

## Arash Kheradvar, M.D., Ph.D., FAHA

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### Research Interests

- Heart Valve Engineering
- Cardiovascular Imaging
- Modeling Congenital Heart Disease
- Technologies for Minimally Invasive Procedures
- Soft Tissue Biomechanics & Biofluid Dynamics
- Artificial Organs

### Education

- Ph.D. (Bioengineering), *California Institute of Technology, Pasadena, California* – defended on November 1, 2006. Thesis title: The role of vortex ring formation and pressure drop on dynamics of the left ventricle during diastole. Academic advisor: Prof. Mory (Morteza) Gharib.
- M.D., *Tehran University of Medical Sciences, Tehran, Iran* – degree received on August 22, 2000. Thesis title: Measurement of the astigmatic changes after Frown small incision cataract surgery. Thesis advisor: Prof. Mahmoud Jabbarvand.

### Professional Employment

*University of California, Irvine*

*10/2010-Present*

- 07/2017 – present: Professor of Biomedical Engineering, Mechanical and Aerospace Engineering, and Medicine
- 07/2013 – 06/2017: Associate Professor of Biomedical Engineering and Medicine (Tenured)
- 07/2013 – 06/2017: Associate Professor of Mechanical & Aerospace Engineering (Joint)
- 07/2011 – 06/2013: Assistant Professor of Mechanical & Aerospace Engineering (Joint)
- 10/2010 – 06/2013: Assistant Professor of Biomedical Engineering and Medicine

*University of South Carolina, Columbia, South Carolina*

*10/2007-10/2010*

- 10/2007 – 10/2010: Assistant Professor of Mechanical Engineering, Medicine and Cell Biology & Anatomy

*California Institute of Technology, Pasadena, California*

*03/2002-10/2007*

- 01/2007 – 10/2007: Postdoctoral Scholar, Cardiovascular and Biofluid Dynamics Laboratory (Mentor: Prof. Mory Gharib)
- 03/2002 – 11/2006: Graduate research assistant, Cardiovascular and Biofluid Dynamics Laboratory

*Tehran University of Medical Sciences, Tehran, Iran*

*02/1993-03/2002*

- 01/2000 - 03/2002: Research Fellow: Immunogenetics Laboratory, Department of Immunology (Mentor: Prof. Behrouz Nikbin)
- 02/1993 – 08/2000: Medical Student

### Refereed Journal Publications

- J48. **Kheradvar A.** On the accuracy of intracardiac flow velocimetry methods, *Journal of Echocardiography*, 2017 June;15(2): 67-69.
- J47. Avendi MR, **Kheradvar A.**, Jafarkhani H. Automatic Segmentation of the Right Ventricle from Cardiac MRI Using a Learning-based Approach, *Magnetic Resonance in Medicine*, 2017 Dec;78(6):2439-2448.
- J46. Alavi SH, Soriano Baliarda M, Bonessio N, Valdevit L, **Kheradvar A.** A Tri-leaflet Nitinol Mesh Scaffold for Engineering Heart Valves, *Annals of Biomedical Engineering*, 2017 Feb;45(2):413-426.
- J45. Sievers HH, Putman LM, **Kheradvar A.**, Gabbert D, Wegner P, Scheewe J, Salehi-Ravesh M, Kramer HH, Rickers C. 4D flow streamline characteristics of the great arteries twenty years after Lecompte and direct spiral arterial switch operation (DSASO) in simple TGA, *Global Cardiology Science and Practice* 2016 (3):29.

