Junlin Yuan

Curriculum Vitae

Mechanical Engineering, Michigan State University
428 S. Shaw Lane, East Lansing, MI, USA, 48824
Phone: +1 (517) 353-6733
Email: junlin@egr.msu.edu

A. EDUCATION

1. Ph.D., Mechanical Engineering, Queen's University, Canada. July 2015.
2. M.S., Mechanical Engineering, Queen's University, Canada. August 2011.
3. B.Eng., Flight Vehicle Design and Engineering, Northwestern Polytechnical University, Xi'an, China. June 2009.

B. PROFESSIONAL APPOINTMENTS

1. Associate Professor, Department of Mechanical Engineering. Michigan State University. (2024/07–present).
2. Assistant Professor, Department of Mechanical Engineering. Michigan State University. (2015/10–2024/06).

C. RESEARCH AND TEACHING FUNDING

C.1. Completed awards

1. Modeling and analysis of fluid-structure interaction in biomimetic undulatory swimming (NSF – CMMI-2015194, 08/01/2020-07/31/2025, $498,861; **PI: Yuan, J**. co-PI: Feeny, B. and Mejia, R.) The goal of this project is to develop a reduced-order model of the undulatory swim of a forced hydroelastic oscillator, aided and validated by simulations and lab experiments. The model will then be used to optimize morphology and forcing for high efficiency.
2. Simulation and modeling of effects of rough walls on non-equilibrium turbulent boundary layers (ONR — N00014-17-1-2102, 1/2/2017-6/1/2022, $851,068; **PI: Yuan, J.** co-PI: Brereton, G. J.) Improve fundamental understanding of non-equilibrium turbulent flows close to rough surfaces based on direct numerical simulation (DNS). Develop physics-based, data-driven models of these flows, based on single-point turbulence closures.
3. CC* Compute: The MSU Data Machine - a high-memory, GPU-enabled compute cluster for data-intensive and AI applications (NSF — CC*-2200792, 08/01/2022-06/30/2025, $399,865; PI: Oshea, B. co-PI: **Yuan, J.** and others.) The goal is to procure and operate a compute cluster that is optimized for data-intensive and machine learning/artificial intelligence applications, including a software ecosystem and user training & support system.
4. Turbulent wall-bounded flows with resolved, realistic roughness topography. Computational resources from Extreme Science and Engineering Discovery Environment (XSEDE) supported by NSF ACI-1548562. **PI: Yuan, J.** 1,605,589.0 SUs, equivalent to $55,730, 7/2016–6/2017.

C.2. Pending / Under Review

1. TEMPEST - Transformative Explorations in Multi-Physics and Engineering of Scientific Turbulence (NSF STC, submitted 06/02/2025, $30,000,000; PI: Murillo, M. co-PI: Kostadinova, E., **Yuan, J.**, Gilbert, A., and Christlieb, A.) Finalist. A Science and Technology Center to revolutionize understanding of turbulent systems across scales from quantum to cosmic regimes.

C.3. Teaching and Instructional Grants

1. Spartan Agentic AI Studio (MSU AI Ready Spartans: Education Innovation Grants Challenge, internal/institutional grant – Office of the Vice Provost for Academic Innovation, 06/01/2026-05/31/2027, $10,000; **PI: Yuan, J.** co-PI: Kou-Herrema, T. and Barber, J.) A teaching-innovation studio that prepares students to design, direct, and verify autonomous agent systems.

D. REFEREED JOURNAL ARTICLES

h-index: 17 | Total citations: 1,105 (Google Scholar, June 2026)

Under review:

1. G. Shen, T. J. Erickson, M. S. Phanikumar, and J. Yuan. "Direct numerical simulations of hyporheic exchange induced by hydraulically rough bedforms." *J. Geophys. Res. Earth Surf.*, (under review, 2026). Manuscript ID 2026JF009381.

