Ambrosio Valencia-Romero

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Research Interests

Strategic engineering design, collective design studies, socio-technical systems modeling.

Educational Interests

Systems thinking, risk analysis, game theory, design justice in engineering education.

Assistant Professor

07/2024 – present

Old Dominion University, Department of Engineering Management & Systems Engineering
Norfolk, VA, United States

Education

2021 **Ph.D. in Systems Engineering**, Stevens Institute of Technology
Dissertation: Strategy Dynamics in Collective Systems Design [MANUSCRIPT] [DEFENSE]
Mentor: Dr. Paul T. Grogan.

2016 **M.Sc. in Mechanical Engineering**, Universidad de Puerto Rico, Recinto Universitario de Mayagüez
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
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.

Peer-reviewed Research Journal Articles

2024 **The Strategy Dynamics of Collective Systems: Underlying Hindrances beyond Two-actor Coordination**
Ambrosio Valencia-Romero and Paul T. Grogan.
PLOS ONE, 19(4):e0301394.

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. Polo-Cano, A. Valencia-Romero, J. Roldán-Mckinley and J. Díaz-González.
Educación en Ingeniería, 7(14), pp. 92–103.

Peer-reviewed Research Conference Articles

2024 **A Proposed Extension to the Functional Basis for AI/ML-Enabled Cyber-physical Systems**
Doreen Valmyr, Ambrosio Valencia-Romero, and Christopher C. McComb.
ASME Paper No. DETC2024-143666.

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.

Presentations

As Presenting Author

06/2025 Strategic Hindrances in Digital Engineering: A Simulation Study of Information Exchange in a System-of-systems Design Problem
Co-author(s): Paul T. Grogan
CESUN 2025, George Mason University, Arlington, VA, United States.

11/2023 The Strategy Dynamics of Collective Systems [EXTENDED ABSTRACT] [VIDEO]
Co-author(s): Paul T. Grogan
CESUN 2023, Northwestern University, Evanston, IL, 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 DTM 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 DTM 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 IMECE, Salt Lake City, UT, 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, NJ, 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

08/2024 A Proposed Extension to the Functional Basis for AI/ML-Enabled CPS [VIDEO]
Presenter: Christopher C. McComb.
Other co-author(s): Doreen Valmyr.
ASME 2024 IDETC/CIE: 36th DTM Conference, Washington, DC, United States.

10/2021 Comparison of Model World Representativeness: Two Cases in Systems Engineering and Design
Presenter: Paul T. Grogan.
Other co-author(s): Erica L. Gralla, Ashish M. Chaudhari,
Jitesh H. Panchal, and Zoe Szajnfarber
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.
Other co-author(s): Javier Roldán-Mckinley and James Díaz-González
XIV Research Seedbeds Meeting: Atlántico, Barranquilla, Atlántico, Colombia.

Research Proposals

In Development

Working title: Using Embodied Intelligence to Computationally Assist Strategic Engineering Design
Personnel: Ambrosio Valencia-Romero (PI)
Target program: NSF Engineering Design and Systems Engineering (EDSE)
Approximate duration / amount: 2 years / 300K USD.

Submitted

05/2023 FMSG: Eco: Human-AI Mutual Reinforcement Learning (HAIM-RL) for Real-Time Joint Design of Product and Supply Chain Adaptable to Inconsistent Sustainable Feedstocks
Personnel: SungKu Kang (PI) and Ambrosio Valencia-Romero (Co-PI)
Target program: NSF Future Manufacturing (FM)
Duration / requested amount: 2 years / 500K USD
Status: Funding declined.

Postdoctoral Experience

09/2022 – 07/2024 The Roux Institute at Northeastern University, 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 (M&SC).

Outcomes: writing M&SC use case for 10M USD NSF proposal submitted to *Expeditions* and submission of M&SC visual analytics proposals to industry partners.

10/2021 – 08/2022 Carnegie Mellon University, Mechanical Engineering Department, 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

Outcomes: 1 published conference paper; and contribution to 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.

01/2015 – 05/2016 **Research Assistant**
The Human Centered Design R&D Lab at the UPR–Mayagüez
Principal Investigator: Dr. José E. Lugo

06/2011 – 07/2014 **Research Team Member**
Design of Mechanical and Robotic Systems—DIMER Lab at the Uniatlántico
Principal Investigator: Dr. Javier Roldán-Mckinley

Teaching Experience

01/2025 – present **Instructor, ENMA 724/824: Risk Analysis**
Old Dominion University, Engineering Management & Systems Engineering Department
Selected topics: Risk and decision theory, systems theory, utility theory, cascading failures, network analysis, random processes.

08/2016 – 12/2016 **Teaching Assistant, INME 4056: Manufacturing Processes Lab (2 groups)**
Recinto Universitario de Mayagüez, Mechanical Engineering Department
Supervisor: Dr. Pedro O. Quintero.
Selected topics: Machining processes, machining economics, computer numerical control, forging and shaping, metrology.

01/2019 – 04/2019 **Trainee, Teaching at the College Level Program**
Stevens Institute of Technology, Center for Faculty Engagement and Advancement
Supervisor: Dr. Alexander De Rosa.
Selected 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.

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
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

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)

Reviewer

NSF 2025 Graduate Research Fellowship Program, Economics Panel
ASME Journal of Mechanical Design (JMD)
ASME Journal of Computing and Information Science in Engineering (JCISE)
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)
International Conference on Research Into Design (ICoRD)
SIMULATION: Transactions of The Society for Modeling and Simulation International

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

Additional Information

Affiliations

04/2025 – present The Society for Risk Analysis

02/2016 – present The Design Society

02/2016 – present The American Society of Mechanical Engineers

06/2021 – present The Game Theory Society

01/2022 – present The Online Encyclopedia of Integer Sequences (as Contributor)

Certifications and Training

Collaborative Institutional Training Initiative (CITI) Program. Certifications:

thru 10/2028 Conflicts of Interest

thru 10/2027 IRB Members - Basic/Refresher

thru 10/2027 Research Study Design

thru 10/2025 Human Subjects Research

thru 10/2025 Social & Behavioral Research

n.d.a. Responsible Conduct of Research for Engineers

02/2023 – 03/2023 NSF I-Corps Spark Program
New England Regional Innovation Node at MIT

11/2022 Cybersecurity 1.0
Correlation One

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).