

Dr. Daniel Selva

CONTACT INFORMATION

Assistant Professor
Aerospace Engineering
Texas A&M University
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RESEARCH INTERESTS

Systems engineering and architecture, engineering design and intelligent systems, with emphasis on space systems: global optimization, multi-objective optimization, visual and data analytics, knowledge-based systems, cognitive assistants, human-agent interaction, model-based systems engineering, Earth observation, satellite remote sensing, satellite communications, small satellites, CubeSats.

TEACHING INTERESTS

Spacecraft Engineering, Systems Architecture, Satellite Remote Sensing, Satellite Communications, Design Optimization, Linear Systems, Feedback Control Systems.

ACADEMIC APPOINTMENTS

Assistant Professor	May 2018 to Present
Aerospace Engineering, Texas A&M University	
Assistant Professor	July 2014 to May 2018
Sibley School of Mechanical and Aerospace Engineering, Cornell University	
Faculty Fellow	July 2014 to May 2018
Atkinson Center for a Sustainable Future, Cornell University	
Faculty Fellow	July 2014 to July 2017
Mario Einaudi Center for International Studies, Cornell University	
Adjunct Assistant Professor	July 2013 to July 2014
Sibley School of Mechanical and Aerospace Engineering, Cornell University	
Postdoctoral Associate	June 2012 to July 2014
Department of Aeronautics and Astronautics, Massachusetts Institute of Technology	

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA

Ph.D., Aeronautics and Astronautics, June 2012

- Dissertation: *Rule-based System Architecting of Earth Observation Satellite Systems*
- Advisor: Professor Edward F. Crawley
- Major: Systems engineering
- Minor: Earth Science

Ecole Nationale Supérieure de l'Aéronautique et de l'Espace, Toulouse, France

Diplôme d'Ingénieur, Aeronautics and Astronautics, August 2004

- Thesis Topic: *A statistical model for aerodynamic losses in jet blades as a function of airfoil geometry*
- Advisor: Dr. Alain Carrère
- Major: Aircraft design
- Minor: Propulsion and Aerodynamics

Universitat Politècnica de Catalunya, Barcelona, Spain

Ingeniero Superior, Electrical (Telecommunications) Engineering, August 2004

- Specialization in Communications (emphasis on electromagnetics, radiation, antennas, and remote sensing)

INDUSTRY EXPERIENCE

Arianespace, Kourou, French Guiana

Operational Engineer

September 2004 to September 2008

- Member of the Ariane 5 Launch team. Successfully launched 21 Ariane 5, including the first launch of three new versions: A5ECA, A5GS, A5ES.
- Ariane 5 Assistant to the Ground Facilities Manager: During launch campaigns, management of the teams performing operations on the ground facilities including transfers of the launch vehicle + launch table from integration facility to launch pad (50+ people team).
- Ariane 5 GNC/Avionics Specialist: During launch campaigns, conducted or supervised all operations of the flight control subsystem: on-board computer, IMU, gyrometers, MIL-STD-1553 buses, sensors (e.g. pressure, temperature, vibrations, shocks, displacement), actuators. This included participating in the resolution of technical anomalies appearing during campaigns.
- Ground software generation manager: Between launch campaigns, responsible for the technical and financial management of the ground software generation team (5-7 people team). Approval of all proposals for modification and oversight of all technical anomalies regarding ground software.
- Resident technical expert on the electrical test beds and simulators of the Ariane 5 rocket.

Electronic Data Systems (now Hewlett-Packard), Barcelona, Spain

Network Management

January 2000 to March 2002

- Monitoring and control of la Caixa's IT network (4000+ branches, 8000+ ATM, servers, routers).

Help Desk

January 1999 to January 2000

- Software and hardware support for la Caixa employees.
- Customer support (Credit Card Help Desk).

CONSULTING
EXPERIENCE

Nu Orion, New York, NY

Board of Advisors

January 2014 to July 2014

- Technical expertise in application of complex simulation and optimization problems to wealth management.

Cambrian Innovation, Cambridge, MA

External consultant

September 2010 to December 2012

- Technical expertise in application of complex simulation and optimization problems to bioelectromechanical systems.
- Developed a MATLAB tool to support systems engineering effort in the design of novel bioelectromechanical systems.
- Conducted preliminary quantification of benefits of incorporating novel bioelectromechanical systems developed by Cambrian Innovation into the current NASA Environmental Control and Life Support System.

Electronic Data Systems (now Hewlett-Packard), Barcelona, Spain

Network Management

January 2000 to March 2002

- Monitoring and control of la Caixa's IT network (4000+ branches, 8000+ ATM, servers, routers).

Help Desk

January 1999 to January 2000

- Software and hardware support for la Caixa employees.
- Customer support (Credit Card Help Desk).