Published:

1. J. Ardister, J. Geddes, B. F. Feeny, and J. Yuan. "Modeling and Computational Fluid Dynamics Validation of a Nonholonomically Constrained Two-Rigid-Body Swimming System." *J. Fluids Struct.*, **142**:104510, (2026).
2. J. Yuan, M. Gatzek, and S. Pargal. "Near-wall characteristics of non-equilibrium turbulent boundary layers on rough walls." *Int. J. Heat Fluid Fl.*, **116**(109937), (2025).
3. S. Pargal, J. Yuan, and S. Moreau. "A generalized wall-pressure spectral model for non-equilibrium boundary layers." *J. Fluid Mech.*, **996**:A27-1—29, (2024).
4. S. C. Mangavelli and J. Yuan. "Effects of form-induced velocity in rough-wall turbulent channel flows." *J. Turbul.*, **24**:14—35, (2023).
5. X. Yang, W. Zhang, J. Yuan, and R. F. Kunz. "In search of a universal rough wall model." *Journal of Fluids Engineering*, **145**:101302-1—7, (2023).
6. A. Caiazzo, S. Pargal, H. Wu, M. Sanjose, J. Yuan, and S. Moreau. "On the effect of adverse pressure gradients on wall-pressure statistics in a controlled-diffusion aerofoil turbulent boundary layer." *Journal of Fluid Mechanics*, **960**:A17-1—44, (2023).
7. M. Aghaei-Jouybari, J. Yuan, Z. Li, G. J. Brereton, and F. A. Jaberi. "Super-sonic turbulent flows over sinusoidal rough walls." *Journal of Fluid Mechanics*, **956**:A3-1—27, (2023).
8. G. Shen, J. Yuan, and M.S. Phanikumar. "Quantifying the effects of bed roughness on transit time distributions via direct numerical simulations of turbulent hyporheic exchange." *Water Resour. Res.*, **58**:e2021WR030503-1—16, (2022).
9. M. Aghaei Jouybari, J.-H. Seo, J. Yuan, R. Mittal, and C. Meneveau. "Contributions to pressure drag in rough-wall turbulent flows: insights from force partitioning." *Phys. Rev. Fluids*, **7**:084602, (2022).
10. S. Pargal, H. Wu, J. Yuan, and S. Moreau. "Adverse-pressure-gradient turbulent boundary layer on convex wall." *Phys. Fluids*, **34**:035107, (2022).
11. G. J. Brereton, M. Aghaei Jouybari, and J. Yuan. "Towards modeling of turbulent flow over surfaces of arbitrary roughness." *Phys. Fluids*, **33**:065121-1—13, (2021).
12. S. C. Mangavelli, J. Yuan, and G. J. Brereton. "Effects of surface roughness topography in transient channel flows." *J. Turbul.*, **22**:434–460, (2021).
13. M. Aghaei Jouybari, J. Yuan, G. Brereton, and M. S. Murillo. "Data-driven prediction of the equivalent sand-grain height in rough-wall turbulent flows." *Journal of Fluid Mechanics*, **912**:A8, (2021).
14. S. Pargal, J. Yuan and G. Brereton. "Impulse response of turbulent flow in smooth and riblet-walled channels." *Journal of Turbulence*, (2021).
15. X. Yang, Z. H. Xia, J. Lee, Y. Lv and J. Yuan. "Mean flow scaling in a spanwise rotating channel." *Physical Review Fluids*, **5**:074603, (2020).
16. G. Shen, J. Yuan and M.S. Phanikumar. "Direct numerical simulations of turbulence and hyporheic mixing near sediment–water interfaces." *J. Fluid Mech.*, **892**:A20-1—30, (2020).
17. J. Yuan, A. A. Mishra, G. J. Brereton, G. Iaccarino, and M. Vartdal. "Single-point structure tensors in turbulent channel flows with smooth and wavy walls." *Physics of Fluids*, **31**:125115-1–15, (2019).

18. M. Aghaei Jouybari, G. Brereton, and J. Yuan. "Turbulence structures over realistic and synthetic wall roughness in open channel flow at Re_τ=1000." *Journal of Turbulence*, **20**:723–749, (2019).
19. W. Wen, U. Piomelli and J. Yuan. "Turbulence statistics in rotating channel flows with rough walls." *Int. J. Heat Fluid Flow*, **80**:108467, (2019).
20. J. Yuan and M. Aghaei Jouybari. "Topographical effects of roughness on turbulence statistics in roughness sublayer." *Physical Review Fluids*, **3**:114603, (2018).
21. G. J. Brereton and J. Yuan. "Wall-roughness eddy viscosity for Reynolds-averaged closures." *Int. J. Heat Fluid Flow*, **73**:74–81, (2018).
22. J. Yuan and U. Piomelli. "Numerical simulation of a spatially developing accelerating boundary layer over roughness." *Journal of Fluid Mechanics*, **780**:192–214, (2015).
23. J. Yuan and U. Piomelli. "Roughness effects on the Reynolds stress budgets in near-wall turbulence." *Journal of Fluid Mechanics*, **760**:R1, (2014).
24. J. Yuan and U. Piomelli. "Estimation and prediction of the roughness function on realistic surfaces." *Journal of Turbulence*, **15**:350–365, (2014).
25. J. Yuan and U. Piomelli. "Numerical simulations of sink-flow boundary layers over rough surfaces." *Physics of Fluids*, **26**:015113, (2014).
26. U. Piomelli and J. Yuan. "Numerical simulations of spatially developing, accelerating boundary layers." *Physics of Fluids*, **25**:101304, (2013).

