CESAR O. AGUILAR
ASSOCIATE PROFESSOR

DEPARTMENT OF MATHEMATICS
STATE UNIVERSITY OF NEW YORK AT GENESEO
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EDUCATION

2005–2010   **Ph.D. in Applied Mathematics**
Title: *Local controllability of affine distributions*
Advisor: Andrew D. Lewis, Queen's University, Kingston, ON

2003–2005   **M.Sc. in Electrical & Computer Engineering**
Title: *Attitude Control of a Differentially Flat Underactuated Rigid Spacecraft*
Advisor: Alan F. Lynch, University of Alberta, Edmonton, AB

1999–2003   **B.Sc. in Mathematics & Engineering (Mechanical)**
Graduated with honors, Queen's University, Kingston, ON

EMPLOYMENT

2020–Present   **Associate Professor, Department of Mathematics**
State University of New York, Geneseo, NY

2016–2020   **Assistant Professor, Department of Mathematics**
State University of New York, Geneseo, NY

2013–2016   **Assistant Professor, Department of Mathematics**
California State University, Bakersfield, CA (CSUB)

2010–2013   **National Research Council Postdoctoral Fellow in Applied Mathematics**
Advisor: Arthur Krener, Naval Postgraduate School, Monterey, CA

Spring 2010   **Postdoctoral Fellow in Mathematics**
Queen's University

TEACHING

GENESEO

100-Level   INTD 121 - R/Programming: Python
MATH 188 - Exp: Introductory Python

200-Level   MATH 221 - Calculus I
MATH 222 - Calculus II
MATH 223 - Calculus III
MATH 230 - Programming and Mathematical Problem Solving
MATH 233 - Linear Algebra I
MATH 262 - R/Applied Statistics

300-Level   MATH 310 - Graph Theory
MATH 324 - Real Analysis I
MATH 325 - Real Analysis II
MATH 330 - Abstract Algebra
MATH 333 - Linear Algebra II
MATH 345 - Numerical Analysis I
MATH 346 - Numerical Analysis II
MATH 380 - Algebraic Graph Theory
MATH 393 - Geometry of Curves
MATH 398 - Honors Thesis
HONR 393 - XC and Machine Learning

CSUB   Calculus I - IV, Ordinary Differential Equations, Introduction to Analysis I, Linear Algebra and Its Applications, Numerical Analysis, Graph Theory and Applications in Control Theory, Research in Industrial Mathematics/Senior Seminar

RESEARCH INTERESTS

Ordinary differential equations and control theory, numerical methods for Hamilton–Jacobi PDEs and center manifolds, algebraic graph theory, linear algebra, matrix analysis

GRANTS

2022   SUNY Geneseo Proposal Writing Support Award
hTeXML: A Web Publishing Tool for STEM Authors, **$2,500**

2015-2019   **National Science Foundation**
RUI: Network Structure and Controllability in Natural and Engineered Interacting Dynamic Systems, Principal Investigator, initially held at CSUB as grant ECCS-1509966 and transferred to SUNY Geneseo as grant ECCS-1700578, **$231,314**

2015   **Mathematical Association of America, National REU Program**
Controllability Classes of Graphs, 8-week summer REU with 4 students at CSUB, **$21,544**

2014   **California State University Promising Practices Program**
Course Redesign with Technology, redesign of a linear algebra course using an integrated delivery system including Clickers, interactive notes, and labs, **$6,400**

2014   **Preparation for Industrial Careers in Mathematical Sciences** (MAA)
Funding to introduce a course in industrial mathematics research; included training workshop at Brigham Young University; advised two groups in a research project proposed by DEKA Research and Development; one student group was chosen by the MAA to present their results at the 2015 MathFest meeting in Washington D.C., **$5,000**

2014   **Research Council of the University**, California State University, Bakersfield
Funding for summer undergraduate research students, advised two students (Christian Michael, Mark Stevens) in an 8-week research project developing parallel algorithms to analyze the controllability properties of graphs, **$5,000**

