

HECTOR J. SANTOS-VILLALOBOS

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RESEARCH OVERVIEW

The main focus of my research is to define and solve inverse problems for imaging purposes; typically, using a prior characterization of the imaging system and/or the imaged object in order to obtain a desired piece of information under complex non-ideal conditions.

EDUCATION

Purdue University Ph.D. in Electrical and Computer Engineering Advisors: Dr. Jan P. Allebach and Dr. Mireille Boutin	West Lafayette, IN <i>July 2010</i>
University of Puerto Rico M.S. in Computer Engineering Advisor: Dr. J. Fernando Vega-Riveros	Mayagüez, PR <i>July 2005</i>
University of Puerto Rico B.S. in Computer Engineering	Mayagüez, PR <i>June 2003</i>

RESEARCH INTERESTS

Image processing	Neutron imaging	Biometrics
Computed tomography	Inverse problems	Computer modeling
Pattern recognition	Intelligent systems	Digital color systems

AWARDS AND HONORS

- Society for Imaging and Science Technology, Itek Award 2011.
- Midwest Crossroads Alliance for Graduate Education and the Professoriate Scholarship, 2009 - 2010.
- Frederic Miller Graduate Scholarship, 2009 - 2010.
- Elected President of the Puerto Rican Student Association, 2009 - 2010.
- Elected Treasurer of the Puerto Rican Student Association, 2007 - 2008.
- Purdue Doctoral Fellowship, 2005 - 2007.
- Elected President of the student organization Christian Youth of the Park, 2002.

TEACHING AND MENTORING EXPERIENCE

- **Instructor Assistant.** ECE438: Digital Signal Processing with Applications, Prof. Mireille Boutin, Fall 2009, Purdue University.
- **Research Mentor.** Louis Stokes Alliances for Minority Participation (LSAMP), Summer 2009 - Present, Purdue University.
- **Research Mentor.** Summer Undergraduate Research Fellowships (SURF), Summer 2006 and Summer 2007, Purdue University.
- **Teaching Assistant.** INEL4101: Electric Circuits I, Prof. Providencia Rodriguez, Spring 2004, University of Puerto Rico at Mayagüez.

RESEARCH EXPERIENCE

- **R&D Staff Associate, Oak Ridge National Laboratory**, March 2012 - Present.
Neutron radiography and tomography. Continue the design and development of a high-resolution (i.e., $1\mu\text{m}$ resolution) coded source neutron imaging system. Developed two iterative algorithms (Maximum Likelihood Estimation and Algebraic Reconstruction Technique) for the reconstruction of coded source radiographs.
Improving iris recognition for non-ideal data. Continue work from postdoc. Produce a new enterprise-appropriate unwrapping algorithm for non-ideal iris data. Non-ideal is defined as off-angle images of the iris beyond 25° off-axis and varying pupil dilations.
- **Post-Doctoral Fellow, Oak Ridge National Laboratory**, Sept. 2010 - March 2012.
Segmentation algorithms. Use of statistical image processing to characterize, detect, and measure the amount of Drusen lesions in retinal images.
Neutron imaging system. Design and development of a high-resolution (i.e., $1\mu\text{m}$ resolution) coded source neutron imaging system.
Improving iris recognition for non-ideal data. Produce a new enterprise-appropriate unwrapping algorithm for non-ideal iris data. Non-ideal is defined as off-angle images of the iris beyond 25° off-axis and varying pupil dilations.
- **Research Assistant, Purdue University**, Oct. 2005 - July 2010.
Comparison method for Gaussian Mixtures, (Jan. 2009 - Present): Development and the assessment of a comparison method that measures the likelihood that two Gaussian mixtures belong to the same distribution. The methodology can be used for shape classification. Research is supported by a National Science Foundation Grant.
Self-help tool for color issues, (May 2006 - Dec. 2008): Web-based troubleshooting tool for color issues among electrophotographic printers. Research was supported by the Hewlett-Packard Company.
Self-help tool for print quality issues, (Oct. 2005 - Apr. 2006): Web-based troubleshooting tool for print quality issues among electrophotographic printers. Currently, the tool serves thousands of customers. Research was supported by the Hewlett-Packard Company.
- **Research Intern, Hewlett-Packard Company, Vancouver, Washington, USA**, Sep. - Dec. 2008.
Developed a graphic user interface in C# and clustering algorithms in C, for personalized content-based grouping and navigation of images.
- **Research Intern, Hewlett-Packard Company, Palo Alto, California, USA**, June - Aug. 2004.
Developed a graphic user interface in Java for the benchmarking of an image auto-cropping application.
- **Research Assistant, University of Puerto Rico at Mayagüez**, Apr. 2004 - June 2005.
Intelligent Systems for Variable Data Printing: Expert system for the detection of artifacts in variable data printing jobs. Research was supported by the Hewlett-Packard Company.

