

# Shaun Harris | Mechanical Engr.

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## Education

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### Stanford University

*Ph.D. Mechanical Engineering, GPA – 3.72*

- Concentration in Fluid Mechanics

**Stanford, CA**

*Mar 2022*

### Stanford University

*M.S. Mechanical Engineering, GPA – 3.7*

- Depth in Fluid Mechanics

**Stanford, CA**

*Apr 2018*

### Utah State University (USU)

*B.S. Mechanical Engineering, GPA – 3.95*

- Summa Cum Laude
- Emphasis: Aerospace
- Minors: Management and Mathematics

**Logan, UT**

*May 2016*

### Utah State University

*A.S. General Studies, GPA – 4.0*

**Logan, UT**

*Aug 2010*

## Experience

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### Sandia National Laboratories

*Graduate Research Year-Round Intern*

- Performed direct numerical simulations using massively parallel computer clusters for compressible high Reynolds number flows and compared to stability analysis for transition modeling [CP1]
- Implemented new boundary condition in massively parallel code architecture using C++
- Obtained and maintained DOE-Q clearance since Jan. 2021

**Albuquerque, NM**

*06/19 – present*

### Center for Turbulence Research

*Graduate Research Student*

- Developed model to study instabilities by using the Orr-Sommerfeld-Squire and the parabolized stability equations for study in laminar, transitional, and turbulent fluid flows [R2, C2, R5, CP2, C3, C5, R6]
- Applied machine learning for study and prediction of peak events in turbulent flow [R4]
- Aided in development of new wall model for LES in prediction of laminar-turbulent transition flow [R1]

**Stanford, CA**

*01/18 – present*

### Sandia National Laboratories

*Graduate Research Summer Intern*

- Simulated computational fluid dynamics of multi-component repair garage for hydrogen fuel cell vehicle failure analysis [A1, R3, C4]
- Created all simulation inputs from scratch and performed refinement/parameter studies

**Livermore, CA**

*06/18 – 09/18*

### Flow Physics and Computation Engineering

*Graduate Research Student*

- Combined LES modeling with weather forecasting data assimilation techniques to enrich scales of LES models using experimental data from high-fidelity 3D PIV system [A2, C7]

**Stanford, CA**

*09/16–11/17*

### Sandia National Laboratories

*Technical Undergraduate Year-Round Intern*

- Performed uncertainty quantification, verification, and validation of computation model of thermal batteries [R7, CP4]

**Albuquerque, NM**

*05/15 – 08/16*

### **High Performance Computational Fluid Dynamics Lab (USU)**

*Undergraduate Computational Fluid Dynamics (CFD) Researcher*

**Logan, UT**  
05/14 – 04/16

- Coded, as part of a team, parts of a CFD strand code (C++ and Fortran) [A3, CP3, CP5]

### **Experimental Fluid Dynamics Lab (USU)**

*Undergraduate Research and Creative Opportunities Grant Recipient*

**Logan, UT**  
1/14 – 12/14

- Led research and conducted experiment in olive oil tracer particle atomization [C8]

### **Experimental Fluid Dynamics Lab (USU)**

*Undergraduate Research Assistant*

**Logan, UT**  
12/12 – 03/14

- Assisted CFD validation experiments for safety analysis of nuclear reactors
- Designed and assembled various parts for particle image velocimetry (PIV) experiment

### **Synthetic Biomanufacturing Center (USU)**

*Undergraduate Research Assistant*

**Logan, UT**  
06/10 – 12/10

- Experimental phase of cohabitating two species in growth reactor for effective bio-diesel algae production
- Presented research finding to professors at conclusion of summer research

## **Awards**

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**Fall 2016:** Stanford Graduate Engineering Fellowship Award

**Undergraduate Awards:** Academic Excellence Senior (2016), Outstanding Undergraduate Researcher (2015), A-pin award (2014), Outstanding Pre-Professional Award (2014)

**Undergraduate Scholarships:** George S. & Dolores Doré Eccles Foundation University, Integrated University Program, USU Presidential, and New Century

**Spring 2010:** High School Salutatorian of 453 students

## **Skills**

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**Coding:** Python, C++, MatLab, Fortran, batch scripts for HPC, LabVIEW, and Vim

