

Dr. Ivan Alejandro Gutierrez Giles

Curriculum Vitae

Contact Information

Instituto Nacional de Astrofisica Optica y Electronica
Computer Sciences Department, Office 8207
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Research Interests

Robotics, dynamic systems, control, algorithm implementation, force control, visual servoing, observers, signal estimation, bioinstrumentation.

Rewards and Stimuli

- **National Researcher Level 1**
01/01/2021 - 31/12/2024
Sistema Nacional de Investigadores (SNI-Conacyt).
- **National Researcher Level 1.**
01/01/2018 - 31/12/2020
Sistema Nacional de Investigadores (SNI-Conacyt).
- **Conacyt Fellowship to Graduate Studies, CVU: 334785.**
10/08/2009 – 31/01/2016
- **High Performance Students Program (PAEA). UNAM.**
13/02/2006 - 13/06/2008

Academic Trajectory

- **Postdoctoral Researcher**
Centro de Estudios en Computacion Avanzada (CECAv) - UNAM, CDMX, Mexico.
01/09/2020 - 31/08/2021
Research collaborator in the Bioinstrumentation Group of the Institute of Applied Sciences and Technology (ICAT) of the National Autonomous University of Mexico (UNAM).

- **Postdoctoral Researcher**
CINVESTAV – Instituto Politecnico Nacional (IPN), CDMX, Mexico.
01/08/2018 - 31/07/2020
Research collaborator in the Electric Engineering and Sciences Graduate Program.
- **Postdoctoral Researcher**
University of Naples Federico II, Naples, Italy.
01/11/2016 - 31/03/2018
Research collaborator in the RoDyMan project (www.rodyman.eu).
- **Research Stay**
University of Naples Federico II, Naples, Italy.
01/10/2015 - 01/12/2015

Academic Experience

- **Researcher/Lecturer – Computational Sciences Graduate Program, INAOE**
16/01/2023 - Present
Master's level courses:
 - **Introduction to Robotics**
- **Lecturer – Engineering Faculty, UNAM**
31/01/2011 - 02/08/2015 / 28/01/2019 – 31/07/2022
Bachelor's level courses for Electrical and Electronics Engineering:
 - **Control of Industrial Robots**
 - **Industrial Robotics**
- **Teacher's Helper**
01/05/2008 - 31/06/2011
Responsibilities including material preparation and grading.
 - **Control Fundamentals**
 - **Robotics**

Education

- **Doctor of Engineering (Electric Engineering – Automatic Control). 05/08/2016**
Universidad Nacional Autonoma de Mexico (UNAM), Mexico, CDMX
Thesis: *Transparent teleoperation with unknown surfaces and force estimation*
- **Master of Engineering (Electric Engineering – Automatic Control) , 18/11/2011**
Universidad Nacional Autonoma de Mexico (UNAM), Mexico, CDMX
- **Electric and Electronics Engineer, 26/08/2009**
Universidad Nacional Autonoma de Mexico (UNAM), Mexico, CDMX

Books

- Marco A. Arteaga, **Alejandro Gutierrez-Giles**, Javier Pliego-Jimenez. *Local Stability and Ultimate Boundedness in the Control of Robot Manipulators*. Lecture Notes in Electrical Engineering (2022). Springer, Cham. ISBN: 978-3-030-85979-4. DOI: 10.1007/978-3-030-85980-0

Book Chapters

- **Alejandro Gutierrez-Giles**, Fabio Ruggiero, Vincenzo Lippiello, Bruno Siciliano. *Pizza-peel handling through a sliding nonprehensile manipulation primitive*. Robot Dynamic Manipulation: Perception of Deformable Objects and Nonprehensile Manipulation Control. Springer Tracts in Advanced Robotics - Springer Nature Switzerland (2022). DOI: 10.1007/978-3-030-93290-9_5
- **Alejandro Gutierrez-Giles**, Aykut C. Satıcı, Alejandro Donaire, Fabio Ruggiero, Vincenzo Lippiello, Bruno Siciliano. *Nonholonomic rolling nonprehensile manipulation primitive*. Robot Dynamic Manipulation: Perception of Deformable Objects and Nonprehensile Manipulation Control. Springer Tracts in Advanced Robotics - Springer Nature Switzerland (2022). DOI: 10.1007/978-3-030-93290-9_7
- Fabio Ruggiero, Jung-Tae Kim, **Alejandro Gutierrez-Giles**, Aykut C Satıcı, Alejandro Donaire, Jonathan Cacace, Luca Rosario Buonocore, Giuseppe Andrea Fontanelli, Vincenzo Lippiello, Bruno Siciliano. *Nonprehensile Manipulation Control and Task Planning for Deformable Object Manipulation: Results from the RoDyMan Project*. International Conference on Informatics in Control, Automation and Robotics 2018. DOI: 10.1007/978-3-030-31993-9.

