

Abe Davis

Assistant Professor
Department of Computer Science
Cornell University

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Education

- 2020-Present **Assistant Professor**, *Cornell University Department of Computer Science.*
- 2019-2020 **Postdoc**, *Cornell Tech.*
- Advisers: Noah Snavely & Serge Belongie
- 2016-2019 **Postdoc**, *Stanford University.*
- Adviser: Maneesh Agrawala
 - Funding: Brown Institute for Media Innovation Magic Grants
- 2010-2016 **PhD, Electrical Engineering and Computer Science**, *Massachusetts Institute of Technology.*
- Adviser: Frédo Durand
 - Thesis: "Visual Vibration Analysis"
 - Funding: Mathworks Fellowship, National Science Foundation Graduate Research Fellowship
- 2010-2012 **MS, Electrical Engineering and Computer Science**, *Massachusetts Institute of Technology.*
- Adviser: Frédo Durand
 - Thesis: "Unstructured Light Fields"
- 2006-2010 **BS, Computer Science**, *Stanford University*, (with honors).
- Thesis: "Interactive Hand-held Light Field Capture"

Research Experience

- Sept 2020 to Present **Cornell University**, *Graphics, Vision, HCI, Computational Imaging, AR/VR.*
Assistant Professor: I am teaching and starting a research group.
- Oct 2019 to Sept 2020 **Cornell Tech**, *Computer Vision, AR/VR.*
Postdoc: Short postdoc to help build connections between Cornell Tech and Ithaca
- Sept 2016 to Oct 2019 **Stanford University**, *HCI & Graphics Groups.*
Postdoc: Conducting research and helping advise students in Computer Graphics, Vision, and Human-Computer Interaction. (PI: Maneesh Agrawala)
- 2010-2016 **Massachusetts Institute of Technology**, *Computer Graphics and Vision Groups.*
Graduate Research Assistant: Developed new computational photography systems, algorithms for image-based rendering and light field capture, and techniques for visual vibration analysis. (Adviser: Frédo Durand)

- 2014 **NVIDIA Research.**
Summer Intern: Research intern, Visual Computing Group, focused on SLAM and computational photography.
- 2011 **Adobe Research.**
Summer Intern: Research intern, Creative Technologies Lab, focused on image-based rendering.
- 2008-2010 **Stanford University Computer Graphics Lab.**
Undergrad researcher: Conducted research in computer graphics and computational photography as part of Marc Levoy's lab. Focused on augmented reality, image-based rendering, and image processing.
- 2006-2007 **Firaxis Games.**
Summer Intern: Game and automated testing tools developer for "Sid Meier's Civilization Revolution!" and "Sid Meier's Railroads!"
- 2006 **Johns Hopkins Computer Graphics Lab.**
High school researcher: Developed a technique for collision detection on GPUs using bounding volume hierarchies encoded into image pyramids.

Select Awards

- 2024 **NSF CAREER.**
- 2020 **Best Paper Nominee for [Visual Chirality](#), CVPR 2020.**
- 2018 **Brown Institute for Innovation in Media Magic Grant for "Paraframe".**
- 2017 **ACM SIGGRAPH Dissertation Award Runner-up.**
- 2017 **Brown Institute for Innovation in Media Magic Grant for "Visual Beat".**
- 2017 **IWSHM 2017 Structural Health Monitoring in Action Award.**
- 2016 **George M. Sprowls Award for Best PhD Thesis in Computer Science at MIT.**
- 2016 **MIT 100K Pitch Competition Finalist.**
- 2016 **Forbes "30 under 30" in Science.**
- 2016 **Business Insider "The 8 most innovative scientists in tech and engineering".**
- 2011 **NSF Graduate Research Fellow.**
- 2011 **Mathworks Fellow.**
- 2011 **Optical Society of America Color Constancy Competition, (3rd Place).**
- 2010 **Eurographics 2010, Second Best Paper.**
- 2009 **Stanford CS348B Annual Rendering Competition, (Grand Prize).**
*Featured in the textbook *Physically Based Rendering: From Theory to Implementation*

