Diego TORREJON

Contact Information

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Positions

JUN 2014 - CURRENT	**Visiting Researcher** at NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY. *Worked on pattern recognition of vector fields under the supervision of Dr. Igor Levin and Dr. Victor Krayzman.*
AUG 2014 - CURRENT	**NSF Graduate Research Fellow** at GEORGE MASON UNIVERSITY. *Advised by Dr. Maria Emelianenko.* Many modern materials have polycrystalline microstructures composed of a large number of crystals (*grains*). Macroscopic material properties are tightly bound to the structure and evolution of *grain boundaries* connecting these grains. Some interesting phenomena can be revealed by modeling the *jump processes* observed in the coarsening of materials microstructure. I study PDE models that attempt to rigorously explain the evolution of grain boundary statistics, such as distributions of grain boundary length, triple junction velocities and misorientations. We pay special attention to certain features of these models, such as global existence of solutions, *existence of a finite-time blowup*, aggregation behavior, the role of initial data and the differences between 1-dimensional and 2-dimensional models.
AUG 2012 - MAY 2014	**Doctoral Research Assistant** at GEORGE MASON UNIVERSITY. *Advised by Dr. Maria Emelianenko.* Mathematical approaches in modeling *chemical, material, and biological* kinetics problems. In particular, my research has focused on the numerical and analytic analysis of one-dimensional *grain boundary* models. The same methodology applied to the infamous *Keller-Segel* model, describing aggregation patterns in biological settings, was adapted to fit the grain boundary model of interest. This analysis leads to unexpected connections with velocity-jump models used in biological applications, and allows to significantly narrow down the type and role of admissible network reconfiguration events occurring during grain growth.
JUN 2011 - AUG 2012	**National Science Foundation CSUMS Undergraduate Research Assistant in Computational Mathematics** at GEORGE MASON UNIVERSITY. *Advised by Dr. Daniel Anderson and Dr. Maria Emelianenko.* Estimation of *rate constants* in *green oxidation* processes by using singular perturbation theory and parameter estimation. The system exhibits a nonlinear conservation law and is modeled via a *perturbation approach*, which is used to obtain closed form relationships between system parameters. A new method is derived that allows to compute all the rate constants in the catalytic cycle, with as little as two linear least squares fits, for the minimal data set collected under any conditions providing that the oxidation of the substrate reactant is incomplete. This method facilitates determination of a critical rate constant that describes the operational lifetime of the catalyst, and greatly reduces the experimental work required to obtain the important rate constants.

Education

Phd Dec 2014 - Present Graduate Courses Taken:	Department of Mathematics, George Mason University, Fairfax VA, USA (http://math.gmu.edu) Mesoscale Modeling, Measure Theoretic Statistics I & II, Calculus of Variations, Computational Topology and Thermodynamics/Kinetics of Materials.
Master of Science Jun 2012 - Dec 2014 Graduate Courses Taken:	Department of Mathematics, George Mason University, Fairfax VA, USA (http://math.gmu.edu) Measure Theory, Functional Analysis, Ordinary Differential Equations, Industrial Mathematics, Topology of Metric Spaces, Dynamical Systems, Nonlinear Functional Analysis, Measure Theoretic Probability Theory, Partial Differential Equations, PDE Constrained Optimization, Stochastic Differential Equations, Numerical Analysis, and Finite Element Methods.
Bachelor of Science Aug 2010 - Jun 2012	Department of Mathematics, George Mason University, Fairfax VA, USA (http://math.gmu.edu) SUMMA CUM LAUDE
Associate of Science Aug 2008 - Jun 2010	Northern Virginia Community College, Alexandria VA, USA (http://nvcc.edu)

