Piyush M. Mehta
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RESEARCH INTEREST AREAS

Reduced Order Modeling	Upper Atmosphere Modeling
Space Situational Awareness	Data Assimilation
Bayesian/Statistical Modeling	(Re)-Entry Modeling and Simulation

EDUCATION

The University of Kansas, Lawrence, KS — May 2013
Doctor of Philosophy with *Honors*, Aerospace Engineering, GPA 3.86
Dissertation: "*Thermospheric Density and Satellite Drag Modeling*"
The University of Kansas, Lawrence, KS — May 2009
Bachelor of Science in Aerospace Engineering, GPA 3.54
Utah State University, Logan, UT
Aerospace Engineering coursework for 3 semesters — Aug 2005 – Dec 2006

RESEARCH EXPERIENCE

The University of Minnesota, Department of Aerospace Engineering and Mechanics
(*Postdoctoral Research Associate*) — Oct 2016 – present
- Manage and direct undergraduate students towards development of a tracking pipeline
- Reduced Order Modeling of Upper Atmosphere (UA)
- Calibration of UA through data assimilation
- Working on various research ideas related to Space Situational Awareness
- White paper and proposal writing

The University of Strathclyde
(*Marie Curie Experienced Researcher*) — Apr 2014 – Mar 2016
- Modeled Atmospheric Re-entry as part of the STARDUST project
- Uncertainty Quantification for re-entry using Monte Carlo and other methods
- Scientific code development towards an open-source tool-kit for re-entry
- Wrote Grant Proposals (Co-I: ESA ITT €150k)
- Performed outreach to several communities
- Attended training activities organized within the Stardust Network

Deimos Space
(*Visiting Fellow*) — Oct 2015 – Dec 2015
- Provide support towards update of DRAMA re-entry tool
- Improve aerodynamic and aerothermodynamic models for re-entry
- Learn architecture development and implementation for simulation tools

The University of New South Wales at the Australian Defense Force Academy
(*Visiting Fellow*) Sep 2014 – Aug 2016

- Provided direction and expertise towards SSA portfolio at UNSW ADFA
- Learned measurement techniques using the Falcon Telescope Network
- Collaborated on other SSA activities

The Los Alamos National Laboratory
(*Visiting Researcher*) Dec 2012 – July 2013

- Improved satellite drag modeling for satellite conjunction analysis
- Developed satellite drag coefficient models using Bayesian estimation methods
- Modeled atmosphere for improved orbit prediction and collision probabilities
- Simulated drag coefficients using rarefied gas dynamic computational methods
- Analyzed and interpreted large measurement and observation data sets
- Planned and executed successive collaborative efforts for the IMPACT project

The University of Kansas, Department of Aerospace Engineering
(Graduate Research Assistant) Aug 2010 – Nov 2012

- Enhanced state-of-the-art space environment knowledge to enhance SSA
- Developed tools and resources for in orbit collision avoidance
- Modeled satellite drag for SSA
- Developed models for satellite drag using DSMC and statistical analysis methods
- Served as the medium of collaboration between KU and LANL

The Los Alamos National Laboratory
(Vela Summer Fellow) Jun 2012 – Jul 2012

- Vela Fellowship: 1 of 7 space science students selected nationwide
- Modeled of satellite drag using Direct Simulation Monte Carlo
- Attended lecture series on several active research topics
- Conducted research with recognized scientists from diverse backgrounds

FELLOWSHIPS AND AWARDS

- Best Paper Award Finalist, ICATT, 2016
- Sir Arthur Clark Award, British Space Achievement, Stardust, 2015
- Rector-Funded Visiting Fellow Travel Award, UNSW @ ADFA
- Marie Curie Fellowship (European Commission)
- Doctoral Dissertation Honors
- Vela Fellowship (Los Alamos National Laboratory)
- Graduate Student Research Award, The University of Kansas, 2011
- 2nd Place: AIAA Undergraduate Engine Design Team Competition 2009