E. INVITED TALKS

1. **J. Yuan**, "Simulation and Modeling of Noncanonical Turbulent Boundary Layers" (Keynote). *ASME FEDSM 2025*, Philadelphia, PA. July 28, 2025.
2. **J. Yuan**, "Simulation and modeling of non-canonical wall-bounded turbulent flows" (Keynote). *CSME-CFDSC-CSR 2025, 32nd Annual Conference of the CFD Society of Canada*, Montreal, Canada. May 27, 2025.
3. **J. Yuan**, "Simulation and modeling of non-canonical turbulence" St. Anthony Falls Laboratory, University of Minnesota. April 28, 2021.
4. **J. Yuan**, "Numerical simulation of rough-wall turbulent boundary layers." Department of Mechanical Engineering, University of Sherbrooke. August 7, 2015.

F. REFEREED CONFERENCE PAPERS

1. J. Ardister, B. F. Feeny, and J. Yuan. "Assessment of Nonholonomic Constraint Models for Undulatory Swimming: Parameter Estimation and Comparison with Computational Fluid Dynamics." In *Proceedings of the ASME 2026 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE)*, Houston, TX, August 16-19, Paper No. IDETC2026-194748, (2026).
2. J. Yuan, M. Gatzek, and S. Pargal. "Near-wall characteristics of non-equilibrium turbulent boundary layers on rough walls." In *13th International Symposium on Turbulence and Shear Flow Phenomena (TSFP13)*, Montreal, Canada, (2024).
3. S. Pargal, J. Yuan, and S. Moreau. "Wall-pressure spectra under turbulent boundary layers with equilibrium pressure gradients." In *30th AIAA/CEAS Aeroacoustics Conference*, Rome, Italy, (2024).
4. S. Shubham, R. D. Sandberg, A. Kushari, S. Pargal, S. Moreau, J. Yuan, and M. Sanjose. "Data-driven empirical wall pressure spectrum models for fan noise prediction." *AIAA Aviation and Aeronautics Forum and Exposition*, San Diego, California, (2023).
5. G. Shen, J. Yuan, and M. S. Phanikumar. "Direct numerical simulations of hyporheic exchange induced by rough bedforms." In *Twelfth International Symposium on Turbulence and Shear Flow Phenomena (TSFP-12)*. Osaka, Japan (Online), July 19-22, (2022).