Journal Publications (JCR)

- **Alejandro Gutierrez-Giles**, Miguel A Padilla-Castaneda, Luis Alvarez-Icaza, Enoch Gutierrez-Herrera (2022). *Force-Sensorless Identification and Classification of Tissue Biomechanical Parameters for Robot-Assisted Palpation*. Sensors No. 22, p.8670. MDPI. DOI: 10.3390/s22228670
- **Alejandro Gutierrez-Giles**, Luis U. Evangelista-Hernandez, Marco A. Arteaga, Carlos A. Cruz-Villar, Alejandro Rodriguez-Angeles (2021). *A force/motion control approach based on trajectory planning for industrial robots with closed control architecture*. IEEE Access, 9, 80728-80740. DOI: 10.1109/ACCESS.2021.3085528
- Mauro Lopez-Rodriguez, Marco A. Arteaga, **Alejandro Gutierrez-Giles**, Emmanuel Nuno (2021). *Resultados experimentales del control de un sistema de teleoperación bilateral de robots con retardos variantes en el tiempo*. Revista Iberoamericana de Automatica e Informatica industrial. ISSN 1697-7920. DOI: 10.4995/riai.2021.14834

- Jose Daniel Castro-Diaz, Pablo Sanchez-Sanchez, **Alejandro Gutierrez-Giles**, Marco A Arteaga-Perez, and Javier Pliego-Jimenez (2020). *Experimental Results for Haptic Interaction with Virtual Holonomic and Nonholonomic Constraints*. IEEE Access, 8, 120959-120973. DOI: 10.1109/ACCESS.2020.3006715
- Suping Zhao, Bruno Siciliano, Zhanxia Zhu, **Alejandro Gutierrez-Giles**, and Jianjun Luo (2019). *Multiwaypoint-based path planning for free-floating space robots*. International Journal of Robotics and Automation 34 (5). DOI: 10.2316/J.2019.206-0032
- Pablo Sanchez-Sanchez, **Alejandro Gutierrez-Giles**, Javier Pliego-Jimenez, Arteaga-Perez, Marco (2019). *Seguimiento de trayectorias con incertidumbre del modelo usando un diferenciador robusto*. Revista Iberoamericana de Automatica e Informatica Industrial. 2019 (00), 1-12. DOI:10.4995/riai.2019.10265
- **Alejandro Gutierrez-Giles**, and Marco Arteaga-Perez, (2019). *Output feedback hybrid force/motion control for robotic manipulators interacting with unknown rigid surfaces*. Robotica. Cambridge. DOI:10.1017/S0263574719000523
- **Alejandro Gutierrez-Giles**, Fabio Ruggiero, Vincenzo Lippiello, and Bruno Siciliano (2018). *Nonprehensile manipulation of an underactuated mechanical system with second order nonholonomic constraints: the robotic hula-hoop*. IEEE Robotics and Automation Letters, Vol. 3, Issue 2, 1136-1143. April 2018. DOI:10.1109/LRA.2018.2792403.
- **Alejandro Gutierrez-Giles** and Marco Arteaga-Perez (2017). *Transparent bilateral teleoperation interacting with unknown remote surfaces with a force/velocity observer design*. International Journal of Control. Taylor & Francis. DOI: 10.1080/00207179.2017.1371338
- **Alejandro Gutierrez-Giles**, Marco Arteaga-Perez, and Hebertt Sira-Ramirez (2016). *Control de Fuerza de Robots Manipuladores Basado en Observadores Proporcionales Integrales Generalizados*. Revista Iberoamericana de Automatica e Informatica Industrial RIAI, 13(2), 238-246. DOI: 10.1016/j.riai.2016.01.004
- Alejandra De la Guerra, Marco Arteaga-Perez, **Alejandro Gutierrez-Giles**, and Paul Maya-Ortiz (2016). *Speed-Sensorless Control of SR Motors based on GPI observers*. Control Engineering Practice 46, 115-128. DOI: 10.1016/j.conengprac.2015.10.010
- Marco Arteaga-Perez, **Alejandro Gutierrez-Giles**, and Jens Weist (2015). *On the Observability and the Observer Design of Differential Pneumatic Pistons*. Journal of Dynamic Systems, Measurement, and Control, 137(8), 081006. DOI: 10.1115/1.4030251
- **Alejandro Gutierrez-Giles**, and Marco Arteaga-Perez (2014). *GPI based velocity/force observer design for robot manipulators*. ISA transactions, 53(4), 929-938. DOI: 10.1016/j.isatra.2014.03.002