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- J44. Dasi LP, Hatoum H, **Kheradvar A**, Zareian R, Alavi SH, Sun W, Martin C, Pham T, Wang Q, Midha P, Gowda VS, Yoganathan A. On the Mechanics of Transcatheter Aortic Valve Replacement, *Annals of Biomedical Engineering*, 2017 Feb;45(2):310-331.
- J43. Falahatpisheh A, Morisawa D, Toosky TT, **Kheradvar A**. A Calcified Polymeric Valve for Valve-in-Valve Applications, *Journal of Biomechanics*, 2017 Jan; 50(1): 77–82.
- J42. Sievers HH, **Kheradvar A**, Kramer HH and Rickers C. 3D Heart Model and 4D Flow MRI 20 Years after Spiral Arterial Switch Operation. *Thorac Cardiovasc Surg Reports*, 2016 Dec; 05(01): 44-46.
- J41. Hajiaghayi M, Groves EM, Jafarkhani H, and **Kheradvar A**. A 3D Active Contour Method for Automated Segmentation of the Left Ventricle from Magnetic Resonance Images, *IEEE Transactions on Biomedical Engineering*, 2017 Jan; 64 (1): 134-144.
- J40. Avendi MR, **Kheradvar A**, Jafarkhani H. A Combined Deep-Learning and Deformable-Model Approach to Fully Automatic Segmentation of the Left Ventricle in Cardiac MRI, *Medical Image Analysis*, 2016 Feb 6;30:108-119.
- J39. Rickers C, **Kheradvar A**, Sievers HH, Falahatpisheh A, Wegner P, Gabbert D, Jerosch-Herold M, Hart C, Voges I, Putman LM, Kristo I, Fischer G, Scheewe J, Kramer HH. Is the Lecompte Technique the last word on transposition of the great arteries repair for all patients? A magnetic resonance imaging study including a spiral technique, two decades postoperatively, *Interactive Cardiovascular and Thoracic Surgery*, 2016 Jun;22(6):817-25.
- J38. Falahatpisheh A and **Kheradvar A**. A Framework for Synthetic Validation of 3D Echocardiographic Particle Image Velocimetry. *Meccanica*, 2017 Feb, 52(3): 555–561.
- J37. Falahatpisheh A, Rickers C, Gabbert DD, Heng EL, Stalder A, Kramer HH, Kilner PJ, **Kheradvar A**. Simplified Bernoulli's method significantly underestimates pulmonary transvalvular pressure Drop. *Journal of Magnetic Resonance Imaging*, 2016;43:1313–1319. (Featured on the cover of the June 2016 issue)
- J36. **Kheradvar A**, Groves EM, Falahatpisheh A, Mofrad MRK, Alavi SH, Tranquillo R, Dasi LP, Simmons CA, Goergen CJ, Baaijens F, Little SH, Canic S, Griffith B. Emerging Trends in Heart Valve Engineering: Part IV. Computational Modeling and Experimental Studies, *Annals of Biomedical Engineering*, 2015 Oct;43(10):2314-2333.
- J35. Alavi SH, Sinha A, Steward E, Milliken JC, and **Kheradvar A**. Load Dependent Extracellular Matrix Organization in Atrioventricular Heart Valves: Differences and Similarities, *American Journal of Physiology - Heart and Circulatory Physiology*, 2015 Jul 15;309(2):H276-84.
- J34. Falahatpisheh A, Pahlevan NM, **Kheradvar A**. Effect of the Mitral Valve's Anterior Leaflet of on Axisymmetry of Transmitral Vortex Ring, *Annals of Biomedical Engineering*, 2015 Oct;43(10):2349-2360.
- J33. Alavi SH and **Kheradvar A**. A Hybrid Tissue-Engineered Heart Valve, *Annals of Thoracic Surgery*, 2015 Jun;99(6):2183-2187.
- J32. Pedrizzetti G, Vlachos P, Little W, Sotiropoulos F, Gharib M, **Kheradvar A**. On Proper Use of Fluid Dynamics Conservation Laws in Defining the Contribution of Diastolic Vortex Ring to Left Ventricular Filling, *Journal of American College of Cardiology*, Jun 16;65(23):2573-4.
- J31. **Kheradvar A**, Groves EM and Tseng E. FOLDAVALVE: A Novel 14Fr Totally Repositionable and Retrievable Transcatheter Aortic Valve: Proof of Concept in Sheep. *Euro Interventions* 2015 Mar 16;10(11) pii: 20141002-01.
- J30. **Kheradvar A**, Groves EM, Dasi LP, Alavi SH, Tranquillo RT, Grande-Allen KJ, Simmons CA, Griffith BE, Falahatpisheh A, Goergen CJ, Mofrad MRK, Baaijens FPT, Little SH, Canic S. Emerging Trends in Heart Valve Engineering: Part I. Solutions for Future, *Annals of Biomedical Engineering*, 2015 Apr;43(4):833-43.
- J29. **Kheradvar A**, Groves EM, Goergen CJ, Alavi SH, Tranquillo RT, Simmons CA, Dasi LP, Grande-Allen KJ, Mofrad MRK, Falahatpisheh A, Griffith BE, Baaijens FPT, Little SH, Canic S. Emerging Trends in Heart Valve Engineering: Part II. Novel and Standard Technologies for Aortic Valve Replacement, *Annals of Biomedical Engineering*, 2015 Apr;43(4):844-57.
- J28. Falahatpisheh A, Pedrizzetti G, **Kheradvar A**. Three-Dimensional Reconstruction of Cardiac Flows Based on Multi-Planar Velocity Fields, *Experiments in Fluids*, November 2014, 55:1848.
- J27. Falahatpisheh A, **Kheradvar A**. A Measure of Axisymmetry for Vortex Rings, *European Journal of Mechanics - B/Fluids*, 49 (2015) 264–271.

