

DR. BRETT A. MEYERS

7829 Hedgehop Drive
Zionsville, IN 46077
(609) 234-7122 (cell)

brett.albert.meyers@gmail.com
<https://www.linkedin.com/in/brett-a-meyers/>

RESEARCH SCIENTIST
Department of Mechanical Engineering
Vlachos Research Group, Purdue University
585 Purdue Mall
West Lafayette, IN 47906
meyers18@purdue.edu

RESEARCH INTEREST

Cardiac biomechanics (hemodynamics, tissue dynamics), Clinical determinants from medical imaging, Experimental fluid mechanics, Image correlation techniques (including Particle Image Velocimetry [PIV]), Micro-scale flows in medical devices.

EDUCATION

- PhD** **Purdue University** | Mechanical Engineering | Graduation: April 2021
Dissertation: [Methods for echocardiographic biomechanical measurements](#)
- MSME** **Virginia Tech** | Mechanical Engineering | Graduation: July 2014
Thesis: [Feasibility of Echo-PIV for evaluation of cardiac LV filling function](#)
- BSME** **Drexel University** | Mechanical Engineering | Graduation: June 2011
Thesis: [Biofactory-on-a-Chip](#)

JOURNAL PUBLICATIONS

1. **Meyers, B.***, Nyce, J.*, Zhang, J., Frank, L. H., Balaras, E., Vlachos, P. P., & Loke, Y. H. (2023). Intracardiac Flow Analysis of the Right Ventricle in Pediatric Patients With Repaired Tetralogy of Fallot Using a Novel Color Doppler Velocity Reconstruction. *Journal of the American Society of Echocardiography*. [\[doi\]](#)
2. Ishizaka, S., Iwano, H., Tsujinaga, S., Murayama, M., Tsuneta, S., Aoyagi, H., Tamaki, Y., Motoi, K., Chiba, Y., Tanemura, A., Nakabachi, M., Yokoyama, S., Nishino, H., Okada, K., **Meyers, B. A.**, Vlachos, P. P., Sato, T., Kamiya, K., Watanabe, M., Kaga, S., Nagai, T., Oyama-Manabe, N., & Anzai, T. (2022). Determinants of exercise capacity in patients with heart failure without left ventricular hypertrophy. *Journal of Cardiology*. [\[doi\]](#)
3. **Meyers, B. A.**, Brindise, M. C., Kutty, S., & Vlachos, P. P. (2022). A method for direct estimation of left ventricular global longitudinal strain rate from echocardiograms. *Scientific reports*, 12(1), 1-11. [\[doi\]](#)
4. Chiba, Y., Iwano, H., Tsuneta, S., Tsujinaga, S., **Meyers, B.**, Vlachos, P., Ishizaka, S., Motoi, K., Aoyagi, H., Tamaki, Y., Tanemura, A., Murayama, M., Yokoyama, S., Nakabachi, M., Nishino, H., Kaga, S., Kamiya, K., Ohira, H., Tsujino, I., & Anzai, T. (2022). Determinants of altered left ventricular suction in pre-capillary pulmonary hypertension. *European Heart Journal-Cardiovascular Imaging*. [\[doi\]](#)
5. Brindise, M. C., **Meyers, B. A.**, Kutty, S., & Vlachos, P. P. (2021). Automated Peak Prominence-Based Iterative Dijkstra's Algorithm for Segmentation of B-Mode Echocardiograms. *IEEE Transactions on Biomedical Engineering*, 69(5), 1595-1607. [\[doi\]](#)
6. Chakraborty, S., **Meyers, B. A.**, Iwano, H., Hall, M. E., & Vlachos, P. P. (2021). A wavelet approach to the estimation of left ventricular early filling wave propagation velocity from color m-mode echocardiograms. *Ultrasound in Medicine & Biology*, 47(5), 1397-1407. [\[doi\]](#)
7. Erickson, C. T., **Meyers, B.**, Li, L., Craft, M., Jani, V., Bliamptis, J., Moukagna, K. S. B., Danford, D. A., Vlachos, P., & Kutty, S. (2021). Progression of left ventricular diastolic

function in the neonate and early childhood from transmitral color M-mode filling analysis. *Pediatric research*, 89(4), 987-995. [[doi](#)]

