Paul Guillermo Arias, Ph.D. **US Citizen**
Senior Research Scientist – Rutgers University Tech Blog: paulgarias.github.io
Founder, Principal Consultant – Resolute Data Science LLC
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SOFTWARE

Programming: Python, MATLAB, C/C++/C#, Apache Spark and Scala, Fortran 90 with MPI, TotalView, Paraview
Web development and maintenance: D3, JavaScript, Flask, SQL, HTML5, CSS, git, hg, Heroku tool kit
Repositories: GitHub.com/paulgarias | bitbucket.org/ariaspg | bitbucket.org/ariaspaul_personal

WORK EXPERIENCE

Rutgers Office of Advanced Research Computing (OARC), Senior Research Scientist 2019-Present

- Provide support for new and current users of Rutgers OARC systems.
- Developed laboratory exercises for course on Big Data Systems, incorporating Hadoop and Spark.
- Support transition of Caliburn systems from RDI^2 to OARC.

Rutgers Discovery Informatics Institute (RDI^2), Associate Research Scientist 2017-Present

- Provide user support to user commuting, technical consultation with faculty and RDI^2 community, and provide policy advice for use of RDI^2 systems.
- Developed strategy for securing software equipment that optimized performance at cost savings of $2400 per year for software subscription.
- Created entry-level and intermediate curriculum for new high-performance computing system users.

Resolute Data Science LLC, Founder and Principal Consultant 2017-Present

- Created strategic plan for founding of data analytics and consulting business, focused on delivering analytics solutions for small- to medium-sized companies.
- Delivered a python-based web application that analyzed historic crime rates in three major US cities.
- Delivered a programmatic-thinking educational module to two clients as part of entry-level offering.

Independent technology consultant 2016-Present

- Developed a strategy to acquire skills in machine learning, database administration, and visualization.
- Communicated my growing skills in visualization, machine learning and data science on my technology blog.
- Participated in the Ann Arbor Health Hackathon and led a team of 6 people to develop an application to reduce hospital readmission rates, which should help save hospitals hundreds of thousands of dollars per year.

University of Michigan, Assistant Research Scientist 2015-2016

- Led a team of 5 graduate students in the development of combustion analysis software (Python & C++).
- Developed a plan for the integration of high performance computing software with a student's Master's project, overseeing progress and quality control with git.
- Utilized decision tree and principle component analysis to reduce complexity of chemical mechanisms, reducing computational time of experiments by factor of 30 and keeping error below 5%.
- Saved research group about 15% per month on CPU-hour costs by performing feasibility and financial study of necessary hardware and related software purchases.
- Developed and delivered a course on data analysis with Python, NumPy, and MATLAB to group of students.

King Abdullah University of Sci. and Tech., Postdoctoral Fellow 2013-2015

- Developed high performance computing software and capabilities for research group and provided training for research assistants to develop new chemical mechanism and to develop new simulation.
- Launched a program to run simulations using high performance computing facilities; produced and analyzed 50TB of data. Reduced statistical/visualization analysis time by 50% through caching random clustered data.
- Managed an international network of scientists to study common research interests while presenting research at various scientific conferences, and disseminated research findings in peer-reviewed journals.

University of Michigan, Research Team Leader 2011-2013

- Established a program to accelerate new team-member training on laboratory methods to study energy efficiency of combustion devices through numerical simulations.
- Oversaw the training of a pair of Master's students to study the effects of micro-combustor flame stability and device efficiency in order to understand the effects of composition dilution on flame shape.
- Instituted best practices, such as source control (hg) and unit testing, ensuring quality control of software development among multi-institutional partners for collaborative research efforts.

University of Michigan, Research Assistant 2005-2011

- Incorporated state-of-the-art theory on sprays into modules of a proprietary high fidelity simulation combustion code.
- Designed experiments to ascertain the sensitivity of aerodynamic and thermal quenching limits due to strain and water spray evaporation.
- Published results in peer-reviewed journals, presented at various conferences, and established relationships with international partners to explore practical applications of results.

EDUCATION

Ph.D. Mechanical Engineering (Computational Combustion), University of Michigan May 2013
M.S.E. Mechanical Engineering/M.S. Mathematics, University of Michigan April 2008
B.S. Mechanical and Aerospace Engineering, Rutgers University May 2005

LEADERSHIP EXPERIENCE

National Graduate Committee Co-Chair, Society of Hispanic Professional Engineers (SHPE) 2012-2013

- Led a team of seven Regional Graduate Representatives through leadership development training as part of a national effort to improve membership value proposition to graduate student leaders.
- Developed and executed a plan to increase the leadership and professional development for graduate students involved in research and development careers tracks.
- Created a uniform, national curriculum for seven regional conferences and secured speakers and presenters across the country to deliver talks.
- Developed presentation and training tools to deliver content regarding academic success for undergraduate students and career benefits of obtaining advanced degrees in science, technology, engineering and mathematics (STEM).
- Increased penetration of graduate student market through improved professional and leadership development offerings and opportunities for mentorship with research faculty.

