Edgar Garduño

edgargar@ieee.org

EDUCATION

Ph.D. in Bioengineering August 2002
Department of Bioengineering, University of Pennsylvania, Philadelphia
Dissertation: *Extraction and Visualization of Structural Components from Reconstructed Volumes*
Advisor: Dr. Gabor T. Herman

M.Sc. in Bioengineering May 1998
Department of Bioengineering, University of Pennsylvania, Philadelphia, (**GPA** 3.64/4.00)

B. Sc. in Computer Engineering May 1995
School of Engineering, National Autonomous University of Mexico (U.N.A.M.), Mexico City (**GPA** 9.08/10.00)

HONORS and AWARDS

Young Mexican Scientist Fellow Summer 2009
Mexican Academy of Sciences (AMC) and the U.S.- Mexico Foundation for Science (FUMEC)

***Member of the National System of Researchers*, Level I** Jan 2007 – Dec 2009
Consejo Nacional de Ciencia y Tecnología (CONACyT), México

Special Session Grantee June 18-21, 2003
Special Session on "The Mathematics of Electronmicroscopic Imaging" in the 1st Joint International Meeting between the AMS and the RSME, Seville, Spain
Title:Fourier Transforms of Trains of Pulses on Various Grids

Fulbright Fellow Fall 1996 – Summer 2000
International Institute of Education (IIE), USA-Mexico

Student Travel Award 13-21 June, 1998
3rd IEEE EMBS International Summer School on Biomedical Imaging, Berder, France

CANIFARMA Award 1994
Granted by the National Chamber of the Pharmaceutical Industry, Mexico
Title: Automatic Computation of the Mitotic Index

RESEARCH EXPERIENCE

Assistant Professor January 2006 – December 2010
Universidad Nacional Autónoma de México (U.N.A.M.), **Department of Computer Science**, **Instituto de Investigaciones en Matemáticas Aplicadas y en Sistemas**, Mexico City, Mexico

Postdoctoral Scholar March 2003 – December 2005
University of California, **San Diego**, **National Center for Microscopy and Imaging Research**, La Jolla, CA
Worked on the NIH funded project "Segmentation of Electron Tomographic Data Sets Using Fuzzy Set Theory" (PI: Dr. Mark H. Ellisman, Co-PI: Dr. Niels Volkmann).

Postdoctoral Scholar July 2002 – February 2003
City University of New York, **Computer Science Department**, **The Graduate Center**, New York, NY
Worked on the NIH funded project "Extraction and Visualization of Structural Components from Reconstructed Volumes"
(PI: Dr. Gabor T. Herman).

Research Assistant Spring – June 2002
City University of New York, **Computer Science Department**, **The Graduate Center**, New York, NY
Worked on the NIH funded project "Extraction and Visualization of Structural Components from Reconstructed Volumes"
(PI: Dr. Gabor T. Herman).

Visiting Scholar Fall 2001
Mathematical Sciences Research Institute, Berkeley, CA

Research Assistant Fall 2000 – Summer 2001
Temple University, **Center for Computer Science and Applied Mathematics**, Philadelphia, PA
Worked on the NIH funded project "Extraction and Visualization of Structural Components from Reconstructed Volumes"
(PI: Dr. Gabor T. Herman).

Research Assistant Fall 1999 – Summer 2000
University of Pennsylvania, **Medical Image Processing Group**, Philadelphia, PA
Worked on the NIH funded project "Extraction and Visualization of Structural Components from Reconstructed Volumes"
(PI: Dr. Gabor T. Herman).

Visiting Scholar Fall 1998 – Summer 1999
National Center of Biotechnology, **Bioinformatics Unit**, Madrid, Spain
Worked on the NIH funded project "Visualization of Reconstructed Volumes using Blobby Model"
(PI: Dr. Gabor T. Herman and Dr. José María Carazo).

Participant June 13–21, 1998
Third IEEE EMBS International Summer School on Biomedical Imaging, Bretagne, France

Research Assistant Fall 1996 – Summer 1998
University of Pennsylvania, **Medical Image Processing Group**, Philadelphia, PA
Worked on the NIH funded project "Boundary tracking in 3D binary images to produce rhombic faces for a dodecahedral model"
(PI: Dr. Gabor T. Herman).

Research Assistant Fall 1993 – Spring 1996
Universidad Nacional Autónoma de México (U.N.A.M.), **Image Processing Laboratory**, **Centro de Ciencias Aplicadas y Desarrollo Tecnológico (formerly Centro de Instrumentos)**, Mexico City, Mexico
Worked on the project "Automatic Computation of the Mitotic Index"
(PI: Dr. Gabriel Corkidi-Blanco).

