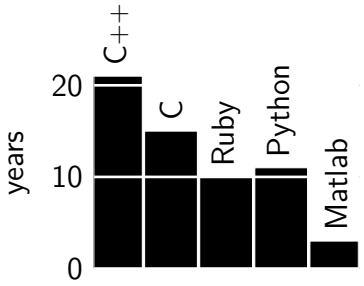
Juno Woods, PhD

703-801-2625
juno@translunar.io
github:translunar
linkedin:translunar

guidance, navigation, & control ∘ applied math ∘ natural language processing ∘ research

Coding Proficiencies

C, C++, Ruby, Python, LaTeX, GNU Octave / Matlab



Familiar Java, SQL, shell scripting, Agile, Go

Forgotten Perl, Fortran 95, Clojure, regular expressions

Libraries Orekit, CSPICE (JPL NAIF), C++ STL and Boost, OpenGL, ∅mq, Trick simulator, Langchain

Contributions Spiceypy, Point Cloud Library, FLANN, NMatrix† (Ruby linear algebra library), Pyquat† (Python attitude library), Glidar† (3D LIDAR simulator)

† indicates primary authorship

Software Copernicus, Satellite Toolkit (STK), Git, GCC, Clang, GDB, Valgrind, CMake, Ubuntu, Mac OS X, GNU Radio, ChatGPT, Claude

Education

The University of Texas at Austin, Austin, Texas
Doctor of Philosophy, Cell & Molecular Biology (Bioinformatics) 2007–2013
- National Science Foundation Fellow (2009–2012), Center for Systems & Synthetic Biology
- Advisor: Dr. Edward M. Marcotte

Virginia Polytechnic Institute & State University, Blacksburg, Virginia
Bachelor of Science, Computer Science, magna cum laude 2002–2007
- Minors in Mathematics, Philosophy, and Russian

Interim Projects (current)

F64
- Experimenting with healthcare applications of large language models such as Claude and ChatGPT, document Q&A

Loloquent
- Foreign language lessons taught by a lolcat named Lolo
- Short silly stories generated by ChatGPT and a speech synthesizer
- Coding a SwiftUI app with Flask backend, working with UX designer

Professional Appointments

Charm Industrial, San Francisco, California
Senior control systems engineer OCT 2022–MAY 2023

- Designed, implemented, and hardware tested custom process automation framework (finite state automata and various PID controllers) for use with programmable logic controllers
- Wrote plant models for chemical engineering processes in fast pyrolysis-based carbon sequestration

Masten Space Systems, Mojave, California
GN&C engineer, 6-DOF (contractor) JUL 2021–JUN 2022
- Derived, designed, and prototyped extended Kalman filter for integrating sensor data into time series least squares model, including attitude
- Designed state machine for automating spacecraft behaviors
- Advised organization on diversity, equity, and inclusion as part of DE&I council

Charismatic Metafauna by Majorelle Arts, Oakland, California
Sound Design Team Lead 2021–2022
- Wrote engineering requirements / system specifications for generative sound design for a large-scale interactive art project ($30K budget, 20 volunteers)
- Coordinating activities of sound design team and interfacing with interactivity team to fulfill engineering requirements

Numina Studios / Nocturne-X, Oakland, California
Electronics Assembly (contractor) SEP–OCT 2021

Open Lunar Foundation, San Francisco, California
Senior Researcher MAR–JUL 2021
Director of Engineering Research & Strategy JUL 2020–MAR 2021
Guidance, Navigation, & Control OCT 2019–APR 2020
- Managed a research fellow to create business plans, engineering schedules, and financial models for various for-profit and non-profit interventions
- Engineering designs and analyses
- Proposed a pipeline for generating vision-based navigation databases; studied positioning, navigation, and timing architectures
- Space policy: multilateral arms control treaties, export control policy, open source, electronic frontiers
- Systems engineering: GN&C systems, optical navigation (computer vision), and interplanetary radios (LunaNet)

Intuitive Machines, Houston, Texas
Senior Development Engineer JUN 2015–SEP 2019
- Trajectory design & optimization; lunar mission design & analysis (NOVA-C)
- Documented and validated extended Kalman filter (Moon Express MX-1)
- ISS rendezvous/berthing plan, preliminary GN&C design (Axiom)
- State estimation (BLS, EKF, complementary) for drilling systems
- GPS-denied navigation and gravimetry (Doppler LIDAR)

- Wrote engineering requirements for payloads, including for molecular biology in microgravity