- Marco Arteaga-Perez and **Alejandro Gutierrez-Giles** (2014). *On the GPI approach with unknown inertia matrix in robot manipulators*. International Journal of Control, 87(4), 844-860. DOI: 10.1080/00207179.2013.861080
- Marco Arteaga-Perez, Juan,Rivera-Duenas, and **Alejandro Gutierrez-Giles** (2013). *Velocity and Force Observers for the Control of Robot Manipulators*. Journal of Dynamic Systems, Measurement, and Control, 135(6), 064502. DOI: 10.1115/1.4024995

Conferences

- Julio C. Flores and **Alejandro Gutierrez-Giles** (2022). *Design and Construction of a Low-Cost Robotic System for Teaching and Research*. Congreso Nacional de Control Automatico. Tuxtla Gutierrez, Chiapas, Mexico. Octubre 2022.
- **Alejandro Gutierrez-Giles**, Miguel A. Padilla-Castaneda, and Luis alvarez-Icaza (2021). *Estimacion de parametros biomecanicos para simulacion realista de tejidos en interfaces hapticas*. Congreso Nacional de Control Automatico. Guanajuato, Mexico. Octubre 2021.
- Alejandra de la Guerra, **Alejandro Gutierrez-Giles**, and Gildas Besancon. *Immersion Based Observer for the Switched Reluctance Motor*. 21st IFAC World Congress 2020. Berlin, Alemania. Julio 2020.
- **Alejandro Gutierrez-Giles**, Alejandro Rodrguez- Angeles, and Marco Arteaga-Perez (2019). *Mejoramiento de la Robustez en un Esquema de Teleoperacion Basado en Estimacion de Velocidad y Fuerza*. Congreso Nacional de Control Automatico. Puebla, Mexico. Octubre 2019.
- Alejandra De La Guerra and **Alejandro Gutierrez-Giles**, (2019). *Challenges in the design of a sensorlesscontrol for the SR motor*. Congreso Nacional de Control Automatico, Puebla, Mexico. Octubre 2019.
- **Alejandro Gutierrez-Giles**, Alejandro Rodriguez-Angeles, and Marco Arteaga-Perez (2019). *Transparent Master-Slave Teleoperation without Force nor Velocity Measurements*. European Control Conference (ECC). Naples, Italy, 2019.
- **Alejandro Gutierrez-Giles**, Fabio Ruggiero, Vincenzo Lippiello, and Bruno Siciliano (2019). *Closed-Loop Control of a Nonprehensile Manipulation System Inspired by the Pizza-Peel Mechanism*. European Control Conference (ECC). Naples, Italy, 2019.
- Alejandra De La Guerra, **Alejandro Gutierrez-Giles**, and Luis Alvarez-Icaza (2017). *Control por Rechazo Activo de Perturbaciones del Motor de Corriente Directa sin Escobillas*. Congreso Nacional de Control Automatico. Monterrey, Nuevo Leon, Mexico. Octubre 2017.