FUNDING

Co-I on NASA NNH16ZDA001N-AIST, “Generalizing Distributed Missions Design Using the Trade-space Analysis Tool for Constellations (TAT-C) and Machine Learning (ML)” (PI: Jacqueline Le Moigne, GSFC). \$185,993 allocated to Dr. Selva, Aug 01 2017–July 31 2019

PI on NASA NSTRF NNX16AM51H (PhD student fellowship), “Intelligent data understanding for architecture analysis of entry, descent, and landing”, \$74,000 Sep 01 2017–Aug 31 2018

Co-I on NASA NNH12ZDA006O-EVI3, “Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats (TROPICS)” (PI: Bill Blackwell, Lincoln Lab). \$217,836 allocated to Dr. Selva, Sep 01 2016–June 30 2019

PI on NSF CMMI-1635253, “Improved human-computer interaction for design of complex systems” (Co-Is: Guy Hoffman and So-Yeon Yoon). \$299,999, \$118,534 allocated to Dr. Selva, Sep 01 2016–Aug 31 2019

PI on NASA NSTRF NNX16AM51H (PhD student fellowship), “Design and Optimization of Space System Architectures: Applying and Extracting Lessons Learned”, \$148,000 Sep 01 2016–Aug 31 2018

PI on Mathworks “Development of Online Course Materials for Spacecraft Engineering Curriculum” (Co-I: Dmitry Savransky), \$40,000, Jul 01 2016–Jun 30 2017

PI on Cornell Einaudi Chair Innovation Grants, “Training the Next Generation of Global Engineers: Lessons Learned From Top Universities Around the World”, \$5,000, January 01 2016–December 31 2016

Co-I on NOAA DG133E-05-RP-1034, “New Sensor Validation Approaches leveraging LEO constellations” (PI: Bill Blackwell, Lincoln Lab), \$75,000 allocated to Dr. Selva’s task, Jul 01 2014–Jun 30 2015

BOOKS

- [1] Crawley, E. F., Cameron, B., and **Selva, D.**, *Systems Architecture: Strategy and product development for complex systems*. Prentice Hall. 2015.

JOURNAL PAPERS

- [2] **Selva, D.**, and Krejci, D. Capabilities of CubeSats for Earth Science. *Journal of Small Satellites*, Under Review.
- [3] N. Hitomi, H. Bang, and **D. Selva**. KDO\AOS: Adaptive Knowledge-Driven Optimization for Architecting a Distributed Satellite System. *Journal of Aerospace Information Systems*. Accepted. 2018.
- [4] Gallud Cidoncha, X., and **Selva, D.** Agent-based simulation framework and consensus algorithm for observing systems with adaptive modularity. *Systems Engineering*. Accepted. DOI: 10.1002/sys.21433. 2018.
- [5] N. Hitomi and **D. Selva**. Incorporating Expert Knowledge Into Evolutionary Algorithms with Operators and Constraints to Design Satellite Systems. *Applied Soft Computing*. Vol. 66, pp.330-345. DOI: 10.1016/j.asoc.2018.02.017. 2018.
- [6] C. Araguz, M. Mari, **D. Selva**, E. Bou-Balust, and E. Alarcon. General-Purpose Payload-Oriented Nano-Satellite Software Architecture. *AIAA Journal of Aerospace Information Systems*, Vo. 15, No. 3 (2018), pp. 107-119. DOI: 10.2514/1.I010537. 2018.

- [7] **Selva, D.**, Golkar, A., and Korobova, O. (2017). Distributed and Federated Satellite Systems: What is Needed to Move Forward? *Journal of Aerospace Information Systems*. Vol. 14(8), pp. 412–438. DOI: 10.2514/1.I010497. 2017.
- [8] **D. Selva**, B. Cameron and E.F. Crawley. Patterns in System Architecture Decisions. *Systems Engineering*. Vol. 19(6), pp. 474–497. DOI: 10.1002/sys.21370. 2016.
- [9] N. Hitomi and **D. Selva**. A Classification and Comparison of Credit Assignment Strategies in Multiobjective Adaptive Operator Selection. *IEEE Transactions on Evolutionary Computation*. Vol. 21(2). pp 294–314. DOI: 10.1109/TEVC.2016.2602348. 2016.
- [10] N. Knerr and **D. Selva**. Cityplot: Visualization of high-dimensional design spaces with multiple criteria. *ASME Journal of Mechanical Design*, Vol. 138(9), pp. 091403–091403-9. 2016. DOI:10.1115/1.40339873
- [11] M. Sanchez, I. Del Portillo, B. Cameron, E.F. Crawley and **D. Selva**. Integrated Tradespace Analysis of Space Network Architectures. *AIAA Journal of Aerospace Information Systems*, Vol 12(8), pp. 564–578. 2015. DOI: 10.2514/1.I010356
- [12] **D. Selva**, B. Cameron, and E.F. Crawley. Rule-based System Architecting of Earth Observing Systems: The Earth Science Decadal Survey. *AIAA Journal of Spacecraft and Rockets*, Vol. 51(5), pp. 1505–1521. 2014. DOI: 10.2514/1.A32656
- [13] **D. Selva**, B. G. Cameron, and E.F. Crawley. A Rule-Based Method for Scalable and Traceable Evaluation of System Architectures. *Research in Engineering Design*, Vol. 25(4), pp. 325.-349. 2014. DOI: 10.1007/s00163-014-0180-x
- [14] **Selva, D.**, and Krejci, D. Survey and assessment of the capabilities of Cube-sats for Earth observation. *Acta Astronautica*, Vol. 74 (May-June 2012):50–68. 2012 (**Most cited article published in the journal since 2012**). DOI: 10.1016/j.actaastro.2011.12.014
- [15] M. Vall-llossera, A. Camps, I. Corbella, F. Torres, N. Duffo, A. Monerris, R. Sabia, **D. Selva**, C. Antolin, E. Lopez-Baeza, J. Ferran Ferrer and K. Saleh. SMOS REFLEX 03: L-band emissivity characterization of vineyards. *IEEE Transactions on Geoscience and Remote Sensing*, Vol. 43(5). 2005. DOI: 10.1109/TGRS.2005.844102
- PEER-REVIEWED
CONFERENCE
PAPERS
- [16] **Selva, D.**, and Dutta, P. (2018). Is there a future to GEO-based weather monitoring? The coverage-cost argument. 2018 IEEE International Geoscience and Remote Sensing Conference. (Short Paper).
- [17] Bang, H., Viros, A., Prat, A., Yoon, S-Y., Hoffman, G., and **Selva, D.** (2018). Exploring the Feature Space to Aid Learning in Design Space Exploration. 2018 Design Computing and Cognition.
- [18] Law, M., Dhawan, N., Bang, H., **Selva, D.**, Yoon, S-Y., and Hoffman, G. Side-by-side Human-Computer Design using a Tangible User Interface. 2018 Design Computing and Cognition.
- [19] Shi, L., Bang, H., **Selva, D.**, Hoffman, G., and Yoon, S-Y. (2018). Cognitive style and field knowledge in complex design problem solving: A comparative case study of decision support systems. 2018 Design Computing and Cognition.
- [20] Sease, M., Smith, B., Hummell, J., and **Selva, D.** Setting Priorities: Demonstrating Stakeholder Value Networks in SysML. 2018 INCOSE International Workshop.