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- J26. **Kheradvar A**, Groves EM, Simmons CA, Griffith BE, Alavi SH, Tranquillo RT, Dasi LP, Falahatpisheh A, Grande-Allen KJ, Goergen CJ, Mofrad MRK, Baaijens FPT, Canic S, Little SH. Emerging Trends in Heart Valve Engineering: Part III. Novel Technologies for mitral valve repair and replacement, *Annals of Biomedical Engineering*, 2015 Apr;43(4):858-70.
- J25. Groves EM, Falahatpisheh A, Su JL, **Kheradvar A**. The Effects of Positioning of Transcatheter Aortic Valve on Fluid Dynamics of the Aortic Root, *ASAIO J*. 2014 Sep-Oct;60(5):545-52 (Featured on the cover of the Sep-Oct 2014 issue).
- J24. Alavi SH, Groves EM, **Kheradvar A**. The Effects of Transcatheter Valve Crimping on Pericardial Leaflets, *The Annals of Thoracic Surgery*, 2014 Apr;97(4):1260-6.
- J23. Abe H, Caracciolo G, **Kheradvar A**, Pedrizzetti G, Khandheria BK, Narula J, Sengupta PP. Contrast echocardiography for assessing left ventricular vortex strength: a prospective case-control pilot study in heart failure, *European Heart Journal – Cardiovascular Imaging*, 2013 Nov;14(11):1049-60.
- J22. Mangual JO, Föll D, Jung B, Pedrizzetti G, **Kheradvar A**. Aging does not Affect Radial Viscoelastic Behavior of the Left Ventricle, *Cardiology*, 2013;125(1):38-49.
- J21. Alavi SH, Ruiz V, Krasieva T, Botvinick EL, and **Kheradvar A**. Characterizing the Collagen Fiber Orientation in Pericardial Leaflets under Mechanical Loading Conditions, *Annals of Biomedical Engineering*, 2013,41 (3) 547-561.
- J20. Alavi SH, Liu WF, **Kheradvar A**. Inflammatory Response Assessment of a Hybrid Tissue-Engineered Heart Valve Leaflet. *Annals of Biomedical Engineering*, 2013, 41 (2) 316-26.
- J19. Falahatpisheh A, **Kheradvar A**. High-Speed Particle Image Velocimetry to Assess Cardiac Fluid Dynamics *in vitro*: From Performance to Validation, *European Journal of Mechanics - B/Fluids*, 35 (2012) 2–8.
- J18. Sengupta PP, Pedrizzetti G, Kilner PJ, **Kheradvar A**, Ebberts T, Tonti G, Fraser, AG, Narula, J. Emerging Trends in Cardiovascular Flow Visualization, *Journal of American College of Cardiology: Cardiovascular Imaging*, 2012, 5; 305-16. (Featured on the cover of the March 2012 issue).
- J17. Alavi SH, **Kheradvar A**. Metal Mesh Scaffold for Tissue Engineering of Membranes, *Tissue Engineering Part C: Methods*, 2012, 18 (4); 293-301. (Featured on the cover of the April 2012 issue).
- J16. **Kheradvar A**, Assadi R, Falahatpisheh, A, Sengupta, PP. Assessment of Transmitral Vortex Formation in Patients with Diastolic Dysfunction, *Journal of American Society of Echocardiography*, 2012, 25 (2) 220-7. (Featured on the cover of the February 2012 issue).
- J15. **Kheradvar A**, Falahatpisheh, A. The Effects of Dynamic Saddle Annulus and Leaflet Length on Transmitral Flow Pattern and Leaflet Stress of a Bi-leaflet Bioprosthetic Mitral Valve, *Journal of Heart Valve Disease*, 2012, 21; 225-233.
- J14. Mangual JO, Jung B, Ritter JA, **Kheradvar A**, Modeling Radial Viscoelastic Behavior of Left Ventricle based on MRI Tissue Phase Mapping, *Annals of Biomedical Engineering*, 2010, 38 (10) 3102-3111.
- J13. **Kheradvar A**, Houle H, Pedrizzetti G, Tonti G, Belcik T, Ashraf M, Lindner JR, Gharib M, Sahn DJ. Echocardiographic Particle Image Velocimetry: A Novel Technique for Quantification of Left Ventricular Blood Vorticity Pattern, *Journal of American Society of Echocardiography (JASE)* 2010, 23(1) 86-94.
- J12. Grosberg A, Gharib M, **Kheradvar A**. The Effect of Fiber Geometry on Pulsatile Pumping and Energy Expenditure, *Bulletin of Mathematical Biology*, 2009, 71: 1580–1598.
- J11. **Kheradvar A**, Gharib M. On Mitral Valve Dynamics and its connection to Early Diastolic Flow, *Annals of Biomedical Engineering*, 2009 Jan, 37(1):1-13.
- J10. **Kheradvar A**, Gharib M. Influence of ventricular pressure-drop on mitral annulus dynamics through the process of vortex ring formation, *Annals of Biomedical Engineering* 2007, 35 (12):2050-2064.
- J09. **Kheradvar A**, Milano M, Gharib M. Correlation between vortex ring formation and mitral annulus dynamics during ventricular rapid filling, *ASAIO Journal (Journal of American Society of Artificial Internal Organs)*, Jan-Feb 2007 53(1): 8-16.
- J08. **Kheradvar A**, Milano M, Gorman RC, Gorman III JH, Gharib M. Assessment of left ventricular viscoelastic components based on ventricular harmonic behavior; *Cardiovascular Engineering*, 2006 March 6(1): 30-39.
- J07. Gharib M, Rambod E, **Kheradvar A**, Sahn DJ, Dabiri JO. Optimal vortex formation as an index of cardiac health. *Proceedings of National Academy of Sciences (PNAS)* 2006, 103 (16): 6305-6308.