PROFESSIONAL and COMMUNITY SERVICE

- Reviewer for Journal of Geophysical Research - Space Physics; Space Weather; Annales Geophysicae; Journal of Guidance, Control, and Dynamics; Advances in Space Research; Journal of Spacecraft and Rockets, American Control Conference.
- Reviewer/Assessor for the Royal Astronomical Society (RAS) Research Fellowships
- Editorial Board: American Journal of Space Science, Journal of Space Exploration

- "Stardust: the Gravity of the Situation", Interactive Q&A
- Stardust SSERC Muse Curriculum for Excellence Pilot Project
- Explorathon and European Researchers' Night, Glasgow Science Center, 2014
- Lecture/Seminar: Scottish Space School, 2014
- Public Outreach: Glasgow Science Festival and Possilpoint Community Centre, 2014

PEER-REVIEWED PUBLICATIONS

1. **Piyush M. Mehta**, and Richard Linares, "A methodology for reduced order modeling and calibration of the upper atmosphere", Space Weather, accepted, doi:10.1002/2017SW001642.
2. **Piyush M. Mehta**, Andrew C. Walker, Eric K. Sutton, and Humberto C. Godinez "New density estimates derived using accelerometers on-board the CHAMP and GRACE satellites," Space Weather, 15, 558-576, doi:10.1002/2016SW001562.
3. **Piyush M. Mehta**, Martin Kubicek, Edmondo Minisci, and Massimiliano Vasile, "Sensitivity Analysis and Probabilistic Re-entry Modeling for Debris using High Dimensional Model Representation based Uncertainty Treatment," Advances in Space Research, in press, September 2016.
4. **Piyush M. Mehta**, Andrew Walker, Earl Lawrence, Richard Linares, Dave Higdon, and Josef Koller, "Modeling Satellite Drag Coefficients with Response Surfaces," *Advances in Space Research*, Vol. 54, No. 8, 2014, pp.1590-1607.
5. **Piyush M. Mehta**, Craig A. McLaughlin, and Eric K. Sutton, "A Drag Coefficient Model for GRACE developed using Direct Simulation Monte Carlo," *Advances in Space Research*, Vol 52, No. 12, 2013, pp. 2035-2051.
6. Andrew Walker, **Piyush M. Mehta**, and Josef Koller, "Drag Coefficient Model using the Cercignani-Lampis-Lord Gas-Surface Interaction Model," *Journal of Spacecraft and Rockets*, Vol. 51, No. 5, 2014, pp. 1544-1563.
7. Andrew Walker, **Piyush M. Mehta**, and Josef Koller, "Different Implementations of Diffuse Reflection with Incomplete Accommodation for Drag Coefficient Modeling," *Journal of Spacecraft and Rockets*, Vol. 51, No. 5, 2014, pp. 1522-1532.
8. **Piyush M. Mehta**, Andrew Walker, Craig A. McLaughlin, and Josef Koller, "Comparing Physical Drag Coefficients Computed with Direct Simulation Monte Carlo using different Gas-Surface Interaction Models," *Journal of Spacecraft and Rockets*, Vol. 51, No. 3, 2014, pp. 873-883.

PEER-REVIEWED MANUSCRIPTS (under-review\in-preperation)

1. **Piyush M. Mehta**, Richard Linares, and Eric K. Sutton, "Data-driven inference and investigation of thermosphere dynamics and variations", in preparation.
2. **Piyush M. Mehta**, Richard Linares, and Eric K. Sutton, "A quasi-physical dynamic reduced order model of thermospheric mass density", in preparation.
3. **Piyush M. Mehta**, Richard Linares, Andrew Walker, David M. Palmer, David C. Thompson, "Photometric Data from Non-Resolved Objects for Improved Drag and Re-entry Prediction," under review.
4. Martin Kubicek, **Piyush M. Mehta**, Edmondo Minisci, Massimiliano Vasile "Multi-Fidelity Model Fusion and Uncertainty Quantification using High Dimensional Model Representation," under review.

