

# Maria Alejandra Zuluaga Valencia

## Postdoctoral Fellow

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## Academic Background

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- PhD in Engineering** **2007- 2010**  
*Université Claude Bernard Lyon I (Lyon, France) – Universidad de los Andes (Bogotá, Colombia)*  
*Supervisors : Maciej Orkisz (Université Lyon I) and Marcela Hernández Hoyos (Universidad de los Andes).*
- MSc in Computer Sciences** **2003-2005**  
*Universidad de los Andes (Bogotá, Colombia)*
- BSc in Electronics Engineering** **1997-2002**  
*Universidad del Valle (Cali, Colombia)*

## Research and Professional Experience

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- Postdoctoral fellow** **Since Feb. 2011**  
European Synchrotron Radiation Facility (Grenoble, France)  
*Research subject:* Segmentation and quantification of bone cellular structures
- Researcher in Training (PhD)** **2007 – 2011**  
Creatis Laboratory (Lyon, France)  
*Research subject:* CAD diagnosis of coronary heart disease
- Visiting Scientist** **Feb. 2007 – Sept. 2007**  
BioMedIA Lab, AeHRC, ICT Centre, CSIRO (Brisbane, Australia)  
*Research subject:* Cortical thickness estimation for the study of Alzheimer's disease
- Research Assistant** **Aug. 2005 – Jan. 2007**  
Universidad de los Andes (Bogotá, Colombia)  
*Research subject:* Atherosclerotic plaque segmentation and characterization
- Junior Software Developer** **2004 – 2005**  
Heinsohn Software House (Bogotá, Colombia)  
*Client specific software development under J2EE platform*

## Teaching and Tutoring

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- Lecturer**  
Object Oriented Programming Aug. 2005 – Jan. 2007  
*Universidad de los Andes (Bogotá, Colombia)*
- Software Architecture Aug. 2004 – Aug. 2005  
*Fundación Universitaria San Martín (Bogotá, Colombia)*
- Teaching Assistant**  
Quality of Software (QoS) Spring semester 2010  
*Universidad de los Andes (Bogotá, Colombia)*
- Image Processing and Analysis Fall semesters 2009 - 2010  
*Universidad de los Andes (Bogotá, Colombia)*
- Electric circuits 2001-2002  
*Universidad del Valle (Cali, Colombia)*

## Honors and Awards

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### *MICCAI 2011 Student Travel Award*

Medical Image Computing and Computer Assisted Intervention Conference. Toronto, Canada, September 2011

### *PhD Scholarship*

Departamento Administrativo de Ciencia, Tecnología e Innovación – Colciencias, 2007 – 2010

### *Best poster award, Runner-up*

*Title: Cortical Thickness Estimation from MR images: Methods and Applications to Alzheimer's Patients*

ICT Centre Conference, Sydney, Australia, 2007

### *University-Enterprise Excellence Scholarship for Master Students*

Universidad de los Andes, 2003 – 2005

### *Summa Cum Laude*

Universidad del Valle, 2002

### *Bachelor Excellence Scholarship*

Instituto de Seguros Sociales, 1997 – 2002

## Participation in Research Projects

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**Project:** Anomaly detection in vascular trees. Project No. C11S01

**Financed by:** Ecos-nord committee

**Involved entities :** Creatis (Lyon, France), Universidad de los Andes (Bogotá, Colombia)

**Principal researcher:** Maciej Orkisz

**Duration:** 2011 – 2012

**Dates of Involvement:** 2011

**Role in the project:** Junior researcher

**Project:** Patient-specific vascular model generation from 3D medical images. Project No. C07M04

**Financed by:** Ecos-nord committee

**Involved entities :** Creatis (Lyon, France), Universidad de los Andes (Bogotá, Colombia)

**Principal researcher:** Maciej Orkisz

**Duration:** 2007 – 2009

**Dates of Involvement:** 2007 - 2009

**Role in the project:** Junior researcher

**Project:** Using deformable surface registration for vessel segmentation on computed tomography angiography.

**Financed by:** Ministère des Affaires étrangères (France)

**Involved entities :** CEREMADE (Paris), Creatis (Lyon, France), Technion (Haifa, Israel) and Tel-Aviv University (Tel-Aviv, Israel)

