# EMMETT J. IENTILUCCI

Digital Imaging & Remote Sensing Laboratory
Center for Imaging Science
Rochester Institute of Technology
54 Lomb Memorial Drive
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## OVERVIEW

Dr. Emmett Ientilucci is an assistant research professor in RIT's Digital Imaging and Remote Sensing (DIRS) group. He has degrees in optics and imaging science. Prior to his faculty position, he was a Postdoctoral Research Fellow for the Intelligence Community.

His recent research interests include the incorporation of physics based (target) modeling into structured hybrid hyperspectral sub-pixel detection algorithms with the addition of a geometric infeasibility metric. In general, Dr. Ientilucci's interests are in geometric and stochastic target detection as well as improvements to the physics based modeling approach as it pertains to the development of target spaces. He has also published on the impact endmember selection has on target detection, spectral variability, and general hyperspectral algorithm development.

Dr. Ientilucci has taught courses and labs in radiometry, geometrical optics, photo science, dimensional metrology, measurement and analysis, and computer techniques for technicians, both at RIT and Monroe Community College. In addition to his own work, he has managed teams of graduate students in imaging and computer science on their work, as it relates to specific government and commercial contracts. He has been thesis advisor for numerous undergraduate and graduate imaging science students.

## EDUCATION

**Rochester Institute of Technology, Rochester, NY**
*Ph.D., Imaging Science*, August 2005
*Doctoral Thesis*: Hyperspectral Sub-Pixel Target Detection Using Hybrid Algorithms and Physics Based Modeling

*M.S., Imaging Science*, June 1999
*Master's Thesis*: Synthetic Simulation and Modeling of Image Intensified CCDs (ICCD)

*B.S., Imaging Science*, with honors, May 1996
*Bachelor's Thesis*: Modular Imaging Spectrometer Instrument Calibration (MISI) Using Blackbody Radiators

**Monroe Community College,** Rochester, NY
*A.A.S., Optical Engineering*, May 1989

**EXPERIENCE**

RIT Center for Imaging Science. Rochester NY 6/08 - present
**Assistant Research Professor**

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RIT Center for Imaging Science. Rochester NY 10/00 – 5/08
**Assistant Scientist/ Post Doctoral Research Fellow**

- Have developed and analyzed algorithms as they pertain to hyperspectral target detection.
- I am responsible for managing undergraduate and graduate students in computer and imaging science. I oversee their work on specific government and commercial contracts.
- Developed a large synthetic facetized scene for modeling and testing of remote sensing algorithms.
- Have worked on developing a radiometric accurate model of the Sun to use for calibration of future satellite systems, in conjunction with outside contractors.
- Have worked with various agencies and sponsors (government and commercial) on maintaining, updating and developing ongoing efforts, as they relate to contractual obligations.
- Wrote a winning proposal for the Director of Central Intelligence (DCI) Postdoctoral Fellowship
- Reviewed papers for numerous journals
- Responsible for teaching undergraduate radiometry laboratory and lecture. Also give guest lectures for graduate classes such as Remote Sensing, Radiometry, and Computing for Imaging Scientists.
- Have been thesis advisor for numerous undergraduate and graduate imaging science students.

Monroe Community College. Rochester, NY 9/97 - 5/99, 4/08 - present
**Adjunct Instructor**

- Taught courses and labs in
    - Computers for Technicians
    - Geometrical Optics
    - Photo Science
    - Dimensional Metrology
    - Measurement and Analysis

RIT Center for Imaging Science. Rochester NY 1/95 - 10/00
**Research and Teaching Assistant**

- Worked on contracts and projects that involved data gathering and analysis by digital image processing and remote sensing methods.
- Organized material in Quark Xpress for assembly of a text book on remote sensing, Schott, J.R., Remote Sensing: The Imaging Chain Approach. Oxford University Press: 1997.
- Worked on thermal calibration design of an airborne line scanner (MISI).

- Designed and constructed feedback scan mirror controller and DC radiometer for airborne line scanner (MISI).
- Coordinated and instructed lectures and laboratories for undergraduate Radiometry course

SIDE. Rochester, NY 6/95 - 9/96

**Research Assistant**

- Worked on developing a synthetic image database (via DIRSIG) that was used for a variety of sensor and algorithm design studies.
- Analyzed the spectral correlation structure of various scenes simulating the AVIRIS and HYDICE sensors. Analysis was made as to the impact of scene content, atmospheric effects and sensor noise on the correlation.