8. **Meyers, B. A.**, Goergen, C. J., Segers, P., & Vlachos, P. P. (2020). Colour-Doppler echocardiography flow field velocity reconstruction using a streamfunction–vorticity formulation. *Journal of the Royal Society Interface*, 17(173), 20200741. [[doi](#)]
9. Brindise, M. C. *, **Meyers, B. A.***, & Vlachos, P. P. (2020). Universality of vortex ring decay in the left ventricle. *Journal of Biomechanics*, 103, 109695. [[doi](#)]
10. Acuna, A. *, Berman, A. G. *, Damen, F. W. *, **Meyers, B. A.***, Adelsperger, A. R. *, Bayer, K. C., Brindise, M. C., Bungart, B., Kiel, A. M., Morrison, R. A., Muskat, J. C., Wasilczuk, K. M., Wen, Y., Zhang, J., Zito, P., & Goergen, C. J. (2018). Computational fluid dynamics of vascular disease in animal models. *Journal of Biomechanical engineering*, 140(8). [[doi](#)]
11. Londono-Hoyos, F. J., Swillens, A., Van Cauwenberge, J., **Meyers, B.**, Koppula, M. R., Vlachos, P., Chirino, J. A., & Segers, P. (2018). Assessment of methodologies to calculate intraventricular pressure differences in computational models and patients. *Medical & biological engineering & computing*, 56(3), 469-481. [[doi](#)]
12. **Meyers, B. A.**, Goergen, C. J., & Vlachos, P. P. (2018). Development and validation of a phase-filtered moving ensemble correlation for echocardiographic particle image velocimetry. *Ultrasound in Medicine & Biology*, 44(2), 477-488. [[doi](#)]
13. Iwano, H., Pu, M., Upadhyia, B., **Meyers, B.**, Vlachos, P., & Little, W. C. (2014). Delay of left ventricular longitudinal expansion with diastolic dysfunction: impact on load dependence of e' and longitudinal strain rate. *Physiological reports*, 2(7), e12082. [[doi](#)]

* Indicates shared co-authorship between primary authors

MANUSCRIPTS IN PROGRESS, UNDER REVIEW, AND PRE-PRINTS

1. **Meyers, B. A.**, Bhattacharya, S., Loke, Y. H., Payne, M. R., & Vlachos, P. P. Diastolic Flow Energy Losses in the Systemic Right Ventricle: A Perinatal Study Using Doppler Vector Reconstruction. (*Under review with PLOS One; pre-print online*). [[doi](#)]
2. **Meyers, B. A.**, Nyce, J., Zhang, J., Loke, Y.H., & Vlachos, P. P. Verification of echocardiography color Doppler Velocity Reconstruction against 4D flow magnetic resonance imaging for assessment of right ventricular intracardiac flow. (*Under review with PLOS One*)
3. **Meyers, B. A.**, Steinhubl, S., & Vlachos, P. P. Echocardiographic identification of fluid overload associated with left ventricular dysfunction using machine learning. (*Under review with JACC Cardiovascular Imaging*)
4. Brindise, M. C., Sharmin, R., Kolliyil, J. J., **Meyers, B. A.**, Zhang, J., & Vlachos, P. P. Spectro-temporal Feature Generation Method for Atrial Fibrillation Detection in ECGs (*Under review with IEEE Journal of Biomedical and Health Informatics*)
5. Chakraborty, S., Bhattacharya, S., **Meyers, B. A.**, Sepulveda, M. S., & Vlachos, P. Evolution of Cardiac Tissue and Flow Mechanics in Developing Japanese Medaka. (*Under review with PLOS One*)
6. Denardo, S. J., Vlachos, P. P., **Meyers, B. A.**, Babakhani-Galangashi, R., Wang, L., Gao, Z., & Tchong, J. E. Translating Proof-of-Concept for Platelet Slip into Improved Antithrombotic Therapeutic Regimens. (*Under review with Platelets*)
7. Cater, D., Mitra, S., Bhattacharya, S., **Meyers, B.**, Serrano, R., Rowan, C. M., & Vlachos, P. Novel Analysis of Echocardiogram Indices and their Association with Outcomes in Pediatric Sepsis. (*In preparation for submission to PLOS One*)