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- J06. **Kheradvar A**, Kasalko J, Johnson D, Gharib M. An *in-vitro* study of changing profile heights in mitral bioprostheses and their influence on flow. *ASAIO Journal* 2006 Jan-Feb 52(1):34-38.
- J05. Amirzargar AA, Tabassi A, Khosravi F, **Kheradvar A**, Rezaei N, Naroueynejad M, Ansari-pour B, Moradi B, Nikbin B. Optic neuritis, multiple sclerosis and human leukocyte antigen: results of a 4-year follow-up study. *European Journal of Neurology* 2005 Jan;12(1):25-30.
- J04. **Kheradvar A**, Tabassi AR, Nikbin B, Khosravi F, Naroueynejad M, Moradi B, Amirzargar AA. Influence of HLA on progression of optic neuritis to multiple sclerosis: results of a four-year follow-up study. *Multiple Sclerosis*. 2004 Oct;10(5):526-31.
- J03. Rad AS, Jabbarvand M, Farahvash MM, **Kheradvar A**. Laser in situ keratomileusis and diode thermal keratoplasty for correction of hyperopia from +5.00 to +10.00 diopters. *Journal of Refractive Surgery*. 2002 May-Jun;18(3 Suppl):S318-20.
- J02. Rad AS, **Kheradvar A**. Juvenile xanthogranuloma: concurrent involvement of skin and eye. *Cornea, The Journal of Cornea and External disease*. 2001 Oct;20(7):760-2.
- J01. Behnia H, **Kheradvar A**, Shahrokhi M. An anatomic study of the lingual nerve in the third molar region. *Journal of Oral & Maxillofacial Surgery*. 2000 Jun;58(6):649-51.

