

# Niraj K. Inamdar | Ph.D.

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## Education

- Massachusetts Institute of Technology**, *Department of Earth, Atmospheric and Planetary Sciences* Cambridge, MA  
*Ph.D., Planetary Science* 2016  
GPA: 5.0/5.0. Dissertation: *The Formation and Evolution of Planetary Systems*
- Massachusetts Institute of Technology**, *Department of Mechanical Engineering* Cambridge, MA  
*S.M., Mechanical Engineering* 2011  
GPA: 5.0/5.0. Thesis: *Analysis and Implementation of the Bilayer Microfluidic Geometry*
- University of Pennsylvania**, *School of Engineering and Applied Science* Philadelphia, PA  
*B.S.E., Mechanical Engineering* 2008  
*Magna Cum Laude*. Senior Design Projects: *Reconnaissance Robot; Envirodyne Filtration Tank Cleaning System*

## Professional Experience: Summary

- Senior Principal Systems Engineer, Raytheon Intelligence & Space June 2019 - present
- Associate Physical Scientist, RAND Corporation May 2018 - June 2019
- Adjunct Faculty, Santa Monica College August 2017 - present
- Senior Member of Technical Staff, The Aerospace Corporation April 2017 - April 2018
- Code Project Developer, TESS, MIT September 2016 - March 2017
- Graduate Research and Teaching Assistant (Doctoral), MIT August 2011 - September 2016
- Graduate Research Assistant (Master's), MIT September 2009 - July 2011
- Mechanical Engineer, Raytheon Space and Airborne Systems July 2008 - September 2009

## Professional Experience: Details

### Raytheon Intelligence & Space El Segundo, CA *Senior Principal Systems Engineer* June 2019 - present

- Algorithm Development and Modeling Lead, Signal Chain. Led development and design of novel algorithms and wrote implementations for self-consistent onboard adaptive spatiotemporal data packet allocation and target identification thresholding; onboard background image transformation, interpolation, and resampling; and ground data packet management on go-fast SBIRS Next Gen OPIR program through successful Mission PDR. Created high-fidelity image generation models and carried out new characterization of focal plane array data, and created high-fidelity physical effects models with novel combinatorial impact analysis. Currently lead 16-engineer team through further design, development, and analysis activities. Technical Lead, R3 resiliency effort.
- Constructed end-to-end performance models for photonic integrated circuit (PIC)-based optical communication networks (Kyber). Created novel concepts and algorithms for automated PIC layout and developed new optical phased array voltage mapping and calibration technique. RSE, optical module (Tumlin).
- Proposals submitted for neural network- and learning-based distributed defense architectures. Finalist for company-wide Raytheon Innovation Challenge.

### RAND Corporation Santa Monica, CA *Associate Physical Scientist* May 2018 - June 2019

I made significant contributions to a number of projects for US Government customers, including:

- Methodology for defining resilient space enterprise in support of Joint Force. Created numerical models for missile dynamics and detection, analytical models for scenarios such as rad-hardened constellation design, and methodology for carrying out sensitivity analysis (USAF).
- Created genetic algorithm codeset to calculate operational energy transport scheduling and allocation for maritime domain and corresponding sea/land interfaces at strategic, operational levels for wargaming (OSD).
- Created novel mathematical and computational models for assessment/valuation of Mosaic warfare systems (DARPA).
- Created end-to-end constellation lifetime fielding and replenishment simulation for proliferated LEO constellations to determine launch, management, and reconstitution requirements (OSD).
- Identified driving and nascent capabilities and technologies for space and quantum computing test and evaluation, assessed current infrastructure, and recommended actions for new ones. Developed taxonomy for space threats, offensive and defensive space capabilities, and corresponding concepts and physical models (OSD).

Other FY19 projects included defining and assessing universal C2 languages (OSD) and Space Mission Force operational readiness (USAF).

### The Aerospace Corporation El Segundo, CA *Senior Member of Technical Staff* April 2017 - April 2018

- Principal Investigator, Project Delphi (May 2017 - April 2018). Led initiative through corporation's iLab to develop techniques to forward engineer innovative concepts for the Corporation and its customers. Project included need-space and solution-space generation exercises integrated with concurrent engineering/concept design methodologies, with demonstration through several case studies.
- Team lead, Project Rogue Flash (January 2018 - March 2018). Team generated out-of-the-box concepts for rapid missile defense and warning capability reconstitution. Team member, Project Thor Blue/Black Swan Futures Foresighting workshop (March 2018).
- Developed network analysis toolset (with Monte Carlo capabilities) for utility, reliability, resiliency, and link budget systems characterization. Developed models for optical communication networks, including novel acquisition probability and optimization calculations.
- Mission Analysis Engineer, SWOT (April 2017-April 2018). Performed earned value management for NASA mission. Developed software utilities in Python and Excel to significantly decrease analysis time and increase analysis fidelity.
- Other activities: Participated in architecture-level design activities and supported end-to-end modeling. Developed utilities in Python and VBA to improve architecture-level mission analysis and Enterprise information exchange (May 2017-April 2018); mentored interns on planetary defense study through Concept Design Center (June 2017 - September 2017); and supported Hosted Payload Office through interface requirements definition and document generation (May 2017).

