Neal Wadhwa

Curriculum Vitae

Computer Science and Artificial Intelligence Laboratory
Massachusetts Institute of Technology
32 Vassar Street, 32-D466
Cambridge, MA 02139

http://people.csail.mit.edu/nwadhwa
nwadhwa@csail.mit.edu

Research Interests

Computer vision, computational photography, signal processing, image and video processing

Education

MIT, CSAIL and Department of Mathematics — Cambridge, MA — February 2016
Ph. D in Applied Math focusing on Computer Vision, GPA: 5.00/5.00
Thesis: Revealing and Analyzing Imperceptible Deviations in Images and Videos
Committee: Professors William T. Freeman (advisor), Frédo Durand, Alan Edelman, John W. M. Bush
Presented real-time demo of thesis topic to numerous audiences from computer vision researchers to high-school students, won best demo award at CVPR 2014

Cambridge University, Department of Pure Math and Statistics — Cambridge, UK — June 2010
Master of Advanced Study in Mathematics focusing on Statistics

Harvard University, School of Engineering and Applied Sciences — Cambridge, MA — June 2009
M.S. in Computer Science, GPA: 4.00/4.00
Relevant coursework: learning theory, algorithms, computer graphics, image processing

Harvard College — Cambridge, MA — June 2009
Magna cum Laude B.A. in Mathematics, GPA: 3.89/4.00
Thesis Advisor: Professor Martin A. Nowak

Experience

Postdoctoral Associate in MIT CSAIL — Cambridge, MA — February 2016 - Present
Explored commericial applications of video magnification thesis topic
2015-2016 Finalist and Semifinalist in MIT 100k Entrepreneurship Competitions
100k Pitch Finalist, 100k Launch Semifinalist, 100k Booz Allen Hamilton Data Analytics Prize Finalist
Learned Leadership Skills at Selective MIT EECS Postdoc Leadership Workshop

Google Research Internship — Mountain View, CA — Summer 2015
Hosts: Sam Hasinoff, Jiawen Chen
Worked on a novel way to enhance digital photographs quickly on mobile platforms

Teaching Assistant for Computational Photography — Cambridge, MA — Spring 2015
For Professor Frédo Durand
Held office hours, created an online submission system for student's C++ code
Created a semi-automated grader to give students detailed feedback on their solutions.

MERL Internship — Cambridge, MA — Summer 2014
Host: Oncel Tuzel
Worked on image denoising techniques

Cognex Internship — Natick, MA — Summer 2012
Host: David Michael
Ported Cognex software to the Android platform

Harvard Mathematics Department — Cambridge, MA — 2007-2009
Course assistant: held office hours, taught sections and graded homework

Skills

C++, MATLAB, Python, Halide, Qt, experience with laser vibrometers and accelerometers, LaTeX, fast image processing, signal processing, Java, NumPy, SciPy, Matplotlib, OpenCV

Publications

Neal Wadhwa, Hao-yu Wu, Abe Davis, Michael Rubinstin, Eugene Shih, Gautham J. Mysore, Justin G. Chen, Oral Buyukozturk, John V. Guttag, William T. Freeman and Frédo Durand. "Eulerian Video Magnification and Analysis". To appear in: *Communications of ACM*. (2016)

Neal Wadhwa, Tali Dekel, Donglai Wei, Frédo Durand and William T. Freeman. "Deviation Magnification: Revealing Departures from Ideal Geometries". In: *ACM Transactions on Graphics (Proc. SIGGRAPH)*. 34.6 (November 2015)

Justin G Chen, Neal Wadhwa, Young-Jin Cha, Frédo Durand, William T. Freeman and Oral Buyukozturk. "Modal identification of simple structures with high-speed video using motion magnification". In: *Journal of Sound and Vibration* 345 (June 2015), 58-71

Tianfan Xue, Michael Rubinstein, Neal Wadhwa, Anat Levin, Frédo Durand and William T. Freeman. "Refraction Wiggles for Measuring Fluid Depth and Velocity from Video". In: *Proceedings of European Conference on Computer Vision (ECCV)*. (Sep 2014)

Abe Davis, Michael Rubinstein, Neal Wadhwa, Gautham Mysore, Frédo Durand and William T. Freeman. "The Visual Microphone: Passive Recovery of Sound from Video". In: *ACM Transactions on Graphics (Proc. SIGGRAPH)*. 33.4 (August 2014), 79:1-79:10