- [21] Santini De Leon, S., and **Selva, D.** A Rule-Based Tool for Science Traceability of Mars Exploration Mission Architectures. 2018 IEEE Aerospace Conference.
- [22] Hitomi, N., and **Selva, D.** Constellation Optimization Using an Evolutionary Algorithm with a Variable-length Chromosome. 2018 IEEE Aerospace Conference.
- [23] Bang, H., Viros, A., Prat, A., and **Selva, D.** (2018). Daphne : An Intelligent Assistant for Architecting Earth Observing Satellite Systems. AIAA SciTech 2018, AIAA 2018-1366. DOI: 10.2514/6.2018-1366
- [24] Bang, H., and **Selva, D.**, Leveraging Logged Intermediate Design Attributes For Improved Knowledge Discovery In Engineering Design, Proceedings of the ASME 2017 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference IDETC/CIE 2017. DOI: 10.1115/DETC2017-67835. 2017.
- [25] Stojanovski, Z., Hall, U., and **Selva, D.** (2017). Optimizing Commonality and Performance in Platform-Based Earth Observing SmallSat Architectures. In *2017 IEEE Aerospace Conference*. DOI: 10.1109/AERO.2017.7943665. 2017.
- [26] N. Hitomi, H. Bang, and **D. Selva.** Extracting and Applying Knowledge with Adaptive Knowledge-driven Optimization to Architect and Earth Observing Satellite System. *AIAA Information Systems-AIAA Infotech @ Aerospace, AIAA SciTech Forum, (AIAA 2017-0794)*. 2017. DOI: 10.2514/6.2017-0794
- [27] N.Knerr, **D. Selva.** Mining Multi-Objective Minimal Commitment Decision Significance via Cluster-and-Find-Changes. *58th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference*. 2017. DOI: 10.2514/1.C000311
- [28] H. Bang, **D. Selva.** iFEED: Interactive Feature Extraction for Engineering Design. *Proceedings of the ASME 2016 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference IDETC/CIE 2016*. 2016. DOI: 10.1115/DETC2016-60077
- [29] N. Hitomi, **D. Selva.** A hyper-heuristic approach to leveraging domain knowledge in multi-objective evolutionary algorithms. *Proceedings of the ASME 2016 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference IDETC/CIE 2016*. 2016. DOI: 10.1115/DETC2016-59870
- [30] R. Patel, W. Paleari and **D. Selva.** Architecture Study of an Energy Microgrid. *2016 11th System of Systems Engineering Conference (SoSE)*, Kongsberg. 2016. DOI: 10.1109/SYSOSE.2016.7542932
- [31] **Selva, D.**, Dingwall, B. and Altunc, S. A Concept for an Agile Mission Development Facility for CubeSat and Suborbital Missions. In: *2016 IEEE Aerospace Conference*, Big Sky, MT, 2016. DOI: 10.1109/AERO.2016.7500564
- [32] S. J. Das, **D. Selva**, and A. Golkar. "An Intelligent Spacecraft Configuration Tool for Mission Architecture Space Exploration", AIAA SPACE 2015 Conference and Exposition, AIAA SPACE Forum, (AIAA 2015-4439). DOI: 10.2514/6.2015-4439.
- [33] N. Hitomi, **D. Selva.** The Effect of Credit Definition and Aggregation Strategies on multi-objective hyper-heuristics. *Proceedings of the ASME 2015 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference IDETC/CIE 2015*. 2015. DOI: 10.1115/DETC2015-47445