PUBLICATIONS

As of March 24, 2023: 87 Total Citations on AMS MATHSCINET, 531 Total Citations on Google Scholar, 316 Total Citations on Scopus, (student co-author marked with *)

Journal Publications

[J11]   C.O. Aguilar, M. Ficarra*, N. Schurman*, B. Sullivan*, *The role of the anti-regular graph in the spectral analysis of threshold graphs*, Linear Algebra and Its Applications, 588: 210-223, 2020. (doi)

[J10]   C.O. Aguilar, *Strongly uncontrollable network topologies*, IEEE Transactions on Control of Network Systems, 7: 878 - 886, 2020. (doi)

[J9]   C.O. Aguilar, J-Y. Lee*, E. Piato*, B.J. Schweitzer*, *Spectral characterizations of anti-regular graphs*, Linear Algebra and Its Applications, 557: 84-104, 2018. (doi)

[J8]   C.O. Aguilar, B. Gharesifard, *Almost equitable partitions and new necessary conditions for network controllability*, Automatica, 80: 25-31, 2017. (doi)

[J7]   C.O. Aguilar, B. Gharesifard, *Laplacian controllability classes for threshold graphs*, Linear Algebra and Its Applications, 171: 575-586, 2015. (doi)

[J6]   C.O. Aguilar, B. Gharesifard, *Graph controllability classes for the Laplacian leader-follower dynamics*, IEEE Transactions on Automatic Control, 60(6): 1611-1623, 2015. (doi)

[J5]   C.O. Aguilar, A.J. Krener, *Numerical solutions to the Bellman equation of optimal control*, Journal of Optimization Theory and Applications, 160(2): 527-552, 2014. (doi)

[J4]   C.O. Aguilar, A.J. Krener, *Patchy solution of a Francis–Byrnes–Isidori partial differential equation*, Int. Journal of Robust and Nonlinear Control, 23(9):1046-1061, 2013.(doi)

[J3]   C.O. Aguilar, *On the existence and uniqueness of solutions to the output regulator equations for periodic exosystems*, Systems and Control Letters, 61(6):702-706, 2012. (doi)

[J2]   C.O. Aguilar, A.D. Lewis, *Small-time local controllability for a class of homogeneous systems*, SIAM Journal on Control and Optimization, 50(3):1502-1517, 2012. (doi)

[J1]   M. Landry, S.A. Campbell, K. Morris, C.O. Aguilar, *Dynamics of an inverted pendulum with delayed feedback control*, SIAM Journal on Applied Dynamical Systems, 4(2): 333-351, 2005. (doi)

Refereed Conference Proceedings

[C9]   C.O. Aguilar, B. Gharesifard, *On almost equitable partitions and network controllability*, 2016 American Control Conference, 179–184. (doi)

[C8]   C.O. Aguilar, B. Gharesifard, *A graph-theoretic classification for the controllability of the Laplacian leader-follower dynamics*, 2014 IEEE 53rd CDC, 619–624. (doi)

[C7]   C.O. Aguilar, A.J. Krener, *Model Predictive Regulation*, 2014 IFAC 19th World Congress, 3682–3689. (doi)

[C6]   C.O. Aguilar, B. Gharesifard, *Necessary conditions for controllability of nonlinear networked control systems*, 2014 American Control Conference, 5379–5383. (doi)

[C5]   C.O. Aguilar, *Local controllability of control-affine systems with quadratic drift and constant control-input vector fields*, 2012 IEEE 51th CDC, 1877-1882. (doi)

[C4]   C.O. Aguilar, A.J. Krener, *High-order numerical solutions to Bellman's equation of optimal control*, 2012 American Control Conference, 1832-1837. (doi)

[C3]   C.O. Aguilar, A.J. Krener, *Power series solutions to the time-varying dynamic programming equations*, 2011 IEEE 50th CDC, 397-402. (doi)