6. G. J. Brereton, J. Yuan, and M. Aghaei-Jouybari. "Surface body-force model for turbulent flow over rough walls." In *34th Symposium on Naval Hydrodynamics*, Washington, DC, (2022).
7. S. Pargal, H. Wu, J. Yuan, and S. Moreau. "Non-equilibrium turbulent boundary layer with adverse pressure gradient and convex wall curvature." In *Proc. CFDSC Conference*, (2021).
8. M. Aghaei Jouybari, J. Yuan and G. Brereton. "DNS data driven modeling of turbulent flows over rough walls." In *Proc. 33rd Symposium on Naval Hydrodynamics*, Osaka (virtual), Japan, 18-23 October (2020).
9. J. Yuan and G. J. Brereton. "Effect of fractal-like surface roughness on fully developed channel flow." In *Proc. TSFP-11*, Southampton, UK, Jul 30-Aug 2, (2019).
10. U. Piomelli, W. Wen and J. Yuan. "Effect of roughness on wall-bounded flows subjected to spanwise rotation." *12th Int. ERCOFTAC Symp. Eng. Turbulence Modelling and Measurements–ETMM12*, Montpellier, France, Sep 26-28, (2018).
11. P. Mottaghian, J. Yuan and U. Piomelli. "Boundary layer separation under strong adverse pressure gradient over smooth and rough walls." In *Direct and Large-Eddy Simulation X*, pages 173–179, Springer, (2018).
12. J. Yuan, G. Brereton, G. Iaccarino, A. A. Mishra and M. Vartdal. "Single-point structure tensors in wall turbulence." Presented at the *17th Biennial Summer Program*, Center for Turbulence Research, Stanford. July 20, (2018).
13. J. Yuan. "Effects of surface roughness topography in developed and transient channel flows." In *Proc. TSFP-10*, Chicago, IL, July 6–9, (2017).
14. J. Yuan and U. Piomelli. "Estimation and prediction of the drag of realistic roughness." Presented at the *22nd Annual Conference of the CFD Society of Canada*, Toronto, Canada, June 1–4, (2014).
15. J. Yuan, J. Nicolle, U. Piomelli and A.-M. Giroux. "Modelling roughness and acceleration effects with application to the flow in a hydraulic turbine." *IOP Conf. Series: Earth and Environmental Science*, **22**:022016, (2014).
16. J. Yuan and U. Piomelli. "Studies of near-wall effects of realistic roughness using Immersed Boundary Method based on the volume-of-fluid approach." In *Proc. Joint EUROMECH/ERCOFTAC Colloquium 549 "Immersed Boundary Methods: Current Status and Future Research Directions"*, Leiden, the Netherlands, June 17–19, (2013).
17. J. Yuan and U. Piomelli. "Large-eddy and Direct numerical simulations of equilibrium accelerating turbulent boundary layers over rough surfaces." Presented at the *21st Annual Conference of the CFD Society of Canada*, Sherbrooke, Canada, May 6–9, (2013).
18. J. Yuan and U. Piomelli. "Large eddy simulation of accelerating turbulent boundary layers over rough surfaces." In *Proc. Turbulent Shear Flow Phenomena 7*, Ottawa, Canada, July 28–31, (2011).

G. OTHER CONFERENCE PROCEEDINGS

1. T. Erickson, G. Shen, **J. Yuan**, and M. S. Phanikumar. "Multi-Scale Assessment of Bedform Hyporheic Exchange: Pore-Scale Insights into Volume-Averaged Model Accuracy." Poster presented at the *American Geophysical Union Fall Meeting*, New Orleans, LA, December 15–19, (2025).
2. **J. Yuan** and G. J. Brereton. "Understanding and modeling the roughness sublayer in non-equilibrium turbulent flows." *APS-DFD*, Salt Lake City, UT, November 24-26, (2024).
3. J. Ardister, J. Geddes, **J. Yuan** and B. F. Feeny. "Modeling and Computational Fluid Dynamics Validation of a Nonholonomically Constrained Two-Rigid-Body Swimming System." *International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE)*, Washington DC, August 25-28, (2024).
4. **J. Yuan**, S. C. Mangavelli and G. Brereton. "Roughness sublayer in non-equilibrium wall-bounded turbulence." *76th Annual Meeting of American Physical Society Division of Fluid Dynamics (APS-DFD)*, Washington DC, November 19-21, (2023).
5. G. Brereton and **J. Yuan**. "Return-to-Equilibrium Anisotropy Model for Non-Equilibrium Reynolds-Stress Closures." *76th Annual Meeting of APS-DFD*, Washington DC, November 19-21, (2023).

