

Alex A. Gorodetsky

CONTACT INFORMATION	Department of Aerospace Engineering University of Michigan 3053 FXB 1320 Beal Avenue Ann Arbor, MI, 48109, USA	<i>email:</i> goroda@umich.edu <i>email:</i> alex@alexgorodetsky.com <i>web:</i> www.alexgorodetsky.com
RESEARCH INTERESTS	Decision making under uncertainty: Uncertainty quantification, autonomous systems, Bayesian inference, statistics, data analysis, machine learning, numerical analysis, tensor methods, stochastic optimal control and optimization, mathematical modeling	
EDUCATION	Massachusetts Institute of Technology , Cambridge, MA Ph.D., Department of Aeronautics and Astronautics, February 2017 <ul style="list-style-type: none">• Thesis: <i>Continuous low-rank tensor decompositions, with applications to stochastic optimal control and data assimilation</i>• Advisers: Professor Sertac Karaman, Professor Youssef M. Marzouk• Areas of Study: Computational Science, Control, Autonomy S.M., Department of Aeronautics and Astronautics, June 2012 <ul style="list-style-type: none">• Thesis: <i>A learning method for the approximation of discontinuous functions for stochastic simulations</i>• Adviser: Professor Youssef M. Marzouk• Area of Study: Computational Science University of Michigan , Ann Arbor, MI B.S.E., Aerospace Engineering, June 2010 <ul style="list-style-type: none">• <i>Summa cum Laude</i>• Minor in Mathematics	
AWARDS	<ul style="list-style-type: none">• John von Neumann Postdoctoral Research Fellowship in Computational Science 2016• Department of Energy Office of Science Graduate Fellowship (DOE SCGF), Finalist, 2012• Chick Evans Scholarship, Full tuition at the University of Michigan, 2006–2010	
PROFESSIONAL EXPERIENCE	Sandia National Laboratories , Albuquerque, NM <i>John von Neumann Postdoctoral Fellow</i> October 2016 – December 2017 <i>Optimization and Uncertainty Quantification Group</i> <i>Computer Science Research Institute</i> Massachusetts Institute of Technology , Cambridge, MA <i>Graduate Research Assistant</i> September 2010 – September 2016 <i>Aerospace Computational Design Laboratory</i>	
PROFESSIONAL SERVICE	Referee Service <ul style="list-style-type: none">• <i>ASME Turbine Technical Conference and Exposition</i>• <i>BIT Numerical Mathematics</i>• <i>IEEE Transactions on Aerospace and Electronic Systems</i>• <i>Journal of Intelligent and Robotic Systems</i>• <i>Mathematical Methods in the Applied Sciences</i>• <i>Neural Computation</i>• <i>Robotics: Science and Systems Conference (RSS)</i>	

- *SIAM Journal of Scientific Computing*
- *SIAM/ASA Journal on Uncertainty Quantification*

JOURNAL
PUBLICATIONS

- [1] Gorodetsky A., Jakeman, J. D. Gradient-based Optimization for Regression in the Functional Tensor-Train Format. (2018) *Submitted*
- [2] Kramer, B., and Gorodetsky, A. System identification via CUR-factored Hankel approximation. (2018) *Accepted, SIAM Journal on Scientific Computing*
- [3] Gorodetsky A., Karaman, S., and Marzouk Y. M. High-dimensional stochastic optimal control using continuous tensor decompositions. (2018) *Accepted, International Journal of Robotics Research*
- [4] Gorodetsky A., Karaman, S., and Marzouk Y. M. Function-train: a continuous analogue of the tensor-train decomposition. (2016) *Submitted*
- [5] Gorodetsky, A., and Marzouk, Y. M. Mercer kernels and integrated variance experimental design: connections between Gaussian process regression and polynomial approximation *SIAM/ASA Journal on Uncertainty Quantification*, 4:1 (2016): 796-828
- [6] Gorodetsky, A., and Marzouk, Y. M. Efficient localization of discontinuities in complex computational simulations. *SIAM Journal on Scientific Computing*, 36.6 (2014): A2584-A2610