RESEARCH INTERESTS

Current Research: Image Segmentation by Fuzzy Set Principles, Transfer Function using Fuzzy Set Principles in Volume Rendering, and Bump Mapping for Boundary Tracking, 3D Reconstruction from Projections.

General Interests: Medical and Biomedical Imaging, Signal and Image Processing, 3D Reconstruction from Projections, Computer Graphics, Scientific Visualization, and Computer Vision.

TEACHING and MENTORING EXPERIENCE

Co-Instructor Fall 2010
National Autonomous University of Mexico (U.N.A.M.), **Introduction to Medical Imaging**, **Graduate Program in Computer Science and Engineering**, Mexico City, Mexico.

Instructor Fall 2008
Universidad Ibero Americana (U.I.A.), **Medical Imaging Systems and Laboratory**, **Curricula in Biomedical Engineering**, Mexico City, Mexico.

Instructor Fall 2008
National Autonomous University of Mexico (U.N.A.M.), **Computer Graphics**, **Graduate Program in Computer Science and Engineering**, Mexico City, Mexico.

Instructor Fall 2007
National Autonomous University of Mexico (U.N.A.M.), **Tridimensional Reconstruction and Scientific Visualization**, **Graduate Program in Computer Science and Engineering**, Mexico City, Mexico.

Instructor Fall 2006
National Autonomous University of Mexico (U.N.A.M.), **Tridimensional Reconstruction and Scientific Visualization**, **Graduate Program in Computer Science and Engineering**, Mexico City, Mexico.

Guest Lecturer Spring 2004
University of California, San Diego (UCSD), **Introduction to Image Processing and Deconvolution**, **NEU259**, **Department of Neurosciences**, San Diego, CA.

Teaching Assistant Fall 2000
Temple University, **Computer Graphics and Image Processing**, **CIS581**, **Graduate Program in Computer Science**, Philadelphia, PA.

Instructor Spring 1996, Spring 1995, Fall 1994
National Autonomous University of Mexico (U.N.A.M.), **C and OpenGL as part of the Computing for Research Program**, **Supercomputer Center**, **Dirección General de Servicios de Cómputo Académico**, Mexico City, Mexico.

Instructor Fall 1991 – Spring 1993
Centro Activo Freire (CAF), **Mathematics and Introduction to Computer Science**, **Junior High School and High School**, Mexico City, Mexico.

TEACHING COMPETENCIES

Fourier Analysis, Data Structures, Signal & Image Processing, Quantitative Image Analysis, Biomedical Imaging, Scientific Visualization and Computer Graphics.

PUBLICATIONS

In Journals

E. Garduño, G. T. Herman, and R. Davidi, "Image Reconstruction from a Limited Number of Projections by and L1-minimization," *Inverse Problems*, vol. 27, pp. 055006, 2011.

E. Garduño and G. T. Herman,"Parallel Fuzzy Segmentation of Multiple Objects", *International Journal of Imaging Systems and Technology*, vol. 18, pp. 336–344, 2008.

E. Garduño, M. Wong-Barnum, N. Volkmann, M. H. Ellisman, "Segmentation of Electron Tomographic Data Sets Using Fuzzy Set Theory Principles," *Journal of Structural Biology*, vol. 162, pp. 368–379, 2008. **doi:10.1016/j.jsb.2008.01.017**.

E. Garduño and G. T. Herman,"Implicit Surface Visualization of Reconstructed Biological Molecule,"*Theoretical Computer Science*, vol. 346, pp. 221–299, 2005. In memoriam: Alberto Del Lungo.

E. Garduño and G. T. Herman,"Optimization of basis functions for both reconstruction and visualization," *Discrete Applied Mathematics*, vol. 139, pp. 95–111, 2004.

B. M. Carvalho, **E. Garduño**, and G. T. Herman, "Multiseeded fuzzy segmentation on the face centered cubic grid," in *ICAPR* (S. Singh, N. A. Murshed, and W. G. Kropatsch, eds.), vol. 2013 of *Lecture Notes in Computer Science*, pp. 339–348, ICAPR, Springer, 2001.

G. T. Herman, R. Marabini, J. M. Carazo, **E. Garduño**, R. M. Lewitt, and S. Matej, "Image processing approaches to biological three-dimensional electron microscopy," *International Journal of Imaging Systems & Technology*, vol. 11, no. 1, pp. 12–29, 2000.

E. Garduño, G. T. Herman, and H. Katz, "Boundary tracking in 3D binary images to produce rhombic faces for a dodecahedral model," *IEEE Transactions on Medical Imaging*, vol. 17, pp. 1097–1100, 1998.