**Principal researcher:** Laurent D. Cohen

**Duration:** 2006 – 2009

**Dates of Involvement:** 2007 – 2009

**Role in the project:** Researcher

**Project:** Stenosis hemodynamical study at the carotid artery bifurcation and its influence on clinical observations. Part II: Image and hemodynamical analysis combination in the diagnosis of atherosclerosis. Project No. 120404 - 16468

**Financed by:** Departamento Administrativo de Ciencia, Tecnología e Innovación – Colciencias. República de Colombia

**Involved entities :** Creatis (Lyon, France), Universidad de los Andes (Bogotá, Colombia), Hospital Universitario San Ignacio (Bogotá, Colombia)

**Principal researcher:** Marcela Hernández Hoyos

**Duration:** 2005 – 2007

**Dates of Involvement:** 2005 – 2007

**Role in the project:** Junior researcher

## Professional Activities

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### *Co-organizer*

#### **3D Segmentation Challenge for Clinical Applications: The Carotid Bifurcation Algorithm Framework Evaluation Framework.**

Workshop organized in conjunction with the conference Medical Image Computing and Computer Assisted Interventions – MICCAI 2009. London, UK. September 2009.

### *Reviewer*

IEEE International Conference on Image Processing (2011), the MICCAI Workshop on Computing and Visualization for (Intra) Vascular Imaging (2011)

## Student Co-Supervision

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- 2011-** Ricardo Alberto Corredor  
Master student  
*Universidad de los Andes (Bogotá, Colombia) and Université Claude Bernard Lyon 1 (Lyon, France)*
- 2011-** Fabián Andrés Gutiérrez  
Master student  
*Universidad de los Andes (Bogotá, Colombia) and Université Claude Bernard Lyon 1 (Lyon, France)*
- 2009 - 2011** Edgar José Fernando Delgado  
Master student  
*Universidad de los Andes (Bogotá, Colombia) and Université Claude Bernard Lyon 1 (Lyon, France)*

## Skills

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**Languages:** Spanish (mother tongue), English (bilingual, TOEFL 109/120), French (bilingual), Italian (beginner)

**Software:** C, C++, Java, PHP, Bash script, Javascript, ITK, VTK, Qt, wxWidgets, Matlab, Octave, MeVisLab, CMake

## Publications

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### **International Journal Publications**

1. K. Hameeteman, **M.A. Zuluaga**, M. Freiman, L. Joskowicz, W.J. Niessen, T. van Walsum *et al.* Evaluation Framework for Carotid Bifurcation Lumen Segmentation and Stenosis Grading, *Medical Image Analysis* 15(4) pp. 477-488, 2011.
2. **MA. Zuluaga**, IE. Magnin, M. Hernández Hoyos, EJF. Delgado, F. Lozano and M. Orkisz. Automatic detection of abnormal vascular cross-sections based on Density Level Detection and Support Vector Machines. *International Journal Of Computer Assisted Radiology And Surgery* 6(2) p.163-74, 2011.
3. **MA. Zuluaga**, L. Ibañez, and F. Peyrin. Large Image Streaming using ITKv4. *The Insight Journal* January-June, p. 7. <http://hdl.handle.net/10380/3263>, 2011.

4. **MA. Zuluaga**, A. Larrue, A. Rattner, L. Vico and F. Peyrin. Acquisition of Synchrotron Radiation micro-CT images for the investigation of bone micro-cracks. The MIDAS Journal – Medical Image Computing <http://hdl.handle.net/10380/3261>, 2011.
5. O. Acosta, P. Bourgeat, **MA. Zuluaga**, J. Fripp, O. Salvado, S. Ourselin and the Alzheimer's Disease Neuroimaging Initiative. Automated voxel-based 3D cortical thickness measurement in a combined Lagrangian-Eulerian PDE approach using partial volume maps. Medical Image Analysis 13(5), 730-743, 2009.