**Software:** ParaView, CUBIT, tecplot, Pointwise, Solid Works, and Solid Edge

**Written:** Microsoft Office, L<sup>A</sup>T<sub>E</sub>X, and ≈ 90 WPM

**Technical:** hand tools, saws, mills, drill presses, and soldering

**Biological:** autoclave, optical density machine, centrifuge, flow hoods, and pipettes

## **Leadership and Volunteer**

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**01/20 – Current:** Member of the American Institute of Aeronautics and Astronautics

**01/15 – Current:** Member of the Tau Beta Pi Society

**01/14 – 12/17:** Member of the American Nuclear Society (ANS)

- Communications Officer (ANS) USU section

**01/13 – 11/13:** Member of the American Society of Mechanical Engineers (ASME)

**01/11 – 12/12:** Full-time Service Volunteer for non-profit organization in Atlantic Canada

- Leader over fellow volunteers in door-to-door communications
- Trained and instructed fellow volunteers in presentation effectiveness
- Worked with people providing addiction recovery and life coaching

**2008:** Eagle Scout

## Articles

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- [A1] B. D. Ehrhart, S. R. Harris, M. L. Blaylock, A. B. Muna, and S. Quong. “Risk assessment and ventilation modeling for hydrogen releases in vehicle repair garages”. In: *International Journal of Hydrogen Energy* 46 (23 2021), pp. 12429–12438. DOI: <https://doi.org/10.1016/j.ijhydene.2020.09.155>.
- [A2] J. W. Labahn, H. Wu, S. R. Harris, B. Coriton, J. H. Frank, and M. Ihme. “Ensemble Kalman Filter for Assimilating Experimental Data into Large-Eddy Simulations of Turbulent Flows”. In: *Flow, Turbulence and Combustion* (2019). ISSN: 15731987. DOI: 10.1007/s10494-019-00093-1.
- [A3] O. Tong, Y. Yanagita, R. Schaap, S. R. Harris, A. Katz, and D. Hunsaker. “High-Order Strand Grid Methods for Shock Turbulence Interaction”. In: *International Journal of Computational Fluid Dynamics* 32.4-5 (2018), pp. 203–217. DOI: 10.1080/10618562.2018.1490411.

## Reports

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- [R1] C. A. Gonzalez, S. R. Harris, and P. Moin. *Falkner-Skan wall model baseflow generation for the parabolized stability equations*. Center for Turbulence Research, 2021.
- [R2] S. R. Harris, P. Moin, and M. J. P. Hack. *Predicting the nonlinear amplification of disturbances using the spatial perturbation equations in a viscous boundary layer*. Center for Turbulence Research, 2021.
- [R3] B. D. Ehrhart, S. R. Harris, M. L. Blaylock, A. B. Muna, and S. Quong. *Risk Assessment and Ventilation Modeling for Hydrogen Release in Vehicle Repair Garages*. English. Tech. rep. Sponsor Org.: USDOE National Nuclear Security Administration (NNSA). United States, 2020. URL: <https://www.osti.gov/servlets/purl/1617120>.
- [R4] S. R. Harris and M. J. P. Hack. *Forecasting extreme dissipation events in wall turbulence using machine learning*. Annual Research Brief. Center for Turbulence Research, 2020. URL: [http://web.stanford.edu/group/ctr/ResBriefs/2020/21\\_Harris.pdf](http://web.stanford.edu/group/ctr/ResBriefs/2020/21_Harris.pdf).
- [R5] S. R. Harris and M. J. P. Hack. *Well-posed marching of disturbances using the spatial perturbation equations*. Annual Research Brief. Center for Turbulence Research, 2020. URL: [http://web.stanford.edu/group/ctr/ResBriefs/2020/24\\_Harris.pdf](http://web.stanford.edu/group/ctr/ResBriefs/2020/24_Harris.pdf).
- [R6] S. R. Harris and M. J. P. Hack. *Well-posed spatial marching of perturbations in viscous shear flows*. Annual Research Brief. Center for Turbulence Research, 2019. URL: [http://web.stanford.edu/group/ctr/ResBriefs/2019/08\\_Harris.pdf](http://web.stanford.edu/group/ctr/ResBriefs/2019/08_Harris.pdf).
- [R7] S. A. Roberts, S. R. Harris, A. C. Hetzler, E. S. Piekos, B. B. Schroeder, and B. L. Trembacki. *Establishing the Credibility of the Thermally Activated Battery Simulator, Full-Battery Version 4: Verification, Validation, and Uncertainty Quantification*. Sandia Report SAND2017-3397. Sandia National Laboratories, 2017.