Electronic Journals

E. Garduño and G. T. Herman, "Optimization of basis functions for both reconstruction and visualization," in *Electronic Notes in Theoretical Computer Science* (S. Fourey, G. T. Herman, and T. Y. Kong, eds.), vol. 46, pp. 1–17, Elsevier Science Publishers, 2001.

At Conferences

F. Arambula-Cosio, E. Lira-Berra, N. Hevia-Montiel, C. Garcia-Segundo, **Edgar Garduño**, M. Alvarado-Gonzalez, R. M. Quispe, B. Reyes-Ramirez, E. Hazan-Lasri, "Computer Assisted Biopsy of Breast Tumors," in *32nd Annual International IEEE EMBS*, (Buenos Aires, Argentina), August 31 - September 4, 2010

A. M. Alvarado, **E. Garduño**, M. E. Martinez-Perez, "Segmentation Of Retinal Blood Vessels by Multi-Scale Feature Extraction and Fuzzy Segmentation Methods," in *11th World Congress on Medical Physics and Biomedical Engineering*, (München, Germany), September 7-11, 2009.

A. M. Alvarado, B. M. Carvalho, and **E. Garduño**, "Incorporating a Measure of Texture in Fuzzy Segmentation Approaches," in *9th Mexican Symposium on Computer Aided Surgery and Medical Image Processing / MEXCAS 2008*, (Mexico City, Mexico), September 4-5, 2008.

B. M. Carvalho, L. M. Oliveira, and **E. Garduño**, "Semi-automatic single particle segmentation on electron micrographs," in *3rd IEEE International Symposium on Biomedical Imaging: From Nano to Macro*, (Arlington, Virginia, USA), pp. 1024 – 1027, April 2006.

E. Garduño and G. T. Herman, "Applications of the geometry of digital spaces to medical imaging," in *Proceedings Fourth IEEE Workshop on Applications of Computer Vision. WACV'98* (IEEE, ed.), (Los Alamitos, California, USA.), pp. 244–245, IEEE Computer Society, IEEE Computer Society, 1998.

E. Garduño, G. T. Herman, and H. Katz, "Boundary tracking in 3D binary images to produce rhombic faces for a dodecahedral model," in *EUSIPCO 98, Island of Rhodes, Greece, September, 1998* (University of Athens, ed.), EUSIPCO, 1998.

G. Hernández, A. Ángeles, A. Herrera, G. Corkidi-Blanco, and **E. Garduño**, "Diseño y entrenamiento de una red neuronal para la clasificación de núcleos de linfocitos," in *Memorias del X Congreso de Instrumentación, September, 1994* (SOMI, ed.), (Xalapa, Ver, México.), SOMI, 1995.

E. Garduño and G. Corkidi-Blanco, "Sistema para el cálculo automático del indice mitótico por procesamiento de imágenes," in *Memorias del IX Congreso de Instrumentación, September, 1994* (SOMI, ed.), (Cancún, Qro, México.), pp. 64–70, SOMI, 1994.

Technical Reports

E. Garduño and G. Corkidi-Blanco, "Manual de operación: Sistema MIT 2000," Tech. Rep. B-194-1, Centro de Instrumentos, National Autonomous University of Mexico, Circuito Interior, Ciudad Universitaria, Mexico City, Mexico, June 1995.

Manuscripts in Preparation

Edgar Garduño, Andreas Buehler, and Vasilis Ntziachristos, "Fuzzy methods for OptoAcoustic Image Segmentation". **Submitted**.

Bruno M. Carvalho, Tiago S. Santos, **Edgar Garduño** and Lucas M. Oliveira, "Fuzzy Segmentation of Video Shots using Hybrid Color Spaces and Motion Information". **Submitted**.

LECTURES and PRESENTATIONS

E. Garduño, "Image Classification of Micrographs at the Department of Computer Science, IIMAS-UNAM." Lecture in the Cycle of Conferences of SIAV-UNAM, Mexico City, Mexico, May 2010.

E. Garduño, "Mathematical and Computational Methods in Electron Microscopy of Biological Specimens." *Guest Speaker* in the Collaborative Program in Biomedical Research, UNAM, Mexico City, Mexico, April 2008.

E. Garduño, "Image Processing of Biomedical Transmission Electron Microscopy." Lecture in the Annual Workshop in Digital Signal and Image Processing and Virtual Environments, UNAM, Mexico City, Mexico, November 2007.

E. Garduño, "Mathematical and Computational Methods in Electron Microscopy of Biological Specimens." Lecture held as part of the *Guest Speaker* Seminars, I.T.A.M., Mexico City, Mexico, October 2007.