Regional Leadership Development Conference Co-Chair, SHPE 2011-2012

- Organized a leadership development conference for industry professionals, as well as graduate, undergraduate, and high school students. Managed a budget of $54000.
- Developed a rigorous curriculum tailored for each development track that teaches leadership skills pertaining to time management, project and program management, and engineering ethics; and provided workshops on SHPE resources to run national and regional outreach projects.
- Managed a planning committee of fourteen students to develop case studies, secure venues for workshops, provide logistics for personnel and participants, design marketing strategy, raise funds for operations, and liaise with national, regional and local support staff.
- Broke attendance record, increased regional representation from university and professional chapters, and received positive feedback and support continuing support from University faculty, staff and administration, while maintaining fiscal responsibility for operations costs and regional and individual awards. Secured net gain of $3300.

PUBLICATIONS

Peer Reviewed Journals

H. A. Uranakar, S. Chaudhuri, H. L . Dave, **P. G. Arias**, H. G. Im, "A flame particle tracking analysis of turbulence-chemistry interaction in hydrogen-air premixed flames," Combust. Flame, 2016, 163, 220-240

Manuscript: http://dx.doi.org/10.1016/j.combustflame.2015.09.033

P. Selvaraj, **P. G. Arias**, B. J. Lee, H. G. Im, Y. Wang, Y. Gao, S. Park, S. M. Sarathy, T. Lu, S. H. Chung, "A computational study of ethylene–air sooting flames: Effects of large polycyclic aromatic hydrocarbons," Combust. Flame, 2016, 163, 427-436

Manuscript: http://dx.doi.org/10.1016/j.combustflame.2015.10.017

P. G. Arias, S. Roy, V. R. Lecoustre, Z. Luo, D. C. Haworth, T. Lu, A. Trouvé, H. G. Im, "Dynamics of Flow-Soot Interaction in Wrinkled Nonpremixed Ethylene-Air Flames," Combust. Theory and Modeling, 2015, 568-586

Manuscript: http://dx.doi.org/10.1080/13647830.2015.1067331

P. Pal, A. B. Mansfield, **P. G. Arias**, M. S. Wooldridge, H. G. Im, "A computational study of syngas auto-ignition characteristics at high-pressure and low temperature conditions with thermal inhomogeneities," 2015, 19, 587-601

Manuscript: http://dx.doi.org/10.1080/13647830.2015.1068373

V. R. Lecoustre, **P. G. Arias**, S. P. Roy, Z. Luo, D. C. Haworth, H. G. Im, T. F. Lu, A. Trouvé, "Direct Numerical Simulation of Non-premixed Ethylene-Air Flames: Local Flame Extinction Criterion," Combust. Flame, 2014, 161, 2933-2950.

Manuscript: http://dx.doi.org/10.1016/j.combustflame.2014.05.016

S. P. Roy, **P. G. Arias**, V. R. Lecoustre, D. C. Haworth, H. G. Im, A. Trouvé, "Development of High Fidelity Soot Aerosol Dynamics Models using Method of Moments with Interpolative Closure," Aerosol Sci. and Tech., 2014, 48:4, 379-391

Manuscript: http://dx.doi.org/10.1080/02786826.2013.878017

P. G. Arias, H. G. Im, P. Narayanan, A. Trouvé "A computational study of non-premixed flame extinction by water spray," Proc. Combust. Inst. 2011, 33, 2591-2597.

Manuscript: http://dx.doi.org/10.1016/j.proci.2010.07.043

PRESENTATIONS

Conference Proceedings

P. G. Arias, S. Chaudhuri, H. G. Im, "Direct numerical simulation of turbulent premixed flames at high Reynolds and Karlovitz numbers," Saudi Arabian Section of the Combustion Institute Meeting 2015, Riyadh, Saudi Arabia

P. G. Arias, H. G. Im, C. S. Yoo, J. H. Chen, "Direct numerical simulation of turbulent reacting flows with embedded solid boundaries," Central States Section of the Combustion Institute Spring Technical Meeting 2012, Dayton, OH