- **Alejandro Gutierrez-Giles**, Fabio Ruggiero, Vincenzo Lippiello, and Bruno Siciliano (2017). *Modelling and control of a robotic hula-hoop system without velocity measurements*. 20th World Congress of the International Federation of Automatic Control (IFAC). Toulouse, France, 2017.
- **Alejandro Gutierrez-Giles** and Maximiliano Bueno-Lopez. *Control Servovisual no Calibrado de Robots Planares sin Modelo Dinamico* (2016). XVII Latin American Control Conference. Medellin, Colombia. Octubre 2016.
- **Alejandro Gutierrez-Giles**, Marco Arteaga-Perez, and Pablo Sanchez-Sanchez (2015). *Observer-based transparent bilateral teleoperation*. Congreso Nacional de Control Automatico. Cuernavaca, Morelos, Mexico. Octubre 2015.
- **Alejandro Gutierrez-Giles** and Marco Arteaga-Perez (2014). *Control Cartesiano de Robots Manipuladores sin Modelo Dinamico y sin Medicion de Velocidad*. XVI Latin American Control Conference. Cancun, Quintana Roo, Mexico. Octubre 2014.
- Alejandra De la Guerra, **Alejandro Gutierrez-Giles**, Marco Arteaga-Perez, and Paul Maya-Ortiz (2014). *Control basado en observadores GPI del Motor de Reluctancia Conmutada*. XVI Latin American Control Conference. Cancun, Quintana Roo, Mexico. Octubre 2014.
- Marco Arteaga-Perez and **Alejandro Gutierrez-Giles** (2014) . *A simple application of GPI observers to the force control of robots*. IEEE International Conference on Control, Decision and Information Technologies (CoDIT), 2014 (pp. 303-308).
- **Alejandro Gutierrez-Giles** and Marco Arteaga-Perez (2013). *Velocity/force observer design for robot manipulators*. 18th IEEE International Conference on Methods and Models in Automation and Robotics (MMAR), 2013, pp. 730-735. Miedzyzdroje. Poland, Agosto 2013.
- Alejandra De la Guerra, **Alejandro Gutierrez-Giles**, Marco Arteaga-Perez and Paul Maya-Ortiz (2013). *Control de Velocidad para el Motor de Reluctancia Conmutada con Par de Carga Desconocido*. Congreso Nacional de Control Automatico. Ensenada, Baja California, Mexico. Octubre 2013.
- **Alejandro Gutierrez-Giles**, Marco Arteaga-Perez, and Hebertt Sira-Ramirez, (2012). *Control de posicion y fuerza de robots con retroalimentacion visual*. Congreso Nacional de Control Automatico. Ciudad del Carmen, Campeche. Mexico, Octubre 2012.
- Maximiliano Bueno-Lopez and **Alejandro Gutierrez-Giles** (2011). *Control servovisual para un robot planar empleando un observador difuso*. Congreso Nacional de Control Automatico. Saltillo, Coahuila, Mexico. Octubre 2011.

Research Projects

- **Research collaborator**
Control and force regulation in bilateral teleoperation systems
Program of Support to Technology Innovation and Research (PAPIIT) of the DGAPA-UNAM. Project IN117820.
- **Research collaborator**
Didactic Elements to Strengthen of the Education in Robotics and Automation.
Program of Support to Innovation and Improvement of Education PAPIME-UNAM. Project PE102823

Academic Evaluations

- **Evaluation of two Master's Degree Program**
Academic Reviewer of a Graduate Program for the National Quality Graduate Programs (PNPC) of the Conacyt.
- **Evaluation of a Posdoctoral Project**
Posdoctoral Stays for Mexico 2021, Conacyt.
- **Evaluation of a Research Project**
Program of Support to Frontier Science 2021, Conacyt.
- **Technical Evaluation of a Research Project**
Scientific, Humanistic, and Technological Research Program 2020. Universidad Iberoamericana.

Thesis Direction

- *Aprendizaje profundo de modelo de impedancias para tareas de contacto fisico en brazos roboticos (co-tutor).*
Student: Cesar Alejandro De La Paz Arteaga.
Main tutor: Dr. Israel Cruz Vega
Master of Sciences in Electronics
Instituto Nacional de Astrofisica, optica y Electronica
Degree date: In progress
- *Diseno y construccion de un brazo robotico para la evaluacion de algoritmos de control no lineales*
Student: Julio Cesar Flores Diaz
Bachelor in Electrical and Electronics Engineering
Universidad Nacional Autonoma de Mexico, Facultad de Ingenieria
Degree date: 06/12/2022

Participation as Synodal

- Master's degree
Universidad Nacional Autonoma de Mexico
Master and Doctoral Engineering Program
Student: Josue Antonio Ortega Mondragon
Degree date: In progress
- Master's degree
Universidad Nacional Autonoma de Mexico
Master and Doctoral Engineering Program
Student: Allen Eduardo Sanchez Ortega
Degree date: 07/12/2020
- Master's degree
Universidad Nacional Autonoma de Mexico
Master and Doctoral Engineering Program
Student: Enrique Martinez Fernandez
Degree date: 22/10/2021
- Bachelor's degree
Universidad Nacional Autonoma de Mexico
Engineering Faculty
Student: Brayan Eduardo Alonso Torres
Degree date: 18/05/2021

