

# Ambrosio Valencia-Romero

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## Research Interests

Strategic engineering, collective design studies, multi-agent systems modeling and simulation.

## Educational Interests

Engineering systems design, engineering optimization, design justice in engineering education.

## Education

- 2021

**Ph.D. in Systems Engineering**  
Stevens Institute of Technology – Hoboken, NJ, United States  
Dissertation: Strategy Dynamics in Collective Systems Design [\[MANUSCRIPT\]](#) [\[DEFENSE\]](#)  
Mentor: Dr. Paul T. Grogan.
- 2016

**M.Sc. in Mechanical Engineering**  
Recinto Universitario de Mayagüez – Mayagüez, Puerto Rico  
Thesis: Part-Worth Utilities of Quantified Gestalt Principles for Product Aesthetics [\[MANUSCRIPT\]](#)  
Mentor: Dr. José E. Lugo.
- 2012

**B.Sc. in Mechanical Engineering**  
Universidad del Atlántico – Barranquilla, Atlántico, Colombia  
Senior Thesis: Graphical User Interface for the Structural Design of a Solar Tracking System in Colombia (Co-authored with Heylen Polo-Cano)  
Mentors: Dr. Javier Roldán-Mckinley and Dr. James Díaz-González.

## Postdoctoral Experience

- 09/2022 – present

**The Roux Institute at Northeastern University**  
Portland, ME, United States  
[Engineering Research](#)  
Supervisor: Prof. Jack Lesko

  - Systems thinking analysis of collective industry systems
  - Identification of research opportunities with industry partners
  - Contribution to the preparation of research proposals and white papers
  - Assess opportunities for Industry 4.0 in Maine’s manufacturing and supply chain.

Outcomes: co-PI in 2-year / 500K USD seed grant proposal submitted to NSF [Future Manufacturing](#); ~7% of project description of 5-year / 10M USD proposal submitted to NSF [Expeditions](#); and submission of manufacturing and supply chain visual analytics proposals to industry partners.
- 10/2021 – 08/2022

**Carnegie Mellon University, Mechanical Engineering Department**  
Pittsburgh, PA, United States  
[The Design Research Collective](#)  
Supervisor: Dr. Christopher C. McComb  
Project: Defining Opportunities to Leverage Artificial Intelligence, Machine Learning, and Data Analytics Applications for Advanced Work Packaging  
Sponsor: Construction Industry Institute - [Research Team RT-391](#)

  - Interview construction industry stakeholders
  - Design thinking and user story mapping activities
  - Advise construction Owners, EPCs, and Suppliers teams
  - Mentoring of ME doctoral students from underrepresented groups.

Outcomes: 1 published conference paper; and 1 design thinking + research interview study conducted ([RT-391 final report](#)).

## Additional Research Experience

08/2016 – 05/2021

### Graduate Research Assistant

*The Collective Design Lab at Stevens*

Principal Investigator: Dr. Paul T. Grogan.

- Support to conducting of human subject studies conducted as part of the NSF-sponsored project “Understanding Strategic Dynamics in the Engineering of Decentralized Systems” (NSF Award No. [1943433](#))  
Outcomes: 1 published journal articles, +1 full article in preparation.
- Development and simulation of multi-agent system models of multi-disciplinary design process as part of the NSF-sponsored project “Demonstrating the Importance of Research Setting Representativeness in Systems Engineering and Design Research” (NSF Award No. [1841109](#))  
Outcomes: 1 conference presentation, 1 full article in preparation.
- Development and conducting of human subjects and agent-based simulation studies as part of the NSF EAGER project “Model-based Foundations of Collective Systems Design Theory” (NSF Award No. [1742971](#))  
Outcomes: 1 published journal articles, 2 published conference papers.
- Development and conducting of networked agent-based simulation studies as part of the “Game-theoretic Risk Assessment for Distributed Systems” sponsored by the Deputy Assistant Secretary of Defense for Systems Engineering;

Outcomes: 3 published journal articles;  
2 published conference papers;  
1 published technical report; and  
2 full articles in preparation.

01/2015 – 05/2016

### Research Assistant

*The Human Centered Design R&D Lab at the UPR–Mayagüez*

Principal Investigator: Dr. José E. Lugo

Outcomes: 2 published journal articles;  
1 published conference papers; and  
1 graduate research award.

06/2011 – 07/2014

### Research Team Member

*Design of Mechanical and Robotic Systems—DIMER Lab at the Uniatlántico*

Principal Investigator: Dr. Javier Roldán-Mckinley

Outcomes: 2 published journal articles;  
1 published conference papers;  
1 undergraduate research award; and  
1 software patent.