Academic Appointments

Applied Space Exploration Laboratory, West Virginia University
Post-doctoral Fellow — Aerospace Engineer jan 2014–jun 2015
- Lidar-based 6 dof pose initialization strategy for non-cooperative rendezvous; derived/implemented dual inertial state ekf (satellite servicing)
- Open source OpenGL-based 3d sensor simulator, Glidar
- Remote sensing technologies for resource surveying and utilization
- Mentored and collaborated with grad students and an undergraduate

Center for Systems & Synthetic Biology, The University of Texas at Austin
National Science Foundation Fellow; Graduate Research Assistant 2007–2014
- Pipelines and automation for large datasets
- Expert recommendation systems, cross-validation
- Researched, designed, and wrote statistical software for searching for genes under various types of selection (positive, purifying, relaxed)
- Invalidated a hypothesis about hiv reservoirs using viral evolution simulation
- Some experience with mass spectrometry-based proteomics

Dept. of Chemistry & Biochemistry, The University of Texas at Austin
Graduate Teaching Assistant 2008, 2013
- Rewrote curriculum in Python (previously in Perl), largely focused on string processing and search algorithms, hidden Markov models, etc.

Dept. of Computer Science, Virginia Tech
Undergraduate Research Assistant Summer 2006
- Multi-lingual noun phrase identification for abstract generation and machine translation
- Part of speech tagging, hidden Markov models

Patents

Marcotte, E.M.; McGary, K.; Wallingford, J.; Park, T.J.; **Woods, J.O.**; Cha, H.J. 12 August 2012. Orthologous phenotypes and non-obvious human disease models. *U.S. Patent Application Publication 2012/0215458 A1.*

Articles

Woods, J.O.; Christian, J.A. 2016. Lidar-based relative navigation with respect to non-cooperative objects. *Acta Astronautica 126*: pp. 298–311.

Woods, J.O.; Christian, J.A. 2016. Glidar: An OpenGL-based, real-time, and open source 3d sensor simulator for testing computer vision algorithms. *Journal of Imaging 2*(1).

Woods, J.O.; Tien, M.Z.; Marcotte, E.M. April 2015. Interrogating conserved elements of diseases using Boolean combinations of orthologous phenotypes. *BioRχiv.*

Woods, J.O.; Singh-Blom, U.M.; Laurent, J.M.; McGary, K.L.; Marcotte, E.M. January 2013. Prediction of gene–phenotype associations in humans, mice, and plants using phenologs. *BMC Bioinformatics 14*: p. 203.

Singh-Blom, U.M.; Natarajan, N.; Tewari, A.; **Woods, J.O.**; Dhillon, I.S.; Marcotte, E.M. January 2013. Prediction and validation of gene–disease associations using methods inspired by social network analyses. *PLoS One 8*(5): e58977.

McGary, K.L.; Park, T.J.; **Woods, J.O.**; Cha, H.J.; Wallingford, J.B.; Marcotte, E.M. April 2010. Systematic discovery of nonobvious human disease models through orthologous phenotypes. *Proceedings of the National Academy of Sciences of the United States of America 107*(14): pp. 6544–9.

Brennan, T.P.; **Woods, J.O.**; Sedaghat, A.R.; Siliciano, J.D.; Siliciano, R.F.; Wilke, C.O. September 2009. Analysis of human immunodeficiency virus type 1 viremia and provirus in resting CD4$^+$ T cells reveals a novel source of residual viremia in patients on antiretroviral therapy. *Journal of Virology 83*(17): pp. 8470–81.

Conference Proceedings

Woods, J.O.; Christian, J.A.; Evans, T. February 2015. A 6-DOF pose initialization strategy for LIDAR-based non-cooperative navigation. In *38th Annual Guidance & Control Conference*, Breckenridge, CO.

Sell, J.L.; Rhodes, A.; **Woods, J.O.**; Christian, J.A.; Evans, T. 2014. Pose performance of LIDAR-based navigation for satellite servicing. In *AIAA/AAS Astrodynamics Specialist Conference*, San Diego, CA.

Posters

Woods, J.O.; Singh-Blom, U.M.; Laurent, J.; McGary, K.L.; Marcotte, E.M. 20–25 February 2012. In *Complex Traits: Genomics and Computational Approaches*, Keystone Symposia, Breckenridge, CO.

Woods, J.O.; Singh-Blom, U.M.; McGary, K.L.; Marcotte, E.M. 13–16 November 2010. In *From Functional Genomics to Systems Biology*, EMBL Heidelberg, Heidelberg, Germany.

Technical Reports

Some internal technical report titles have been changed for external clarity or to maintain client confidentiality.

Woods, J.O. 2021. An engineer's history of US and multilateral export controls. *OLF–ENG–2021–01*, Open Lunar Foundation, San Francisco, CA.