REFEREED
CONFERENCE
PUBLICATIONS

- [7] Tal, E., Gorodetsky, A., Karaman, S. Continuous Tensor Train-Based Dynamic Programming for High-Dimensional Zero-Sum Differential Games. *American Control Conference (ACC)*, Milwaukee, WI, USA, 2018 (To appear).
- [8] Sayre-McCord, R. T., Guerra, W., Antonini, A., Arneberg, J., Brown, A., Cavalheiro, G., Fang, Y., Gorodetsky, A., McCoy, D., Quilter, S., Riether, F., Tal, E., Terzioglu, Y., Carlone, L., Karaman, S. Visual-inertial navigation algorithm development using photorealistic camera simulation in the loop. *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, Brisbane, Australia, 2018.
- [9] Eldred, M. S., Geraci, G., Gorodetsky, A., and Jakeman, J. Multilevel-Multifidelity Approaches for Forward UQ in the DARPA SEQUOIA project. *2018 AIAA Non-Deterministic Approaches Conference*. 2018.
- [10] Gorodetsky, A., Karaman S., and Marzouk, Y. M. Low-rank tensor integration for Gaussian filtering of continuous time nonlinear systems In: *56th IEEE Conference on Decision and Control*, Melbourne, Australia, December, 2017.
- [11] Alora, J., Gorodetsky, A., Karaman S., Lowry, N., and Marzouk, Y. M. Automated synthesis of low-rank control systems from sc-LTL specifications using tensor-train decompositions In: *55th IEEE Conference on Decision and Control*, Las Vegas, NV, USA, December, 2016.
- [12] Gorodetsky, A., Karaman S., and Marzouk, Y. M. Efficient high-dimensional stochastic optimal motion control using tensor-train decomposition. In: *Proceedings of Robotics: Science and Systems*, Rome, Italy, July, 2015.

SELECTED
CONFERENCE
TALKS

- [13] Gorodetsky, A., Geraci, G., Eldred, M., Jakeman J. Multifidelity Model Management using Latent Variable Bayesian Networks. In *2nd Physics Inspired Machine Learning Conference*, Santa Fe, NM, USA, January 21 -0 25, 2018.
- [14] Gorodetsky, A. Low rank functional decompositions, with application to stochastic optimal control. In: *2017 Meeting of the International Linear Algebra Society*, Ames, IA, USA, July 24 – July 28 2017.

- [15] Gorodetsky, A. Exploiting low-rank structure in stochastic optimal control and filtering problems. In: *SIAM Conference on Control and its Applications*, Pittsburgh, PA, USA, July 10 – July 12 2017.
- [16] Gorodetsky, A. and Jakeman J. D. Continuous alternating least squares for regression of low-rank functions. In: *SIAM Conference on Computational Science and Engineering*, Atlanta, GA, USA, February 27 – March 3 2017.
- [17] Gorodetsky, A., Karaman, S., and Marzouk, Y. M. Function-train: a continuous analogue of the tensor-train decomposition. In: *Approximation Theory 15*, San Antonio, TX, USA, May 2016.
- [18] Gorodetsky, A., Karaman, S., and Marzouk, Y. M. Exploiting tensor structure in Bayesian inference problems: application to Gaussian filtering. In: *SIAM Conference on Uncertainty Quantification*, Lausanne, Switzerland, April 2016.
- [19] Gorodetsky, A., Karaman, S., and Marzouk, Y. M. Function-train: a continuous analogue of the tensor-train decomposition. In: *14th Copper Mountain Conference on Iterative Methods*, Copper Mountain, CO, USA, March 2016.
- [20] Gorodetsky, A., Karaman, S., and Marzouk, Y. M. High-dimensional optimal stochastic control using tensor decompositions. In: *MIT ROBOCON 2016*, Cambridge MA, Feb. 13 2016.

OPEN SOURCE
SOFTWARE

GPEXP: Experimental design for Gaussian process regression

- Python package for performing experimental design for Gaussian process models
- Github source code: <https://github.com/goroda/GPEXP>

C³: Compressed Continuous Computation

- Library for computing with multidimensional functions in a compressed format
- Has utilities to aid computation in the context of control, optimization, probabilistic inference, multilinear algebra, and integration
- Github source code: <https://github.com/goroda/Compressed-Continuous-Computation>

C³SC: Compressed Continuous Computation for Stochastic Optimal Control

- Library for solving stochastic optimal control problem with nonlinear dynamics
- Github source code: <https://github.com/goroda/c3sc>

PROFESSIONAL
MEMBERSHIPS

Society for Industrial and Applied Mathematics (SIAM), Member, 2010–present
 American Institute of Aeronautics and Astronautics (AIAA), Member, 2017–present
 Institute for Electrical and Electronics Engineers (IEEE), Member, 2018–present

CITIZENSHIP

USA