

QUALIFICATIONS SUMMARY

Highly creative, effective and accomplished expert in manufacturing processes, robotics and automation with multi-disciplinary experience in R&D, systems integration & technology management at a global scale for product, service & manufacturing applications. Broad applied expertise in project management, global collaboration, external leveraging, intellectual property management, technology planning, innovation forecasting & road mapping as well as technology transfer. Results-driven leader with an outstanding implementation track record of data-mining based forecasting techniques and real-time decision support systems that deliver sustainable value to organizations.

AWARDS, HONORS, AND DISTINCTIONS

Distinguished with over **40 corporate, academic and professional awards** including: 4 “Boss” Kettering Awards (GM’s top technical honor), 3 McCuen Awards (GM R&D’s top honor), Chairman Honors Award (GM’s top corporate honor), GM R&D “Spark Plug” Award, Elected IEEE Senior Member, NSF GOALI Award, NSERC Collaborative Research Grant, SME OYME Award, **IEEE Robotics & Automation Early Career Award**, Federal Laboratory Consortium (FLC) Award for Excellence in Tech. Transfer for R2, NASA Exceptional Space Act Award for R2, and NASA JSC’s Exceptional Software Award for **Robonaut 2 (R2)**

PUBLICATIONS & INTELLECTUAL PROPERTY RECORD

Authored over **50 technical publications** and 50 Records of Invention (ROI)/Invention Disclosures that in turn have been translated into over **30 patents & patent applications**, 7 Defensive Publications, and 9 Trade Secrets.

EDUCATION

- 2000- 2003 GEORGIA INSTITUTE OF TECHNOLOGY, Atlanta, GA, USA
Doctor of Philosophy (Ph.D.) in Electrical & Computer Engineering
- 1999-2000 GEORGIA INSTITUTE OF TECHNOLOGY, Atlanta, GA, USA
Master of Science (M.S.) in Electrical & Computer Engineering
- Major in **Control Systems & DSP**; Minor in **Mathematics**
- 1991-1996 UNIVERSIDAD DISTRITAL FRANCISCO JOSÉ DE CALDAS (UDFJC), Bogotá, Colombia
Bachelor of Science (B.S.) in Electrical Engineering
- Major in **Telecommunications & Control Systems; (Valedictorian)**
- 1990-1991 MILITARY SERVICE, COLOMBIAN ARMY Special Operations, Bogotá, Colombia
Reserve 2nd Lieutenant. Ranked 2nd, with Honors, in class of 400

INDUSTRY EXPERIENCE

GENERAL MOTORS, GM R&D, MANUFACTURING SYSTEMS RESEARCH LABORATORY

2008-Present **Staff Researcher**. Advanced Robotics Group.

Responsible for managing and leading the global design and development of GM’s cross-platform framework for automotive assembly robot command and control and its standard interfaces. This framework encompasses robot vision, robot & automation control, high-level intelligent & flexible perception, human-robot interaction & learning, and highly flexible & dexterous robots/end-effectors. Scope of contributions for selected projects:

- *Obtained funding, directed & conducted* research project in collaboration with NASA Johnson Space Center and HRL Labs on **Imitation Learning for Intelligent and Dexterous Assembly Robots**. Supported platforms include several industrial & research robots (FANUC, KUKA, Motoman, R17, Meka) as well as the NASA-GM 42-DOF/+350-sensor humanoid robot **Robonaut 2 (R2)**
- *Obtained funding & co-directed* research on **Collaborative, Human-Focused, Assistive Robotics For Manufacturing (CHARM)** in a large multi-institutional agreement (British Columbia, Laval & McGill) jointly sponsored by GM and the Natural Sciences & Engineering Research Council (NSERC) of Canada
- *Directed & conducted* research project in collaboration with Sungkyunkwan University (SKKU, Korea) on **Structured Light 3D-Vision-Based Automotive Sub-Assembly Automation**

Leandro G. Barajas, Ph.D., PMP – US Citizen

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- *Directed & conducted* collaborative research project on **Interaction and Learning for Autonomous Assembly Robots** with the Georgia Institute of Technology
- *Directed* research project on **Virtual Workspace Generation for Industrial Robots via 3D Measurements** from stereo and time-of-flight (TOF) cameras
- *Directed* research project on the development of an **Automated Real-Time Workspace Calibration of Monocular, Stereo, and 3D-TOF Cameras** from static and dynamic viewpoints
- *Directed & conducted* research project on **Dexterous Robotic Grasping Methods for Automotive Parts**