6. J. Ardister, B. F. Feeny and **J. Yuan**. "Dynamics and constraint loading in a nonholonomic model of body-caudal-fin locomotion." *International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE)*, Boston, MA, August 20-23, 2023.
7. **J. Yuan**, G. Shen and M.S. Phanikumar. "Pore-resolved direct numerical simulations of hyporheic exchange induced by rough bedforms." Poster presented at the *American Geophysical Union Fall Meeting*, Chicago, IL, December 12-16, 2022.
8. S. C. Mangavelli, **J. Yuan**, and G. Brereton. "Data driven prediction of roughness-sublayer mean velocity profiles." *75th Annual Meeting of APS-DFD*, Indianapolis, IN, November 20-22, 2022.
9. S. Pargal, **J. Yuan**, and S. Moreau. "Wall pressure spectra modelling for trailing edge noise in non-equilibrium adverse pressure gradient boundary layers." *75th Annual Meeting of APS-DFD*, Indianapolis, IN, November 20-22, 2022.
10. S. Pargal, H. Wu, **J. Yuan** and S. Moreau. "Non-equilibrium turbulent boundary layer with adverse pressure gradient and convex wall curvature." *74th Annual Meeting of APS-DFD*, Phoenix, AZ, November 21–23, 2021.
11. S. C. Mangavelli, **J. Yuan** and G. J. Brereton. "Effect of roughness texture on a transient accelerating channel flow." *74th Annual Meeting of APS-DFD*, Phoenix, AZ, November 21–23, 2021.
12. G. Shen, **J. Yuan** and M.S. Phanikumar. "Pore-resolved direct numerical simulations of hyporheic exchange induced by bedforms and bed roughness." *74th Annual Meeting of APS-DFD*, Phoenix, AZ, November 21–23, 2021.
13. M. Aghaei Jouybari, J.H. Seo, **J. Yuan**, R. Mittal and C. Meneveau. "How are flow structures related to drag forces and equivalent sandgrain height in turbulent flows over rough walls?" *74th Annual Meeting of APS-DFD*, Phoenix, AZ, November 21–23, (2021).
14. S. C. Mangavelli, **J. Yuan** and G. Brereton. "Effect of wall roughness texture on transient turbulent channel flow." *73rd Annual Meeting of APS-DFD (Virtual)*, Chicago, IL, November 22–24, (2020).
15. G. Shen, **J. Yuan** and M.S. Phanikumar. "Effects of grain-scale sediment-bed roughness on surface-subsurface mass exchange." *73rd APS-DFD*, Chicago, IL, November 22–24, (2020).
16. G. Pargal, **J. Yuan** and G. Brereton. "Small-span simulation of transient half-channel flow with application to riblets." *73rd APS-DFD*, Chicago, IL, November 22–24, (2020).
17. M. Aghaei Jouybari, **J. Yuan**, F. A. Jaberi and G. Brererton. "Turbulence behavior in supersonic channel flows with two-and three-dimensional sinusoidal roughness." *73rd APS-DFD*, Chicago, IL, November 22–24, (2020).
18. B. Phan, G. Shen and **J. Yuan**. "Turbulent flow kinematics across sediment-water interfaces." *11th annual Mid-Michigan Symposium for Undergraduate Research Experiences (Mid-SURE)*, MSU (virtual), August 10, (2020).
19. G. J. Brereton, M. Aghaei Jouybari and **J. Yuan**. "Modeling Turbulent Rough-Wall Flow with Pseudo Body Forces." *72nd Annual Meeting of APS-DFD*, Seattle, WA, November 23–26, (2019).
20. G. Shen, **J. Yuan** and M.S. Phanikumar. "Direct simulation of momentum transport across sediment-water interfaces with various particle roughness." *72nd Annual Meeting of APS-DFD*, Seattle, WA, November 23–26, (2019).
21. M. Aghaei Jouybari, G. J. Brereton and **J. Yuan**. "Multi-parameter prediction of roughness function and drag profiles in turbulent channel flows over rough walls." *72nd Annual Meeting of APS-DFD*, Seattle, WA, November 23–26, (2019).
22. S. C. Mangavelli, **J. Yuan** and G. J. Brereton. "Effect of roughness texture on transient, accelerating channel flows." *72nd Annual Meeting of APS-DFD*, Seattle, WA, November 23–26, (2019).
23. S. Pargal, **J. Yuan** and G. J. Brereton. "Minimal-span direct simulation of transient, accelerating channel flows and application with wall riblets." *72nd Annual Meeting of APS-DFD*, Seattle, WA, November 23–26, (2019).
24. T. Aminov, **J. Yuan** and J. Foss. "Vortical/Non-vortical boundary identification for a turbulent single stream shear layer." Poster presented at the *Mid-Michigan Symposium for Undergraduate Research Experiences (Mid-SURE)*, MSU, July, (2019).
25. M. Aghaei Jouybari, **J. Yuan** and G. J. Brereton. "Effects of irregular roughness on roughness-sublayer turbulence statistics and coherent motions." *71st Annual Meeting of APS-DFD*, Atlanta, GA, November 18–20, (2018).

26. G. J. Brereton and **J. Yuan**. "Wall-roughness eddy viscosity model for Reynolds-averaged closures." *71st Annual Meeting of APS-DFD*, Atlanta, GA, November 18–20, (2018).

27. G. Shen, **J. Yuan** and M.S. Phanikumar. "Direct simulation of turbulent sediment-water interface." *71st Annual Meeting of APS-DFD*, Atlanta, GA, November 18–20, (2018).