Professional Presentations

July 2015	GRC Physical Metallurgy at the University of New England Poster presentation , "Triple Junctions and their Role in Mathematical Modeling of Materials Coarsening".
May 2015	Student Research Talks at George Mason University Talk presentation, "Probability Theory: A Gentle Introduction".
Mar 2015	SIAM Mid-Atlantic Mathematics Student Conference at George Mason University Talk presentation, "Collective Behavior in Mesoscale Grain Growth Models".
Sep 2014	Graduate Seminar at George Mason University Talk presentation, "Applying to Professional Workshops: The How and Where".
Mar 2014	Graduate Seminar at George Mason University Talk presentation, "Existence of Optimal Controls in PDE Constrained Problems".
Oct 2013	Graduate Seminar at George Mason University Talk presentation, "Shear Band Formation in Bulk Metallic Glasses".
Aug 2013	IMA Mathematical Modeling in Industry XVII Talk presentation, "Shear Band Formation in Bulk Metallic Glasses".
May 2013	CNA Summer School at Carnegie Melon University Poster presentation, "Collective Behavior in Mesoscale Grain Growth Models".
Mar 2013	Graduate Seminar at George Mason University Talk presentation, "Aggregation, Blowup, and Collapse: The ABC's of Taxis in Reinforced Random Walks".
Apr 2013	SIAM Regional Meeting at Shippensburg, Pennsylvania Poster presentation, "An Analytical Approach to Green Oxidation".
Oct 2012	Graduate Seminar at George Mason University Talk presentation, "An Analytical Approach to Green Oxidation".
Jul 2012	SIAM Annual Meeting at Minneapolis, Minnesota Talk presentation, "An Analytical Approach to Green Oxidation".
Apr 2012	Undergraduate Mathematics Conference in DC at George Washington University Talk presentation, "An Analytical Approach to Green Oxidation".
Mar 2012	SIAM Regional Meeting at Shippensburg, Pennsylvania Talk presentation, "An Analytical Approach to Green Oxidation".

Feb 2012	Institute for Green Science at Carnegie Melon University
	Talk presentation, "An Analytical Approach to Green Oxidation".
Jan 2012	Joint Mathematical Meetings in Boston, Massachusetts
	Talk and Poster presentation, "An Analytical Approach to Green Oxidation".
Oct 2011	Undergraduate Mathematics Conference at James Madison University
	Talk presentation, "An Analytical Approach to Green Oxidation".

Professional Activities

Jun - Oct 2015	Visiting Researcher at National Institute of Standards and Technology
	Worked in *data analysis of Reverse Monte Carlo refinements of nano-scale atomic correlations* under the supervision of Dr. Igor Levin from the National Institute of Standards and Technology (NIST).
July 2015	GRC Physical Metallurgy
	Participant at the Gordon Research Conference summer school on Frontiers in Physical Metallurgy held at the University of New England.
Feb - Mar 2015	Lecturer at the PDE and Optimal Control Seminar
	Presented a series of lectures on $\Gamma-$convergence.
Dec 2014 - Present	Elected Executive Committee Member of the GMU SIAM Chapter
	See the *SIAM Activities* section below for organized events as a GMU SIAM officer. Also visit our website.
Oct 2014 - Mar 2015	Executive organizing member and webmaster for the Fifth SIAM Mid-Atlantic Student Conference
	See the *SIAM Activities* section below for more details.
Aug 2014 - Mar 2015	Webmaster for the Finite Element Circus
	First finite element circus held at George Mason University. Visit the website.
Jul 2014	PCMI Graduate Summer School
	Participant at the 2014 Park City Math Institute Graduate Summer School.
Jun 2014	George Mason Modeling Days
	Participant at the first annual George Mason University modeling summer workshop. Worked in *Credit Risk Analytics Modeling* financial project under the supervision of BancLab managing director Michael Libman.
Mar - Jul 2014	Webmaster for Mason Modeling Days
	First modeling summer workshop organized at George Mason University. Visit the website.
Aug - Nov 2013	Lecturer at the PDE and Optimal Control Seminar
	Presented a series of lectures on optimal control theory for elliptic PDEs.
Aug 2013	IMA Mathematical Modeling in Industry XVII
	Participant at the Institute of Mathematics and its Applications Annual Workshop. Worked in *Shear Band Formation* under the supervision of Dr. Timothy Burns from the National Institute of Standards and Technology (NIST).
May 2013	CNA Graduate Summer School
	Participant at the Center for Nonlinear Analysis summer school held at Carnegie Melon University.
May 2013 - Dec 2014	Elected President of the GMU SIAM Chapter
	See *SIAM Activities* section for organized events as GMU SIAM President.
Jun 2012	Mathematical Problems in Industry
	Participant at the 2012 MPI workshop held at the University of Delaware. Worked with graduate, and post-doctoral students on *Modeling Industrial Coalescers: Droplet Dynamics and Stability* under the supervision of Dr. Burt Tiley and Dr. Tom Witelski.
May 2012	Elected Secretary of the GMU SIAM Chapter
May 2011 - May 2012	Accepted to the Undergraduate Research in Computational Mathematics Program.