- [34] N. Hitomi, **D. Selva**. Experiments with Human Integration in Asynchronous and Sequential Multi-Agent Frameworks for Architecture Optimization. *Procedia Computer Science*, Vol. 44, pp. 393-402. 2015. DOI: 10.1016/j.procs.2015.03.024
- [35] C. Abello, N. Hitomi, **D. Selva**. Preliminary Experiments with Learning Agents in an Interactive Multi-agent Systems Architecture Tradespace Exploration Tool. *2015 Annual IEEE Systems Conference (SysCon) Proceedings*, Vancouver, BC, 2015 pp. 445-452. DOI: 10.1109/SYSCON.2015.7116791
- [36] M. Jacobs, **D. Selva**. A Cubesat Catalog Design Tool for a Multi-Agent Architecture Development Framework. In: *2015 IEEE Aerospace Conference*, Big Sky, MT, 2015. DOI: 10.1109/AERO.2015.7119240
- [37] I. Del Portillo, E. Bou, E. Alarcon, M. Sanchez-Net, **D. Selva**, A. Alvaro. On scalability of Fractionated Satellite Network architectures. *2015 IEEE Aerospace Conference*, Big Sky, MT, 2015. DOI: 10.1109/AERO.2015.7119143
- [38] **Selva, D.**, Development of a Test-Bed for Knowledge-Intensive System Architecture Optimization, *2014 IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, San Diego, CA, 2014, pp. 3394-3398. DOI: 10.1109/SMC.2014.6974452
- [39] **Selva, D.**, Knowledge-intensive Global Optimization of Earth observing System Architectures: A Climate-centric Case Study, *Proc. SPIE. 9241, Sensors, Systems, and Next-Generation Satellites XVIII, 92411S*. 2014. DOI: 10.1117/12.2067558
- [40] Helmuth, D., **Selva, D.**, and Dwyer, M., Collaboration pathways using new tools for optimizing operational climate monitoring from space: A Climate-centric Case Study, *Proc. SPIE. 9241, Sensors, Systems, and Next-Generation Satellites XVIII, 92411R*. 2014. DOI: 10.1117/12.2067427
- [41] Dwyer, M. Szajnfarber, Z., **Selva, D.**, Crawley, E., 2014. The Cost of Jointness and How to Manage It. *AIAA SPACE 2014 Conference and Exposition, AIAA SPACE Forum, (AIAA 2014-4443)*. 2014. DOI: 10.2514/6.2014-4443
- [42] Dwyer, **Selva, D.**, M. Szajnfarber, Z., Cameron, B., Crawley, E., 2014. Exploring the Trade-offs of Aggregated versus Disaggregated Architectures for Environmental Monitoring in Low-Earth Orbit. *AIAA SPACE 2014 Conference and Exposition, AIAA SPACE Forum, (AIAA 2014-4416)*. 2014. DOI: 10.2514/6.2014-4416
- [43] M. Sanchez, **D. Selva**, B. Cameron, A. Seas, B. Seery and E.F. Crawley. Results of the MIT Space Communication and Navigation Architecture Study. *2014 IEEE Aerospace Conference*, Big Sky, MT, 2014. DOI: 10.1109/AERO.2014.6836339
- [44] **D. Selva** Experiments in knowledge-intensive system architecting: Interactive architecture optimization. *2014 IEEE Aerospace Conference*, Big sky, MT, 2014. DOI: 10.1109/AERO.2014.6836282
- [45] M. Sanchez, **D. Selva**, A. Golkar. Exploring Classification Algorithms for Early Mission Formulation Cost Estimation. *2014 IEEE Aerospace Conference*, Big Sky, MT, 2014. DOI: 10.1109/AERO.2014.6836326
- [46] **D. Selva** and E.F. Crawley. VASSAR: Value Assessment of System Architectures Using Rules. *2013 IEEE Aerospace Conference*, Big Sky, MT, 2013. DOI: 10.1109/AERO.2013.6496936
- [47] M. Sanchez, **D. Selva**, B. Cameron, A. Seas, B. Seery and E.F. Crawley. Exploring the Architectural Trade Space of NASA's Space Communication and Navigation Program. *2013 IEEE Aerospace Conference*, Big Sky, MT, 2013. DOI: 10.1109/AERO.2013.6497173