8. Derakshandeh, R., Bhattacharya, S., **Meyers, B. A.**, & Vlachos, P. P. Ultrasound Image Velocimetry Uncertainty Quantification. (*In preparation for submission to Ultrasound in Medicine and Biology*)
9. Mitra, S., **Meyers, B. A.**, & Vlachos, P. P. Evolution of Left Ventricular Filling Vortex in the Growing Heart. (*In preparation for submission to Journal of the American Society of Echocardiography*)
10. Zhang, J., **Meyers, B. A.**, Brindise, M. C., Loke, Y. H., & Vlachos, P. P. New Method for Evaluating Left Ventricular Diastolic Flow Propagation for Heart Failure Diagnostics. (*In preparation for submission to Journal of the Royal Society Interface*)
11. Denardo, S. J., Wang, L., Gao, Z., Zhang, Y., Sabbaghi, A. **Meyers, B. A.**, Vlachos, P. P., & Tchong, J. E. Searching for Disparities in Coronary Interventional Care and Outcomes Within an Exceptionally Challenged Rural Environment. (*In preparation for submission to JACC Advances*)

CONFERENCE PROCEEDINGS

1. Derakhshandeh, R., Bhattacharya, S., **Meyers, B.**, & Vlachos, P. (2021, July). Ultrasound PIV Uncertainty Quantification. *ISPIV21; 14th International Symposium on Particle Image Velocimetry, Chicago, IL, August 1-4, 2021*. Illinois Institute of Technology. [[doi](#)]
2. **Meyers, B.**, Charanko, J., Pu, M., Little, W., & Vlachos, P. (2013, July). Robust clinical cardiac Echo Particle Image Velocimetry (EchoPIV). *ISPIV13; 10th International Symposium on Particle Image Velocimetry, Delft, The Netherlands, July 1-3, 2013*. Delft University of Technology, Faculty of Mechanical, Maritime and Materials Engineering, and Faculty of Aerospace Engineering. [[doi](#)]

CONFERENCE PRESENTATIONS & POSTERS

1. Babakhani Galangashi, R., Bhattacharya, S., **Meyers, B. A.**, & Vlachos, P. (2023, November). Application of stereomicroscope in volumetric micro-PIV. *American Physical Society, Division of Fluid Dynamics 76th Annual Meeting, Washington, D.C.*
2. Bhattacharya, S., **Meyers, B.**, Loke, YH., Payne, M., & Vlachos, P. (2023, November). Investigating Blood Flow Patterns and Hydrodynamics of the Perinatal Single Ventricle Heart: An In Vivo Study. *American Physical Society, Division of Fluid Dynamics 76th Annual Meeting, Washington, D.C.*
3. Singh, A., Anand, P., Eshraghi, J., **Meyers, B. A.**, Bhattacharya, S., & Vlachos, P. P. (2023, November). Wakes of Three Cylinders in a Falling Soap Film: Linking Lagrangian Coherent Structures from PIV to Interferograms. *American Physical Society, Division of Fluid Dynamics 76th Annual Meeting, Washington, D.C.*
4. **Meyers, B.**, Zhang, J., Loke, YH., & Vlachos, P. (2023, November). Assessment of right ventricle intracardiac flow in congenital heart disease: Comparison of enhanced echocardiography and 4D flow MRI measurements. *American Physical Society, Division of Fluid Dynamics 76th Annual Meeting, Washington, D.C.*
5. Cater, D., Mitra, S., Bhattacharya, S., **Meyers, B.**, Serrano, R., Rowan, C., & Vlachos, P. (2023). 1237: Novel Analysis Of Echocardiogram Indices and Their Association with Outcomes in Pediatric Sepsis. *Critical Care Medicine, 51(1)*, 617.
6. Mitra, S., **Meyers, B. A.**, Bhattacharya, S., & Vlachos, P. P. (2022, November). Characterization of left ventricle vortex ring decay in the growing heart. *American Physical Society, Division of Fluid Dynamics 75th Annual Meeting, Indianapolis, IN.*