## Conference Papers

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- [CP1] **S. R. Harris** and R. Wagnild. “Second mode growth in a high-velocity boundary layer using stability theory and DNS”. In: *AIAA Aviation 2021 Forum*. DOI: 10.2514/6.2021-2845.
- [CP2] **S. R. Harris** and M. J. P. Hack. “Well-posed spatial marching of high-amplitude perturbations in viscous shear flows”. In: *AIAA SciTech 2020 Forum*. Jan. 2020. DOI: 10.2514/6.2020-0829.
- [CP3] **O. Tong**, Y. Yanagita, S. R. Harris, D. Work, and A. Katz. “Asymptotic Geometry Representation for Complex Configurations on Strand Grids”. In: *AIAA SciTech*. Jan. 2016. DOI: 10.2514/6.2016-1584.
- [CP4] **B. Trembacki**, S. Harris, E. Piekos, and S. Roberts. “Uncertainty Quantification, Verification, and Validation of a Thermal Simulation Tool for Molten Salt Batteries”. In: *47th Power Sources Conference, Orlando FL*. 2016. URL: <https://www.osti.gov/servlets/purl/1365182>.

- [CP5] **O. Tong**, Y. Yanagita, R. Schaap, S. R. Harris, and A. Katz. “High-Order Strand Grid Methods for Shock Turbulence Interaction”. In: *22nd AIAA Computational Fluid Dynamics Conference*. 2015. doi: 10.2514/6.2015-2283.

## Conferences

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- [C1] **C. A. Gonzalez**, M. Karp, S. R. Harris, and P. Moin. “Reduced-order Modeling of Laminar Boundary Layers”. In: *74th Annual Meeting of the APS Division of Fluid Dynamics*. Nov. 2021. URL: <https://meetings.aps.org/Meeting/DFD21/Session/M08.6>.
- [C2] **S.R. Harris**, M.J.P. Hack, and P. Moin. “Predicting the nonlinear amplification of disturbances using the Spatial Perturbation Equations in a viscous boundary layer”. In: *74th Annual Meeting of the APS Division of Fluid Dynamics*. Nov. 2021. URL: <https://meetings.aps.org/Meeting/DFD21/Session/T03.2>.
- [C3] **S. R. Harris**, M.J.P. Hack, and P. Moin. “Modeling the amplification of disturbances using the Spatial Perturbation Equations”. In: *73rd Annual Meeting of the APS Division of Fluid Dynamics*. Nov. 2020. URL: <https://meetings.aps.org/Meeting/DFD20/Session/H05.8>.
- [C4] **B. D. Ehrhart**, S. R. Harris, M. Blaylock, A. B. Muna, and D. Olivia. “Risk assessment and ventilation modeling for hydrogen vehicle repair garages”. In: *International Conference on Hydrogen Safety*. 2019. URL: [https://hysafe.info/myfiles/ichs2019/ICHS\\_2019\\_Program.pdf](https://hysafe.info/myfiles/ichs2019/ICHS_2019_Program.pdf).
- [C5] **S. R. Harris** and M. J. P. Hack. “Nonlinear spatial marching of high-amplitude perturbations”. In: *72nd Annual Meeting of the APS Division of Fluid Dynamics*. 2019. URL: <http://meetings.aps.org/Meeting/DFD19/Session/P33.6>.
- [C6] **J. Labahn**, H. Wu, S. Harris, W. M. Ihme, and J. H. Frank. “The application of data assimilation to combine experimental data and LES for improved state-estimation”. In: *71st Annual Meeting of the APS Division of Fluid Dynamics*. 2018. URL: <https://meetings.aps.org/Meeting/DFD18/Session/D31.10>.
- [C7] **S. R. Harris**, J. Labahn, and M. Ihme. “The coupling of high-speed high resolution experimental data and LES through data assimilation techniques”. In: *70th Annual Meeting of the APS Division of Fluid Dynamics*. 2017. URL: <http://meetings.aps.org/Meeting/DFD17/Session/L28.11>.
- [C8] **S. R. Harris** and B. Smith. “Olive Oil Tracer Particle Size Analysis for Optical Flow Investigations in a Gas Medium”. In: *67th Annual Meeting of the APS Division of Fluid Dynamics*. 2014. URL: <http://meetings.aps.org/link/BAPS.2014.DFD.R29.9>.