Xerox Corporation, Wilson Center for Research and Technology, Webster, NY 11/90-9/94

**Research/Electrical Technician**

- Designed and built electrical and mechanical fixtures such as motor controllers, optical sensors, and computer hardware/software interface devices for data acquisition.
- Worked in Process Physics Area setting up various xerographic experiments, collecting data and examining results. Conclusions were drawn in monthly reports.
- Machined specialized parts using lathes, drill presses and milling machines

## THESIS ADVISEMENT

Lead Advisor:

1. Stefania, Ph.D. student supervisor.
2. Tony Rizzuto, "Low Light Level Imaging and Sensor Trade Studies", M.S., Current.
3. Albano, J., "Evaluation of using physics based models in hyperspectral target detection", March, 2008.
4. Kwong, J., "*Impact of Calibration Errors on Physics Based Target Detection*", May 2006
5. Stabb, B.M., *"Investigation of Noise and Dimensionality Reduction Transforms on Hyperspectral Data as Applied to Target Detection"*, May, 2005
6. Spivey, A.J., *"Multiband Texture Re-Synthesis"*, May, 2004.
7. Kennedy, C.S., *"The Testing and Assessment of Texturing Tools Used to Build Scenes in DIRISIG"*, May, 2002.
8. Banta, M.S., *"Lunar Calibration Techniques"*, May, 2001.

Committee Advisor:

1. Ariel Ph.D., Current.
2. Alvin Spivey, "*Development of a scale independent approach for landscape pattern metrics using Fourier vector analysis of satellite images*". Ph. D., Current

3. Jake Ward, "*Realistic Texture in Simulated Thermal Infrared Imagery*", Ph.D., 2008
4. Jason Casey, M.S., "*Improving Hyperspectral Target Detection When Using Misregistered Data*". M.S., 2007.
5. Manuel Ferdinandus, M.S., "*Selection of Optimal Background Estimation Methods for Unstructured Detectors*". M.S., 2007
6. Foster, M., "*Geometrically-constrained Subspaces for Physics-based Target Detection*". Ph.D., 2007.
7. Cisz, A., "*Performance Comparison of Hyperspectral Target Detection Algorithms*", M.S., August 2006

**TEACHING**

1. Graduate Remote Sensing I, II, guest lectures and recitations
2. LaTeX, Computing for Imaging Science, guest lecture
3. Graduate Radiometry and Lab
4. Undergraduate Radiometry and Lab
5. Geometrical Optics
6. Photo Science
7. Dimensional Metrology
8. Computer Techniques for Technicians
9. Measurement and Analysis

**JOURNAL REVIEWER**

1. Journal of IS&T, Imaging Science and Technology
2. ASPRS Photogrammetric Engineering & Remote Sensing
3. Journal of Image and Vision Computing
4. IEEE Transactions on Geoscience and Remote Sensing
5. Journal of the Optical Society of America A
6. Optical Engineering
7. Journal of Electronic Imaging

**SOCIETY MEMBERSHIP**

1. Member of The International Society for Optical Engineering (SPIE)
2. Member of the Institute of Electrical and Electronic Engineers (IEEE)

**COMPUTER EXPERIENCE**

Operating Systems

- MS-DOS, Windows(95/98/NT), Macintosh, UNIX, Linux, VAX/VMS, X-Windows, Sun, SGI, and DEC Stations

Languages

- C and C++ for PC, VAX, and UNIX, Awk, BASIC, FORTH, IDL, HTML, JavaScript, Perl

Software

- Photoshop, MSOffice, CorelDRAW, Dreamweaver, Fireworks, Flash, QuarkXpress, MathCAD, AutoCAD, SCHEMAx, MATLAB, MINITAB, AVS, ENVI, Viewdac/Assyst, ERDAS Imagine, MODTRAN, OSLO, LaTeX

**HONORS AND ACTIVITIES**

- Batting 1000 Award for PI funding, RIT
- Recipient of the Director of Central Intelligence (DCI) Postdoctoral Fellowship
- Awarded Graduate School Scholarship in Imaging Science
- Recipient of Outstanding Undergraduate Scholarship
- Vice President, Society for Imaging Science and Technology, student chapter
- Secretary, RIT Jazz Ensemble
- Honor's Certificate from Percussion Institute of Technology, L.A.,CA
- Private drum/percussion instructor