7. Zhang, J., **Meyers, B.**, Brindise, M., Loke, Y. H., & Vlachos, P. (2022, November). Evaluation of Left Ventricular Flow Propagation Velocity from Multi-Dimensional Cardiac Imaging. *American Physical Society, Division of Fluid Dynamics 75th Annual Meeting*, Indianapolis, IN.
8. Babakhani Galangashi, R., **Meyers, B. A.**, Bhattacharya, S., Eshraghi, J., & Vlachos, P. (2022, November). Vascular velocity reconstruction using Color Doppler flow field velocity. *American Physical Society, Division of Fluid Dynamics 75th Annual Meeting*, Indianapolis, IN.
9. Derakhshandeh, R., Bhattacharya, S., **Meyers, B.**, & Vlachos, P. (2022, November). Ultrasound Image Velocimetry (UIV) Uncertainty Quantification. *American Physical Society, Division of Fluid Dynamics 75th Annual Meeting*, Indianapolis, IN.
10. Sharmin, R., Zhang, J., **Meyers, B.**, Bhattacharya, S., Eshraghi, J., & Vlachos, P. (2022, November). Color Doppler Echocardiography Velocity Reconstruction using Data Fusion with 4D Flow MRI. *American Physical Society, Division of Fluid Dynamics 75th Annual Meeting*, Indianapolis, IN.
11. **Meyers, B.**, Nyce, J., Zhang, J., Loke, Y. H., & Vlachos, P. (2022, October). Validation of Echocardiography Color Doppler Velocity Reconstruction against 4D Flow MRI in Assessment of Right Ventricular Intracardiac Flow. *American Heart Association's 2022 Scientific Sessions*, Chicago, IL.
12. **Meyers, B. A.**, Bhattacharya, S., Brindise, M., Loke, Y. H., Payne, R. M., & Vlachos, P. (2022, October). Quantification of Flow and Biomechanics by Echocardiography (echo) in the Fetal Single Ventricle (sv). *American Heart Association's 2022 Scientific Sessions*, Chicago, IL.
13. Zhang, J., **Meyers, B.**, Brindise, M., Loke, Y. H., & Vlachos, P. (2022, November). Evaluation of Left Ventricular Flow Propagation Velocity From Multi-Dimensional Cardiac Imaging. *American Heart Association's 2022 Scientific Sessions*, Chicago, IL.
14. Nyce, J., **Meyers, B.**, Zhang, J., Frank, L., Balaras, E., Vlachos, P., & Loke, Y. H. (2022, April). Assessment of abnormal right ventricular vorticity in repaired Tetralogy of Fallot patient using Doppler velocity reconstruction (DoVeR). *American College of Cardiology Conference 2022*, Washington, D.C.
15. **Meyers, B.**, Brindise, M., Payne, M., & Vlachos, P. (2022, April). Flow and biomechanics quantification in the single ventricle [SV]. *American College of Cardiology Conference 2022*, Washington, D.C.
16. **Meyers, B.**, Paul, G., & Vlachos, P. (2022, April). Detecting abnormal left ventricular function using gradient boosting learning. *American College of Cardiology Conference 2022*, Washington, D.C.
17. Chiba, Y., Iwano, H., Tsuneta, S., Tsujinaga, S., **Meyers, B.**, Vlachos, P., Ishizaka, S., Motoi, K., Aoyagi, H., Tamaki, Y., Tanemura, A., Murayama, M., Yokoyama, S., Nakabachi, M., Nishino, H., Kaga, S., Kamiya, K., Ohira, H., Tsujino, I., & Anzai, T. (2022, April). Determinants of impaired left ventricular suction in pre-capillary pulmonary hypertension. *American College of Cardiology Conference 2022*, Washington, D.C.
18. **Meyers, B.**, Brindise, M., Sharmin, R., Zhang, J., & Vlachos, P. (2022, April). Detecting atrial fibrillation in ECGs using correlation-based features and machine learning. *American College of Cardiology Conference 2022*, Washington, D.C.
19. Derakhshandeh, R., Bhattacharya, S., **Meyers, B.**, & Vlachos, P. (2021, August). Ultrasound PIV uncertainty quantification. *The 14th International Symposium on Particle Image Velocimetry*, Chicago, IL.