PUBLICATIONS

JOURNAL PAPERS

1. Hector J. Santos-Villalobos, Mireille Boutin, "A computational efficient comparison method for the shape of Gaussian mixtures". *Journal of Electronic Imaging*, 21 (2), p. TBD (2012).
2. Hector Santos-Villalobos, Hyung Jun Park, Chulwoo Kim, Pilsung Choe, Roy Kumontoy, Kainlu Low, Kristian Oldenberger, Maria Ortiz, Xinran Lehto, Mark Lehto, Jan Allebach, "Web-Based Diagnosis Tool for Customers to Self-Solve Print Quality Issues," *Journal of Imaging Science and Technology*, 54 (4), p. 040503 (2010). **Received IS&T Itek Award**

PENDING JOURNAL PAPERS

3. Hector J. Santos-Villalobos, Jan P. Allebach, "Troubleshooting for a color preference: a customer self-help tool for printing color issues." In preparation for *Journal of Imaging Science and Technology*.

4. Hector J. Santos-Villalobos, Philip R. Bingham, "Design of a high-resolution coded source neutron imaging system." In preparation.

CONFERENCES AND PROCEEDINGS

5. Hector J. Santos-Villalobos, Del Barstow, Mahmut Karakaya, Edward Chaum, Chris Boehnen, "ORNL biometric eye model for iris recognition", Submitted for peer review to IEEE Fifth International Conference on Biometrics: Theory, Applications and Systems (BTAS 2012).
6. Hector J. Santos-Villalobos, Philip Bingham, "Non-uniform contrast correction for coded source neutron imaging," *Electronic Imaging 2012, Computational Imaging X*, San Francisco, USA, Jan. 2012.
7. Hector Santos-Villalobos, Thomas Karnowski, Deniz Aykac, Luca Giancardo, Yaqin Li, Trent Lee Nichols, Kenneth Tobin, Edward Chaum, "Statistical Characterization and Segmentation of Drusen in Fundus Images," *33rd Annual International IEEE EMBS Conference, Advances in Retinal Image Analysis II*, Boston, USA, Sept. 2011.
8. Philip Bingham, Hector Santos-Villalobos, Ken Tobin, "Coded source neutron imaging," *Electronic Imaging 2011, Image Processing: Machine Vision Applications IV*, San Francisco, USA, Feb. 2011.
9. Hector J. Santos-Villalobos, Victor Loewen, Mark Lehto, Jan Allebach, "A web-based troubleshooting tool to help customers self-solve color issues with a digital printing workflow," *Electronic Imaging 2011, Imaging and Printing in a Web 2.0 World II*, San Francisco, USA, Feb. 2011.
10. Hector J. Santos-Villalobos, Mireille Boutin, "An empirical method for comparing the shape of two Gaussian mixtures," *International Conference on Image Processing 2010*, Hong Kong, China, Sept. 2010. **Full-paper peer-review.**
11. Hector J. Santos-Villalobos, Mireille Boutin, "A method for recognizing the shape of a Gaussian mixture from a sparse sample set," *SPIE Electronic Imaging Conference 2010*, San Jose, California, Feb. 2010.
12. Hector J. Santos-Villalobos, Victor Loewen, Jan P. Allebach, "Houston, we have a color issue!," *SPIE Electronic Imaging Conference 2009, Color Imaging XIV: Displaying, Processing, Hardcopy, and Applications*, San Jose, CA, January 18, 2009, Vol. 7241(1), page 72411D.
13. Hector Santos-Villalobos, Hyung Jun Park, Chulwoo Kim, Pilsung Choe, Roy Kumontoy, Kainlu Low, Kristian Oldenberger, Maria Ortiz, Xinran Lehto, Mark Lehto, and Jan Allebach, "A Web-Based Self-Diagnosis Tool to Solve Print Quality Issues," *IS&T's NIP22: International Conference on Digital Printing Technologies*, Print and Image Quality, Denver, Colorado, September 17 2006, Vol. 22, pages 465-471. (Focal Paper)
14. J. Fernando Vega-Riveros and Hector Santos-Villalobos, "Graphic design principles for automated document segmentation and understanding," *SPIE Electronic Imaging 2006, Document Recognition and Retrieval XIII*, San Jose, California, January 15-19, 2006, Vol. 6067.
15. J. Fernando Vega-Riveros and Hector Santos-Villalobos, "A hybrid intelligent approach to artifact recognition in digital publishing," *SPIE Electronic Imaging 2006, Digital Publishing*, San Jose, California, January 15-19, 2006, Vol. 6076.

OTHER REPORTS

16. Hector J. Santos-Villalobos, Xiaofan Lin, "Benchmarking of Automated Image Cropping Technology", *HP Technical Report*, Hewlett-Packard Company, Palo Alto, CA, June 2005.

PROFESSIONAL ACTIVITIES

- Task force for engaging stakeholders, College of Engineering Strategic Planning and Assessment, Purdue University, West Lafayette, IN, Fall 2009.

PROFESSIONAL SOCIETIES

- IEEE Society
- Society of Imaging Science and Technology