28. **J. Yuan**, G. Brereton, G. Iaccarino, A. A. Mishra and M. Vartdal. "Single-point structure tensors in wall turbulence." *71st Annual Meeting of APS-DFD*, Atlanta, GA, November 18–20, (2018).

29. U. Piomelli, W. Wen and **J. Yuan**. "Turbulence structures in rotating channel flows with rough wall." *71st Annual Meeting of APS-DFD*, Atlanta, GA, November 18–20, (2018).

30. C. Luedtke and **J. Yuan**. "Numerical simulation of the turbulent wake behind a square cylinder." Poster presented at the *Mid-Michigan Symposium for Undergraduate Research Experiences (Mid-SURE)*, MSU, July, (2018).

31. M. Aghaei Jouybari and **J. Yuan**. "Roughness topographical effects on mean momentum and stress budgets in developed turbulent channel flows." *70th Annual Meeting of APS-DFD*, Denver, CO, November 19–21, (2017).

32. G. Brereton and **J. Yuan**. "Wall-roughness eddy viscosity model for Reynolds-averaged closures." *70th Annual Meeting of APS-DFD*, Denver, CO, November 19–21, (2017).

33. U. Piomelli, W. Wu and **J. Yuan**. "Rotating channel flows over rough and smooth surfaces." *70th Annual Meeting of APS-DFD*, Denver, CO, November 19–21, (2017).

34. J. R. Zhang and **J. Yuan**. "Wavelet-based synthesis of wall roughness for realistic turbulent flow simulations." Poster presented at the *Mid-Michigan Symposium for Undergraduate Research Experiences (Mid-SURE)*, MSU, July, (2017).

35. J. West and **J. Yuan**. "Visualization of near-wall eddy evolution in turbulent channel flow." Poster presented at the *Mid-Michigan Symposium for Undergraduate Research Experiences (Mid-SURE)*, MSU, July 27, (2016).

36. **J. Yuan**. "Coupling between roughness and freestream acceleration in turbulent boundary layers." *43rd Midwest Universities Fluid Mechanics Retreat*, Rochester, Indiana, April 7–9, (2016).

37. **J. Yuan** and U. Piomelli. "Coupling between roughness and freestream acceleration in turbulent boundary layers." *68th Annual Meeting of the American Physical Society–Division of Fluid Dynamics*, Boston, Massachusetts, November 22–24, (2015).

38. **J. Yuan** and U. Piomelli. "Response of the rough-wall boundary layer to free-stream acceleration." *67th Annual Meeting of APS-DFD*, San Francisco, CA, November 23–25, (2014).

39. P. Mottaghian, **J. Yuan** and U. Piomelli. "Numerical simulation of adverse-pressure-gradient boundary layer with or without roughness." *67th Annual Meeting of APS-DFD*, San Francisco, CA, November 23–25, (2014).

40. **J. Yuan** and U. Piomelli. "Numerical simulations of flow over realistic rough surfaces." *66th Annual Meeting of APS-DFD*, Pittsburgh, PA, November 23–26, (2013).

41. **J. Yuan** and U. Piomelli. "Simulations of equilibrium accelerating turbulent boundary layers over rough walls." *65th Annual Meeting of APS-DFD*, San Diego, CA, November 18–20, (2012).

42. **J. Yuan** and U. Piomelli. "Large eddy simulation of accelerating turbulent boundary layers over rough surfaces." *64th Annual Meeting of APS-DFD*, Baltimore, MD, November 20–22, (2011).

43. **J. Yuan**, V. Grazioso, and U. Piomelli. "Large-eddy and direct simulations of accelerating boundary layers." *63rd Annual Meeting of APS-DFD*, Long Beach, CA, November 21–23, (2010).

H. AWARDS AND RECOGNITIONS

1. Advised design team received the ME 481 Edison Award for Best Capstone Design Project, MSU (2026).
2. PhD student nominated for the 2021-22 Fitch H. Beach Award for Outstanding Doctoral Research, College of Engineering, MSU (2022).
3. PhD student received Richard H. Brown Endowed Fellowship in Mechanical Engineering, MSU (2021).

4. PhD student received CFD Society of Canada Graduate Scholarship (2021).
5. Paper selected as Physics of Fluids Editor's-Choice paper (2019).
6. Second place in graduate student paper contest, CFD Society of Canada annual meeting (2013).
7. Sun Microsystems of Canada Scholarship in Computational Sciences and Engineering (2010).
8. Outstanding Graduate of Shaanxi Province (Shaanxi Provincial Department of Education), 2009.