**PRESENTATIONS SINCE 2006**

1. NARP September 2008
2. NGA/NRL meeting at the Institute for Pure & Applied Mathematics (IPAM), UCLA, July, 2008.
3. Stan Rottman Visit, Rochester, NY, June 19, 2008
4. NRL Program Review, Washington, D.C., June 4, 2008
5. Digital Globe, WorldView Assessment, Rochester, NY, April 11, 2008.
6. ITTVis meeting, Washington, D.C., January 4, 2008.
7. NGA meeting, Washington, D.C., January 4, 2008.
8. ***Invited Talk***, *Condor Applications,* Research computing informational seminar series, Rochester, NY, January 25, 2007.
9. Stan Rotman Visit, Rochester, NY, February 14, 2007.
10. Greg Boer Visit, Rochester, NY, February 15, 2007.
11. SPIE Conference, *Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XIII*. Orlando Florida, April, 9, 2007.
12. IC post-doc conference, Washington, D.C., May 2, 2007.
13. DIRS Research Symposium, Rochester, NY, June 5, 2007.
14. NGA Lunch Seminar, Washington, D.C., July 12, 2007.
15. DIRS Group Meeting, Oblique target detection radiometry, July 17, 2007.
16. NGA/NRL meeting at the Institute for Pure & Applied Mathematics (IPAM), UCLA. October 26, 2007.
17. *Thesis and Post Doc Review*, NGA, Washington, D.C., January 4, 2006.
18. *IC Post Doc Poster*, Washington, D.C., April 17, 2006
19. ***Invited Paper*** *presentation,* ICASSP Conference, Toulouse, France, May 19, 2006.
20. *DIRS Research Symposium,* Rochester, NY, June 6, 2006
21. *DIRS Meeting,* August 8, 2006.
22. *SPIE Optics and Photonics Conf, Imaging Spectrometry XI,* San Diego, CA, Aug 14, 06.
23. *Falcon Workshop at Ball Aerospace.* Dayton, OH, September 13, 2006.
24. *Virtual Scopics (Ed Ashton),* Rochester, NY, September 22, 2006.
25. *Wayne Hallada Visit,* Rochester, NY, September 28, 2006.
26. *MURI Review, Annual.* Washington, D.C., October 23, 2006.
27. ***Invited Talk***, Center for Advanced Information Technologies (CAIT), Binghamton University, Binghamton, NY, December 1, 2006.

**FUNDING**

1. **Ientilucci, E.J.,** "*Used Energy-Related Laboratory Equipment Grant Program (ERLE)*", Department of Energy, July 28, 2008. **[Funded, $XX]**
2. **Ientilucci, E. J**., "*Generation and Characterization of Physically-Derived Signature Spaces (PDSS)*", NRL BAA Proposal. April 27, 2007, [**Funded $224,989** over 3 yrs]
3. **Ientilucci, E.J.,** "*Used Energy-Related Laboratory Equipment Grant Program* (ERLE)", Department of Energy, May 17, 2007. [**Funded $132**]
4. **Ientilucci, E. J.,** "Radiometry Equipment Proposal", CIS, June 20, 2007, [**Funded $8,853**]
5. Schott, J.R., **Ientilucci**, E.J., "Pixel Identifications Techniques using Hybrid Algorithms and Physics Based Models applied to Target Detection", 3rd year follow on funding for IC Postdoc, **[Funded $120,000**]
6. *Spring-Summer Student Employment Proposal*, Obtained funding for student to work on physics based modeling topics, January 16, 2006. [**Funded**]

**PUBLICATIONS**

1. Bishoff, J.P., Messinger, D. W., **Ientilucci**, E.J., "Oblique Hyperspectral Target Detection", in Proc. SPIE, Imaging Spectrometry XIII, Vol. 7086, (San Diego, CA), August 2008.
2. Gillis, D., Bowles, J., **Ientilucci**, E., Messinger, D., "A Generalized Linear Mixing Model for Hyperspectral Imagery", in Proc. SPIE, Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XIV, Vol. 6966, (Orlando, Fla), April 2008.
3. **Ientilucci**, E., Bajorski, P., "Stochastic Modeling of Physically Derived Signature Spaces", *Journal of Applied Remote Sensing (JARS)*, Vol. 2, 023532, 2008.
4. Basener, B., **Ientilucci**, E., Messinger, D., "Anomaly Detection using Topology", in Proc. SPIE, Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XIII, Vol. 6565, (Orlando, Fla), April 2007.
5. Gillis, D., Bowles, J., **Ientilucci**, E., Messinger, D., "Linear Unmixing using Endmember Subspaces and Physics Based Modeling", in Proc. Imaging Spectrometry XII, Vol. 6651, ISBN: 9780819468093, (San Diego, CA), August 2007.
6. **Ientilucci**, E.J., "*Pixel Identification Techniques using Hybrid Spectral Algorithms and Physics Based Models Applied to Target Detection"*, Research Summary, Journal of Intelligence Community Research and Development (JICRID), September 29, 2006
7. **Ientilucci**, E.J. "Statistical Models for Physically Derived Target Sub-Spaces", In Proc. SPIE Imaging Spectrometry XI, Vol. 6302, (San Diego, CA), August 2006.
8. **Ientilucci**, E.J. "Two Dimensional Decision Spaces Generated from Physics Based Target Detection as Applied to Hyperspectral Imagery", International Congress of Imaging Science (ICIS), May 2006.
9. **Ientilucci**, E.J., Schott, J.R., "Physics Based Target Detection using a Hybrid Algorithm with an Infeasibility Metric", **Invited Paper**, *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, (Toulouse, France), May 2006.