20. **Meyers, B. A.**, Brindise, M., Payne, R. M., & Vlachos, P. (2019). Fetal and Pediatric Heart Flow and Function in Hypoplastic Left Hearts. *The International conference on Biomechanics and Medical Engineering*, San Diego, CA.
21. **Meyers, B. A.**, Brindise, M., Kutty, S., & Vlachos, P. (2019, September). Fully-Automated B-mode Analysis for Left Ventricle Measurements. *The International conference on Biomechanics and Medical Engineering*, San Diego, CA.
22. **Meyers, B.**, Payne, R. M., & Vlachos, P. (2018, November). Tiny hearts in big trouble: cardiac flow hydrodynamics in fetal single ventricle hearts. *American Physical Society, Division of Fluid Dynamics 71st Annual Meeting*, Atlanta, GA.
23. Erickson, C. T., **Meyers, B.**, Li, L., Craft, M., Vlachos, P., Danford, D. A., & Kutty, S. (2018, November). Color m-mode echocardiography derived left ventricular diastolic indices in infants strongly correlate with left ventricular linear dimensions. *American Heart Association's 2018 Scientific Sessions*, Chicago, IL.
24. Erickson, C. T., Li, L., **Meyers, B.**, Craft, M., Schuster, A., Vlachos, P., & Kutty, S. (2017, November). Maturation of Early Diastolic Left Ventricular Function is Largely Complete in the First Month of Life: Insights From Semiautomated Analysis of Color M-Mode Echocardiographic Filling Velocities. *American Heart Association's 2017 Scientific Sessions and Resuscitation Science Symposium*, Chicago IL.
25. **Meyers, B.**, Goergen, C., Scalo, C., & Vlachos, P. (2017, June). Color Doppler Echocardiogram Velocimetry Flow Reconstruction Using Streamfunction-Vorticity Formulation, *3rd Annual Summer Biomechanics, Bioengineering and Biotransport Conference*, Tucson, AZ.
26. **Meyers, B.**, Vlachos, P., Goergen, C., & Scalo, C. (2016, November). Color Doppler Ultrasound Velocimetry Flow Reconstruction using Vorticity-Streamfunction Formulation. *American Physical Society, Division of Fluid Dynamics 69th Annual Meeting*, Portland, OR.
27. **Meyers, B.**, Vlachos, P., Charonko, J., Giarra, M., & Goergen, C. (2015, November). Accuracy and Robustness Improvements of Echocardiographic Particle Image Velocimetry for Routine Clinical Cardiac Evaluation. *American Physical Society, Division of Fluid Dynamics 68th Annual Meeting*, Boston, MA.
28. Londoño Hoyos, F. J., **Meyers, B.**, Vlachos, P., Chirinos, J., & Segers, P. (2014, November). Assessment of intraventricular pressure gradients in patients with heart failure with preserved ejection fraction during an acute dose of sublingual Nitro-Glycerine. *13th Belgian National Day on Biomedical Engineering*, Brussels, Belgium.
29. Londoño, F., **Meyers, B.**, Vlachos, P., Segers, P., & Chirinos, J. (2014, October) P6. 8 Effect of organic nitrates on intraventricular pressure gradients in heart failure patients with preserved ejection fraction. *Artery Research*, 8(4), 147-147.
30. Bhattacharya, S., **Meyers, B.**, Giarra, M., La Foy, R., & Vlachos, P. (2013, November). Uncertainty estimation for Stereo-Particle Image Velocimetry measurements. *American Physical Society, Division of Fluid Dynamics 66th Annual Meeting*, Pittsburg, PA.
31. Iwano, H., Pu, M., Upadhya, B., **Meyers, B.**, Vlachos, P., & Little, W. C. (2013, November). Relation of Early Diastolic Mitral Annular Velocity, Mitral Flow Velocity, and Left Ventricular Strain Rate on Intraventricular Pressure Difference. *American Heart Association's 2013 Scientific Sessions and Resuscitation Science Symposium*, Chicago, IL.
32. Iwano, H., Pu, M., Upadhya, B., **Meyers, B.**, Vlachos, P., & Little, W. C. (2013, November). The Determinants of Early Diastolic Intra Left Ventricular Pressure Difference. *American Heart Association's 2013 Scientific Sessions*, Chicago IL.