## Grants

### Current

- G24. PI for the American Heart Association Grant-in-Aid: "Assessing the Risk of Transcatheter Heart Valve Calcification and Biomechanical Failure", until June 30, 2018
- G23. PI for NIH-1R21EB021513-01A1: "Ultrasound-Guided Delivery System for Accurate Positioning/Repositioning of Transcatheter Aortic Valves"; until July 2018.
- G22. PI for the American Heart Association Innovative Research Grant: "IVUS-Guided Delivery System for Accurate Positioning/Repositioning of Transcatheter Aortic Valves", until December 2017.
- G21. Mentor for the American Heart Association postdoctoral grant (Fellow: S Hamed Alavi, Ph.D.): "Tissue Engineered Heart Valve with a Non-Degradable Scaffold", until December 2017.
- G20. PI for NIH UC Center for Accelerated Innovation for the project: "A bio-inspired transcatheter mitral valve", until September 2017
- G19. PI for NIH UC Center for Accelerated Innovation for the project: "Development of a Self-Regenerative Hybrid Heart Valve", until July 2017.
- G18. Gift from the Edwards Lifesciences Foundation for Preclinical Studies Related to the Self-Regenerating Hybrid Heart Valve program.
- G17. Mentor for the American Heart Association postdoctoral grant (Fellow: Ahmad Falahatpisheh, Ph.D.): "Computation of kinetic energy dissipation inside the right heart of patients with repaired tetralogy of Fallot", until June 2016.
- G16. PI for Children's Heart Foundation grant: "A Self-Regenerative Hybrid Heart Valve", Until December 31, 2015.
- G15. Mentor for the American Heart Association Medical Student Research Program (Fellow: S. Reed Plimpton): "Development and Testing of a Bio-Prosthetic Mitral Valve with Dynamic Annulus", 06/01/2013-08/31/2014
- G14. PI for 2013-14 CORCL's Multi-Investigator Research Grant: "3D Segmentation of Cardiac Magnetic Resonance Images", Until July 2015.
- G13. PI for 2013 Unmet Clinical Needs in Cardiovascular Medicine Seed Grant Competition: "Development of a Bio-Inspired Transcatheter Mitral Valve for Transapical Implantation", Until December 31, 2015.
- G12. PI for American Heart Association Grant-in-Aid: "Assessment of the right ventricular flow in patients with RV dysfunction", until December 31, 2015.
- G11. Gift from the Edwards Lifesciences for the Development and Testing of a First Hybrid, Self-Regenerating Heart Valve program.
- G10. PI for ICTS Translation of Device-Based Research Grant: "Animal Feasibility Study for the First Patient-Specific Hybrid Heart Valve". Until July 2015