[C2]   C.O. Aguilar, A.J. Krener, *Piecewise smooth solutions to the nonlinear output regulation PDE*, 2011 American Control Conference, 1426-1427. (doi)

[C1]   C.O. Aguilar, A.D. Lewis, *Jet bundles and algebro-geometric characterizations of controllability of affine systems*, 2008 IEEE 47th CDC, 1267-1274. (doi)

In Special Collections

[L1]   A.J. Krener, C.O. Aguilar, T.W. Hunt, *Series Solutions of HJB Equations*, in Mathematical System Theory–Festschrift in Honor of Uwe Helmke on the Occasion of his Sixtieth Birthday, edited by J. Trumpf and K. Hueper, 247–260, 2013. (link)

CONFERENCE & SEMINAR PRESENTATIONS

2022   MAA Seaway Section Meeting (Fall)
Publishing LATEX documents on the web

2021   Sociolinguistics Symposium 23, The University of Hong Kong (virtual)
Colonial European Dominant Language Versus Maintenance of Vernaculars in Equatorial Guinea
Co-authored with Susana Castillo-Rodriguez (presenter)

2019   MAA Seaway Section Meeting (Fall)
Eigenvalues of threshold graphs

2019   SUNY Geneseo, Mathematics Colloquium
Examples in analysis

2019   Joint Mathematics Meetings, Baltimore, MD
Spectral characterizations of anti-regular graphs

2017   State University of New York, Mathematics Colloquium, Geneseo, NY
The PageRank Algorithm: The mathematics behind Google's search engine and its applications in sports rankings

2016   State University of New York, Mathematics Colloquium, Geneseo, NY
Controllability of graphs

2016 State University of New York, Mathematics Colloquium, Oswego, NY
Controllability of graphs

2014 53rd IEEE Conference on Decision and Control, Los Angeles, CA
A graph-theoretic classification for the controllability of the Laplacian leader-follower dynamics

2014 American Control Conference, Portland, OR
Necessary conditions for controllability of nonlinear multi-agent control systems

2013 California State University, Mathematics Colloquium, Bakersfield, CA
Google's PageRank Algorithm: An Application of Undergraduate Linear Algebra

2013 California State University, Bakersfield, CA
Computational problems in optimal control and controllability theory

2012 Center for Nonlinear Science, Georgia Institute of Technology, Atlanta, GA
Numerical solutions to the optimal stabilization Hamilton-Jacobi PDE in control theory

2012 51th IEEE Conference on Decision and Control, Maui, HI
Local controllability of control-affine systems with quadratic drift and constant control-input vector fields

2012 Mitsubishi Electric Research Laboratory, Cambridge, MA
Numerical solutions to partial differential equations arising in nonlinear control theory

2012 American Control Conference, Montreal, QC
High-order numerical solutions to Bellman's equation of optimal control

2011 50th IEEE Conference on Decision and Control, Orlando, FL
Power series solutions to the time-varying dynamic programming equations

2011 2nd Monterey Worshop on Computational Issues in Nonlinear Control, Monterey, CA
High-order numerical solutions to the dynamic programming equations of optimal control

2011 SIAM Conference on Control & Its Applications, Baltimore, MD
Power series solutions to the dynamic programming equation for time-varying discrete nonlinear systems

2011 American Control Conference, San Francisco, CA
Piecewise smooth approximate solutions to the nonlinear output regulation PDE

2010 Department of Applied Mathematics Colloquium, Naval Postgraduate School
Controllability of quadratic control systems

2010 4th Biennial Regional Meeting on Nonlinear Control & Applications, Kingston, ON
Small-time local controllability of homogeneous control-affine systems

2008 18th Int. Symposium on Mathematical Theory of Networks & Systems, Virginia Tech.
Algebraic conditions for local controllability of affine systems using jet bundle geometry