2007-2008 Senior Plant Engineer. Rotational assignment at the Orion (MI) General Assembly Plant. Technically lead the development and pilot deployment of a wide set of **Real-Time Data-Driven Decision Support Tools for Automotive General Assembly**. This initial deployment realized a 9% body shop throughput improvement; currently this system is being rolled out globally across all GM Manuf. plants

2006-2007 Senior Manufacturing Engineer. Rotational assignment at GM Manufacturing Engineering, Controls, Conveyors, Robotics & Welding Division. Technically lead, designed, developed and piloted GM's **Next Generation Global Plant Floor Systems Architecture, Data Collection & Control Protocols**. Estimated benefits of this system deployment include several months of launch time reduction and the elimination of most system maintenance costs

2003-2006 Senior Research Engineer. Plant Floor Systems & Controls Group. Pioneered advanced **Diagnostics, Prognostics & Health Management for Manufacturing Operations** in GM obtaining significant savings in maintenance costs per year

ADDITIONAL WORK EXPERIENCE

1999-2003 GEORGIA INSTITUTE OF TECHNOLOGY, Atlanta, GA. Graduate Research Assistant

2001 Summer SIEMENS DEMATIC ELECTRONICS ASSEMBLY SYSTEMS, Software Developer (Internship)

1997-1999 SCADA TECHNICAL CONSULTANT for British Petroleum, Texaco, Halliburton, & Ecopetrol

1997 LOGIC SUPPORT, Bogotá, Colombia, R&D Engineer

1996-1999 OCCIDENTAL PETROLEUM, Bogotá/Caño Limón, Colombia. R&D Engineer

LICENSES & CERTIFICATIONS

2009 PROJECT MANAGEMENT INSTITUTE, Newtown Square, PA, USA
Project Manager Professional (PMP) Certification, PMP No. 1275782, 06/23/2009

2007-2008 UNITED STATES FEDERAL AVIATION ADMINISTRATION (FAA), Pontiac, MI, USA
Private Pilot License - Aircraft Single Engine Land (PP-ASEL), High-Perf. Endorsement

1998 COLOMBIAN ASSOCIATION OF ELECTRICAL & MECHANICAL ENGINEERS, Bogotá, Colombia
Professional Engineer (P.E.) License, Registration No. CN206-29343

TECHNICAL SKILLS

Engineering Matlab/Simulink, Microsoft Robotics Developer Studio (MRDS), ROS, Minitab, MathCAD, Maple, Mathematica, QFD Capture, DExpert, LabVIEW, NI-DAQ, and WEKA

CAD/CAE Polyworks, Meshlab, Blender, AT-3D, Open CASCADE, AutoCAD, PSpice, OrCAD & Eagle

Programming Microsoft .NET (C#, VB, C++), VBA, Java, JavaScript, Python, PHP, C++, C, Dynamic C, SQL, XML, HTML, UML, Fortran, Perl, Delphi, Pascal, Arduino, AutoHotkey & assembler

Comp. Vision OpenCV, Matlab IP/IA, MVTech Halcon, Cognex VisionPro, Labview NI Vision/IMAQ

Telecomms DSS/CCR, XML, TCP/IP, UDP, SOAP; IEEE 802.x: WiFi, Bluetooth, Zigbee & WiMax

Applications Microsoft: Access, Office (Word, PowerPoint, Excel, Outlook), Project, Visio; SQL Server, MySQL, Oracle; Exceed, Lotus Notes, EndNote, ProCite, Adobe Acrobat, & LaTeX

Platforms Windows 7/Vista/XP/2000/CE/NT/9x/3.x, Ubuntu/Suse/Red Hat Linux, DOS, OS/2 and RTOS

Affiliations IEEE, AUVSI, SME, SAE, PMI, SIAM, Sigma Xi, SHPE, AOPA, FIRST Robotics

Languages Fluent **English and Spanish**, basic German and French, currently learning Russian