Neal Wadhwa, Michael Rubinstein, Frédo Durand and William T. Freeman. "Riesz pyramids for Fast Phase-Based Video Magnification.". In: *Computational Photography (ICCP), 2014 IEEE International Conference on*. (May 2014)

Justin Chen, Neal Wadhwa, Young-Jin Cha, Frédo Durand, William T. Freeman, Oral Buyukozturk. "Structural Modal Identification through High Speed Camera Video: Motion Magnification". In: *Proceedings of the 32nd International Modal Analysis Conference*. (Feb. 2014)

Neal Wadhwa, Michael Rubinstein, Frédo Durand and William T. Freeman. "Phase-Based Video Motion Processing". In: *ACM Transactions on Graphics (Proc. SIGGRAPH)*. 32.4 (July 2013), 80:1-80:12

Michael Rubinstein, Neal Wadhwa, Frédo Durand, and William T. Freeman. "Revealing Invisible Changes in the World". In: *Science*. 339.6119 (Feb. 2013), p. 519.

V. Feldman, S. Shah, N. Wadhwa, "Separating Models of Learning with Faulty Teachers" In: *Proceedings of Algorithmic Learning Theory*. **4754** (Jan. 2007) 94-106

M. Rocek and N. Wadhwa, "On Calabi-Yau Supermanifolds" In: *Advances in Theoretical and Mathematical Physics*. **9** (2005) 315-320

Patents and Patents Pending

Neal Wadhwa, Michael Rubinstein, Frédo Durand, William T. Freeman, Hao-yu Wu, Eugene Shih and John V. Guttag."COMPLEX-VALUED PHASE-BASED EULERIAN MOTION MODULATION". (U.S. Patent 9324005). 2016

Neal Wadhwa, Michael Rubinstein, Frédo Durand, and William T. Freeman. "RIESZ PYRAMIDS FOR FAST PHASE-BASED VIDEO MAGNIFICATION". 61/925,283 (Patent Pending). Filed in 2015

William T. Freeman, Frédo Durand, Michael Rubinstein Myers Abraham Davis and Neal Wadhwa. "METHOD AND APPARATUS FOR RECOVERING AUDIO SIGNALS FROM IMAGES". 61/856,919 (Patent Pending). Filed in 2014

William T. Freeman, Frédo Durand, Tianfan Xue, Michael Rubinstein and Neal Wadhwa. "REFRACTIVE FLOW MEASUREMENT SYSTEM". 61/823,580 (Patent Pending). Filed in 2014

Awards

Invited Research Highlight in Communications of the ACM	2016
CSAIL Amazing Research Highlight Winner	2015
Best Demo at Computer Vision and Pattern Recognition conference for "Real-time Video Magnification"	2014
National Science Foundation Graduate Fellowship	2013-2014
National Defense Science and Engineering Graduate Fellowship	2010-2013

Selected Press

MIT News (11/2015): “Amplifying – or removing – visual variations.”

Wall Street Journal (05/2015): “Monitoring Tiny Vibrations to Avert Big Problems”

MIT News (04/2015): “Magnifying Vibrations in Bridges and Buildings”

Reuters (01/2015): “Amplifying Tiny Movements to Visualize the Invisible”

IEEE Spectrum (08/2014): “Your Candy Wrappers are Listening”

New York Times (02/2013): “Finding the Visible in the Invisible”

Invited Talks and Conference Presentations

Affordable and Accessible Healthcare Workshop at ICCV 2015, Santiago, Chile (invited talk): “Video Magnification for Healthcare”.

MIT 6.865 Computational Photography Guest Lecture. “Revealing Imperceptible Deviations in Images and Videos.”

SIGGRAPH Asia 2015, Kobe, Japan: “Deviation Magnification: Revealing Departures from Ideal Geometries”.

National Board of Medical Examiners, Philadephia, PA (invited talk): “A Big World of Small Motions”.

International Conference in Computational Photography 2014, Santa Clara, CA: “Riesz Pyramids for Fast Phase-Based Video Magnification”.

SIGGRAPH 2013, Anaheim, CA: “Phase-Based Video Motion Processing”.