2006 Intel Science Talent Search, (7th Place).

Publications

- 2024 Ruyu Yan, Jiatian Sun, and Abe Davis. Chromaticity gradient mapping for interactive control of color contrast in images and video. In *Proceedings of the 37th Annual ACM Symposium on User Interface Software and Technology*, **ACM UIST '24**, New York, NY, USA, 2024. Association for Computing Machinery.
- 2024 Nhan Tran, Ethan Yang, Angelique Taylor, and Abe Davis. Personal time-lapse. **ACM UIST '24**, New York, NY, USA, 2024. Association for Computing Machinery.
- 2024 Zeqi Gu, Ethan Yang, and Abe Davis. Filter-guided diffusion for controllable image generation. In *ACM SIGGRAPH 2024 Conference Papers*, **ACM SIGGRAPH '24**, New York, NY, USA, 2024. Association for Computing Machinery.
- 2023 Jiatian Sun, Longxiulin Deng, Triantafyllos Afouras, Andrew Owens, and Abe Davis. *Eventfulness for interactive video alignment*. **ACM Trans. Graph. | SIGGRAPH 2023 Journal Paper**.
- 2023 Mackenzie Leake, Kathryn Jin, Abe Davis, and Stefanie Mueller. *Institches: Augmenting sewing patterns with personalized material-efficient practice*. **ACM Conference on Human Factors in Computing Systems (CHI 2023)**.
- 2023 Zeqi Gu, Wenqi Xian, Noah Snavely, and Abe Davis. *Factormatte: Redefining video matting for re-composition tasks*. **ACM Transactions on Graphics (TOG) | SIGGRAPH 2023 Journal Paper**.
- 2023 Eric Ming Chen, Sidhant Holalkere, Ruyu Yan, Kai Zhang, and Abe Davis. Ray conditioning: Trading photo-consistency for photo-realism in multi-view image generation. In *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV 2023)*, pages 23242–23251, October 2023.
- 2022 Ruyu Yan, Jiatian Sun, Longxiulin Deng, and Abe Davis. *Recapture: Ar-guided time-lapse photography*. **ACM Symposium on User Interface Software and Technology (UIST 2022)**.
- 2021 Mackenzie Leake, Gilbert Bernstein, Abe Davis, and Maneesh Agrawala. *A mathematical foundation for foundation paper pieceable quilts*. **ACM Trans. Graph. | SIGGRAPH 2021 Journal Paper**.
- 2020 Zhiqiu Lin, Jin Sun, Abe Davis, and Noah Snavely. *Visual chirality*. **IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2020)**, (Selected for Oral, Best Paper Nominee).
- 2020 Zhengqi Li, Wenqi Xian, Abe Davis, and Noah Snavely. *Crowdsampling the plenoptic function*. **Proc. European Conference on Computer Vision (ECCV 2020)**, (Selected for Oral).