- [48] M. Dwyer, **D. Selva**, Z. Szajnarfarber, B. Cameron, and E. F. Crawley. The impact of technical complexity on the decision to collaborate and combine. *2013 IEEE Aerospace Conference*, Big Sky, MT, 2013. DOI: 10.1109/AERO.2013.6496898
- [49] L. Dyrud, J. Fentzke, G. Bust, B. Erlandson, S. Whitely, B. Bauer, S. Arnold, **D. Selva**, K. Cahoy, S. Slagowski, W. Wiscombe, S. Lorentz, R. Bishop, B. Gunter, K. Trenberth. GEOScan: A Global, Real-Time Geoscience Facility. *2013 IEEE Aerospace Conference*, Big Sky, MT, 2013. DOI: 10.1109/AERO.2013.6497141
- [50] **Selva, D.**, and Krejci, D., Preliminary Assessment of Performance and Cost of a Cubesat Component of the Earth Science Decadal Survey. *27th Annual AIAA-USU Conference on Small Satellites*, August 2013.
- [51] **D. Selva** and E.F. Crawley. A rule-based decision support tool for architecting Earth observing missions. *2012 IEEE Aerospace Conference*, Big Sky, MT, 2012. DOI: 10.1109/AERO.2012.6187439
- [52] **D. Selva** and E.F. Crawley. Exploring Packaging Architectures for the Earth Science Decadal Survey. *2011 IEEE Aerospace Conference*, Big Sky, MT, 2011. DOI: 10.1109/AERO.2011.5747651
- [53] **D. Selva** and E.F. Crawley. Integrated Assessment of Packaging Architectures in Earth Observing Programs. *2010 IEEE Aerospace Conference*, Big Sky, MT, 2010. DOI: 10.1109/AERO.2010.5446885
- [54] P. M. Cunio, A. Babuscia, Z. J. Bailey, H. Chaurasia, R. Goel, A. Golkar, **D. Selva**, E. Timmons, B. E. Cohanin, J. A. Hoffman, and D. W. Miller. Initial Development of an Earth-Based Prototype for a Lunar Hopper Autonomous Exploration System. *AIAA SPACE 2009 Conference & Exposition, AIAA SPACE Forum*. 2009. DOI: 10.2514/6.2009-6713
- [55] J. Krueger, **D. Selva**, M. Smith and J. Keesee. Constellation and Spacecraft Design for a Continuous Responsive Imaging System in Space. *AIAA SPACE 2009 Conference & Exposition, AIAA SPACE Forum*. 2009. DOI: 10.2514/6.2009-6773
- [56] **Selva Valero, D.**, Near-Far Field Corrections in the Measurement of an Interferometric Two-Dimensional Radiometer in Anechoic Chambers. *IAF abstracts, 34th COSPAR Scientific Assembly, The Second World Space Congress*, 10–19 October, 2002.
- CONFERENCE POSTERS
- [57] N. Knerr, N. Kinzly, and D. Selva. “Cityplot-VR: Implementing virtual reality for design decision tradeoff visualization”. *IDETC 2017*, 2017. Poster.
- [58] N. Knerr and **D. Selva**. Cityplot: Multi-objective Tradeoff Visualization Respecting Decisions Similarity. *CESUN Meeting 2016*, 2016. Poster.
- [59] H. Bang and **D. Selva**. Designing visual and verbal interactions for improved understanding and validation of rule-based value functions in system architecture. *CESUN Meeting 2016*, 2016. Poster.
- [60] N. Hitomi, **D. Selva**. Adaptive Domain-Specific Heuristics for Optimization of Systems Architecture. *CESUN Meeting 2016*, 2016. Poster.
- [61] N. Hitomi, **D. Selva**. A Knowledge-Based Decision-Support Tool for Architecting Severe Weather Monitoring Nanosatellite Constellations *AGU Fall Meeting 2014*, December 2014. Poster.

[62] W. Blackwell, C. Crail, C. Galbraith, R. Leslie, I. Osaretin, M. Shields, A. Marinan, A. Nicholas, K. Cahoy, and **D. Selva**. Nanosatellite Architectures for Improved Study of the Hydrologic Cycle. *AGU Fall Meeting 2012*, December 2012. Poster.

[63] C. Calvo-Juan, T. Seher, **D. Selva**, B. Suarez, T. Sutherland, and E. F. Crawley. Computational Tools for Architecting the nation's space-based Earth Observation Program. *2nd International Conference on Computational Sustainability*, June 28–30 2010. Poster.

THESIS AND
DISSERTATION

[64] **D. Selva**, *Rule-based System Architecting of Earth Observing Satellite Systems*. Dissertation, Massachusetts Institute of Technology, Cambridge, MA, 2012.

[65] **D. Selva**, *Modélisation des pertes de profil d'aubage dans l'outil de mise en place de veine compresseur*. Master's thesis, Ecole Nationale Supérieure de l'Aéronautique et de l'Espace, Toulouse, France, 2004.

INVITED TALKS,
PANELS AND
SEMINARS

- Invited seminar at **Jet Propulsion Lab**, February 9, 2018.
- Invited seminar at **MITRE**, December 6, 2017.
- Invited seminar at **Texas A&M University**, August 17, 2017.
- Invited seminar at **Oregon State University**, March 3, 2017.
- Invited seminar at **University of Connecticut** UTC Institute for Advanced Systems Engineering, February 17, 2017.
- Panelist at **4th FSS Workshop**, Rome, Oct 10, 2016.
- Invited seminar at **The Aerospace Corporation**, May 17, 2016.
- Invited seminar at **Syracuse University**, April 29, 2016.
- Invited seminar at **University of Alabama in Huntsville**, April 13, 2016.
- Invited seminar at **Boeing Helicopters**, February 22, 2016.
- Panelist at the **INCOSE Finger Lakes Chapter Annual Dinner**, April 27, 2015.
- Guest lecturer at **Institut Supérieur de l'Aéronautique et de l'Espace**, April 27, 2015.
- Invited seminar at **Lockheed Martin**, July 17, 2014.
- Invited seminar at **Cornell University** - Mechanical&Aerospace Engineering School, March 13, 2013.
- Invited seminar at **European Space Agency** - Advanced Concepts Team, February 22, 2013.
- Invited seminar at **NASA Jet Propulsion Laboratory**, December 11, 2012.
- Invited seminar at **George Washington University**, November 1, 2012.
- Invited seminar at **Applied Physics Laboratory**, John Hopkins University, March 1, 2012.
- Invited talk at **NASA Langley Research Center**, October 5, 2010.
- Invited talk at **Future In-Space Operations Working Group**, December 16, 2009.