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- G09. Mentor for the American Heart Association predoctoral grant (Fellow: Ahmad Falahatpisheh): “Modeling the flow inside the right heart of patients with repaired tetralogy of Fallot” until December 31, 2014.
- G08. PI for the California-Catalonia Program for Engineering Innovation Award: “Development of a Biocompatible Tissue Engineered Heart Valve Leaflet Using Stem Cell” until November 2013
- G07. PI for Coulter Translational Research Award: “Development of a Novel Self-expandable Bioprosthetic Heart Valve for Percutaneous Delivery and Implantation” until July 2014.
- G06. PI for Leducq Foundation’s Transatlantic Career Development Award in Cardiovascular and Neurovascular Research: “Flow through the right heart after repair of tetralogy of Fallot: an Image-based modeling approach” until July 2014.
- G05. PI for the California-Catalonia Program for Engineering Innovation Award: “Development of a Biocompatible Tissue Engineered Heart Valve Leaflet Using Endothelial Progenitor Cells” until November 2012.
- G04. PI for ICTS Pilot Grant: “Development of a Novel Self-expandable Bioprosthetic Heart Valve for Percutaneous Delivery and Implantation”, completed.
- G03. PI for a seed grant from Edwards Lifesciences Center for Advanced Cardiovascular Technology: “Development of a Novel Hybrid Tissue Material for Heart Valve Leaflet”, completed.
- G02. PI for AHA Beginning Grant-in-Aid: “Development of 3D Echocardiographic Particle Image Velocimetry (Echo-PIV) for Assessment of Right Ventricular Flow Pattern, completed.
- G01. PI for SC COBRE supplement grant: “Modeling Development of Tetralogy of Fallot in-silico”, completed.

### Books and Chapters

- B01. **Kheradvar A** and Pedrizzetti G. Vortex Formation in the Cardiovascular System. ISBN: 1447122879, Springer Cardiology and Angiology.
- B02. Plimpton SR, Liu, WF and **Kheradvar A**. Immunological and Phenotypic Considerations in Supplementing Cardiac Biomaterials with Cells (book chapter), in “Biomaterials for Cardiac Regeneration“ by Springer; editors: Mark Ruel and Erik Suuronen. ISBN 978-3-319-10971-8.
- B03. **Kheradvar A** (Editor) Principles of Heart Valve Engineering, to be published by Elsevier (2019).

### Issued Patents

- IP15. **Kheradvar A**, Kelley G and Gharib M. Handle mechanism and functionality for repositioning and retrieval of transcatheter heart valves, U.S. Patent#9,744,037.
- IP14. **Kheradvar A**, Kelley G and Gharib M. Percutaneous heart valve delivery systems. U.S. Patent# 9,668,859.
- IP13. **Kheradvar A**, Gharib M, Grosberg A. Cardiac assist system using helical arrangement of contractile bands and helically-twisting cardiac assist device, U.S. Patent#9,656,009
- IP12. Alavi SH and **Kheradvar A**. Mesh enclosed tissue constructs; U.S. Patent#8,936,650
- IP11. **Kheradvar A** and Karmaus W. Nursing bottle apparatus for improvement of suckling; U.S. Patent#8,915,387
- IP10. Alavi SH and **Kheradvar A**. Mesh enclosed tissue constructs; U.S. Patent#8,900,862
- IP09. **Kheradvar A**. Implantable prosthetic valves and methods; U.S. Patent#8,876,897
- IP08. **Kheradvar A**, Gharib M, Hickerson A. Helically actuating positive-displacement pump. U.S. Patent# 8,794,937.
- IP07. **Kheradvar A**, Sutton MA, Membrane-deformation mapping technique, U.S. Patent# 8,767,049.
- IP06. **Kheradvar A**, Gharib M. Expandable stent that collapses into a non-convex shape and expands into an expanded, convex shape, U.S. Patent# 8,702,788.
- IP05. **Kheradvar A**, Gharib M. In-situ formation of a valve. U.S. Patent# 8,348,999.
- IP04. **Kheradvar A**, Gharib M. In-situ formation of a valve. U.S. Patent# 8,133,270.
- IP03. **Kheradvar A**, Gharib M, Hickerson A. Helically actuating positive-displacement pump. U.S. Patent# 7,883,325
- IP02. **Kheradvar A**, Gharib M. Monolithic in situ forming valve system. U.S. Patent# 7,780,724.
- IP01. **Kheradvar A**, Gharib M. Implantable small percutaneous valve and methods of delivery. U.S. Patent# 7,331,991