Academic Translations

- Università di Napoli Federico II
Translation to spanish of the online course *Robotics Foundation*
Federica Web Learning - edX
Instructor: Prof. Bruno Siciliano
<https://www.edx.org/course/fundamentos-de-robotica-i-modelado-de-robots>

Talks in Research Seminars

- Seminar of the Institute of Applied Sciences and Technology (ICAT).
Universidad Nacional Autonoma de Mexico (UNAM). 03/05/2022
Title: *Problemas de estimacion y control en robotica aplicada a sistemas biomecanicos.*
- Graduate Program in Engineering, Automatic Control. 04/12/2020
Title: *Teleoperacion robotica: estimacion y control.*
- University of Naples Federico II, Naples, Italy. 19/06/2019
Title: *Transparency and Telepresence for Estimation-Based Robotic Teleoperation Systems..*

- Graduate Program in Engineering, Automatic Control. 21/09/2018
Title: *Manipulacion robotica no prensil*.

Conferences Organization

- Program Committee Member of the 15th International Conference on Electrical Engineering, Computing Science and Automatic Control 2020 (CCE). Mexico City, Mexico. 11/09/2020.
- Associate Editor of the 2019 National Conference on Automatic Control fo the Automatic Control Mexican Asociation (AMCA). Puebla, Puebla, Mexico 23/10/2019.
- Program Committee Member of the 15th International Conference on Electrical Engineering, Computing Science and Automatic Control 2019 (CCE). Mexico City, Mexico. 11/09/2019.
- Program Committee Member of the 15th International Conference on Electrical Engineering, Computing Science and Automatic Control 2018 (CCE). Mexico City, Mexico. 05/09/2018.
- Associate Editor of the 2017 National Conference on Automatic Control fo the Automatic Control Mexican Asociation (AMCA). Monterrey, Nuevo Leon, Mexico 04/10/2017.
- Program Committee Member of the 12th International Conference on Electrical Engineering, Computing Science and Automatic Control 2015 (CCE). Mexico City, Mexico. 26/09/2015.
- Program Committee Member of the 11th International Conference on Electrical Engineering, Computing Science and Automatic Control 2014 (CCE). Ciudad del Carmen, Campeche, Mexico. 29/09/2014.
- Program Committee Member of the 10th International Conference on Electrical Engineering, Computing Science and Automatic Control 2013 (CCE). Mexico City, Mexico. 30/09/2013.
- Program Committee Member of the 9th International Conference on Electrical Engineering, Computing Science and Automatic Control 2012 (CCE). Mexico City, Mexico. 26/09/2012.

Reviewer for Journals (JCR)

- IEEE Transactions on Automatic Control
- Automatica
- IEEE Transactions on Systems, Man, and Cybernetics: Systems
- IEEE Robotics and Automation Letters
- Mechatronics

- International Journal of Control
- Robotica
- Journal of Dynamic Systems, Measurement, and Control
- Asian Journal of Control
- International Journal of Advanced Robotic Systems
- Symmetry
- Sensors

Publons profile: publons.com/researcher/AAV-1946-2020/

Reviewer for International Conferences

- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE International Conference on Intelligent Robots and Systems (IROS)
- European Control Conference (ECC)
- Latin American Conference on Automatic Control (CLCA)
- Mediterranean Conference on Control and Automation (MED)

Academic Memberships

- IEEE Student Member, 01/05/2010 - 31/01/2016
Membership number: 90820477

Participation in Competitions

- First place in the Mexican Robotis Tournament 2009 – OPEN category, Guadalajara, Jalisco, Mexico.
- Participation in the Latin American Robotics Competition LARC 2009, Valparaiso, Chile.
- Referee of the *XIV Design and Construction of Experimental Models and Prototypes of the Basic Sciences Division, Engineering Faculty, UNAM.*

Software Experience

- Programming Languages:
 - **C/C++, C#, Java, Python, Basic, Matlab, assembly.**
- Specialized software:
 - **ABB Robot Studio, ROS, Unity, Blender, Coppelia Sim.**
- Embedded Systems programming experience:
 - **Motorola, AVR, and Microchip.**

- Additional Software:
 - **Autocad, Maple, Mathematica, LaTeX, MS-Word, MS-Excel.**

Languages

- **Spanish** (Native).
- **English** (Fluent) – 627 point in TOEFL ITP, equivalent to the MCER level C1.
- **Italian** (Fluent).
- **Russian** (Basic).