## Teaching Experience

Fall 2016

### Teaching Assistant, INME 4056: Manufacturing Processes Lab (2 groups)

*Recinto Universitario de Mayagüez, Mechanical Engineering Department*

Supervisor: Dr. Pedro O. Quintero.

- Instruct fourth-year mechanical and industrial engineering students on the theory and operation of manual and CNC machine tools
- Prepare and supervise the laboratory practice sessions
- Promote safe and responsible use of the machine equipment
- Grade of class reports and final projects.

Spring 2019

### Trainee, Teaching at the College Level Program

*Stevens Institute of Technology, Center for Faculty Engagement and Advancement*

Supervisor: Dr. Alexander De Rosa.

Topics: Principles of learning, principles of teaching, active learning.

## Professional Experience

06/2013 – 07/2014

### Research Engineer, Machinery and Propulsion Division

*COTECMAR – Science and Technology Corporation for the Development of the Naval, Maritime and Riverine Industries*, Cartagena de Indias, Bolívar, Colombia

Supervisors: Diana Ramírez-Wilches and Adolfo Silva-Bohórquez

- Analysis of piping systems for coastal and offshore patrol vessels
- Development of shipbuilding piping practices and standards
- Outfitting layout of engine and auxiliary machinery rooms
- Selection of hydraulic fluid machinery equipment.

08/2012 – 02/2013

### Planning Intern, CAT Certified Rebuild Machine Service Shop

*Relianz CAT (formerly GECOLSA Mining Division)*, Soledad, Atlántico, Colombia

Supervisors: Arleth Silvera-Rada and Breyner Martínez-Angarita

- Support to tracking of work orders
- Support to inventory of spare parts
- Preparation of technical reports

10/2010 – 12/2011

### Support Staff, Mechanical Engineering Program Coordination

*Universidad del Atlántico, Faculty of Engineering*, Barranquilla, Colombia

Supervisors: Alfonso Rodríguez-Peña and Lisandro Vargas-Henríquez

- Organization and formatting of the mechanical engineering program's Qualified Registry Renewal documents before their submission to the Ministry of Education of the Republic of Colombia
- Front desk assistance to mechanical engineering students, faculty, and guests
- Note-taking during the Qualified Registry Renewal board meetings.

## Service

### Participation in Committees

05/2018 – present

Broadening Participation of Underrepresented Groups (as Committee Member)

*ASME Design Engineering Division*

04/2018 – 05/2021

Graduate Student Academic Integrity Board (as Student Representative)

*Stevens Institute of Technology*

01/2018 – 12/2019

Graduate Research Conference (as Committee Member)

*Stevens Institute of Technology*

### Review Coordinator / Session Organizer

2023

ASME International Conference on Design Theory and Methodology (DTM)

2022

ASME International Conference on Design Education (DEC)

### Peer Reviewer

ASME International Conference on Design Theory and Methodology (DTM)

ASME Computers and Information in Engineering Conference (CIE)

ASME Design Automation Conference (DAC)

ASME International Conference on Design Education (DEC)

International Conference on Design Computing and Cognition (DCC)

### Mentoring Activities

01/2022 – 06/2022

Diversity, Equity, and Inclusion Mentorship Program (as Mentor)

*Carnegie Mellon University, College of Engineering*

08/2020 – 05/2021

Doctoral Student Peer Mentoring Program (as Peer Mentor)

*Stevens Institute of Technology, Office of Graduate Education*

### Other Academic Activities

- 01/2020 – 05/2020 School of Systems and Enterprises' Ph.D. Student Seminar (as Co-organizer)  
*Stevens Institute of Technology*
- 12/2019 Graduate Research Conference (as Program Chair)  
*Stevens Institute of Technology*

### Honors and Scholarships

- 2021 Award for Distinguished Leadership by a Ph.D. Student  
 in the School of Systems and Enterprises  
*Stevens Institute of Technology*
- 2017 Attendance Scholarship for the NSF 2023 From Lab to Impact:  
 Broadening Participation Summit - Northeast  
*NSF I-Corps™ / New England Regional Innovation Node at MIT*
- 2017 Attendance Scholarship for the NSF 2017 Summer School on  
 Engineering Systems Design Research Methods  
*NSF and Clemson University*
- 2015 First Place Award in the Graduate Research Category at the  
 8th NEA Science Day, Mayagüez, Puerto Rico, 19 March 2015  
*Northeast Alliance for Graduate Education and the Professoriate*
- 2011 Outstanding Undergraduate Research and Advance to Nationals  
 at the XIV Research Seedbeds Meeting: Atlántico, 20 May 2011  
*Red Colombiana de Semilleros de Investigación*