I. TEACHING EXPERIENCES

I.1. Graduate-Student Mentoring at MSU

1. Ryan DePree (master). Turbulent simulation and modeling. Summer 2026–present (MS program begins Fall 2026).
2. Tommy Erickson (master, co-supervised by M. S. Phanikumar, CEE). Thesis title: Pore-scale simulation of reactive transport and biofilm growth in hyporheic sediments. Aug. 2024–May 2026.
3. Mace Gatzek (master). Effect of wall roughness in turbulent boundary layers subjected to adverse pressure gradients. Jan. 2020–May 2022, June 2024–June 2025. Current employment: CFD Research Corporation, Huntsville, AL.
4. James P. Geddes (doctoral). Project: Simulation of fluid-structure interaction in undulatory swim. Aug. 2023–Dec. 2024.
5. Sai C. Mangavelli (doctoral). Simulation and modeling of wall roughness in equilibrium and non-equilibrium turbulence boundary layer. Sep 2018–Feb 2024. Numerical simulations of fish swim. Aug. 2021–Dec. 2022. Current employment: Honda (Ohio, US).
6. Saurabh Pargal (doctoral). Thesis title: Non-equilibrium wall-bounded turbulence and associated noise generation. Jan 2018–Jan 2023. Current position: applied technology technical specialist (acoustics) at Cummins Inc.
7. Guangchen Shen (doctoral). Thesis title: Numerical simulations of permeable-wall turbulence with applications in hyporheic exchange. Jan. 2018–Mar. 2022. Current position: Cloud HPC Engineer at Rescale Inc.
8. Mostafa Aghaei Jouybari (doctoral, co-supervised by G. Brereton, ME). Thesis title: Simulation and modeling of compressible and incompressible turbulent channel flows over rough walls. Sep. 2016–Dec. 2020. Current position: Assistant Professor at Department of Aerospace Engineering, University of Kansas.

I.2. Undergraduate-Student Mentoring at MSU

1. Madeline Blomberg (undergrad). Adapting research tooling and findings for outreach. 2024–Aug. 2025.
2. Noah Schott (undergrad). Reduced-order model of undulatory swim. Funded by NSF REU supplement; Feb. 2023–May 2024.
3. Sydney M. Kelly (undergrad). FSI simulation of undulatory swim. Funded by NSF REU supplement; 2023–2024;
4. Brandon Phan (undergrad). Turbulent flow kinematics across sediment-water interfaces. May–Aug. 2020.
5. Timur Aminov (undergrad). 1. Characterization of the viscous super layer from experimental measurement of a single-stream shear layer. May 2019 - Dec. 2019. 2. Turbulence wall-model development for rough-wall channel flows (co-supervised by G. Brereton). Jan 2019 - Apr 2019.
6. Christian Luedtke (undergrad). Numerical simulation of the turbulent wake behind a square cylinder. 2018 Summer EnSURE. May–Jul. 2018.
7. Jinrong Zhang (undergrad). Wavelet-based surface roughness synthesis and interpreting evolving and moving patterns in turbulent flows. Funded by EnSURE. Nov 2016–Jun 2017.
8. Jonathan West (undergrad). Visualization technique development of rough-wall turbulence, 2016 Summer EnSURE. May–Jul. 2016.

I.3. Courses taught at MSU

1. Undergraduate-level Fluid Mechanics (ME332): FS16-18, SS17, SS20, SS22;
2. Introduction to Computational Fluid Dynamics and Heat Transfer (ME433): SS18, SS23-26;
3. Design of Alternative Energy System (ME417): SS21;
4. Mechanical Engineering Design Project (ME481): FS16, SS19, SS25, FS25;
5. Graduate-level Fluid Mechanics I (ME830, both in-person and online master degree): FS19-25;
6. Computational Fluid Dynamics and Heat Transfer (ME840): SS18.

I.4. Mentoring at Queen's University (till 2015)

1. Pouya Mottaghian (master). Separating turbulent boundary layers over roughness. Sept. 2013–Jul. 2015.
2. Anzhu Sun (undergrad). Turbulent data compression based on wavelet transform. May 2014–Sept. 2014.
3. Roberto Zonza (master). Response of turbulent boundary layer over heterogeneous roughness. Aug. 2011–Feb. 2012.

