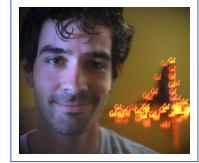# Nick Antipa

Curriculum Vitae

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Education

2014-present **PhD Candidate, University of California Berkeley**, *Electrical Engineering*.
Expected Summer 2019

Advisors: Laura Waller and Ren Ng

Research Area: Computational Imaging

2009 **MS, University of Rochester**, *Optics*.
Advisor: Julie Bentley

Thesis: *Effective Utilization of Off-the-Shelf Optics: Balancing application, performance, and cost.*

2008 **BS, University of California Davis**, *Optical Science and Engineering*, GPA 3.89.

Employment

20014-present **Graduate Student Researcher, UC Berkeley**, *Electrical Engineering and Computer Sciences (EECS)*.

2009-2014 **Optics Engineer, Lawrence Livermore National Lab**, *National Ignition Facility (NIF)*, Livermore, California.

Skills

Coding Proficient with MATLAB and comfortable with Python

Lens Design Comfortable with Zemax OpticStudio and familiar with Code V

Optics In depth experience building lensless imagers and optical metrology systems. Highly experienced with interferometry, confocal surface profiling, depth sensing, lens design, geometric optics and aberration theory, physical optics, microscopy

Algorithms Proficient with inverse problems, convex optimization, and compressed sensing, familiar with image processing and machine-learning

Selected Research and Projects

2018-2019 **Lensless compressive video**, *UC Berkeley*.
Lensless cameras produce highly multiplexed data. Rolling shutter sensors record images row-by-row at extremely high speeds (over 100,000 lines/second). By coupling lensless imaging with rolling shutter, each row from a single rolling shutter capture can be expanded into an entire 2D frame from a video.

2017-present	**Compact neural imaging devices**, *UC Berkeley*.
	I am designing compact (2 to 3 grams) head mountable fluorescent microscopes. The ultimate goal is a miniature system capable of time-resolved, *in-vivo* 3D imaging of fluorescent neural signal on freely behaving animals (e.g. mice).
2017-present	**Lensless single-shot volumetric imaging**, *UC Berkeley*.
	This prototype imaging system consists solely of a diffuser placed in front of an image sensor. By solving a large-scale compressed sensing-style inverse problem, 3D images of sparse scenes can be recovered from a single 2D measurement taken with this camera. I am working with a team to develop compact depth-capable cameras based on this approach.
2018-present	**Simultaneous end-to-end optimization of optics and algorithms**, *UC Berkeley*.
	To constrain the computational cost of image reconstruction and discover novel optical designs, I am exploring machine learning-inspired techniques for optical system design. The goal of this work-in-progress is to simultaneously optimize the optics and the reconstruction algorithm parameters for task-specific sensing problems (e.g. neural imaging).
2013-2014	**High-speed fiber-based photodiode characterization**, *LLNL*.
	I designed and prototyped two different all-fiber systems for measuring the transfer function of high-speed (60 GHz bandwidth) photodiodes. The first used two frequency-tunable lasers to produce a heterodyne signal, providing amplitude transfer function characterization. The second relied on dispersion-broadening femtosecond pulses, which were then used to characterize the complex photodiode transfer function.
2012	**Endoscopic relay lens for imaging inner walls of NIF targets**, *LLNL*.
	To enable viewing of the interiors of cylindrical NIF targets, I developed and built an endoscopic relay lens. This custom 5-element compound lens comprised only off-the-shelf optics, significantly lowering the cost and build time as compared to custom lens designs.

Journal or Journal Equivalent Publications

2019 **Nick Antipa***, Patrick Oare*, Emrah Bostan, Ren Ng, and Laura Waller. Video from stills: Lensless imaging with rolling shutter. *arXiv preprint arXiv:1905.13221*, 2019.

2018 **Nick Antipa***, Grace Kuo*, Reinhard Heckel, Ben Mildenhall, Emrah Bostan, Ren Ng, and Laura Waller. Diffusercam: lensless single-exposure 3d imaging. *Optica*, 5(1):1–9, 2018.

2016 Nicolas C Pégard, Hsiou-Yuan Liu, **Nick Antipa**, Maximillian Gerlock, Hillel Adesnik, and Laura Waller. Compressive light-field microscopy for 3d neural activity recording. *Optica*, 3(5):517–524, 2016.

2016 **Nicholas Antipa**, Sylvia Necula, Ren Ng, and Laura Waller. Single-shot diffuser-encoded light field imaging. In *Computational Photography (ICCP), 2016 IEEE International Conference on*, pages 1–11. IEEE, 2016.

2013 **Nick Antipa**, SH Baxamusa, ES Buice, AD Conder, MN Emerich, MS Flegel, CL Heinbockel, JB Horner, JE Fair, LM Kegelmeyer, and others. Automated ICF capsule characterization using confocal surface profilometry. *Fusion Science and Technology*, 63(2):151–159, 2013.

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* indicates co-first authorship

Conference Abstracts and Technical Reports

2018 Grace Kuo, **Nick Antipa**, Ren Ng, and Laura Waller. 3d fluorescence microscopy with diffusercam. In *Computational Optical Sensing and Imaging*, pages CM3E–3. Optical Society of America, 2018.

2017 Grace Kuo, **Nick Antipa**, Ren Ng, and Laura Waller. Diffusercam: diffuser-based lensless cameras. In *Computational Optical Sensing and Imaging*, pages CTu3B–2. Optical Society of America, 2017.

2017 **Nick Antipa**, Grace Kuo, Ren Ng, and Laura Waller. 3d diffusercam: Single-shot compressive lensless imaging. In *Computational Optical Sensing and Imaging*, pages CM2B–2. Optical Society of America, 2017.