TEACHING
EXPERIENCE

Cornell University, Ithaca, NY

- MAE 4160: Spacecraft Technology and Systems Architecture (Spring 2016).
 - Broad survey of the spacecraft mission design process including payload and subsystem technologies.
- SYSEN 5400: Systems Architecture (Fall 2015, Spring 2015, Fall 2016).
 - Stakeholder analysis, architecture description languages and frameworks, architecture enumeration, evaluation, tradespace analysis, flexibility, resilience, commonality, legacy systems.

STUDENT
ADVISING

PhD Students

- **Samalis Santini De Leon.** PhD candidate at Cornell University MAE (2016-present). PhD topic: Intelligent Data Understanding for Architecture Analysis of Entry, Descent, and Landing Systems
- **Pau Garcia Buzzi.** PhD candidate at Cornell University MAE (2016-present). PhD topic: Adaptive formulations for design optimization.
- **Harris Bang.** PhD candidate at Cornell University MAE (2014-present). PhD topic: Mixed-initiative engineering design of complex systems.
- **Nathan Knerr.** PhD candidate at Cornell University MAE (2013-present). PhD topic: Data and visual analytics for knowledge discovery in engineering design of complex systems.
- **Nozomi Hitomi.** PhD candidate at Cornell University MAE (2013-present). PhD topic: Robust system architecture optimization and incorporation of domain-specific knowledge.

Masters Students

- **Guanqiao Qian.** MEng, Mechanical Engineering, Cornell University (2017). MEng project: Natural Language Processing for Cognitive Design Assistant.
- **Allegra Moran.** MEng, Aerospace Engineering, Cornell University (2017). MEng project: Visualization tools and instructional materials for spaceflight mechanics.
- **Greg Cristina, Matt Eisner, Eric Grohn, Sushruth Kamath, Niccolo Porcari, Albert Quizon, Ellen Thiel, Cory Thomas.** MEng, Mechanical Engineering/Aerospace Engineering/Engineering Mechanics, Cornell University (2017). MEng project: CUGravity: Design of a CubeSat to demonstrate artificial gravity.
- **Anjit Fageria.** Meng candidate at Cornell University Systems Engineering (2015-2016). Meng project: Spacecraft configuration automation for concurrent architecture development software.
- **Alyssa Francken.** Meng candidate at Cornell University Systems Engineering (2015-2016). Meng project: Architecture study for a constellation of LEO satellites for global internet services.
- **Monica Jacobs.** Meng candidate at Cornell University Systems Engineering (2014-2015). Meng project: A Cubesat Catalog Design Tool for a Multi-Agent Architecture Development Framework.
- **Spandan Das.** Meng candidate at Cornell University MAE (2014-2015). Meng project: An automatic spacecraft configuration tool for rapid tradespace exploration.

PhD Committee Membership

- Minor Member, Bernardo Carvalho, PhD in Civil and Environmental Engineering, Cornell University (exp. 2018)
- Minor Member, Kyle Doyle, PhD in Mechanical and Aerospace Engineering, Cornell University (exp. 2018)
- Minor Member, Gabriel Soto, PhD in Mechanical and Aerospace Engineering, Cornell University (exp. 2019)
- Minor Member, Zelin Linghu, MS in Mechanical and Aerospace Engineering, Cornell University (exp. 2018)
- Reader, Narek Shougarian (MIT)
- Reader, Ben Corbin (MIT)

Undergraduates and visiting students

- **Amritansh Kwatra.** Undergraduate student at Cornell University (Summer 2017). **Engineering Learning Initiatives Undergraduate Research Award.**