J. SERVICE TO PROFESSION

J.1. Proposal reviewer:

- NSF TRAILBLAZER: Behavioral Modelling & Robotics panel (2024)
- NSF CMMI/DCSD panels (2020, 2023)
- NSF CBET Fluid Dynamics panel (2016)
- MITACS Accelerate research proposal (2020, 2025)

J.2. Article reviewer (around 10 articles/year):

- *Journal of Fluid Mechanics*
- *Physical Review Fluids*
- *Water Resources Research*
- *Journal of Turbulence*
- *Physics of Fluids*
- *International Journal of Heat and Fluid Flow*
- *International Journal of Multiphase Flow*
- *Journal of Hydro-environment Research*
- *AIAA Journal*
- *Boundary-Layer Meteorology*
- *Theoretical and Computational Fluid Dynamics*
- *Journal of Hydraulic Research*
- *International Journal of Advances in Engineering Sciences and Applied Mathematics*
- *Fluid Dynamics Research*
- *Experimental Thermal and Fluid Science*
- *Fluids*
- *Canadian Acoustics*
- *Transactions of the Canadian Society for Mechanical Engineering*
- *ASME FEDSM*
- *International Conference on Physics, Mathematics and Statistics*
- Stanford CTR Summer Program report reviewer

J.3. Session chair:

- Session 5D: "Aerodynamics and Acoustics", in 10th International Symposium on Turbulence and Shear Flow Phenomena (Chicago, IL, 2017)
- Session: "Fundamentals of Fluid Dynamics in the Naval Context (1)", in 34th Symposium on Naval Hydrodynamics (Washington, DC, 2022)
- Session: Turbulence: "Wall-Bounded II - Roughness", in the Annual Meeting of APS-DFD (Washington DC, 2023)
- Session: "Porous Media Flows: General", in the Annual Meeting of APS-DFD (Washington DC, 2023)
- Session: "Flow over rough wall I" in 13th International Symposium on Turbulence and Shear Flow Phenomena (Montreal, Canada, 2024)
- Session: "Boundary Layer Roughness Effect II" in the Annual Meeting of APS-DFD (Salt Lake City, UT, 2024)

J.4. Others service

- APS-DFD External Affairs Committee (2025-present)

K. INSTITUTIONAL SERVICE (MSU)

1. Engineering Research Committee of the College of Engineering (2025-2027, two-year elected term beginning 8/16/25)
2. Faculty advisor for ME Graduate Student Association (2024-present)
3. Advisory Committee (to the Chair) for ME department (2020-2023, 2024-present)
4. Scientific Advisory Board (2019-2022) and the User Advisory Board (2023-present) for the Institute for Cyber-Enabled Research at MSU
5. Search Committees for Department of Mechanical Engineering (2019, 2023), Department of Chemical Engineering and Material Science (2024), and JA Schmidt Endowed Professorship in Thermal Fluid Sciences in Department of Mechanical Engineering (2024). Process Fairness Advocate (2019)
6. Graduate Studies Committee for ME department (2018-2019)

L. OUTREACH ACTIVITIES

1. High School Engineering Institute (HSEI) at MSU, Mechanical Engineering session. Group project for around 60 students. Airfoil lift generation and wing design and vehicle aerodynamics based on turbulent simulations using ANSYS Fluent. July 2016, 2017, 2019, 2021 (virtual), 2025. Cumulative: 340+ high school students since 2016.
2. Designed and led projects for 12 historically underrepresented high-school students in the 2021 (virtual) Detroit Area Pre-College Engineering Program (DAPCEP) camp at MSU, on estimating airfoil forces and designing aircraft wings, based on numerical simulations of turbulent flows
3. Ran the Matlab sessions for the Computer Science and Engineering for DAPCEP 2023 and 2024 at MSU, on data processing for fluid flow simulations of fish swim
4. Grandparents University at MSU, ME session. Team projects on building structures using popsicle sticks. June 26, 2019

M. PROFESSIONAL SKILLS

1. Turbulence modeling and simulations (direct, large-eddy and Reynolds-averaged simulations), immersed boundary methods
2. Programming: Fortran and C (MPI parallelization), Python, Matlab, Perl/Shell script
3. CFD-related: COMSOL, ANSYS Fluent and CFX, OpenFOAM, Tecplot, Paraview

N. LANGUAGES

English (bilingual proficiency), Mandarin & Cantonese (native), French (intermediate-advanced)

O. PROFESSIONAL MEMBERSHIPS

American Physical Society, American Geophysical Society

Updated June 23, 2026.