## Transiting Exoplanet Survey Satellite

### Code Project Developer

Cambridge, MA

October 2016 - March 2017

- Developed architecture description, module interface standards, and best practices for TESS simulated image generator (TSIG) system performance model, which will generate simulated data used to constrain engineering and scientific error budgets on TESS, NASA's next generation exoplanet discovery mission. Interfaced new astrophysics and noise models into TSIG's Python framework.

## Massachusetts Institute of Technology

### Research Assistant

Cambridge, MA

August 2011-September 2016

- Constructed self-consistent planet formation models to identify formation pathways for super-Earths and mini-Neptunes. Other work on planetesimal statistical mechanics and reconstruction of NRM of 433 Eros (April 2014-September 2016).
- Science Lead for REXIS, an X-ray imaging spectrometer which will examine surface composition of asteroid 101955 Bennu for NASA's OSIRIS-REx mission. Constructed instrument system performance model, modeling Solar X-ray and asteroid fluorescence spectra, as well as instrument response (including radiation damage) and data interpretation in order to determine whether REXIS can place Bennu within an analogue meteorite class and infer its formation history (September 2012-June 2014). Other contributions to REXIS include instrument cover deployment dynamics and shielding analysis, coded aperture mask and frame design, and carrying out engineering model thermal test (September 2011-June 2014).
- Constructed quaternion dynamics models and leapfrog integrator for NIAC-funded project investigating use of high-temperature superconductors for electromagnetic formation flight and structures deployment (August 2011-October 2012)
- Modeled dynamics and control of small satellites implementing laser-based communication systems at  $\sim 1$  AU distances for Planetary Resources. Built testbed to demonstrate tip-tilt mirror laser control (February 2012-February 2013).

## MIT & Charles Stark Draper Laboratory

### Research Assistant

Cambridge, MA

October 2009 - August 2011

- Conducted research in microfluidics towards development of new devices for *in vitro* biomedical applications
- Developed the first analytical model characterizing solute transport and consumption in bilayer geometry and as a byproduct, investigated properties of PDEs in adjacent domains
- Designed, built, and populated bilayer microfluidic devices with hTERT mesenchymal stem cells. Research supported under Award Number R01EB010246 from the National Institute of Biomedical Imaging and Bioengineering.

## Raytheon Space and Airborne Systems

### Mechanical Engineer

El Segundo, CA

July 2008 - September 2009

- Design and drafting of assemblies for next generation radar and processing systems, Global Hawk and ASARS
- Sustaining mechanical engineer, AESA; sustaining mechanical engineer, P1196; and mechanical engineering lead, Transmit Drive integrated microwave assembly, MIRA. Mechanical design in Pro/E and circuit board layout in AutoCAD and Pantheon. Significant collaboration with electrical engineers and vendors throughout the design process.

## Teaching

- Current adjunct faculty at Santa Monica College in Physical Sciences Department. Past experience at MIT, the Politecnico di Torino in Italy, and University of Pennsylvania, with original teaching material developed. Details available upon request.

## Publications and Presentations

- Extensive list of publications includes journal articles, conference proceedings, book chapters, and refereed abstracts. Extensive list of presentations includes conference talks and formal design reviews. Details available upon request.

## Additional Details

- Computing:** MATLAB, Simulink, AutoCAD, Pro/E, SolidWorks, Inventor, CATIA, UN\*X, VBA,  $\LaTeX$ , Python, R, experience with C++, IDL, and DELMIA
- Languages:** English, Italian, Latin, Gujarati, varying levels of familiarity with several other languages
- Art:** Extensive portfolio of engineering/architectural design, figure drawing, and other artwork
- Writing:** Details available upon request
- Mentoring:** Extensive mentoring experience with undergraduate and graduate students at MIT and the University of Pennsylvania. Details available upon request.
- Outreach and Other Activities:** Reviewer for *Astronomical Journal* and *Astrophysical Journal*. Details available upon request.

## Selected Awards, Honors, and Fellowships

- Invention Award, Raytheon Technologies, July 2020
- Achievement Award, Raytheon Intelligence & Space, May 2020
- Finalist, Raytheon Innovation Challenge, January 2020
- Asteroid 134180 Nirajinamdar named for me, August 2016
- Robert R. Shrock Fellowship, June 2015 - June 2016
- Grant recipient, de Florez Fund for Humor, MIT, December 2015
- On the Spot Award, MIT Division of Student Life, April 2015
- Grayce B. Kerr Fellowship, September 2014 - May 2015
- Award for Excellence in Teaching, MIT Department of Earth, Atmospheric and Planetary Sciences, May 2014
- Achievement Award, Raytheon SAS, June 2009
- Research Fellowship, Draper Labs, October 2009-August 2011
- Spotlight on Performance Award, RF Surveillance Group, Raytheon SAS, January 2009
- Engineering Excellence Award, Boeing Integrated Defense Systems, August 2006