

Curriculum Vitae

Abe Davis

Education

- Sept 2016 **Postdoc, Stanford University.**
to Present
 - 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 2016 **Stanford University, HCI & Graphics Groups.**
to Present *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

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. Sprows Award for Best PhD Thesis in Computer Science at MIT.**

2016 **MIT 100K Pitch Competition, (Finalist).**

2016 **Forbes "30 under 30".**

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

2018 **Abe Davis** and Maneesh Agrawala. *Visual rhythm and beat.* **SIGGRAPH 2018.**

2017 Mackenzie Leake, **Abe Davis**, Anh Truong, and Maneesh Agrawala. *Computational video editing for dialogue-driven scenes.* **SIGGRAPH 2017.**

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- 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. Guttag, 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.* **SIGGRAPH Asia 2016.**
- 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.* **SIGGRAPH Asia 2015.**
- 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.* **SIGGRAPH 2014.**
- 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**.

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

- 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.

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- 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

- 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"

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.

General:

- 2016 **Forbes** [🔗](#), "30 under 30".
- 2015 **Business Insider** [🔗](#), "The 8 most innovative scientists in tech and engineering".

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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*".

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)

2017 **Visual Rhythm and Beat**, youtube.com/watch?v=K3z68mOLbNo.

2017 **Computational 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.