33. Ohara, T., Iwano, H., Pu, M., **Meyers, B.**, Charonko, J., Vlachos, P., & Little, W. C. (2013, November). "Left Ventricular Systolic Circumferential Deformation is Associated with Left Ventricular Diastolic Apical Suction", *Japanese Heart Failure 17th Annual Scientific Meeting*.
34. **Meyers, B.**, Charonko, J., Pu, M., Little, W. C., & Vlachos, P. (2013, July) Robust clinical cardiac Echo Particle Image Velocimetry (EchoPIV). *The 10th International Symposium on Particle Image Velocimetry*, Delft, Netherlands.

PATENTS AND INTELLECTUAL PROPERTY

PATENTS

1. Scalo, C., Vlachos, P. P. & **Meyers, B. A.** *Method of processing an image*. U.S. Patent 11,506,783 B2, filed March 4, 2019, and issued November 22, 2022.
2. **Meyers, B. A.**, Vlachos, P. P., & Brindise, M. *System architecture and method of processing images*. U.S. 2021/0287375 A1, filed March 11, 2021. Patent pending.
3. **Meyers, B. A.**, & Vlachos, P. P. *System architecture and method of processing images*. U.S. 2021/0287371 A1, filed March 11, 2021. Patent pending.
4. Vlachos, P. P., & **Meyers, B. A.** *Video processing methods and software architectures for analyzing transformation in objects*. U.S. 2020/0175686 A1, filed November 26, 2019. Patent pending.

INTELLECTUAL PROPERTY DISCLOSURES

1. *Assessment of the Drug Delivery Phenomena in the Tissue Injection using High-speed Synchrotron Radiography* (2023)
2. *A Method for Automatic Echocardiogram Segmentation* (2020)
3. *A Method for Direct Estimation of Heart Mechanics from Echocardiograms* (2020)
4. *Method for optical detection of neurological alterations* (2019)
5. *Method for Reconstructing Two Component Velocity Fields from Ultrasound Color Doppler Scans* (2017)

MEDIA MENTIONS

1. Purdue engineer, IU cardiologist collaborate to offer innovative tool and fresh hope for babies with heart defects, *Purdue EVPRP Research Articles* (online; 2023)
2. Babies Born with Broken Hearts: A collaboration of medicine and engineering in Indiana explores cardiac flow hydrodynamics in fetal single ventricle hearts (*across several outlets*)
3. Out of the box: Diagnosing concussions with a smart phone, *Journal of Purdue Undergraduate Research* (2017)

ACADEMIC, TEACHING, AND PROFESSIONAL EXPERIENCE

ACADEMIC EXPERIENCE

Purdue University, West Lafayette, IN

July 2014 - Present

01/24-Present: Assistant Director, Eli Lilly and Company and Purdue University Research Alliance Center (LPRC)

I assist in generating new opportunities for undergraduate research in pharmaceutical and drug delivery projects aligned with the Eli Lilly and Company and Purdue University partnership.

08/23-Present: Research Scientist, Regenstrief Center for Healthcare Engineering (RCHE)

I collaborate with RCHE-affiliated data scientists and faculty, using advanced statistical approaches in multidisciplinary research to assess healthcare strategy impact on patients facing significant barriers to ultimately enhance healthcare delivery.

Secondary Responsibilities

- Lead a team of graduate students in an exhaustive literature review of intrathecal drug delivery.
- Assist in research grant preparation and submission (~\$10M applied for as of December 2023).
- Explore integrating echographic parameters with clinical and lab measurements in regression models to predict outcomes in cirrhosis patients.

05/21-08/23: Postdoctoral Researcher, School of Mechanical Engineering

Advisor: Pavlos P. Vlachos

My research focused on developing digital biomarker collection methods of cardiac biomechanics and other biofluids problems.

Secondary Outcomes

- Investigated the association of image-based biomarkers and outcomes in pediatric sepsis.
- Reviewed current methods for wearable device measurement of biofluid analytes.

07/14-04/21: Graduate Research Associate, School of Mechanical Engineering

Advisor: Pavlos P. Vlachos

I led research projects developing innovative techniques for quantifying tissue motion and hemodynamics from non-invasive medical imaging, specifically ultrasound. These methodologies improve measurement accuracy from fetal echocardiograms, addressing challenges posed by the small size of the heart and required imaging depths.

Secondary Outcomes

- Created an automated pupil light reflex measurement application for smartphones.
- Investigated left ventricle vortex ring decay rate as a novel heart failure biomarker.