CONFERENCE PROCEEDINGS AND OTHER PUBLICATIONS

1. **Piyush M. Mehta**, and Richard Linares, "Data-driven inference of thermosphere dynamics and variations", *AGU Fall Meeting*, accepted for poster presentation, 2017.
2. **Piyush M. Mehta**, and Richard Linares, "A methodology for reduced order modeling and calibration of the upper atmosphere", *Astrodynamics Specialist Conference*, Stevenson, WA, August 20-24, 2017.
3. **Piyush M. Mehta**, Andrew C. Walker, Eric K. Sutton, and Humberto C. Godinez "New density estimates derived using accelerometers on-board the CHAMP and GRACE satellites," AGU Fall Meeting, SA31A-2349, 2016.
4. **Piyush M. Mehta**, and Richard Linares, "A methodology for reduced order modeling and calibration of the upper atmosphere", AAS/AIAA Astrodynamics Specialist Conference, August 2017.
5. **Piyush M. Mehta**, Gonzalo Blanco-Arnao, Davide Bonetti, Edmondo Minisci, Massimiliano Vasile, "Computer Graphics for Space Debris", 6th International Conference on Astrodynamics Tools and Techniques, Darmstadt, Germany, 14-17 March, 2016.
6. Martin Kubicek, **Piyush M. Mehta**, Edmondo Minisci, Massimiliano Vasile, "Multi-Fidelity Uncertainty Quantification for Atmospheric Re-entry using High Dimensional Model Representation", 26th AAS/AIAA Space Flight Mechanics Meeting, Napa, California, 14-18 February, 2016.
7. **Piyush M. Mehta**, Martin Kubicek, Edmondo Minisci, Massimiliano Vasile, "Surrogate Model for Probabilistic modeling of Atmospheric Entry for small NEOs", 26th AAS/AIAA Space Flight Mechanics Meeting, Napa, California, 14-18 February, 2016.
8. **Piyush M. Mehta**, Martin Kubicek, Edmondo Minisci, Massimiliano Vasile, "Debris Re-entry Modeling using High Dimensional Derivative Based Uncertainty Quantification", AAS/AIAA Astrodynamics Specialist Conference, Vail, Colorado, 9-13 August, 2015.
9. **Piyush M. Mehta**, Edmondo Minisci, Massimiliano Vasile, Andrew Walker, and Melrose Brown, "Sensitivity Analysis towards Probabilistic Re-Entry Modeling of Spacecraft and Space Debris," AIAA Modeling and Simulation Technologies Conference, Aviation 2015, Dallas, TX, 22-26 June, 2015.
10. **Piyush M. Mehta**, Edmondo Minisci, and Massimiliano Vasile, "Break-up Modeling and Trajectory Simulation under Uncertainty for Asteroids," 4th IAA Planetary Defense Conference (PDC), Frascati, Roma, 13-17 April, 2015.
11. **Piyush M. Mehta**, Edmondo Minisci, Massimiliano Vasile, Andrew Walker, and Melrose Brown, "An Open-Source Hypersonic Aerodynamic and Aerothermodynamic Modeling Tool," 8th ESA symposium for Aerothermodynamics of Space Vehicles, Lisbon, Portugal, 2-6 March, 2015.
12. Josef Koller, Sean M. Brennan, Humberto C. Godinez, Moriba K. Jah, Thomas Kelecy, Brian A. Larsen, …. , **Piyush M. Mehta**, …. , Brent E. Wohlberg, "A Framework for Integrated Modeling of Perturbations in Atmospheres for Conjunction Tracking (IMPACT)", *AIAA Space Operations Conference*, Pasadena, CA, May 2014.
13. Andrew Walker, Michael Shoemaker, **Piyush M. Mehta**, and Josef Koller, "Gas-Surface Interactions for Satellites orbiting in the lower Exosphere," 24th AAS/AIAA Space Flight Mechanics, AAS 14-436, Santa Fe, NM, 2014.
14. Alexei V. Klimenko, Sean M. Brennan, Humberto C. Godinez, Dave Higdon, Josef Koller, Earl Lawrence, …. , **Piyush M. Mehta**, …. , Craig McLaughlin, "IMPACT:

Integrated Modeling of Perturbations in Atmospheres for Conjunction Tracking", *AAS/AIAA Space Flight Mechanics Conference*, Santa Fe, NM, January 2014.