- 2020 Harald Haraldsson, Søren Skovsen, Ser-Nam Lim, Steve Marschner, Serge Belongie, and Abe Davis. *Head-mounted augmented reality for guided surface reflectance capture*. **CVPR Workshop on Computer Vision for Augmented and Virtual Reality**.
- 2020 Søren Skovsen, Harald Haraldsson, Abe Davis, Henrik Karstoft, and Serge Belongie. *Decoupled localization and sensing with hmd-based ar for interactive scene acquisition*. **CVPR Workshop on Computer Vision for Augmented and Virtual Reality**.
- 2018 Abe Davis and Maneesh Agrawala. *Visual rhythm and beat*. **ACM Trans. Graph. | SIGGRAPH 2018 Journal Paper**.
- 2017 Mackenzie Leake, Abe Davis, Anh Truong, and Maneesh Agrawala. *Computational video editing for dialogue-driven scenes*. **ACM Trans. Graph. | SIGGRAPH 2017 Journal Paper**.
- 2017 Abe Davis, Katherine L. Bouman (co-first author), Justin G. Chen, Michael Rubinstein, Oral Buyukozturk, Fredo Durand, and William T. Freeman. *Visual vibrometry: Estimating material properties from small motions in video*. **IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)**.
- 2017 Abe Davis, Justin G. Chen, Oral Buyukozturk, Frédo Durand, and Doug L. James. *Structural health monitoring from the window seat of a passenger airplane*. **11th International Workshop on Structural Health Monitoring (IWSHM 2017)**.
- 2016 Neal Wadhwa, Hao-Yu Wu, Abe Davis, Michael Rubinstein, Eugene Shih, Gautham J. Mysore, Justin G. Chen, Oral Buyukozturk, John V. Gutttag, William T. Freeman, and Frédo Durand. *Eulerian video magnification and analysis*. **Communications of the ACM**.
- 2016 Lukas Murmann, Abe Davis, Jan Kautz, and Frédo Durand. *Computational bounce flash for indoor portraits*. **ACM Transactions on Graphics (TOG) | SIGGRAPH Asia 2016 Journal Paper**.
- 2016 Abe Davis. *Visual Vibration Analysis*. PhD thesis, Massachusetts Institute of Technology, Sep 2016, **MIT Sprowls Award | *Runner-up, SIGGRAPH Dissertation Award**.
- 2016 Oral Buyukozturk, Justin G Chen, Neal Wadhwa, Abe Davis, Frédo Durand, and William T Freeman. *Smaller than the eye can see: Vibration analysis with video cameras*. **19th World Conference on Non-Destructive Testing (WCNDT 2016)**.
- 2015 Abe Davis, Justin G. Chen, and Frédo Durand. *Image-space modal bases for plausible manipulation of objects in video*. **ACM Trans. Graph. | SIGGRAPH Asia 2015 Journal Paper**.
- 2015 Abe Davis, Katherine L. Bouman (co-first author), Justin G. Chen, Michael Rubinstein, Fredo Durand, and William T. Freeman. *Visual vibrometry: Estimating material properties from small motion in video*. **IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2015)**, (Selected for Oral Presentation).

- 2015 Justin G Chen, Neal Wadhwa, Abe Davis, Frédo Freeman Durand, T William, and Oral Buyukozturk. *Long distance video camera measurements of structures*. **10th International Workshop on Structural Health Monitoring (IWSHM 2015)**.
- 2015 Justin G Chen, Abe Davis, Neal Wadhwa, Frédo Durand, William T. Freeman, and Oral Buyukozturk. *Video camera-based vibration measurement for condition assessment of civil infrastructure*. **International Symposium Non-Destructive Testing in Civil Engineering (NDT-CE 2015)**.
- 2014 Lixin Shi, Haitham Hassanieh, Abe Davis, Dina Katabi, and Fredo Durand. *Light field reconstruction using sparsity in the continuous fourier domain*. **ACM TOG | SIGGRAPH 2015**.
- 2014 Abe Davis, Michael Rubinstein, Neal Wadhwa, Gautham J. Mysore, Frédo Durand, and William T. Freeman. *The visual microphone: Passive recovery of sound from video*. **ACM Trans. Graph. | SIGGRAPH 2014 Journal Paper**.
- 2013 Abe Davis. *Unstructured light fields*. Master's thesis, Massachusetts Institute of Technology, Sep 2013.
- 2012 YiChang Shih, Abe Davis, Samuel W. Hasinoff, Frédo Durand, and William T. Freeman. *Laser speckle photography for surface tampering detection*. **IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2012)**, *Google Student Travel Award*.
- 2012 Abe Davis, Marc Levoy, and Fredo Durand. *Unstructured light fields*. **Computer Graphics Forum | Eurographics 2012**.
- 2010 Andrew Adams, Jongmin Baek, and Abe Davis. *Fast high-dimensional filtering using the permutohedral lattice*. **Computer Graphics Forum | Eurographics 2010**.

