

Zachary del Rosario

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Education

PhD	Stanford University	Aeronautical and Astronautical Engineering	2020
	Co-advisors:	Gianluca Iaccarino and Art B. Owen	
MS	Stanford University	Aeronautical and Astronautical Engineering	2018
BS	Olin College of Engineering	Mechanical Engineering	2014

PhD Thesis

“Principled Marins: Rigorous Tools and Strategies for Aircraft Design Under Uncertainty”

Competitive aircraft design walks the razors edge, balancing weight reduction with aircraft safety. Design tends to lean conservative, with cascaded margins for myriad uncertainties. This thesis introduces design margins that provably yield minimal weight penalties at desired levels of safety. Comparisons against industry standards, tractable approximations, and ramifications for both conceptual and detailed design are considered.

Grants and Fellowships

Source	For	Size	
Teaching Advancement Grant, Vice Provost for Teaching and Learning	SeeME	~\$470	2019
<i>Travel grant to attend NABI summit 2019, Stanford internal</i>			
SPICE Grant, Vice Provost for Graduate Education	ASEE	\$2,500	2018
<i>Grant to support club activities, Stanford internal</i>			
Teaching Advancement Grant, Vice Provost for Teaching and Learning	ASEE	~\$800	2018
<i>Travel grant to attend ASEE Annual Conference 2018, Stanford internal</i>			
Diversifying Academia, Recruiting Excellence (DARE) Fellowship	-	~\$116,000	2018
<i>Competitive fellowship for promising faculty candidates, Stanford internal</i>			
Statistical Perspectives on UQ (SPUQ) travel award	-	\$500	2017
<i>Travel grant to attend SPUQ 2017, SAMSI-funded</i>			
Stanford Speaker's Bureau Co-sponsorship	ASEE	\$1,500	2017
<i>Pitch-based funding for ASEE Colloquium 2017, Stanford internal</i>			
NSF Graduate Research Fellowship	-	~\$300,000	2015

Honors and Awards

Stanford MECON Oral Presentation award, 1st place	2017
<i>Mechanical Engineering Department-sponsored speaker competition</i>	
AIAA Jefferson Goblet Best Student Paper	2017
<i>Highest honor for student papers at AIAA SciTech annual conference</i>	

Teaching Experience

Course Instruction

Uncertainty Quantification, (ME 470) Stanford	Spring 2019
<i>Designed, implemented, and delivered graduate-level elective course for 10 advanced students. Taught using a mixture of lecture and evidence-based methods. Sought professional consultation for mid-quarter feedback and implemented changes.</i>	
Uncertainty Quantification, (ME 470) (Two lectures) Stanford	Winter 2018
<i>Guest lecturer. Developed two lectures, supporting notes, and designed a homework to reinforce content. Iterated on this content in 2019.</i>	

Workshops

Teacher Workshops, (SeeME) Stanford	2019
<i>Developed and delivered workshops on the fundamentals of teaching, including lessons on learning goals and The 5E Model. Ran workshops for audiences of 10.</i>	
Groupwork Workshop, (VPTL Consultant) Stanford	2018-2019
<i>Co-developed and delivered workshop on evidence-based best-practices for groupwork in the classroom. Digested, summarized, and applied education literature, designed hands-on activities, co-facilitated workshop on several occasions for audiences of 16.</i>	

Outreach

Intro to Exploratory Data Analysis, (SeeME) Stanford	2016
<i>Introductory hands-on class to introduce students to principles of visualization, exploring data, understanding trends, and basic causal reasoning.</i>	
“What the heck is engineering?”, (Splash) Stanford	2014-2015
<i>Introductory discussion-based class meant to introduce students to engineering as a profession.</i>	

Assistantships

Applied Aerodynamics, (AA 200) Stanford	2016
<i>Held office hours, graded homeworks and exams.</i>	
Partial Differential Equations, Olin College	2014
<i>Held office hours, graded homeworks and exams.</i>	
Machine Shop Instructor, Olin College	2014
<i>Taught basic machine shop operations, milling, turning, shop safety.</i>	
Transport Phenomena, Olin College	2013
<i>Heat transfer and fluid mechanics; held office hours, graded homeworks and exams.</i>	
Linearity, Olin College	2012
<i>Introductory linear algebra; held office hours, graded homeworks and exams.</i>	

Mentoring

Writing		Outcome	
Cindy Nguyen	Research and Personal Statements	NSF GRFP; Stanford, Dept. of Electrical Engineering	2019
Larissa Little	Personal Statements	NDSEG; Harvard, Dept. of Materials Science	2018
Mason del Rosario	Research and Personal Statements	NSF GRFP Honorable Mention, UC Davis, Dept. of Electrical Engineering	2018
Rongfei Lu	Personal Statements	Stanford, Dept. of Aeronautics and Astronautics	2018
Emma (Zeyan) Xu	Research and Personal Statements	NSF GRFP, Columbia, Dept. of Material Science	2017
Research		Project	
Mark Benjamin	Rotation Advisor	Advised rotation student on investigation of reliability-based design optimization strategies, focusing on comparing various density-matching approaches.	2018

Refereed research papers

1. del Rosario, Z., R. Fenrich, and G. Iaccarino (2019). Cutting the Double Loop: Theory and Algorithms for Reliability-Based Design Optimization with Statistical Uncertainty. *International Journal for Numerical Methods in Engineering*.
2. del Rosario, Z., M. Lee, and G. Iaccarino (2019). Lurking Variable Detection via Dimensional Analysis. *SIAM / ASA Journal on Uncertainty Quantification*.
3. del Rosario, Z., Fenrich, Richard W., and G. Iaccarino (2019, Accepted). Fast Precision Margin with FORM. *AIAA Journal*.