E. Garduño, "The Blobby Model to Visualize Electron Microscopic Data." Lecture held during Visual Computing: Fundamental and Applications 2006., U.N.A.M., Mexico City, Mexico, September 2006.

E. Garduño, "Mathematical and Computational Methods in Electron Microscopy of Biological Specimens." Lecture held during the 4th Biomedical Engineering Week, School of Engineering, U.N.A.M., Mexico City, Mexico, September 2006.

E. Garduño, "Mathematical and Computational Methods in Electron Microscopy of Biological Specimens." Lecture held as part of the Invited Lectures Seminar, U.C.M., Mexico City, Mexico, May 2006.

E. Garduño, "Multi Object Segmentation Using Fuzzy Connectedness." Talk held at the Data Club Series, National Center for Microscopy and Imaging Research, UCSD, La Jolla, California, USA, Aug. 2004.

E. Garduño, "Segmentation of Electron Tomographic Datasets Using Fuzzy Theory Principles" Talk held at the NBCR Technical Series, San Diego SuperComputer Center, UCSD, La Jolla, California, USA, Jan. 2005.

E. Garduño, "Mathematical Methods for Electron Microscopy." Presentation at the Third International Congress on Electron Tomography, Rensselaerville, NY, Apr. 2004.

E. Garduño, "Fourier transforms of trains of pulses on various grids." Talk held at the Special Session on Mathematics of Electronmicroscopic Imaging, First Joint International Meeting between the American Mathematical Society and the Real Sociedad Matemática Española, Seville, Spain,Jun. 2003.

E. Garduño, "Ejemplos de procesamiento de imágenes en microscopía electrónica de especimenes biológicos." Talk held at the Instituto de Investigaciones en Matemáticas Aplicadas y en Sistemas, U.N.A.M., Mexico City, Mexico, Jun. 2003.

E. Garduño, "Boundary tracking for both the simple cubic and the facecentered cubic grids." Talk held at the DIMACS Workshop on Computational Geometry and Medical Applications, DIMACS Center, Rutgers University, Piscataway, New Jersey, USA, Apr. 2003.

E. Garduño, "Three-dimensional reconstruction of macromolecules consisting of repeating subunits." Talk held at the Computer Science Department Seminar, The Graduate Center, City University of New York, New York, USA, Feb. 2003.

E. Garduño, "Blobs for reconstruction and visualization." Talk held at the Computer Science Department Seminar, The Graduate Center, City University of New York, New York, USA, Feb. 2003.

E. Garduño, "Extraction and visualization of structural components from reconstructed volumes." Talk held at the Medical Imaging Processing Group, University of Pennsylvania, Philadelphia, Pennsylvania, USA, Apr. 1998.

GRANTS

Current Support

- **PAPIIT-UNAM IN101108**
  National Autonomous University of Mexico (U.N.A.M.), Mexico Start/End Dates: Spring 2008 – Winter 2010
  Amount: 10,000.

SERVICE

Academic Service

- Reviewer:
  Computerized Medical Imaging and Graphics
  Computer Methods and Programs in Biomedicine
  IEEE Transactions on Information Technology in BioMedicine
  IEEE Transactions on Medical Imaging

PROFESSIONAL MEMBERSHIPS

Member of the Institute of Electrical and Electronics Engineers, Inc. (IEEE), since 1998
IEEE Computer Society
IEEE Engineering in Medicine and Biology Society (EMBS)
Member of the Association for Computing Machinery (ACM), since 2005

TECHNICAL SKILLS

Programming Languages: C, C++, FORTRAN, Java, UNIX Shell, OpenMP, CUDA
Graphical/Visualization Libraries: OpenGL, VRML 2.0, TIFF
Operating Systems: UNIX, Windows, Macintosh
Editing Software: LaTeX, LyX, Microsoft Word, JabRef
Software Packages: DX (Visualization Software), Amira, Photoshop, Maya
NIH Image, Matlab, Mathematica
Microsoft Office (Word, Excel, PowerPoint and Access)

LANGUAGES

English (fluent), Spanish (fluent)

REFERENCES

- Gabor T. Herman, Ph.D.
Advisor of Doctoral Project
(formerly at the Medical Image Processing Group, University of Pennsylvania)
Department of Computer Science
The Graduate Center
City University of New York
New York, NY 10016
USA
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- José María Carazo, Ph.D.
Advisor at the BioComputing Unit
Centro Nacional de Biotecnología
Campus Universidad Autónoma de Madrid
28049 Madrid, Spain
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- Mark H. Ellisman, Ph.D.
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National Center for Microscopy and Imaging Research
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University of California, San Diego
Basic Sciences Building, Room 1000
9500 Gilman Drive, MC 0608
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