### Peer-reviewed Research Journal Articles

- 2022 **Strategic Robustness in Bi-level System-of-systems Design**  
 Jordan L. Stern, Ambrosio Valencia-Romero, and Paul T. Grogan.  
*Design Science*, 8(e6), pp. 1–31.
- 2020 **Structured to Succeed?: Strategy Dynamics in Engineering Systems Design  
 and their Effect on Collective Performance**  
 Ambrosio Valencia-Romero and Paul T. Grogan.  
*Journal of Mechanical Design*, 142(12), p. 121404.
- 2019 **Strategic Risk Dominance in Collective Systems Design**  
 Paul T. Grogan and Ambrosio Valencia-Romero.  
*Design Science*, 5(e24), pp. 1–28..
- 2017 **An Immersive Virtual Discrete Choice Experiment for Elicitation of  
 Product Aesthetics Using Gestalt Principles**  
 Ambrosio Valencia-Romero and José E. Lugo.  
*Design Science*, 3(e11), pp. 1–24..
- 2016 **Part-Worth Utilities of Gestalt Principles for Product Esthetics:  
 A Case Study of a Bottle Silhouette**  
 Ambrosio Valencia-Romero and José E. Lugo.  
*Journal of Mechanical Design*, 138(8), p. 081102.
- 2013 **Structural Safety Evaluation of a Solar Tracking System in Colombia**  
 H. Polo-Cano, A. Valencia-Romero, J. Roldán-Mckinley and J. Díaz-González.  
*Visión Electrónica*, 7(2), pp. 162–174.
- 2012 **A Methodology for the Structural Safety Evaluation of a Solar Tracking System**  
 H. , A. Valencia-Romero, J. Roldán-Mckinley and J. Díaz-González.  
*Educación en Ingeniería*, 7(14), pp. 92–103.

## Peer-reviewed Research Conference Articles

- 2022 **Deriving Recommendations for the Use of Agent-based Models in Engineering Design**  
Malena Agyemang, Noriana Radwan, Sierra Hicks, Fariha Azhar, Ambrosio Valencia-Romero, and Christopher C. McComb.  
[ASME Paper No. DETC2022-90961.](#)
- 2019 **The Effects of Locus of Control and Big Five Personality Traits on Collaborative Engineering Design Tasks with Negotiation**  
Alkım Z. Avşar, Ambrosio Valencia-Romero, and Paul T. Grogan.  
[ASME Paper No. DETC2019-97311.](#)
- 2018 **Toward a Model-Based Experimental Approach to Assessing Collective Systems Design**  
Ambrosio Valencia-Romero and Paul T. Grogan.  
[ASME Paper No. DETC2018-85786.](#)
- 2016 **Quantification of Symmetry, Parallelism, and Continuity as Continuous Design Variables for 3D Product Representations**  
Ambrosio Valencia-Romero and José E. Lugo.  
[ASME Paper No. DETC2016-59707.](#)
- 2013 **A Tool for the Structural Safety Evaluation of a Solar Tracking System in Colombia**  
Heylen Polo-Cano, Ambrosio Valencia-Romero, Javier Roldán-Mckinley and James Díaz-González.  
In *Proceedings of the VI International Congress of Mechanical Engineering, CIMM 2013*, Barranquilla, Colombia, 2–4 May 2013.

## In Review

- 2023 **The Strategy Dynamics of Collective Systems: Underlying Hindrances beyond Two-actor Coordination**  
Ambrosio Valencia-Romero and Paul T. Grogan.  
Manuscript is under review for journal publication.

## Presentations

### As Presenting Author

- 11/2023 The Strategy Dynamics of Collective Systems [\[EXTENDED ABSTRACT\]](#) [\[VIDEO\]](#)  
Co-author(s): Paul T. Grogan  
*9th International Engineering Systems Symposium — CESUN 2023*, Northwestern University, Evanston, Illinois, United States.
- 08/2022 Deriving Recommendations for the Use of Agent-based Models in Engineering Design [\[VIDEO\]](#)  
Co-author(s): Malena Agyemang, Noriana Radwan, Sierra Hicks, Fariha Azhar, and Christopher C. McComb  
*ASME 2022 IDETC/CIE: 34th Design Theory and Methodology Conference*, St. Louis, MO, United States.
- 08/2020 Structured to Succeed?: Strategy Dynamics in Engineering Systems Design and their Effect on Collective Performance [\[VIDEO\]](#)  
Co-author(s): Paul T. Grogan  
*ASME 2020 IDETC/CIE: 32nd Design Theory and Methodology Conference*, Virtual event, United States.
- 11/2019 Fear and Greed Strategy Dynamics in the Collective Design of Engineering Systems  
Co-author(s): Paul T. Grogan  
*ASME 2019 International Mechanical Engineering Congress and Exposition (IMECE)*, Salt Lake City, Utah, United States.
- 02/2017 Assessing Collective Efforts Between Independent Decision Makers in a Federated System  
Co-author(s): Paul T. Grogan

