

# Alexandros “Alex” Tsolovikos

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## Education

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**MS/PhD, Aerospace Engineering**, The University of Texas at Austin

[May 2023]

- Master’s and Doctoral student in the Department of Aerospace Engineering and Engineering Mechanics.
- GPA: **4.00/4.00**
- Relevant Coursework: Reinforcement Learning, Robot Learning, Stochastic Optimal Control, Autonomous Robots, Statistical Estimation Theory, Linear Systems, Optimal Control, Nonlinear Dynamics, Dynamics of Turbulence, Multivariable Control Systems, Fluid Mechanics

**BS/MS, Mechanical Engineering**, National Technical University of Athens

[February 2018]

- Bachelor of Science & Master of Science; 5-year joint degree; 300 ECTS
- GPA: **9.06/10.00** (early graduate with *highest honors*; top 10 among undergraduate class of 180 students)
- Concentration: Air and Ground Transport Vehicles
- Relevant Coursework: Computational Fluid Dynamics, Optimization Methods in Aerodynamics, Computational Methods in Turbomachines, Flight Dynamics, Control Systems, Microprocessor-Based Control
- Thesis: *“Deformation of Computational Meshes Using Delaunay Graph Parameterization – Applications in the Adjoint-Based Aerodynamic Shape Optimization”*

## Work Experience

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**Radar Machine Learning Intern**, Aptiv, Agoura Hills, CA

[May 2022 – August 2022]

- Deep learning-based radar-only object detection.
- Trained and compared performance of different backbones and detection heads with raw radar data as inputs and oriented bounding boxes as outputs.
- Extended MMDetection & MMRotate libraries to work with low-level radar inputs.

**Environment Perception Engineering Intern**, Aptiv, Remote

[June 2021 – August 2021]

- Remote internship supporting the Advanced Engineering/Road Model team in Agoura Hills, CA.
- Developed a Radar-based Simultaneous Localization and Mapping (SLAM) framework that uses pose graphs and loop closures to create a Radar occupancy gridmap from scratch.
- Integrated occupancy gridmap updates from multiple visits of the same area in the SLAM framework.
- Developed ROS pipeline in Python and C++.

**Environment Perception Engineering Intern**, Aptiv, Remote

[June 2020 – July 2020]

- Remote internship supporting the Advanced Engineering/Road Model team in Agoura Hills, CA.
- Developed a sensor fusion framework for lane marker estimation from vision, HD maps, GNSS, and odometry information, along with necessary data pipelines and visualization tools in Python.

## Research Experience

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**Graduate Researcher**, The University of Texas at Austin

[August 2018 – Present]

- Research interests:
  - Data-driven control of high-dimensional, nonlinear dynamical systems.

- Reduced-order modeling of turbulent flows using modal analysis and non-parametric methods.
- Turbulent flow control via model predictive control (MPC) and reduced-order models.
- Stochastic optimal control with learned non-parametric models (Gaussian processes).
- Reinforcement-learning for flow control.
- Motion prediction in autonomous driving settings using Transformers and Gaussian processes.
- Computational engineering and high-performance computing with an emphasis on direct numerical simulations of turbulent flows.

**Undergraduate/Associate Researcher**, National Technical University of Athens [May 2017 – July 2018]

- Group: *Parallel CFD and Optimization Unit*
- Research interests:
  - Adjoint-based optimization of partial differential equations (e.g. aerodynamic shape optimization).
  - Grid generation and manipulation; computational geometry.
  - Computational fluid dynamics (CFD).
- Developed and programmed a fast dynamic grid morpher based on Delaunay triangulation parameterization for OpenFOAM in C++ and coupled it with the adjoint-based aerodynamic shape optimization software.
- Set up a fluid-structure interface between ANSYS and an in-house CFD software for simulating the deformation of an inflatable wing.
- Programmed an adjoint error-based grid refinement tool for the OpenFOAM environment for use in automatic mesh generation and for improving the accuracy of computing functionals of interest.