Mentoring/Teaching Activities

May 2014 - May 2015	**EXTREEMS Program at George Mason University**
	Gave lectures on probabilistic and statistical methods, presented a research talk on *Collective Behavior in Mesoscale Grain Growth Models*, and advise student *Robert Argus* on his ongoing research in "2D Grain Growth Dynamics".
Feb - May 2015	**Applied Math Tutor**
	During the Spring 2015, I tutored senior students James Collier and Joseph Mahakian on Volterra equations, Fredholm equations, and green's functions.
Aug - Dec 2014	**PDE Tutor**
	During the Fall 2014, I tutored senior student James Collier on partial differential equations theory and numerical analysis.
Aug - Dec 2014	**Applied Math Tutor**
	During the Fall 2014, I tutored senior student Joseph Mahakian on nondimensionalization methods, perturbation theory, and phase plane dynamics.
Aug - Nov 2014	**NSF Graduate Research Fellowship Program Mentor**
	As a recent recipient of the NSF fellowship, I advised GMU students Dana Shaat and Yukiko Yagi Yarnall with their NSF-GRFP applications. Yukiko Yagi Yarnall was awarded the 2015 NSF GRFP fellowship in the field of *Physics and Astronomy*.
June 2013 - May 2015	**Aspiring Scientist Summer Internship Program**
	Co-advised Thomas Jefferson High School student Sushrutha Reddy in ODE stability for a model describing *Atherosclerotic Plaque Growth*.
May-Jul 2013	**Assist with the GMU REU Workshop**
	Gave lectures on ODE stability, perturbation methods, and nondimensionalization techniques. took the REU students to a tour at NIST, and advise *Deborah Koch* on her ongoing research on *Mathematical Modeling of Social Dynamics*.
May-Jul 2012	**Assist with the GMU REU Workshop**
	I gave a series of lectures on numerical solvers, Matlab programming, and LaTeX; and gave a research presentation on *Perturbation Methods in Chemical Kinetics*, . I also co-advised students *Alex Price* and *Matthew Villemarette* with their REU project on *Mathematical Modeling of Latent HIV Cell Dynamics in Vivo*.

SIAM Outreach Activities

As elected GMU SIAM executive committee member, president, and secretary, I jointly with my SIAM officers have planned and organized the following events,

April 2015	**First National Math Festival**
	Members participated as volunteers in guarding the *Museum of Math* exhibits at *2015 Math Festival*.
Oct 2014 - Mar 2015	**Scientific Organizing Committee Member for the Fifth Annual SIAM Mid-Atlantic Student Conference**
	Co-organizer of the fifth annual regional student conference and industry days held at George Mason University. Co-writer of the proposal draft that was submitted to the National Science Foundation, Grant Number DMS-**1532843**. I was in charge of advertisement, hotel arrangement, book of abstracts, conference booklet, scheduling, and reimbursement. Visit the website.
2013, & 14	**Semi-Annual Faculty Research Symposium**
	During the seminar, students listen to research talks presented by faculty from the Department of Mathematical Sciences. The symposium has been held six times and my officers and I have planned the following ones: Fall 2013, Spring 2014 and Fall 2014. Please check our website for photos of the symposium.
2012, 13, 14, & 15	**MatchCounts**
	My SIAM fellow members have offered their services as graders and proctors for the regional *MathCounts* competition (2012, 2013, 2014, and 2015).
2012, 13, 14, & 15	**SIAM Chapter Representatives at the SIAM Annual Meeting**
	We have sent representatives to the past four SIAM Annual Meetings held on Minneapolis, San Diego, Chicago, and Salt Lake City, respectively.