2016 AV Hamza, A Nikroo, E Alger, **N Antipa**, LJ Atherton, D Barker, S Baxamusa, S Bhandarkar, T Biesiada, E Buice, and others. Target development for the national ignition campaign. *Fusion Science and Technology*, 69(1):395–406, 2016.

2016 Gautam Gunjala, Aamod Shanker, Volker Jaedicke, **Nick Antipa**, and Laura Waller. Optical transfer function characterization using a weak diffuser. In *Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXIII*, volume 9713, page 971315. International Society for Optics and Photonics, 2016.

2015 Nicolas C Pegard, Evan Lyall, Alan Mardinly, **Nick Antipa**, Laura Waller, and HIllel Adesnik. High-speed 3d brain activity quantification with compressive light-field microscopy. In *Novel Techniques in Microscopy*, pages NW2C–3. Optical Society of America, 2015.

2015 Nicolas Pégard, Hsiou-Yuan Liu, **Nick Antipa**, Laura Waller, and Hillel Adesnik. Functional brain imaging at cellular resolution with compressive light-field microscopy. In *Imaging Systems and Applications*, pages JTh4A–3. Optical Society of America, 2015.

2015 LC Carlson, EL Alfonso, H Huang, A Nikroo, ME Schoff, MN Emerich, T Bunn, **Nick Antipa**, and JB Horner. Automation of NIF target characterization and laser ablation of domes using the 4pi system. *Fusion Science and Technology*, 67(4):762–770, 2015.

2014 JD Lindl, OL Landen, J Edwards, EI Moses, and others. Erratum to physics of plasmas 21, 020501 (2014). *Phys. Plasmas*, 21:129902, 2014.

2013 DM Haas, H Huang, AQL Nguyen, K Sequoia, RB Stephens, A Nikroo, and **Nick Antipa**. Advancements in capsule surface defect characterization. *Fusion Science and Technology*, 63(2):160–168, 2013.

2013 Eric Buice, Richard C Montesanti, **Nicholas Antipa**, Alan D Conder, Michael A Johnson, and John S Taylor. Method and system for inspecting surfaces of miniature components, May 16 2013. US Patent App. 13/662,434.

2013 SH Baxamusa, SD Bhandarkar, JL Reynolds, B Maranville, J Horner, DC Mason, CL Heinbockel, **Nick Antipa**, and AD Conder. A solvent cleaning process for the outer surface of plastic ICF capsules. *Fusion Science and Technology*, 63(2):169–176, 2013.

2012   Daniel Potter and **Nick Antipa**. Visualization of target inspection data at the national ignition facility. *Fusion Engineering and Design*, 87(12):2136–2139, 2012.

2012   **Nick Antipa**. The capsule-fill-tube-assembly mapping system. *Proc. 20th Target Fabrication Mtg*, pages 20–24, 2012.

2011   ES Buice, ET Alger, **Nick Antipa**, SD Bhandarkar, TA Biesiada, AD Conder, EG Dzenitis, MS Flegel, AV Hamza, CL Heinbockel, and others. Development of a 3d surface mapping system to inspect capsule fill-tube assemblies used in laser-driven fusion targets. Technical report, Lawrence Livermore National Lab.(LLNL), Livermore, CA (United States), 2011.

2011   ES Buice, ET Alger, **Nick Antipa**, SD Bhandarkar, TA Biesiada, AD Conder, EG Dzenitis, MS Flegel, AV Hamza, CL Heinbockel, and others. 3d surface mapping of capsule fill-tube assemblies used in laser-driven fusion targets. Technical report, Lawrence Livermore National Lab.(LLNL), Livermore, CA (United States), 2011.

Students Mentored

Undergrad   **Sylvia Necula**, *Georgia Tech*, Summer 2015.

Jon Silberstein, *UC Berkeley*, Fall 2015.

Camille Biscarrat, *UC Berkeley*, Spring 2017 - Summer 2018.

Shreyas Parthasarathy, *UC Berkeley*, Spring 2017 - Summer 2018.

Essence Hansberry, *UC Berkeley*, Summer 2017.

Patrick Oare, *UC Berkeley*, Summer 2018 - present.

Grad   **Kyrollos Yanny**, *UC Berkeley*, Spring 2017 - present.

Teaching

2018   **EE123: Digital Signal Processing**, *Graduate Student Instructor*, Fall.

2015   **EE118/218a: Introduction to Optical Engineering**, *Graduate Student Instructor*, Fall.

Honors and Awards

2019   **Best Paper**, *Video from Stills: Lensless Imaging with Rolling Shutter*, IEEE International Conference on Computational Photography (ICCP).

2017   **Best Demo**, *DiffuserCam: A Diffuser-Based Lensless Camera*, IEEE International Conference on Computational Photography (ICCP).

2016   **Best Paper**, *Single-Shot Diffuser-Encoded Light Field Imaging*, IEEE International Conference on Computational Photography (ICCP).

2015   **Outstanding Graduate Student Instructor**, *Electrical Engineering 118/218a: Introduction to Optical Engineering*, UC Berkeley.

2012   **Engineering Division Award**, *Outstanding contribution to the National Ignition Facility Capsule Mapping System*, Lawrence Livermore National Laboratory.

2011   **NIF and Photon Science Award**, *Outstanding Contributions in Ignition Capsule Metrology*.

2010 **NIF and Photon Science Award**, *Development of Prototype Capsule Surface Inspection*.

2008 **Graduate with Highest Honors**, *UC Davis*.

2008 **Applied Science Departmental Citation**, *UC Davis*.