#### Articles in Conference Proceedings

1. **MA. Zuluaga**, A. Pacureanu, P. Dong, M. Orkisz and F. Peyrin. Minimum Cost Path Approach for the Segmentation of Bone Canalicular Network from Nano-CT Images, IEEE Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, October (In press)
2. **MA. Zuluaga**, D. Hush, E. J. F. Delgado Leyton, M. Hernández Hoyos, and M. Orkisz. Learning from Only Positive and Unlabeled Data to Detect Lesions in Coronary CT Images. In: MICCAI 2011, LNCS 6893, pp. 9-16, 2011.
3. **MA. Zuluaga**, E. J. F. Delgado Leyton, M. Hernández Hoyos, and M. Orkisz. Feature selection for SVM-based vascular anomaly detection. In: MICCAI Workshop on Medical Computer Vision, volume LNCS, Beijing, China, p. 141-152, September 2010.
4. **MA. Zuluaga**, E. J. F. Delgado Leyton, M. Hernández Hoyos, and M. Orkisz. Can the coronary artery centerline extraction in computed tomography images be improved by use of a partial volume model?. In: Int Conf Comput Vision Graphics, volume LNCS 6375, Warsaw, Poland, pages 385-392, September 2010. Springer.
5. **MA. Zuluaga**, M.Orkisz, E.J.F. Delgado, V. Doré, A. Morales & M. Hernández Hoyos. Adaptations of MARACAS algorithm to the segmentation of the carotid bifurcation and stenosis quantification in CTA images. In: MICCAI Workshop - 3D Segmentation in the Clinic: A Grand Challenge III. London, 2009.
6. F. Benmansour, L.D. Cohen, E.E. Dávila-Serrano, P.C. Douek, M. Orkisz, and **MA. Zuluaga**. New Interactive Methods for Tubular Structure Segmentation on Medical Images. In: 12th ISRA-CAS (Israeli Symposium on Computer-Aided Surgery, Medical Robotics, and Medical Imaging), Tel-Aviv, Israel, 2009.
7. M. Hernández Hoyos, **MA. Zuluaga**, M. Lozano, JC. Prieto, PC. Douek, IE. Magnin and M.Orkisz. Coronary centerline tracking in CT images with use of an elastic model and image moments. In: 3D Segmentation in the Clinic: a Grand Challenge II: MICCAI 2008 workshop proceedings, 2008.
8. P. Bourgeat, O. Acosta, **MA. Zuluaga**, O. Salvado and S. Ourselin. Improved Cortical Thickness Measurement from MR Images Using Partial Volume Estimation. In 5th IEEE International Symposium on Biomedical Imaging: From Nano to Macro ISBI'2008, Paris, May 2008.
9. **MA. Zuluaga**, O. Acosta Tamayo, P. Bourgeat, M. Hernández Hoyos, O. Salvado and S. Ourselin. Cortical Thickness Measurement from Magnetic Resonance Images Using Partial Volume Estimation. In Proceedings of SPIE: Medical Imaging, San Diego, USA, February 2008.
10. O. Salvado, P. Bourgeat, O. Acosta, **MA. Zuluaga** and S. Ourselin. Fuzzy classification of brain MRI using a priori knowledge: weighted fuzzy C-means. In: MMBIA'07 in conjunction with ICCV 2007, Rio de Janeiro, October 2007.
11. Fernández, MA. Navas, **MA. Zuluaga**, LF. Uriza, JC. Briceño and M. Hernández Hoyos. Carotid stenosis disease: use of mathematical and computational analysis as a diagnostic aid In: ASAIO's 53rd Annual Conference, v.53 n.2 p.52A - 52A, Chicago, USA, June 2007.
12. **MA. Zuluaga**, E. Dávila, LF. Uriza, M. Hernández Hoyos. Carotid artery segmentation and characterization in 3D computed tomography (CT) images International Journal

Of Computer Assisted Radiology And Surgery. Springer Berlin 2(1), p.S72 - S74, 2007.

13. JA. Arias, **MA. Zuluaga**, LF. Uriza, SI. Mesa and M. Hernández Hoyos. Hemodynamics of carotid stenosis: a diagnostic image characterization and computational study. In: ASAIO's 52nd Annual Conference, v.52 n.2 p.57A -57A, Chicago, USA, June 2006.