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### Selected Pending Patent Applications

- P18. **Kheradvar A.** Calcified polymeric valve and vessels for valve-in-valve applications; US20170076637.  
P17. **Kheradvar A.** Collapsible atrioventricular valve prosthesis; US20170252163.  
P16. **Kheradvar A.** Transcatheter Mitral Valve; US20160143730.  
P15. Falahatpisheh A and **Kheradvar A.** Method for post-processing flow-sensitive phase contrast magnetic resonance images; US20160358328.  
P14. Falahatpisheh A and **Kheradvar A.** Ultrasound-based volumetric particle tracking method; US20160140730  
P13. Kulinsky L and **Kheradvar A.** Imprinter for Conformal Coating of Three-Dimensional Surfaces; US20160129469  
P12. Jafarkhani H., Hajiaghayi M., Groves E.M., **Kheradvar A.** Automated 3D Reconstruction of the Cardiac Chambers from MRI and Ultrasound. US20160140751  
P11. Falahatpisheh A and **Kheradvar A.** Multi-plane method for three-dimensional particle image velocimetry; US20140149055.  
P10. **Kheradvar A.**, Su JL, Falahatpisheh A, Gharib M. Medical device fastener mechanisms; US20140100651A1.  
P09. Falahatpisheh A, and **Kheradvar A.** WO/2013/166357A1  
P08. Alavi SH and **Kheradvar A.**, World Intellectual Property Organization Patent #2013/025239A3  
P07. Alavi SH and **Kheradvar A.**, World Intellectual Property Organization Patent #2013/025239A2  
P06. **Kheradvar A.**, Kelley G and Gharib M. Percutaneous heart valve delivery systems, World Intellectual Property Organization Patent #2013/022798  
P05. Gharib M, **Kheradvar A.**, Grosberg A. Cardiac assist system using helical arrangement of contractile bands and helically-twisting cardiac assist device, World Intellectual Property Organization Patent # 2011/126572A9.  
P04. **Kheradvar A.** and Gharib M. An expandable stent that collapses into a non-convex shape and expands into an expanded, convex shape, World Intellectual Property Organization Patent # 2011/126572A9.  
P03. Gharib M and **Kheradvar A.**, In-situ formation of a valve, World Intellectual Property Organization Patent # 2008/091493A1.  
P02. **Kheradvar A.**, DeLegge MH. Inflatable Gastric Device and Methods Relating to the Same, US20090292306.  
P01. **Kheradvar, A.** Wireless hemodynamic monitoring system integrated with implantable heart valves, US20120123284.

### Selected Provisional Patents

- **Kheradvar A.** and Su J. Ultrasound-Guided Delivery System for Accurate Position/Repositioning of Transcatheter Heart Valves, *patent pending*.
- Su J, **Kheradvar A.**, Gharib M. Pull-Lock and Release Mechanism for Medical Device Applications, *patent pending*.
- Falahatpisheh A and **Kheradvar A.** A Real-Time three-dimensional Echocardiographic Particle Image Velocimetry Technique, *patent pending*.
- **Kheradvar A.**, Kelley GS, Gharib M. Apparatus for Controlled Deployment and Repositioning of the Percutaneous Heart Valve, *patent pending*.
- Alavi SH and **Kheradvar A.** Scaffold for fabrication of engineered heart valves and other applications, *patent pending*.
- Alavi SH and **Kheradvar A.** Apparatus for growing a heart valve in 3D, *patent pending*.