## Skills

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<b>Programming:</b>	Proficient in C/C++, Python, Matlab, Fortran 95, Unix
<b>Libraries/Tools:</b>	PyTorch, ROS, GPyTorch, GTSAM, Numpy, Eigen (C++), Git, OpenCV, CGAL, OpenFOAM, Arduino
<b>Other Tools:</b>	LaTeX, MS Office (ECDL Expert), Solidworks, ANSYS, LS-DYNA, EASY
<b>Languages:</b>	English (fluent), Italian (basic), Greek (native)

## Publications

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### Journal Articles

- **Tsolovikos, A.**, Suryanarayanan, S., Bakolas, E., Goldstein, D., (2020), “Model predictive control of material volumes with application to vortical structures”, *AIAA Journal*, 2021.
- **Tsolovikos, A.**, Bakolas, E., Suryanarayanan, S., Goldstein, D., (2020), “Estimation and control of fluid systems using sparsity-promoting dynamic mode decomposition with control”, *IEEE Control Systems Letters*.
- Gkaragkounis, K., Papoutsis-Kiachagias, E., **Tsolovikos, A.**, Giannakoglou, K., (2020), “The effect of grid displacement methods on continuous adjoint-based sensitivity derivatives in aerodynamic and conjugate heat transfer problems”, *Engineering Optimization*.

### Conference Papers

- **Tsolovikos, A.**, Suryanarayanan, S., Bakolas, E., Goldstein, D. B. (2022). Multiple Model Dynamic Mode Decomposition for Flowfield and Model Parameter Estimation. In AIAA SCITECH 2022 Forum (p. 2427).
- **Tsolovikos, A.**, Bakolas, E. (2021), “Cautious Nonlinear Covariance Steering using Variational Gaussian Process Predictive Models”, to be presented at the *Modeling, Estimation and Control Conference 2021*.
- Saravanos, A.D., **Tsolovikos, A.**, Bakolas, E. and Theodorou, E.A. (2021), Distributed Covariance Steering with Consensus ADMM for Stochastic Multi-Agent Systems, *Robotics: Science and Systems 2021*.

- Bakolas, E., **Tsolovikos, A.**, (2020), “Greedy finite-horizon covariance steering for discrete-time stochastic nonlinear systems based on the unscented transform”, *American Control Conference 2020*, Denver, CO, July 1-3, 2020.
- **Tsolovikos, A.**, Suryanarayanan, S., Bakolas, E., Goldstein, D., (2020), “Toward model-based control of near-wall turbulent coherent structures”, *AIAA SciTech 2020*, Orlando, FL, January 6-10, 2020.

## Teaching Experience

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**Teaching Assistant**, The University of Texas at Austin

[August 2018]

- Assisted in the *Linear Systems* course by grading and holding review sessions (Spring 2019, Fall 2020 & Spring 2021).
- Assisted in the *Compressible Flow* course by lecturing, grading and holding office hours (Spring 2019).
- Taught and supervised the *Low-Speed Aerodynamics Lab*; graded lab reports, and held office hours (Fall 2018).
- Assisted in the *Applied Aerodynamics* course by grading homework and holding office hours (Fall 2018).

## Awards and Fellowships

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- “Graduate Dean’s Prestigious Fellowship Supplement” Fellow (September 2020)
- “**A. Onassis Foundation Scholarship**” for Ph.D. studies in Aerospace Engineering (September 2020 - May 2023, valued at over \$40,000)
- “Hellenic Professional Society of Texas Scholarship” recipient (February 2020)
- “Gerondelis Foundation Graduate Study Scholarship” recipient (December 2019)
- “**Graduate Continuing Fellowship**” awarded by the Graduate School at the University of Texas at Austin (June 2019 – May 2020, \$44,000 toward tuition and stipend)
- “KARY” award for the highest GPA in the Mechanical Engineering School during the academic year 2015 – 2016 (September 2017)
- “Thomaideio” award for the highest GPA in the 5<sup>th</sup> and 6<sup>th</sup> semesters in the Mechanical Engineering School (September 2017)
- “Christos Papakyriakopoulos” award for the highest score in mathematics courses (September 2015)
- “A Great Moment for Education” award for the highest score in University Entrance Examinations, Eurobank (2013)