2008 3rd Biennial Regional Meeting on Nonlinear Control & Applications, Waterloo, ON
A jet bundle setting for studying the reachable set

INVITED TALKS

2019 University of Buffalo, Applied Math Seminar
Anti-regular graphs as seen from within threshold graphs

2016 American Control Conference, Boston, MA
On almost equitable partitions and network controllability

2015 University of Colorado, ECEE Department Seminar, Boulder, CO
Network Structure and Controllability in Multi-Agent Control Systems

2013 Bakersfield College, Bakersfield, CA
Job Opportunities with a Mathematics Degree

2013 SIAM Conference on Computational Science & Engineering, Boston, MA

An adaptive patchy method for the numerical solution of the Hamilton–Jacobi–Bellman equation

2009   III Summer School on Geometry, Mechanics, & Control, Spain
A generator independent approach to local controllability of affine systems

OTHER CONFERENCES ATTENDED

2018	57th IEEE Conference on Decision and Control, Miami, FL
2018	MAA Seaway Section, Fall meeting, University of Toronto, Mississauga, ON
2018	American Control Conference, Milwaukee, WI
2017	MAA Seaway Section, Fall meeting, SUNY Broome, Binghamton, NY
2016	55th IEEE Conference on Decision and Control, Las Vegas, NV
2015	54th IEEE Conference on Decision and Control, Osaka, Japan
2014	MAA MathFest, Portland, OR
2014	AMS/MAA Joint Mathematics Meeting, Baltimore, MD
2013	MAA MathFest, Hartford, CT
2013	AMS/MAA Joint Mathematics Meeting, San Diego, CA
2010	49th IEEE Conference on Decision and Control, Atlanta, GA

TEACHING RELATED PROFESSIONAL DEVELOPMENT

MAR 2023   **Improving Mathematics Help-Seeking by Fostering Belonging and Inclusion**
Monthly Math Workshops by Lumen Learning (Webinar)

OCT 2022   **Open Pedagogy As A Tool For Student Empowerment**
Community College Consortium for OER Webinar Series

JUNE 2022   **MAA PIC Math Workshop on Interdisciplinary Data Science**
4-day in-person workshop at Brigham Young University in Provo, UT. Attended with Byeong-Hak Choe from SUNY Geneseo's School of Business.

FEB 2021   **MAA Seaway Conversations**
A Seaway Conversation on the Course - History of Mathematics (Webinar)

2020   **Real Analysis: A conversation about the content in a standard offering**
MAA Seaway Fall 2020 Virtual Meeting (Webinar)

STUDENT ADVISING

2021   **Riley Grossman**, Mathematics Honors Thesis (HONR 393)
A year-long research project using machine learning, data analysis, Python, R, and PageRank algorithms to predict NCAA cross-country rankings (pursuing PhD in Business Data Science, NJIT; Named 2022 CoSIDA Academic All-American)

2021   **Riley Grossman**, Geneseo Foundation Undergraduate Research Fellowship
Ten week summer research advisement on using techniques from statistical and machine learning to predict NCAA cross-country rankings

2020   **Matthew Ficarra**, MATH 393 (Geometry of Curves)
A semester long course on the differential geometry of curves and surfaces

2020   **Eric Piato**, Mathematics Honors Thesis (HONR 393)
A year-long research project entitled *Moore Graphs: A survey on Moore graphs and algebraic graph theory* (pursuing PhD in Economics, University of Maryland, College Park)

2019   **Matthew Ficarra, Natalie Schurman, Brittany Sullivan**, NSF Funded
The role of the anti-regular graph in the spectral analysis of threshold graphs: 10-week summer research leading to published paper in *Linear Algebra and Its Applications* (see [J10]); Ficarra presented at the Fall 2019 MAA Seaway Meeting, Sullivan and Schurman presented at the 22nd Annual Nebraska Conference for Undergraduate Women in Mathematics