Funding Sources

- 2024 **NSF CAREER**.
- 2022 **Gift from Meta Platforms Inc.**
- 2021 **USDA DSFAS-CIN: Integrating multiscale remote sensing data for enhancing data-driven predictive analytics in crop breeding and management**.

Patents (As Myers Abraham Davis)

Issued:

“**Laser speckle photography for surface tampering detection**”, *US Patent 9,131,118*, Yichang Shih, Samuel Hasinoff, William T. Freeman, Frédo Durand, and **Abe Davis** .

"Method and Apparatus for Recovering Audio Signals from Images", *US patent No. 10129658*, Michael Rubinstein, Frederic Durand, William T. Freeman, Neal Wadhwa, and **Abe Davis**.

Pending:

"Systems and Methods for Dancification", *US Application 62/685,743*, **Abe Davis** and Maneesh Agrawala.

"Video-based identification of operational mode shapes.", *US Application 15/012,835*, Oral Buyukozturk, William T. Freeman, Frédo Durand, Neal Wadhwa, Justin G. Chen, and **Abe Davis**.

"Methods and apparatus for modeling deformations of an object", *US Patent Application 15/068,357*, **Abe Davis** and Frédo Durand, Justin G. Chen.

"Methods and devices for measuring object motion using camera images", *US Patent Application 62/382,709*, Oral Buyukozturk, William T. Freeman, Frédo Durand, Neal Wadhwa, Justin G. Chen, and **Abe Davis**.

Teaching

- Fall 2021-2024 **Cornell 4620/5620: Introduction to Computer Graphics & Graphics Practicum**, *Instructor*, Introduction to Computer Graphics. See [course assignment docs](#) for a taste of what the course covers, including example [final project submissions](#)..
- Fall 2020-2023 **Cornell 4621/5621: Computer Graphics Practicum**, *Instructor*, A practicum course for students interested in doing an extra project related to computer graphics..
- Spring 2021, 2022, 2023, 2024 **Cornell CS6682: Computation for Content Creation**, *Instructor*, A graduate course covering a breadth of topics from graphics, vision, HCI, signal processing, and music—all related to computational tools for content creation..
- Spring 2021, 2022, 2023, 2024 **Cornell CS6682: Computation for Content Creation**, *Instructor*, A graduate course covering a breadth of topics from graphics, vision, HCI, signal processing, and music—all related to computational tools for content creation..
- Fall 2020 **Cornell CS4620/5620/4621/5621: Intro to Computer Graphics**, (*Virtual version, Co-Instructor w/ Steve Marschner*).
- Spring 2020 **Cornell CS5670: Intro to Computer Vision**, *Co-Instructor*.
- 2016 **Stanford EE368/CS232 "Digital Image Processing"**, *Guest Lecturer*, Guest lecturer on computational photography and visual vibration analysis.
- 2012–2016 **MIT 6.882 (Computational Photography)**, *Guest Lecturer*, Guest lecturer on light fields and image based rendering.
- 2013 **MIT 6.882 (Computational Photography)**, *Teaching Assistant*, Ran office hours, prepared and graded assignments, created and presented one of the course lectures.

- 2008 **Stanford CS248 (Intro to Computer Graphics)**, *Teaching Assistant*, Gave some lectures, held office hours and review sessions, helped design assignments and exams.
- 2005 **Baltimore Polytechnic, Computer Programming**, *Instructor*, Created and taught a free computer programming class for Baltimore City public high school students.
- 2005 **Baltimore Algebra Project**, *Algebra Tutor*, Tutored inner-city kids from Robert Poole Elementary (shut down in 2009) in algebra.