P. G. Arias, V.R. Lecoustre, S. P. Roy, W. Wang, Z. Luo, D. C. Haworth, H. G. Im, T. F. Lu, K. L. Ma, R. Sankaran and A. Trouvé, "Direct numerical simulation of temporally evolving luminous jet flames with detailed fuel and soot chemistry," 7th U.S. National Combustion Meeting, Atlanta, GA, 20-23 March 2011

P. G. Arias, V.R. Lecoustre, S. P. Roy, W. Wang, Z. Luo, D. C. Haworth, H. G. Im, T. F. Lu, K. L. Ma, R. Sankaran and A. Trouvé, "Direct numerical simulation of temporally evolving luminous jet flames with detailed fuel and soot chemistry," 13th International Conference on Numerical Combustion, Corfu, Greece, 27-29 April 2011

P. G. Arias, P. Narayanan, H. G. Im, A. Trouvé, "Direct Numerical Simulation of Nonpremixed Extinction by Water Spray", AIAA Aerospace Sciences Meeting 2010, Orlando, Florida

P. G. Arias, H. G. Im, P. Narayanan, A. Trouvé, "Direct Numerical Simulation of Turbulent Nonpremixed Flames by Water Spray", US National Combustion Meeting 2009, Ann Arbor, MI

S. Gupta, **Paul G. Arias**, H. G. Im, M. Valorani, "Time Scale Analysis of Ignition Processes using Computational Singular Perturbation," US National Combustion Meeting 2009, Ann Arbor, MI

P. Narayanan, A. Trouvé, **P.G. Arias**, H.G. Im, "Mixture Fraction and State Relationships in Diffusion Flames Interacting with an Evaporating Water Spray," US National Combustion Meeting 2009, Ann Arbor, MI

Additional Presentations

P.G. Arias, "High Performance Computing and Discovery in Combustion Physics," Society of Hispanic Professional Engineers Hispanic Faculty Congress, 2015, Baltimore, MD

P. G. Arias, S. Roy, V. Lecoustre, H. G. Im, D. C. Haworth, A. Trouvé, "Soot Modeling of Diffusion Flames Using Method of Moments with Interpolative Closure", European Combustion Meeting 2013, Lund, Sweden

P. G. Arias, H. G. Im, P. Narayanan, A. Trouvé, "A computational study of non-premixed flame extinction by water spray," Society of Hispanic Professional Engineers National Conference 2012, Fort Worth, TX

P. G. Arias, Hong G. Im, P. Narayanan, A. Trouvé, "A computational study of non-premixed flame extinction by water spray," Engineering Graduate Symposium Poster 2012, University of Michigan, Ann Arbor, MI

H. G. Im, A. Trouvé, **P. G. Arias**, P. Narayanan, "Direct Numerical Simulation of Turbulent Nonpremixed Flame Extinction by Water Spray," SciDAC 2008, Seattle, Washington

P. G. Arias, H. G. Im, P. Narayanan, A. Trouvé, "Direct Numerical Simulations of Nonpremixed Flame Quenching by Fine Water Droplets", SIAM Tenth International Conference on Numerical Combustion March 2008, Monterrey, California

H. G. Im, A. Trouvé, C. J. Rutland, **P. G. Arias**, P. Narayanan, S. Srinivasan, C. S. Yoo, "Direct Numerical Simulation of Turbulent Counterflow Nonpremixed Flames", SciDAC 2007, Boston, Massachusetts

AWARDS & HONORS

2012 Engineering Graduate Symposium, University of Michigan
2nd Place Poster, Fluidic Dynamics, Thermodynamics, Heat Transfer, and Combustion Session

Society of Hispanic Professional Engineers (SHPE) National Technical Achievement and Recognition Award
Graduate Student Role Model (2012)

Martin Luther King, Jr Spirit Award
University of Michigan (2012)

SHPE Graduate Student Member of the Year
University of Michigan Student Chapter (2009)

Rackham Merit Fellowship (RMF)
Engineering Fellow –University of Michigan (2005-2010)

Unisys Scholarship
Mechanical and Aerospace Engineering, Rutgers University (2003 – 2005)

Martin Luther King, Jr. Scholarship
NJ Department of Education, Rutgers University (2002)

ADDITIONAL

Volunteer as IT consultant for non-profit organizations | Raspberry Pi project enthusiast |Woodworker | Scuba diver | Travelled to six continents | Black belt in Tae Kwon Do
Google Scholar Page: https://scholar.google.com/citations?user=4AqB6JgAAAAJ&hl=en

LANGUAGES

Fluent: Spanish | Conversational: Portuguese, Mandarin Chinese