- **Ria Singh.** Undergraduate student at Cornell University (Summer 2017).
- **Nathaniel Kinzly.** Undergraduate student at Cornell University (Spring 2017). Research project: Virtual reality environment for visualization of high-dimensional design spaces. Resulted in a poster presentation at IDETC.
- **Antoni Viros Martin.** Visiting student at Cornell University MAE (Spring and Summer 2017). Thesis project: Question-answering system and Historian skill for cognitive assistant for Earth observation satellite mission design. Resulted in a conference paper.
- **Arnau Prat Sala.** Visiting student at Cornell University MAE (Spring and Summer 2017). Thesis project: Virtual reality environment, physical embodiment, and Critic skill for cognitive assistant for Earth observation satellite mission design. Resulted in a conference paper.
- **Sooyoun Oh.** Undergraduate student at Cornell University (Summer 2016). Research project: Visual and data analytics for design of GN&C systems.
- **Kevin Liu.** Undergraduate student at Cornell University (Summer 2016). Research project: Improved astrodynamics model for concurrent architecture development software. Engineering Learning Initiatives Undergraduate Research Award.
- **Samuel Wu.** Undergraduate student at Cornell University (Summer 2016). Research project: Improved Structures model for concurrent architecture development software.
- **Carmen Fang.** Undergraduate student at Cornell University (Summer 2016). Research project: Thermal model for concurrent architecture development software.
- **Nelson Ng.** Undergraduate student at Cornell University (Summer 2016). Research project: Improved ADCS model for concurrent architecture development software.
- **Ximo Gallud Cidoncha.** Visiting student at Cornell University MAE (2016-present). Thesis project: Agent-based simulation of systems with adaptive modularity. Resulted in a conference presentation and journal paper.
- **Zvonimir Stojanovski.** Undergraduate student at Cornell University (2015-present). Research project: Design tool for families of satellite missions with commonality. Engineering Learning Initiatives Undergraduate Research Award. Resulted in a conference paper, conference presentation, and submitted journal paper.
- **Pau Garcia-Buzzi.** Visiting student at Cornell University MAE (2015-2016). Thesis project: Bi-level optimization of communications and power subsystems for concurrent architecture development software.
- **Joe Shin.** Undergraduate student at Cornell University (2015-2016). Research project: ADCS and propulsion subsystems design models for concurrent architecture development software.
- **Eric Grohn.** Undergraduate student at Cornell University (2014-2015). Research project: Astrodynamics approximations for fast mission analysis in concurrent architecture development software.
- **Clara Abello.** Visiting student at Cornell University MAE (2014-2015). Thesis project: Knowledge discovery in system architecture using association rules learning.
- **Marc Sanchez Net.** Visiting student at MIT Aeronautics and Astronautics. Master's thesis: Development of a performance simulation tool for the NASA Space Communication and Navigation system. February – December 2012.
- **Carlos Calvo Juan.** Visiting student at MIT Aeronautics and Astronautics. Master's thesis: Optimal scheduling of Earth observing missions using linear and integer programming. February – December 2010.

MIT System Architecture Lab, Cambridge, MA

Research Assistant

September 2008 to June 2012

- Advisor: Prof. Edward F. Crawley. Development of computational tools to support the system architecting process in different projects:
 - Draper Laboratory: Architecture study for the Iridium Next GEOScan hosted payload program, September 2011 to June 2012
 - Draper Laboratory: System Architecture study of the Earth Science Decadal Survey (under URAD grants), September 2009 to September 2011
 - NASA Goddard Space Flight Center: Comprehensive Analysis and Selection of System Architectures for Earth Observation Campaigns (under grant #NNX08AU06G), September 2008 to September 2009
 - NASA Langley Research Center: GN&C system commonality analysis (under grant #NNX07AE12A), September 2008 to February 2009

European Space Agency, Noordwijk, The Netherlands

Stagiaire

Summer 2009

- Supervisor: Mr. Miguel Aguirre. Multi-instrument satellites versus dedicated platforms.
 - Developed an integrated quantitative model to compare different architectures for Earth observing programs, with emphasis on the trade between large multi-instrument platforms and smaller dedicated platforms.
 - The model contained lifecycle cost, risk, schedule, and performance modules, and it was applied to the Envisat program for validation and to Eumetsat's Post EPS program as a case study.

Snecma Moteurs, Villaroche, France

Research Assistant

March 2004 - September 2004

- Supervisor: Mr. Jean-Francois Rios. MS Thesis: A new 2D model for aerodynamic losses in jet blades as a function of the airfoil geometry.
 - Developed and tested a new model that correlates aerodynamic losses in jet blades to the airfoil geometric parameters.
 - This model was subsequently integrated in a 2D CFD meridian code resulting in an improvement of the code's performance.

Remote Sensing Lab, Universitat Politecnica de Catalunya, Barcelona, Spain

Research Assistant

Summer 2003

- Advisor: Prof. Adriano Camps. Worked on the REFLEX (REFerence Pixel L-band Experiment) project, sponsored by the ESA in preparation of the SMOS (Soil Moisture and Ocean Salinity) mission
 - Led a measurement campaign (REFLEX 03) of the L-band emissivity of a vineyard using multiangular radiometric measurements.
 - Processed data with MATLAB and studied the effect of vegetation parameters in the soil moisture retrieval process using the $\tau - \omega$ model.

PROFESSIONAL
SERVICE

Advisory Committees

- Member, Advisory Committee for Earth Observation, *European Space Agency*, 2018 - 2020

Editor

- Guest Editor for *AIAA Journal of Aerospace Information Systems*, 2016

Referee Service

- *NSF Panelist*, 2016–present
- *IEEE Systems Journal*, 2015–present
- *INCOSE Systems Engineering Journal*, 2015–present
- *Design Studies*, 2015–present
- *ASME Journal of Mechanical Design*, 2015–present
- *ASME IDETC Design Automation Conference*, 2015–present
- *IEEE Systems Conference*, 2015
- *NASA External Reviewer*, 2015
- *NSERC Discovery Grant External Reviewer*, 2015
- *AIAA Journal of Aerospace Information Systems*, 2015–present
- *Research in Engineering Design*, 2014–present
- *IEEE Transactions on Aerospace and Electronic Systems*, 2014–present
- *Acta Astronautica*, 2014–present
- *IEEE Aerospace Conference*, 2014–present
- *AIAA Journal of Spacecraft and Rockets*, 2010–present