Woods, J.O. 2020. Concepts in lunar positioning, navigation, and timing. *OLF–GNC–2020–01*, Open Lunar Foundation, San Francisco, CA.

Woods, J.O. 2019. Navigation filter design towards a lunar lander. *OLF–GNC–2019–02*, Open Lunar Foundation, San Francisco, CA. *Work in progress,*

ceased and published early due to pandemic. github.com/openlunar/navmemos/raw/master/filter/filter.pdf

Woods, J.O. 2019. Two-way range and range-rate observables in a sequential filter. *OLF–GNC–2019–01*, Open Lunar Foundation, San Francisco, CA. github.com/openlunar/navmemos/raw/master/radiometric/memo.pdf

Woods, J.O. 2018. Observability and sensitivity analyses for attitude estimation using a gimballed gyroscope. *IM–TM–2018–04*.

Woods, J.O. 2018. Position and velocity variance growth during dead reckoning of a drill. *IM–TM–2018–02*.

Woods, J.O. 2018. Derivation of the Doppler LIDAR measurement model in the inertial and topocentric frames. *IM–TM–2018–01*.

Crain, T.C.; **Woods, J.O.**; Baine, M.; Moore, J.; Getchius, J.; Ronalds, A.; Stewart, S. 2018. Cislunar navigation architecture study. *IMDM–9*.

Woods, J.O. 2017. A dual MARG complementary filter for attitude state estimation while drilling. *IM–TM–2017–04*.

Woods, J.O.; Christian, J.A. 2014. A real-time, software-based 3D sensor simulator. ASEL Technical Memorandum: *ASEL–14–005*.

Sell, J.; Rhodes, A.; **Woods, J.**; Christian, J.A. 2014. Theoretical foundations of pose estimation and covariance computation for non-cooperative relative navigation. ASEL Technical Memorandum: *ASEL–14–001*.

Natarajan, N.; Singh-Blom, U.M.; Tewari, A.; **Woods, J.O.**; Dhillon, I.S.; Marcotte, E.M. 2011. Predicting gene–disease associations using multiple species data. UTCS Technical Report: *TR–11–37*.

Selected Honors & Awards

Burning Man Honorarium: *Charismatic Metafauna*	2022
Masten Space Systems: Diversity, Equity, and Inclusion Council member	2022
White House Champion of Change	2014
National Science Foundation Graduate Research Fellowship	2009–2012
"Best of Austin" Award: Best Activist (*The Austin Chronicle*)	2011
Scholar, Netroots Nation	2011
Initiate, Friar Society (University of Texas at Austin)	2010
Graduate School Recruitment Fellowship (University of Texas at Austin)	2007
Black Belt, Tae Kwon Do (Chung Do Kwan)	2006
Member, Hillcrest Honors Community (Virginia Tech)	2003–2007
Inductee, ΥΠΕ (Virginia Tech)	2006
Gilbert & Lucille Seay Scholarship (Virginia Tech)	2005
National Merit Scholarship	2002

Community Contributions

Lunar Surface Innovation Consortium 2021–present
Communications Subgroup Lead 2021–2022

Black Rock Rangers 2018–present
Green Dot 2019–present

Ruby Science Foundation (SciRuby)
Director & Co-Founder 2012–2018

Texas Gun Sense
Co-founder, Advisory Board Member 2013–present

Activities & Interests: dance (lindy hop and ballet), music, roller skating, circus arts, space exploration, large-scale interactive art, immersive theatre

Foreign Languages: English (native tongue), Spanish (conversational), Russian (needs refreshing)

Other Skills: Metal fabrication and MIG welding, fiberglass/resin casting, FEMA ICS-100 certification

References:

Chris Hadfield chris@chrishadfield.ca
Chair, Open Lunar Foundation; Commander, CSA and NASA

John Christian john.christian@mail.wvu.edu
Asst. Professor of Aerospace Engineering, Rensselaer Polytechnic Institute

Tim Crain tim@intuitivemachines.com
Vice President of Research and Development, Intuitive Machines

Amanda Acevedo amanda.acevedo@vedosystems.com
President, Vedo Systems; formerly Project Manager, Intuitive Machines

Ben Howard ben@openlunar.org
Chief Engineer, Open Lunar Foundation; Chief Spacecraft Architect, Planet

Eva Pettinato eva.pettinato@gmail.com
Lead Guidance, Navigation, and Control Engineer, Masten Space Systems

Edward Marcotte marcotte@icmb.utexas.edu 512-471-5435
Professor of Chemistry & Biochemistry, The University of Texas at Austin