- 12th Graduate Research Conference, Stevens Institute of Technology, Hoboken, New Jersey, United States.
- 03/2016 Elicitation of Aesthetic Subject Preference for Product Shapes via Gestalt Principles  
Co-author(s): José E. Lugo  
2016 JTM/PRISM, PUC Puerto Rico, Ponce, Puerto Rico.
- 05/2015 Applying the Quantification of Gestalt Principles to Product Silhouettes  
Co-author(s): José E. Lugo  
8th NEA Science Day, UPR Mayagüez, Mayagüez, Puerto Rico.
- 10/2011 Characterization of a Solar Tracking Structure with Azimuthal Movement  
Co-presenter: Heylen Polo-Cano.  
Co-author(s): Javier Roldán-Mckinley and James Díaz-González  
XIV National VIII International Research Seedbeds Meeting, Neiva, Huila, Colombia.
- 05/2011 Supercavitation Phenomenon and its Applications in Turbomachinery  
Co-presenter: David Fernández-Arévalo.  
Co-author(s): Rafael Ramíez-Restrepo  
XIV Research Seedbeds Meeting: Atlántico, Barranquilla, Atlántico, Colombia.

### As Co-author

- 10/2021 Comparison of Model World Representativeness: Two Cases in Systems Engineering and Design  
Presenter: Paul T. Grogan.  
Co-author(s): Erica L. Gralla, Ashish M. Chaudhari, Jitesh H. Panchal, and Zoe Szajnfarder  
8th International Engineering Systems Symposium — CESUN 2021, University of Virginia, Charlottesville, VA, United States.
- 08/2021 Risk Dominance as a Decision Criterion for Collective Systems Design [VIDEO]  
Presenter: Paul T. Grogan.  
ASME 2020 IDETC/CIE: 32nd Design Theory and Methodology Conference, Virtual event, United States.
- 11/2019 Game-theoretic Risk Assessment for Distributed Systems (GRADS)  
Presenter: Paul T. Grogan.  
11th Annual SERC Sponsor Research Review, Systems Engineering Research Center, Washington, DC, United States.
- 05/2011 Characterization of a Solar Tracking Structure with Azimuthal Movement  
Presenter: Heylen Polo-Cano.  
Co-author(s): Javier Roldán-Mckinley and James Díaz-González  
XIV Research Seedbeds Meeting: Atlántico, Barranquilla, Atlántico, Colombia.

## Additional Information

### Affiliations

- 02/2016 – present The Design Society (Associate Member)
- 02/2016 – present American Society of Mechanical Engineers (Member)
- 06/2021 – present The Game Theory Society (Member)
- 01/2022 – present Online Encyclopedia of Integer Sequences (Contributor)

Certifications and Training

- 02/2023 – 03/2023

NSF I-Corps Spark Program  
New England Regional Innovation Node at MIT
- 11/2022

Cybersecurity 1.0  
Correlation One
- 04/2015 – 10/2025

Responsible Conduct of Research, Social and Behavioral Research, Conflict of Interest  
Collaborative Institutional Training Initiative – CITI Program
- 04/2019 – 05/2019

Science Communication Training  
Science Riot/The Symposium: Academic Stand-up, New York City, United States
- 05/2017

NSF Summer School on Engineering Systems Design Research Methods  
The CEDAR Group at Clemson University, Clemson, South Carolina, United States
- 02/2012

Non-destructive Testing of Materials  
National Training Service (SENA), Barranquilla, Atlántico, Colombia
- 01/2012

Efficient Energy Management/ISO 50001:2011 (Basic Training)  
Universidad del Atlántico, Barranquilla, Atlántico, Colombia

Patents

- 04/2017

Safe Solar Tracking Software  
Authors(s): Javier Roldán-Mckinley, Ambrosio Valencia-Romero, Heylen Polo-Cano, and James Díaz-González.  
Colombian Ministry of Interior, Registry No. 13-59-313.

Languages

English (fluent), Spanish (native).