15. Josef Koller, Sean M. Brennan, Humberto C. Godinez, Dave Higdon, Alexei Klimenko, Brian A. Larsen, …. , **Piyush M. Mehta**, …. , Earl Lawrence, "IMPACT: Integrated Modeling of Perturbations in Atmospheres for Conjunction Tracking", *AGU Fall Meeting*, San Francisco, CA, December 2013.
16. Josef Koller, Sean M. Brennan, Humberto C. Godinez, Dave Higdon, Alexei Klimenko, Brian A. Larsen, …. , **Piyush M. Mehta**, …., Craig McLaughlin, "IMPACT: Integrated Modeling of Perturbations in Atmospheres for Conjunction Tracking", Oral presentation and paper at the *AMOS Conference*, Maui, HI, September 2013.
17. Richard Linares, Michael Shoemaker, Andrew Walker, **Piyush M. Mehta**, David M. Palmer, David C. Thompson, Josef Koller, John L. Crassidis, "Photometric Data from Non-Resolved Objects for Space Object Characterization and Improved Atmospheric Modeling," *AMOS*, September 2013.
18. **Piyush M. Mehta**, Andrew Walker, Earl Lawrence, Richard Linares, David Higdon and Josef Koller, "Modeling Satellite Drag Coefficients with Response Surfaces," *AAS/AIAA Astrodynamics Specialist Conference*, Hilton Head, South Carolina, August 2013.
19. Andrew Walker, **Piyush M. Mehta**, and Josef Koller, "The Effect of Different Adsorption Models on Satellite Drag Coefficients," *AAS/AIAA Astrodynamics Specialist Conference*, Hilton Head, South Carolina, August 2013.
20. Andrew Walker, **Piyush M. Mehta**, and Josef Koller, "A Comparison of Drag Coefficients computed with Diffuse and Quasi-specular Gas-Surface Interaction Models," *Space Weather Workshop*, Boulder, Colorado, April 2013.
21. Alexei V. Klimenko, David Thompson, Sean M. Brennan, Humberto C. Godinez, Dave Higdon, Josef Koller, …. , **Piyush M. Mehta**, …. , Craig McLaughlin, "IMPACT: Integrated Modeling of Perturbations in Atmospheres for Conjunction Tracking", Oral presentation at the *MIT Lincoln Laboratory Space Control Conference*, Lexington, MA, April 2013.
22. Josef Koller, Sean M. Brennan, Humberto C. Godinez, Dave Higdon, Moriba K. Jah, Alexei Klimenko, …. , **Piyush M. Mehta**, …. , Brent Wohlberg, "Integrated Modeling of Perturbations in Atmospheres for Conjunction Tracking", *Space Weather Week Workshop*, Boulder, CO, April 2013.
23. **Piyush M. Mehta**, and Craig A. McLaughlin, "GRACE Drag Coefficient Model Developed using Direct Simulation Monte Carlo (DSMC) Method," *23rd AIAA/AAS Space Flight Mechanics Conference*, AAS 13-284, Kauai, Hawaii, Feb 2013.
24. **Piyush M. Mehta** and Craig A. McLaughlin, "Energy-Accommodation Coefficient and Drag Coefficient Modeling for Stella and Starlette," *International Astronautical Congress*, IAC-12-C1.6.10, Naples, Italy, October 2012.
25. **Piyush M. Mehta** and Craig A. McLaughlin, "Density and Ballistic Coefficient Estimation Revisited," *AAS/AIAA Astrodynamics Specialist Conference*, AAS 11-609, Girdwood, Alaska, July 31 – August 4, 2011.
26. Craig A. McLaughlin, Eric Fattig, Dhaval Mysore Krishna, Travis Locke and **Piyush M. Mehta**, "Time Periods of Anomalous Density for GRACE and CHAMP," *AAS/AIAA Astrodynamics Specialist Conference*, AAS 11-613, Girdwood, Alaska, July 31 – August 4, 2011.