Virginia Tech, Blacksburg, VA

August 2011 – July 2014

08/11-07/14: Graduate Research Associate, Mechanical Engineering Department

Advisor: Pavlos P. Vlachos

I developed a novel framework for performing echo-PIV on clinical echocardiograms.

Secondary Outcomes

- Improved processing for an atrio-ventricular valve annulus loading measurement algorithm.
- Contributed on 2014 PIV Challenge Vortex Ring experiment setup and data collection.

Drexel University, Philadelphia, PA

June 2008 – August 2011

06/08-06/11: Undergraduate Researcher, Department of Mechanical Engineering and Mechanics

Advisor: MinJun Kim

My senior thesis research involved developing a multi-level micro-fluid chip capable of capturing individual cells for studying cell taxes.

Secondary Outcomes

- Part of student teams focused on cell swarming and artificial micro-swimmers.

TEACHING EXPERIENCE

Purdue University, West Lafayette, IN

August 2014–Present

01/24-Present: Instructor/Mentor, Vertically Integrated Projects (VIP)

I mentor an interdisciplinary vertically integrated team, spanning freshmen to seniors, engaged in pharmaceuticals and drug delivery research with the Eli Lilly and Company and Purdue University Research Alliance Center (LPRC). Students are learning to apply their classroom-learned skills on real world problems, gaining professional development experience along the way.

01/24-Present: Instructor/Mentor, Data Science Capstone Project (CS490)

I mentor senior computer science students in applying their classroom-learned skills to construct machine learning/artificial intelligence models using longitudinal medical data from congenital heart defect (CHD) patients to predict outcome from select surgical interventions.

08/23-12/23: Limited Term Lecturer, Fluid Mechanics (ME308)

I taught *Fluid Mechanics* to an 85-student classroom three days per week, preparing lectures and in-class quizzes. Topics included hydrostatics, flow visualization, integral and differential control volume analysis, dimensional analysis, boundary layer theory, drag and lift, pipe flow and fluid machinery, and compressible flows.

01/21-12/21: Instructor/Mentor, Purdue Polytechnic Institute Capstone Project (ECET 380)

I mentored an interdisciplinary team of senior Purdue Polytechnic Institute students in applying their classroom-learned skills to create a deployable app and web storage interface for performing a pupillary light reflex test using a smartphone.

08/14-05/16: Graduate Teaching Assistant, Fluid Mechanics (ME309)

I oversaw lab sessions, conducted recitation lectures, proctored exams, and graded assignments. Additionally, held office hours for lab, homework, and exam assistance. I also served as the Lead TA for redesigned undergraduate Fluid Mechanics lab experiments.

Virginia Tech, Blacksburg, VA

August 2011 – May 2012

08/14-05/16: Graduate Teaching Assistant, Junior Lab (ME4005)

I oversaw labs and graded assignments for experiment design and measurement systems projects.

08/14-05/16: Graduate Teaching Assistant, Senior Lab (ME4006)

I oversaw labs and graded assignments for various experiments with an emphasis on technical writing and presentation development.

PROFESSIONAL EXPERIENCE

Johnson & Johnson, Consumer Group, Lititz, PA

April – Sept. 2010

Process Engineer

I improved packaging processes for worker safety and efficiency on manufacturing operation lines.

Agilent Technologies, Wilmington, DE

Sept. 2008 - March 2009

Research & Design Engineer

I was responsible for designing prototype assemblies, participating in engineering design reviews, and conducting performance and life testing for a new Gas Chromatograph product line.

Kensey Nash Corp., Exton, PA

Sept. 2007 – March 2008

Biomaterials Engineer

I collaborated with lead engineers on design reviews and production of surgical implants, while also conducting strength, life, and quality tests on product line samples.

MENTORSHIP EXPERIENCE

GRADUATES

Ruhi Sharmin, Fall 2021 – Present, Project: Automated Detection and Classification of Cardiac Abnormalities from Electrocardiogram (ECG), and Photoplethysmogram (PPG) Signals.

Shailee Mitra, Fall 2021 – Present, Project: Characterization of Left Ventricle Vortex Ring Decay in the Growing Heart.