### Conference Proceedings Editor

K. Hameeteman, M. Freiman, **MA. Zuluaga**, L. Joskowicz, S. Rozie, MJ. Van Gils, L. Van den Borne, J. Sosna, P. Berman, N. Cohen, P. Douek, I. Sanchez, M. Aissat, A. Van der Lugt, GP. Krestin, W. Niessen and T. Van Walsum. Editorial: 3D Segmentation in the Clinic: A Grand Challenge III – Carotid Lumen Segmentation and Stenosis Grading Challenge In: MICCAI Workshop 3D Segmentation in the Clinic: A Grand Challenge III. London, 2009.

### Conference Abstracts

1. K. Hameeteman, **MA. Zuluaga**, M. Freiman, A. van der Lugt, and T. vanWalsum. An standardized evaluation framework for automated carotid bifurcation lumen segmentation and stenosis grading methods. In: Radiological Society of North America, 96th Annual Meeting, Chicago, USA, November 2010. (abstract)
2. **MA. Zuluaga**, M. Orkisz, M. Hernández Hoyos, F. Lozano and IE. Magnin. Towards vascular abnormality detection: An SVM Approach. In: Proceedings of Computer Assisted Radiology And Surgery. p. S355-6, Geneve, June 2010. (abstract)
3. **MA. Zuluaga**, M. Hernández Hoyos and M.Orkisz. Evaluation of partial volume effects in computer tomography for the improvement of coronary artery segmentation. In: Proceedings of Computer Assisted Radiology and Surgery. Berlin, June 2009. (abstract)

### National Journal Publications

1. **MA. Zuluaga**, M. Orkisz, E. J. F. Delgado Leyton, V. Doré, A. Morales Pinzón, and M. Hernández Hoyos. Adaptación del algoritmo MARACAS para la segmentación de la bifurcación de la arteria carótida y cuantificación de estenosis en imágenes TAC. Actas Biológicas Colombianas, 15(3), pp. 195 - 210, 2010.
2. **MA. Zuluaga**, M. Orkisz, and M. Hernández Hoyos. Mejoramiento de la segmentación arterial coronaria a través del modelamiento del volumen parcial en imágenes TAC. Revista Colombiana de Radiología, 20 (3), pp. 2702-2707, 2009.
3. **MA. Zuluaga**, SI. Mesa, LF. Uriza, M. Hernández Hoyos Segmentación vascular y caracterización de placas ateroscleróticas en imágenes de tomografía computarizada 3D. Revista Colombiana de Radiología. Medellín: , v.16, n.2, 2005.

### Articles in National Conference Proceedings

1. **MA. Zuluaga**, SI. Mesa, LF. Uriza, M. Hernández Hoyos Segmentación vascular y caracterización de placas ateroscleróticas en imágenes de tomografía computarizada 3D. II Congreso Nacional de Bioingeniería e Ingeniería Biomédica. Bogotá, 2005.
2. **MA. Zuluaga**, LF. Uriza, SI. Mesa and M. Hernández Hoyos. Segmentación vascular y caracterización de placas ateroscleróticas en imágenes de tomografía computarizada. In: XXXI Conferencia Latinoamericana de Informática CLEI 2005, Cali, Colombia, October 2005.

### Reports

1. **MA. Zuluaga**, O. Acosta Tamayo, P. Bourgeat , O. Salvado and S. Ourselin. Cortical Thickness Estimation From MR images: Methods and Applications to Alzheimer's Patients. Technical report No. 07/340. BioMedIA Lab. eHRC, ICT Centre, CSIRO. September 2007.

2. Segmentación vascular y caracterización de placas ateroscleróticas en imágenes de tomografía computarizada 3D. Master thesis. Universidad de los Andes. 2005.

**Publications in preparation**

1. **M.A. Zuluaga**, P. Dong, A. Pacureanu, M. Orkisz and F. Peyrin. An automatic 3D geodesic voting strategy for Lacunar-canalicular network segmentation bone Nano-CT images. To be submitted to IEEE Transactions on Medical Imaging, Nov. 2011.
2. **MA. Zuluaga**, M. Hernández Hoyos, and M. Orkisz. Fast lesion registration in coronary artery disease diagnosis and follow up. To be submitted to ISBI 2012. Nov. 2011.

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