Invited talks

1. del Rosario, Z., A. Towne, and G. Iaccarino (2018c). Dimension Reduction for Shape Design Insight. In: Aerospace Computational Design Lab (ACDL) seminar, MIT.
2. del Rosario, Z. (September 6, 2018). Lost in Hyperspace: The Curse of Dimensionality. In: Wellesley College student seminar.
3. del Rosario, Z. (October 19, 2018). The Curse of Dimensionality: Problems and Strategies. In: von Karman Institute: Uncertainty Quantification in Computational Fluid Dynamics (STO-AVT 326).

Papers in conference proceedings

1. del Rosario, Z., R. W. Fenrich, and G. Iaccarino (2019). Beyond Basis Values: Fast Precision Margin with FORM. In: 21st AIAA Non-Deterministic Approaches Conference.
2. del Rosario, Z., A. Towne, and G. Iaccarino (2018b). Dimension Reduction for Shape Design Insight. In: 20th AIAA Non-Deterministic Approaches Conference.
3. del Rosario, Z., P. Constantine, and G. Iaccarino (2017c). Developing Design Insight Through Active Subspaces. In: 19th AIAA Non-Deterministic Approaches Conference.

Pre-prints

1. Constantine, P. G., Z. del Rosario, and G. Iaccarino (2016). Many physical laws are ridge functions. *arXiv preprint arXiv:1605.07974*.
2. Constantine, P. G., Z. del Rosario, and G. Iaccarino (2017, Forthcoming in JCP). Data-driven dimensional analysis: algorithms for unique and relevant dimensionless groups. *arXiv preprint arXiv:1708.04303*.

Conference talks

1. del Rosario, Z. (2019). Stanford SeeME: Student-driven research within an R1 institution. In: National Alliance for Broader Impacts (NABI) Summit.
2. del Rosario, Z., A. Banko, A. Horwitz, and G. Iaccarino (2018). Data-Driven Physical Inquiry: Discovering Relevant Dimensionless Numbers With Physics-Constrained Machine Learning. In: 71th Annual Meeting of the American Physical Society, Division of Fluid Dynamics.
3. del Rosario, Z., A. Towne, and G. Iaccarino (2018a). Dimension Reduction for Shape Design Insight. In: Thermal, Fluid science Sponsors, and Affiliates conference (TFSA).
4. del Rosario, Z., P. Constantine, and G. Iaccarino (2017a). Algorithm-Driven Insight. In: Thermal and Fluid Science Affiliates Conference.
5. del Rosario, Z., P. Constantine, and G. Iaccarino (2017b). Data-Driven Dimensional Analysis. In: CompFest.
6. del Rosario, Z., M. Lee, and G. Iaccarino (2017). Discovering Hidden Controlling Parameters using Data Analytics and Dimensional Analysis. In: 70th Annual Meeting of the American Physical Society, Division of Fluid Dynamics.
7. del Rosario, Z., A. Towne, and G. Iaccarino (2017). Handling Classes of Variables in Dimension Reduction. In: SIAM Workshop on Parameter Space Dimension Reduction (DR17).

Poster presentations

1. del Rosario, Z. and G. Iaccarino (2017). Hidden Parameter Hypothesis Testing. In: Statistical Perspectives on Uncertainty Quantification.
2. Torres, H., Z. del Rosario, and G. Iaccarino (2017). MCRT. In: WEST Conference.

Service and Leadership

President (American Society for Engineering Education, Stanford Chapter) 2018-2019

Led and served on a 5-person organizing team. Organized a seminar sequence with internal and external speakers. Directed a Colloquium event attended by 70 persons, featuring workshops on "The Fundamentals of Teaching."

2017-Present

Founder and Director of Curriculum (SeeME)

Co-founded Stanford Mechanical Engineering's student-run research outreach program SeeME. Developed and delivered workshops to train grad student instructors. Wrote grants to support operations and conference travel. Served as program leader and interfaced with the Department Chair.

2017-2018

Financial Officer (American Society for Engineering Education, Stanford Chapter)

Served on 4-person organizing team. Wrote and won grants to fund speaker series and Colloquium. Point person on organizing seminar sequence.

2014-2016

Chair of Teacher Development (Stanford Splash)

Served on 20-person organizing team serving thousands of high school students. Owned our teacher training training program; co-facilitated workshops to introduce Stanford students to the basics of teaching. Enhanced teacher evaluations by introducing new survey system.

2014-2016

Robotics Mentor (FIRST Robotics, Team 751)

Volunteered on 3-mentor team for a high-school robotics program. Taught machine shop operations (milling and turning), mechanical design and drawing, coordinated travel logistics for away competitions.

Employment

Citrine Informatics, Instructional Designer and Data Scientist

Sumer 2019

Northrop Grumman Corporation, Research intern

Summer 2017

Developed statistical methods to identify anomalies in time series data. Supported exoplanet detection research team.

Licenses and Certifications

- Private Pilot, Single engine land, Certificate Number 3386055
- Amateur radio operator, Technician Class, callsign KC3HMT

The Engineer's Entreaty:
 "Grant me the Insight to abstract the things I do not need,
 Tenacity to understand the things I require,
 And Wisdom to know the difference."