Select Invited Talks

Talks/Guest Lectures

- 2024 **Cornell Information Science Colloquium.**
Title: "New Opportunities at the Intersection of Graphics, Vision, & HCI"
- 2022-2024 **Talk at CS More CS More.**
Title: "Stochastic Gradient Descent Needs a Better Name"
- 2022 **Guest Lecture, Cornell DEA 2200.**
Topic: Representations for Content Creation
- 2022 **Guest Lecture, Cornell CS6670, Graduate Computer Vision.**
Topic: Image Based Rendering and Light Fields/Radiance Fields
- 2017 **ProVideoCoalition.com Webinar.**
Title: "The Beginning of the End for Assistant Editors"
- 2017 **Unity Technologies.**
Title: "Computational Video Editing"
- 2017 **Stanford Center for Image Engineering (SCIEN).**
Title: "Visual Vibration Analysis"
- 2016 **Microsoft Future Decoded 2016.**
Keynote, 10,000+ in attendance | Title: "Vision Beyond the Visible"
- 2016 **Google Daydream Team.**
Title: "Dynamic Video"
- 2016 **FMX 2016 Computational Cinematography.**
(Talk and Panel)
- 2016 **2016 World Game Protection Conference (WGPC).**
Keynote Speaker
- 2015 **TED 2015** [🔗](#)
Title: "Abe Davis: New video technology that reveals an object's hidden properties"

Committees

- 2025 **SIGGRAPH 2025 Technical Papers Committee.**
- 2024 **SIGGRAPH 2024 Technical Papers Committee.**
- 2023 **SIGGRAPH Asia 2023 Technical Papers Committee.**
- 2021 **SIGGRAPH 2021 Technical Papers Committee.**
- 2019 **SIGGRAPH Asia 2019 Technical Papers Committee.**



Select Press Coverage

My work has been featured in most major media outlets that cover science and technology. Below are a few examples of coverage for different projects. More can be found on the [press coverage page](#) of my website.




AR Time Lapse:

- 2022 **Cornell Chronicle** , *"App creates time-lapse videos with a smartphone"*.



Visual Microphone:

- 2014 **The Washington Post** , *"MIT researchers can listen to your conversation by watching your potato chip bag "*.
- 2014 **TIME** , *"MIT Researchers Can Spy on Your Conversations With a Potato-Chip Bag"*.

Interactive Dynamic Video:

- 2016 **IEEE Spectrum** , *"Beyond Pokémon GO: The Secret to a Better Augmented Reality Experience"*.
- 2016 **NBC News** , *"Want More Life in Your Pokemon? Now They Can React in the Real World"*.
- 2016 **Fox News** , *"Breakthrough lets you touch videos instead of just watch" .*

Computational Video Editing:

- 2017 **Engadget** , *"AI film editor can cut scenes in seconds to suit your style"*.
- 2017 **Digital Trends** , *"Adobe and Stanford just taught AI to edit videos — with impressive results"*.

General:

- 2016 **Forbes** , *"30 under 30"*.

2015 **Business Insider** [↗](#), "*The 8 most innovative scientists in tech and engineering*".

Select Videos [↗](#)

I frequently create videos about my research and post them on line. Many can be found at [this link](#). A few examples, as well as my 2015 TED talk, are also provided below:

(* indicates >1M views)

2020 **Visual Chirality**, <https://youtu.be/gc5lvTozU9M>.

2020 **Crowdsampling the Plenoptic Function**, <https://youtu.be/MAVFKWX8LYo>.

2018 **Visual Rhythm and Beat**, <youtube.com/watch?v=K3z68mOLbNo>.

2017 **Computataional Video Editing**, <youtube.com/watch?v=tF43Zqoue20>.

* 2016 **Interactive Dynamic Video**, <youtube.com/watch?v=4f09VdXex3A>.

2016 **Pokemon GO and Interactive Dynamic Video**, <youtube.com/watch?v=9f1fCCb3hVg>.

* 2014 **The Visual Microphone**, <youtube.com/watch?v=FKXOucXB4a8>.

* 2015 **TED 2015 *New video technology that reveals and object's hidden properties***, ted.com/talks/abe_davis_new_video_technology_that_reveals_an_object_s_hidden_properties.