2018   **Joon-yeob Lee, Eric Piato, Barbara Schweitzer**, NSF Funded

Spectral characterizations of anti-regular graphs: 10-week summer research leading to published paper in *Linear Algebra and Its Applications* (see [J9]); Lee presented at the Fall 2018 meeting of the MAA Seaway Section, Piato presented at the Geneseo Mathematics Colloquium, Schweitzer presented at the 21st Annual Nebraska Conference for Undergraduate Women in Mathematics, Piato and Lee presented at 2019 GREAT Day and their work was included in the Proceedings of GREAT Day 2019

2018 **Duncan Ho**, Directed Study
Nonlinear analysis; semester long study on real analysis on general metric spaces, fixed point theorems, and applications, made an extended presentation in MATH 346

2017 **Justen Geddes**, Directed Study
Graph theory and biology; semester long study the relationship between cancer network structures and 5-year survival rate, presented at GREAT Day 2018 (pursuing PhD in Applied Mathematics, North Carolina State)

2017-2018 **BethAnna Jones**, NSF Funded
Eigenvalue bounds for regular graphs; 10-week summer research leading to a presentation at 20th Annual Nebraska Conference for Undergraduate Women in Mathematics (pursuing PhD in Systems Science & Mathematics, Washington University in St. Louis)

2015 **Ursula Trigos**, MAA PIC Math
Controllability of graphs with vertices of degree $n-2$, presented at the 2015 MAA Southern California-Nevada Fall Meeting (pursuing PhD in Applied Mathematics, University of Michigan)

2015 **Frank Madrid**
Boundary point detection from noisy tomographic data, MAA PIC Math project, presented at 2015 MAA MathFest, Washington D.C.

2014 **Mark Stevens**
Summer research project: 10-week summer research on developing parallel algorithms to analyze the controllability properties of graphs

Awards & Honors

2020 Outstanding Service as Reviewer of the IEEE Control Systems Letters (L-CSS)
Part of a small group of referees selected annually by the Editorial Board of the L-CSS for having "done a truly outstanding job reviewing papers submitted to" the journal.

2018-2019 Youngs & Linfoot Real Estate Faculty Incentive Award, SUNY Geneseo
Awarded annually to a faculty member at SUNY Geneseo engaged in activity or research beneficial to the department and its students.

2014-2015 CSUB Research Excellence Award

2013-2014 Project NExT Fellow (Brown Dot), Mathematical Association of America

2010–2013 National Research Council Postdoctoral Award, National Academy of Sciences

2006–2008 NSERC Ph.D. Award, $21,000/year for 2 years

2008 Ontario Graduate Scholarship in Science and Technology, $10,000

2003–2005 NSERC M.Sc. Award, $17,300/year for 2 years

2002-2003 NSERC Undergraduate Student Research Award, (two summers)

Service to the Profession

Nov 2022 **SIAM Associate Editor**
Served as SIAM Associate Editor in the Conference Editorial Board for papers submitted to the 2023 American Control Conference. Responsible for overseeing the review process of 3 papers including reviewer selection and providing a publication recommendation for each paper.

2020–Present	**MAA Seaway Webmaster** (maaseaway.org)
	• Designer, creator, and maintainer of the MAA Seaway mobile friendly website
	• The website hosts recent Seaway meetings in one place
	• Created a meeting registration process with secure payment using Square's PHP API
	• Created an abstract submission process and a scheduling tool for the program and talks

Grant Panel Reviewer

Mar 2017	National Science Foundation (Energy, Power, Control, and Networks)

Journal Referee and Reviewer

Australasian Journal of Combinatorics
Automatica
Discrete Applied Mathematics
IEEE Transactions on Automatic Control
IEEE Transactions on Control of Network Systems
IEEE Control Systems Letter
IEEE Transactions on Control Systems Technology
International Journal of Robust and Nonlinear Control
Journal of Optimization Theory & Applications
Linear Algebra and Its Applications
Mathematics of Control, Signals, & Systems
MathSciNet reviewer
SIAM Journal on Control and Optimization
SIAM Undergraduate Research Online
Special Matrices
Systems & Control Letters