10. **Ientilucci**, E.J. "Hyperspectral Sub-Pixel Target Detection Using Hybrid Algorithms and Physics Based Modeling", *PhD dissertation* Rochester Institute of Technology, August 2005.
11. **Ientilucci**, E.J., "Target Detection in a Structured Background Environment Using an Infeasibility Metric in an Invariant Space", *in Proc. SPIE, Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XI*, Vol. 5806, ISBN 0-8194-5791-4, (Orlando, Fla), April 2005.
12. West, J., Schott, J.R., **Ientilucci**, E.J., "Matched Filter Stochastic Background Characterization for Hyperspectral Target Detection", *in Proc. SPIE, Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XI*, Vol. 5806, ISBN 0-8194-5791-4, (Orlando, Fla), April 2005.
13. Bajorski, P., **Ientilucci**, E.J., Schott, J.R., "Geometric Basis-Vector Selection Methods and Subpixel Target Detection As Applied to Hyperspectral Imagery", *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, (Anchorage, Alaska), September 2004.
14. Brown, S.D., **Ientilucci**, E.J., "Wide-Area Electro-Optical Hyperspectral Scene Simulation for Algorithm Performance Evaluation", *In Proc. of SPIE Targets and Backgrounds X: Characterization and Representation*, April 2004.
15. Bajorski, P., **Ientilucci**, E.J., Schott, J.R., "Comparison of Basis-Vector Selection Methods for target and Background Subspace as Applied to Subpixel Target Detection", *In Proc. of SPIE Algorithms and Technologies for Multispectral, Hyperspectra, and Ultraspectral Imagery X*, Vol. 5425, pp. 97-108, ISBN 0-8194-5348-X, (Orlando, Fla), April 2004.
16. **Ientilucci**, E.J., Brown, S.D., "Advances in Wide Area Hyperspectral Image Simulation", *in Proc. of SPIE Targets and Backgrounds IX: Characterization and Representation*, Vol. 5075, pp.110-121, ISBN: 0-8194-4934-2, (Orlando, Fla), April 2003.
17. **Ientilucci**, E.J., Schott, J.R., Banta, M.S., "*Solar and Lunar Radiometric Calibration*", prepared for Eastman Kodak Company (Federal Systems Division) RIT/DIRS Report 01-68-163, Rochester, NY, August, (2001).
18. **Ientilucci**, E.J., Brown, S.D., Schott, J.R., "*Low-Light-Level Simulations*", Presented at the Northeast Regional Meeting on Optolectronics, Photonics, and Imaging. Conference NE02-11, April, (2001).
19. Brown, S.D., **Ientilucci**, E.J., Raqueno, R.V., Schott, J.R., "*DIRSIG/GENESSIS Hybrid Hyperspectral System Simulation of the Fort AP Hill Site*", prepared for Photon Research Associates RIT/DIRS Report 00/01-71-162, Rochester, NY, January, (2001).
20. **Ientilucci**, E.J., Brown, S.D., Schott, J.R., "*Low-Light-Level Simulations and Extended Area Source Modeling*", prepared for Eastman Kodak Company (Federal Systems Division) RIT/DIRS Report 00/01-68-159, Rochester, NY, January, (2001).
21. **Ientilucci**, E.J., "*Synthetic Simulation and Modeling of Image Intensified CCD's (ICCD),*" Masters Thesis August (1999).
22. **Ientilucci**, E.J., Brown, S.D., Schott, J.R., Raqueno, R.V., "*Multi-spectral Simulation Environment for Modeling Low-Light-Level Sensor Systems*," Proceedings of the SPIE conference on Earth Observing Systems and Remote Sensing, Vol. 3434, pp. 10-19, ISBN: 0-8194-2889-2, July (1998).
23. Schott, J.R., Brown, S.D., Raqueno, R.V., **Ientilucci**, E.J., "*Characterization of the Spectral Correlation of Imaging Spectrometer Data*", prepared for Eastman Kodak

Company (Federal Systems Division) SIDE Report 96-51-107, Rochester, NY, January (1997).