Conference Organizer/Co-Chair

- *Invited Session chair*, *AIAA SciTech Conference*, 2018
- *Workshop co-chair*, *AIAA Intelligent Systems Workshop*, 2017
- *Session co-chair*, *ASME IDETC Design Automation Conference*, 2016–present
- *Conference co-chair*, *Federated Satellite Systems Workshop*, 2014–present
- *Session co-chair and Best Paper Award Committee co-chair*, *IEEE Aerospace Conference*, 2014–present

Technical Committee Memberships

- *AIAA Intelligent Systems Technical Committee*, 2016–present
 - Intelligent Systems Workshop subcommittee
 - Intelligent Systems Roadmap subcommittee

UNIVERSITY SERVICE

Cornell Systems Program

- Chair, PhD Research Committee, 2016 – Present
 - Led the development of a new PhD and MS program in Systems, including curriculum development (new and existing courses, qualifying exam), marketing, and admissions.
 - Worked on the development of the new Ezra Scholars program, providing various opportunities for Systems researchers to come to Cornell in various capacities (invited scholar, post-doc, speaker) for a few days up to a few years.
- Organizer, Ezra Systems Seminar, 2016 – Present
- Member, Executive Committee, 2014 – Present

Cornell Sibley School of Mechanical and Aerospace Engineering

- Member, Spacecraft Engineering Faculty Search Committee, 2017
- Member, Engineering Design Group
 - Designed a new qualifying exam in engineering design area, 2017
- Member, Dynamics Systems and Controls Group, 2014 – Present
 - Participated in qualifying exams and admissions in DSC
 - Participated in the revamping of the DSC curriculum
- Member, Graduate Program Committee, 2016 – Present
- Organizer, MAE Colloquium, 2016
- Faculty Advisor, Cornell Rocketry Team, 2015 – Present

PROFESSIONAL MEMBERSHIPS

Member

- American Society of Mechanical Engineers (ASME), 2014–present
- International Council on Systems Engineering (INCOSE), 2014–present
- Institute for Electrical and Electronics Engineers (IEEE), 2009–present
- American Institute of Aeronautics and Astronautics (AIAA), 2009–present

OUTREACH AND
VOLUNTEER
SERVICE

Cornell University, Ithaca, NY

4-H Career Exploration Workshop Organizer

June 2017

- Organized a workshop “Mission to Mars” with 5 groups of 15 middle-schoolers as part of the Cornell 4-H Career Exploration program. This included developing a simple concurrent design environment to facilitate the collaborative design of a mission to Mars, taking into account different design decisions and criteria.

Massachusetts Institute of Technology, Cambridge, MA

Co-Instructor

September 2010

- Led the design, implementation, and instruction of a project-based introductory course to space systems engineering for the Girl Scouts of New England.
 - Developed a GUI in MATLAB designed to simulate a concurrent engineering facility for a human exploration mission to Mars or the Moon.
 - Designed a 2h-class around the software and taught it to several groups of Girl Scouts.

HARDWARE AND
SOFTWARE SKILLS

Computer Programming:

- Projects with 10,000+ lines in MATLAB, Java, Jess (CLIPS), Python, C.
- Basic knowledge of LISP, Perl, JavaScript, Maple, Mathematica, SQL, Basic, and others.

MATLAB skill set:

- Linear algebra, Fourier transforms, Monte Carlo analysis, statistics, design of experiments, optimization, visualization.
- Toolboxes: optimization and global optimization, statistics, signal processing.

Productivity Applications:

- Microsoft Excel, Word, Access, Visio, Project, T_EX.

EXPERTISE

Mathematics:

- Linear Algebra, Real and Complex Analysis, Probability and Statistics, Fourier Analysis, Differential Equations, Graph Theory, Combinatorics.

Operations Research:

- Linear Programming, Integer Programming, Stochastic Programming, Robust Optimization, Dynamic Programming, Multi-Objective Optimization, Large-Scale Optimization.

Artificial Intelligence:

- Search Algorithms, Constraint Satisfaction, Knowledge Representation and Reasoning, Supervised and unsupervised Machine Learning.

Communications and Signal Processing:

- Probability, Random Variables, Stochastic Processes, Information Theory, Estimation, Networks

Earth Science and Remote Sensing:

- Atmospheric physics and chemistry, atmospheric radiation, inverse models, atmospheric sounding, soil moisture retrieval, microwave remote sensing.

HONORS AND
AWARDS

IEEE Aerospace Conference 2013

- Best Paper Award, March 7 2013 (400+ entries)

Acta Astronautica

- Most cited Acta Astronautica article since 2012, 2017

MIT International Science and Technology Initiatives

- MIT-Germany Fellowship, Summer 2010
- MISTI 2.0 Fellowship April 2011

La Caixa - Obra Social

- La Caixa Fellowship, 2008–2010

Universitat Politecnica de Catalunya

- Nortel Networks Scholarships for Academic Excellence, Given to top 10 students in year 4 of the school of electrical engineering, 2002

Asociacion Nacional de Quimicos de Espana

- Silver Medal, Spanish National Chemistry Olympics, 1998