Nov 2014	Orientation 101: For and by Graduate Students
	We set up a panel of four senior math graduate students to answer the common questions about the PhD process and share their past anecdotes with the attendees.
April 2014	USA Science and Engineering Festival
	Members participated as volunteers in guarding the National SIAM booth during the *2014 USA Science and Engineering Festival*.
Apr 2014	1st Annual Elementary and middle School Science and Engineering Fair
	Members participated as judges for the poster session at the fair.
Apr 2014	Mumbai Mythology and Mathematics
	In this multimedia presentation, best-selling author and mathematician Manil Suri took us in a journey through the past, present and future of India as explored in his trilogy of novels named after gods from Hindu mythology. He also made startling connections between his fiction writing and mathematics..
Mar 2014	Traveling Math Midway 2Go Exhibit
	Members participated as volunteers for the *Museum of Math* exhibit at T.C. Williams High School.
Mar 2014	SIAM Website Workshop
	The event provided all attendees with a basic Html tutorial to set up their own website. Every attendee left the workshop with a published website on the GMU math website.
Apr 2013	Undergraduate Mathematics Conference
	A regional undergraduate mathematics research conference organized by George Washington University, Williams & Mary and George Mason University. The conference consisted of student talks, keynote speakers and a career panel. The GMU SIAM chapter assisted with the planning and registration of the conference.
Apr 2013	SIAM/MAA Fourth Mid-Atlantic Regional Applied Mathematics Student Conference
	A regional applied mathematics conference at Shippensburg University in partnership with the SIAM Student Chapters at University of Delaware, George Mason University, Penn State University and University of Maryland - Baltimore County. As secretary, I was in charge of creating the book of abstracts and conference schedule.

Grants, Fellowships, and Awards

Jul 2015	Physical Metallurgy GRC Travel Grant
May 2015	Carl Storm Underrepresented Minority Fellowship
Mar 2015	Certificate of Appreciation for presenting a talk at the 2015 Fifth SIAM Annual Regional Student Conference
July 2014	PCMI Graduate Summer School Travel Grant
Mar 2014	PI, National Science Foundation Graduate Research Proposal Fellowship
	In the field of *Mathematical Sciences - Computational Mathematics*, NSF Grant Number DGE-1356109. Recognition appeared in George Mason's Newsletter, as seen in this link.
Aug 2013	IMA Mathematical Modeling in Industry Workshop Travel Grant
May 2013	CNA Graduate Summer School at Carnegie Mellon University Travel Grant
Mar 2013	SIAM Student Chapter Certificate of Recognition
	In recognition of outstanding accomplishments as president of the SIAM Chapter at George Mason University.
Jul 2012	SIAM Annual Meeting Travel Grant
Jun 2012	Mathematical Problems in Industry at the University of Delaware Travel Grant
May 2012	Klaus Fischer Academic Achievement Award in Mathematics
Apr 2012	Speech Nomination
	Nomination for George Mason College of Science Graduation Speech.
Apr 2012	Young Innovator Award
	Prize awarded to my work on "An Analytical Approach to Green Oxidation". Talk presentation session held during the Undergraduate Mathematics Conference in DC.

Jan 2012	Best Poster Award
	Prize awarded to my work on "An Analytical Approach to Green Oxidation". Poster session held during the MAA Joint Mathematical Meetings held in Boston on 2012. Recognition appeared in George Mason's Newsletter, as seen in this link.
May 2008	Winburn Technology Institute Scholarship
May 2008	Building Better Futures Scholarship

Publications

Maria Emelianenko (GMU), **Diego Torrejon**, Matthew A. DeNardo (CNA), Alexander D. Ryabov (CNA), Terrence J. Collins (CNA), *"Estimation of Rate Constants in Nonlinear Reactions Involving Chemical Inactivation of Oxidation Catalysts"*, Journal of Mathematical Chemistry, 2014, 52, 1460-1476.

Community Service

April 2015	Volunteer at Liberty Middle School
	The Centreville High School math club invited me to participate in an event with the sole purpose of promoting mathematics. The event took place at Liberty Middle School and was a success with several students doing mathematics while having fun.
2005-2008	Member of the National Honor Society (NHS)
	We participated in community service activities. I was elected as the National Honor Society (NHS) Coordinator of Tutoring and Mentoring Services.
2005-2008	Member/Coordinator of Building Better Futures (BBF)
	Served as the Building Better Futures (BBF) Coordinator of Tutoring Activities. I also served as a math and chemistry tutor during my four years of high school at T.C. Williams High School.

Memberships

Society for Industrial and Applied Mathematics (SIAM).
American Mathematical Society (AMS).
Latino Scientists and Engineers (MAES).
Association for Women in Mathematics (AWM).

Languages

English:	Fluent
Spanish:	Native

Computer Skills

Basic Knowledge:	**Mathematica, html, Linux (*ubuntu*), and C++.**
Intermediate Knowledge:	**LaTeX, Matlab, SAS, and Java.**

Other

Interests: rugby, hiking, world history and nature.
Work Experience: *Manager* and *waiter* at Mango Mike's Restaurant since May, 2008 until January 2014.