Normalization for Robust Geometric Feature Learning. To appear in The IEEE/CVF Conference on Computer Vision and Pattern Recognition, 2021. C-3

	C. Gao, X. Liu, W. Gu, <b>B. D. Killeen</b> , M. Armand, R. Taylor, M. Unberath. Generalizing Spatial Transformers to Projective Geometry with Applications to 2D/3D Registration. <i>MICCAI</i> , 2020, arxiv:2003.10987.	C-2
	X. Liu, Y. Zhang, <b>B. Killeen</b> , M. Ishii, G. Hager, R. Taylor, M. Unberath. Extremely Dense Point Correspondences using a Learned Feature Descriptor. <i>Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition</i> , pp. 4847-4856, 2020.	C-1
Preprints	J. Y. Wu*, <b>B. D. Killeen*</b> , P. Nikutta, M. Thies, A. Zapaishchykova, S. Chakraborty, M. Unberath. Changes in Reproductive Rate of SARS-CoV-2 Due to Non-pharmaceutical Interventions in 1,417 U.S. Counties. <i>medRxiv preprint</i> , Jun. 2020, doi: 10.1101/2020.05.31.20118687.	M-2
	<b>B. D. Killeen*</b> , J. Y. Wu*, K. Shah, A. Zapaishchykova, P. Nikutta, A. Tamhane, S. Chakraborty, J. Wei, T. Gao, M. Thies, M. Unberath. A County-level Dataset for Informing the United States' Response to COVID-19. <i>arXiv preprint</i> , 2020, arXiv:2004.00756.	M-1
Patents	G. W. Burr and <b>B. D. Killeen</b> . 2020. Efficient Processing of Convolutional Neural Network Layers Using Analog-memory-based Hardware. 20200117986, filed March 25, 2019, and issued April 16, 2020, uspto.report/patent/app/20200117986.	P-1
Selected Press	Dziarkach, Andrei. <b>"Details with Andrei Dziarkach."</b> Voice of America. November 21, 2020 Accessed November 26, 2020. <a href="https://www.golosameriki.com/a/detali/5671254.html">golosameriki.com/a/detali/5671254.html</a> . Rosen, Jill. <b>"Dog Training Methods Help JHU Teach Robots to Learn New Tricks."</b> The Johns Hopkins University Hub. The Johns Hopkins University, October 26, 2020. <a href="https://hub.jhu.edu/2020/10/26/positive-reinforcementfor-robots">hub.jhu.edu/2020/10/26/positive-reinforcementfor-robots</a> .	2020
Teaching		
Assistant Teaching	<b>Machine Learning and Large Scale Data Analysis</b> , Department of Computer Science, University of Chicago, Chicago, IL, USA With Prof. Yali Amit. Wrote supplementary course material and held weekly lab sessions.  Selected review: "Ben was incredibly patient during office hours and always responsive to student questions. In addition, he often presented demos during office hours or showed easier ways to handle the homework assignments; both were very helpful." More reviews available at <a href="https://benjamindkilleen.com/teaching/2019-spring-lsda">benjamindkilleen.com/teaching/2019-spring-lsda</a>	03/2019 - 06/2019
Grading	Department of Computer Science, University of Chicago, Chicago, IL, USA - <b>Scientific Visualization</b> - <b>Introduction to Computer Science I</b> - <b>Introduction to Computer Science II</b>	01/2019 - 08/2019
Tutoring	<b>Topics in Computer Science, Machine Learning</b> , Baltimore, MD, USA. I tutor young people (middle- and high-school age) who are interested in CS and ML. More info at <a href="https://benjamindkilleen.com/teaching/2020-tutoring">benjamindkilleen.com/teaching/2020-tutoring</a> .	06/2020 - present
Supervision	I have supervised a number of talented masters and undergraduate students on research projects and theses: <b>Nethra Venkatayogi</b> , The University of Texas at Austin, Austin, TX, USA. <b>Max Judish</b> , Brown University, Providence, RI, USA. <b>Shreya Chakraborty</b> , Johns Hopkins University, Baltimore, MD, USA. <b>Philipp Nikutta</b> , Technical University of Munich, Munich, Germany.	05/2021 - present 01/2021 - present 08/2020 - present 12/2019 - 03/2020
Service	<b>Graduate Student Committee Representative</b> , Laboratory for Computational Sensing and Robotics, Baltimore, MD, USA. <b>Volunteer Instructor</b> , CompileHer, Chicago, IL, USA.	2020 - present 2019
Peer Review	- IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) - Nature Scientific Data	2021 2020
Selected Coursework		
Graduate	Vision as Bayesian Inference	

	Reliable Software Systems Theory of Computation Parallel Programming Nonlinear Optimization II Computer Integrated Surgery II Computer Integrated Surgery I Deep Learning	
Undergraduate	Unsupervised Learning* Computer Vision Machine Learning and Large Scale Data Analysis Operating Systems Honors Combinatorics Honors Algorithms Honors Discrete Mathematics Scientific Visualization Programming Languages Networks and Distributed Systems Quantum Mechanics I \& II Intermediate Mechanics Electronics Wizards  *Graduate level.	GPA: 3.81
Memberships	IEEE Graduate Student Member	2020 - present
Extracurricular	In my spare time, I enjoy running, climbing, and making visual art. I also write creatively: <b>Creative nonfiction:</b> <a href="https://benjamindkilleen.medium.com">benjamindkilleen.medium.com</a> <b>Science Fiction:</b> novel in progress.	
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