UNDERGRADUATES

John Cappetta, Fall 2020 – Fall 2022, Project: Design of a Butterfly IQ portable ultrasound holder; Automated unidimensional longitudinal strain (ULS) for detecting abnormal cardiac motion.
Danielle Newhouse, Spring 2018 – Detecting abnormal pupil light reflex after alcohol ingestion in abusive partner relationships.

AWARDS AND HONORS

- MSME, Mechanical Engineering (*with distinction*) Virginia Tech
- BSME, Mechanical Engineer (*Cum Laude*) Drexel University
- Dean's undergraduate honors list Drexel University
- Travel Award, Purdue University \$1000 (*cumulative*)
- Augusta H. Hess Mechanical Engineering Scholarship \$2,000 (*cumulative*)
- A. J. Drexel Merit Scholarship \$16,000 (*cumulative*)
- H & T Kraiker Endowment Scholarship \$24,000 (*cumulative*)
- Pi Tau Sigma Inductee November 2010
- National Society of Collegiate Scholars Inductee September 2009
- National Cooperative Education Honor Society Inductee May 2008
- Drexel ASME Mentorship Chair September 2010 - June 2011

MEMBERSHIPS/AFFILIATIONS

- American Society of Mechanical Engineers (ASME) Sept. 2007 – Present
- American Physical Society (APS) Nov. 2011 – Present
- American Heart Association (AHA) Sept. 2021 – Present

SERVICE ACTIVITIES

JOURNAL REVIEWER

1. ASME Journal of Biomechanical Engineering
2. BMC Cardiovascular Disorders

CONFERENCE ORGANIZATION

1. Session organizer – multiple topic areas, *American Physical Society, 75th Annual Meeting for the Division of Fluid Dynamics*, Indianapolis, IN.

RESEARCH SUPPORT

ACTIVE

An Integrated and Automated Tool for Quantification of Biomechanics in Fetal and Neonatal Echocardiography

Co-PI: Pavlos Vlachos, R. Mark Payne 09/2022-08/2024

Role: Postdoctoral research associate, Co-author assisting in preparation of proposal submission
Summary: We have developed automated analysis tools to study the biomechanics of Single Ventricle (SV) heart defects, aiming to identify differences between SV and normal hearts, establish correlations with outcomes, and improve surgical planning and clinical management for patients with SV heart defects.

Eli-Lilly

Co-PI: Pavlos Vlachos, 2023-2028 (renewable for 5 years)

Role: Research Assistant, Postdoctoral research associate

COMPLETED

Echocardiography Analysis Tools for Congenital Heart Disease

Co-PI: Pavlos Vlachos, R. Mark Payne 04/2018-04/2022

Role: Research Assistant, Co-author assisting in preparation of proposal submission

Summary: We researched on ways to improve long-term survival rates and clinical management for children with single ventricle (SV) hearts by developing automated analysis tools to quantify ventricular biomechanics, investigating hemodynamic and biomechanical differences between healthy and SV hearts, and establishing correlations between these parameters and outcomes at different stages of SV heart development.

Assessment of Left Ventricle Function Using Color M-Mode Echocardiography

PI: Pavlos Vlachos, 07/2014-06/2016

Role: Research Assistant

Summary: We investigated changes in left ventricle filling dynamics for patients with cardiac dysfunction by analyzing the filling propagation velocity (V_p), and proposing a novel parameter called early filling strength (V_s) to better differentiate between different dysfunction states.

Development of new measurement tools for accurate estimation of wall-shear stress in medical devices using Particle Image Velocimetry (PIV) methods

PI: Pavlos Vlachos, 07/2012-06/2014

Role: Research Assistant

Summary: The goal of this research was to create accurate and detailed measurement datasets for the flow geometry of implantable cardiovascular devices.

Eli-Lilly

Co-PI: Pavlos Vlachos, 2017-2022 (renewable for 5 years)

Role: Research Assistant, Postdoctoral research associate

Causally driven Healthcare Science, Integrative Data Science Initiative, Purdue

Co-PI: Pavlos Vlachos, Mohammad Adibuzzaman, 06/2018-(06/2021)

Role: Research Assistant

Summary: This study aims to explore potential enhancements in heart failure diagnosis by utilizing a novel scoring method derived from structural causal modeling. The effectiveness of this method will be compared against state-of-the-art algorithms.