27. Craig A. McLaughlin, Travis F. Lechtenberg, Stephen R. Mance, Travis Locke and **Piyush M. Mehta**, "Fitted Drag Coefficients as a Source of Density Information," *21st AAS/AIAA Space Flight Mechanics Meeting Conference Proceedings*, AAS 11-174, New Orleans, February 13-17, 2011.

PROFESSIONAL MEMBERSHIPS

- Member American Geophysical Union (AGU)
- Member AAS: American Astronautical Society
- Associate Member AIAA: American Institute of Aeronautics and Astronautics
- Member Sigma Gamma Tau, SGT: National Aerospace Engineering Honor Society

PROPOSALS/GRANTS

- Co-I: Benchmarking Re-entry Prediction Uncertainties. Awarded: Total: 150k €, Strathclyde: 40k €.
- Rector-Funded Visiting Fellow Travel Grant, UNSW @ ADFA (AU$5,500; awarded but declined)
- National Research Council (NRC) Post-Doctoral Fellowship (Air Force Research Laboratory): Recommended for award by committee with highest grade ('A'), no awards made due to sequestration.

GRADUATE ADVISING

- M.S. Thesis Committee Member for Chris Ostrom
  Open Source Re-entry Break-up Modeling Tool
  Department of Aerospace Engineering, California Polytechnic State University

TEACHING EXPERIENCE

Department of Aerospace Engineering, California Polytechnic State University
(*Lecturer*) Aug 2013 – March 2014

- AE 401 Propulsion Systems (Fall 2013)
- AE 407 Reentry Aerodynamics (Winter 2014)
- AE 215 Introduction to Aerospace Design (Winter 2014)

Department of Aerospace Engineering, The University of Kansas
(Graduate Teaching Assistant) May 2009 - July 2009

- Aircraft Aerodynamics and Performance (Fall 2009)

⇒ Served as a substitute for the Primary Instructor on sabbatical
⇒ Prepared material and conducted class sessions 3 times a week
⇒ Conducted office hours 2 days/week to help students outside of the classroom

- Senior Aircraft Design (Spring 2010)

School of Engineering, The University of Kansas
(*Tutor***)** Feb 2007 – May 2009

- Tutored Math and Physics
- 1-on-1 tutoring for students with diverse backgrounds

Engineering Learning Community, The University of Kansas
(*Tutor*) Aug 2007 – May 2008

- Recruited on recommendation by the School of Engineering

- Conducted one-on-one and group tutoring sessions in university dormitory

INVITED TALKS

- Seminar – Leolabs, Inc, January 2017.
- Seminar – Indian Institute of Technology, Department of Aerospace Engineering, Mumbai, India 2016
- Seminar – The Royal Melbourne Institute of Technology, School of Mathematical and Geospatial Sciences School Seminar, Melbourne, Australia, 2015
- Seminar – Oklahoma State University, Department of Mechanical and Aerospace Engineering, Stillwater, Oklahoma, 2015
- Seminar – The University of New South Wales at ADFA, School of Engineering and Information Technology, Canberra, Australia, 2014
- Seminar – The Royal Melbourne Institute of Technology, School of Mathematical and Geospatial Sciences School Seminar, Melbourne, Australia, 2014
- Graduate Student Seminar - The University of Colorado, Department of Aerospace Engineering Sciences, Boulder, Colorado, 2012

MEDIA PRESENCE

- Newspaper Article: "Meet the heroes keeping us safe from space junk", The Daily Dot, 17th May 2015. (*website*)