24. **Ientilucci**, E.J., "*Modular Imaging Spectrometer Instrument (MISI) Calibration Using Blackbody Radiators*," Undergraduate Senior Research Final Report, May (1996).
25. Raqueno, R.V., **Ientilucci**, E.J., Schott, J.R., "*Evaluation of Multispectral Fusion Algorithms for High Resolution Imaging*", prepared for Eastman Kodak Company (Federal Systems Division) SIDE Report 96-63-107, Rochester, NY, January (1996).
26. Brown, S.D., **Ientilucci**, E.J., Schott, J.R., "*Generation of Synthetic Images for use in Evaluation of Exploitation Tools*", prepared for Eastman Kodak Company (Federal Systems Division) SIDE Report 96-71-106, Rochester, NY, January (1996).

**TECHNICAL REPORTS**

1. **Ientilucci**, E.J., "*Oblique Hyperspectral Radiometry Phenomenology Study*", February 2, 2008.
2. **Ientilucci**, E.J., NURI Tools User Guide. 17 pgs., January 3, 2007.
3. **Ientilucci**, E.J., Using MODTRAN: Predicting Sensor-Reaching Radiance, February 5, 2007
4. **Ientilucci**, E.J., Messinger, D., and Pogorzala, D., "Oblique Hyperspectral Radiometric Phenomenology Study", Preliminary Task Report, December, 2007
5. **Ientilucci**, E.J., "*On Using and Computing the Kappa Statistic*", January 16, 2006.
6. **Ientilucci**, E.J., "*Finding Basis Vectors using the SVD function in IDL*", January 22, 2005.
7. **Ientilucci**, E.J., "*Using the MaxD Target Detection (MaxDTD) Algorithm in ENVI with AVIRIS Data*", January 12, 2004.
8. **Ientilucci**, E.J., "*Using the Singular Value Decomposition* ", May 29, 2003.
9. **Ientilucci**, E.J., "*Comparison and Usage of Principal Component Analysis (PCA) and Noise Adjusted Principal Component Analysis (NAPC) or Maximum Noise Fraction (MNF)*", May 6, 2003.
10. **Ientilucci**, E.J., "*AVIRIS Noise Analysis and Processing*", March 12, 2003.
11. **Ientilucci**, E.J., Ewald, K., Marcin, J., Spively, A., "*Guide to Building Large Scale DIRSIG Scenes*", January 30, 2003.
12. **Ientilucci**, E.J., "*Evaluating the Utility of a New Blue Band on LANDSAT for Water Quality Assessment*", September, 2002.
13. **Ientilucci**, E.J., "*Predicting Atmospheric Parameters using Canonical Correlation Analysis*", May, 2002.
14. **Ientilucci**, E.J., "*Solar and Lunar Radiometric Calibration Techniques*", August, 2001.
15. **Ientilucci**, E.J., "*Hyperspectral Image Classification Using Orthogonal Subspace Projections: Image Simulation and Noise Analysis*", April, 2001.
16. **Ientilucci**, E.J., "*Low-Light-Level Simulations and Extended Area Source Modeling*", January, 2001.
17. **Ientilucci**, E.J., "*Low-Light-Level Validation Proposal*", September, 2000.
18. **Ientilucci**, E.J., "*Measurement of the Spectral Distribution of Gas Discharge, Fluorescent and Incandescent Source*s", June, 2000.

19. **Ientilucci**, E.J., "*Hexadecimal Number System and Color Representation*," March, (2000).
20. **Ientilucci**, E.J., "*Synthetic Simulation and Modeling of Image Intensified CCD's (ICCD)*," Masters Thesis, August, (1999).
21. **Ientilucci**, E.J., "*Modular Imaging Spectrometer Instrument Calibration (MISI) Using Blackbody Radiators*", May, (1996).

**BOOKS**

- Fundamental Principles of Radiometry, **Ientilucci, E.J**., Schott, J.R., In progress.