Research Sessions and Panel Discussions Organized

Dec 2015	*Controllability, Stabilizability, and Robustness in Networked Multi-Agent Control Systems*, 54th IEEE Conference Decision and Control, Osaka, Japan (research session)
Dec 2014	*Controllability and Stability of Networked Control Systems* 53rd IEEE Conference Decision and Control, Los Angeles, CA (research session)
Aug 2014	*Strategies for Improving Recruitment and Retention of Math Majors* MAA MathFest, Portland, OR (panel discussion)
Jan 2014	*Introducing a New Course* Joint Mathematics Meetings, Baltimore, MD (panel discussion)

Service to the University

Fall 2022	Hispanic Heritage Month (Department of Global Languages and Cultures) Panelist in round table discussion on "how your ties with the Hispanic/Spanish culture and language inform and inspire your academic and professional self"
2021–2023	At-Large College Senator
2020–2021	Geneseo Club Baseball faculty advisor
2018–2020	College Senate
2018–2020	Student Affairs Committee
2017–Present	Academic Advising
2013–2016	School of Natural Sciences, Mathematics, and Engineering Elections Committee, (served as Chair from 2014-2015), CSUB
Jan 2017	*Research Weekend: Google's PageRank Algorithm*, SUNY Geneseo, NY

The SUNY Geneseo Math department invites annually "*an accomplished mathematician to campus to give a colloquium and to lead a two-day research experience in mathematics to a select group of students*". I was invited to lead the 2017 Research Weekend on a project using linear algebra to predict NCAA college football standings.

Professional Development Workshops/Seminars

MARCH 2020   Recognizing and Responding to Microaggressions in the Classroom (TLC)

New York Master Teacher Program, Geneseo, NY

DEC 2019   Matrices in Action!: Presented a 2 hour interactive workshop on matrices and linear algebra

JAN 2017   LaTeX Workshop: Presented a 2 hour interactive LaTeX workshop

SERVICE TO THE DEPARTMENT

2021–PRESENT   Scheduling Committee
              Created a web application that automates the department course scheduling process; built using PHP, Javascript, and Postgres database.

2021–PRESENT   Honors Committee

2021–2022   Scholarship Committee

2020–PRESENT   Departmental Committee (as Chair in spring 2023)

2020–2021   Curriculum Committee

2019–2021   5-Year Department Review Committee

2018–2019   Undergraduate Research Committee

2017–2020   PRISM (Math Club) faculty advisor

2017–2018   Staffing Committee

2017–2018   Colloquium Committee

2016–2021   Department Website Coordinator

2018–PRESENT   LaTeX Workshops
              I lead annual workshops open to all Geneseo students on using LaTeX for homework, reports, & presentations

SERVICE TO THE COMMUNITY

2019-2021   **Board Member**, Genesee Country Christian School

FEB 2017   **Job Shadow Program**, Livonia High School
              High school student John Dutra shadowed me for a full day; I offered insight and advice on the possible career options as a mathematics major and a typical career path as a mathematics professor

PROFESSIONAL MEMBERSHIPS

ACTIVE   Society for Industrial and Applied Mathematics (SIAM)

ACTIVE   Mathematical Association of America (MAA)

SOFTWARE

Programming Languages
    PYTHON, PHP, C/C++, JAVASCRIPT

Math & Statistical Software
    MAPLE, MATHEMATICA, MATLAB, R, JAMOVI

Typesetting and Markup Languages

LaTeX, HTML/CSS, Markdown

Databases

Postgres, MySQL, SQLite

Development Tools

Git, Git CoPilot, VS Code, pgAdmin, Spyder, Docker, JupyterLab

Languages

Fluent   English, Spanish

Basic   French