### Peer Reviewed Conference Proceedings

- C75. Arafati A., Morisawa, D., Assadi R., Amini R., **Kheradvar A.** Fully Automatic Multi-Chamber Segmentation of Heart in Ultrasound Images Using Deep-learning Algorithms. Artificial Intelligence in Medicine (AIMed), December 11-14, 2017, Laguna Beach, CA.

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- C74. Morisawa D., Avenatti E., Little S.H., **Kheradvar A.** Intraventricular Vortex Interaction between Transmitral Flow and Paravalvular Leak. 2017 AHA Scientific Sessions, November 11-15, Anaheim, CA, USA.
- C73. Kulkarni A. Morisawa D., Gonzalez D., **Kheradvar A.** Vortex Formation Time Changes with Age in Children. 2017 AHA Scientific Sessions, November 11-15, Anaheim, CA, USA.
- C72. Zareian R., Tseng J., Fraser R., Meganck J., Kilduff M., Peterson J., **Kheradvar A.** Stent-Crimp-Induced Calcification of Transcatheter Aortic Valves. 2017 AHA Scientific Sessions, November 11-15, Anaheim, CA, USA.
- C71. Morisawa D, Chen Z, **Kheradvar A.** A Feasibility Study on Application of Intravascular Ultrasound for Detection of Valvular Calcification. 2017 ASE Scientific Sessions, Baltimore, MD, June 2-6, 2017.
- C70. Falahatpisheh A and **Kheradvar A.** On Three-Dimensional Quantification of Vortex Rings and its Significance in Cardiac Flows, Society of Engineering Science 53<sup>rd</sup> Annual Technical Meeting, College Park, MD, October 2-5, 2016
- C69. Arafati A, Avendi MR, Morisawa D, Amini MR, Assadi R, **Kheradvar A.** Fully Automatic Echocardiographic Segmentation using Machine-Learning Algorithms. 2016 ASE Scientific Sessions, Seattle, WA, June 10-14, 2016.
- C68. **Kheradvar A.** Folda valve: a novel 14Fr repositionable and retrievable TAVI, EuroPCR 2016, Paris, France, May 17-20, 2016.
- C67. Sinha A and **Kheradvar A.** Crimp Induced Leaflet Damage and Calcification of Transcatheter Heart Valves. The Heart Valve Society Meeting 2016., New York, NY, March 17-20, 2016.
- C66. Alavi SH, Baliarda MS, Valdevit L, **Kheradvar A.** A Nitinol Mesh Scaffold for Heart Valve Engineering. The Heart Valve Society Meeting 2016., New York, NY, March 17-20, 2016.
- C65. Falahatpisheh A and **Kheradvar A.** "Volumetric Echocardiographic Particle Image Velocimetry (V-Echo-PIV)", 8th International Biofluid Symposium, Caltech, Pasadena, February 12-14, 2016.
- C64. Falahatpisheh A and **Kheradvar A.** "Shape Characterization of Vortex Rings Formed Downstream of a Model of Mitral Valve", 8th International Biofluid Symposium, Caltech, Pasadena, February 12-14, 2016.
- C63. Falahatpisheh A and **Kheradvar A.**, "Significance of Negligence of the Unsteady Term of Bernoulli Equation in Pressure Drop Estimation", 8th International Biofluid Symposium, Caltech, Pasadena, February 12-14, 2016.
- C62. Avendi MR, **Kheradvar A** and Jafarkhani H. Fully automatic segmentation of heart chambers in cardiac MRI using deep learning. SCMR 19th Annual Scientific Sessions, January 27-30, 2016, Los Angeles, CA.
- C61. Falahatpisheh A and **Kheradvar A.** Volumetric Echocardiographic Particle Image Velocimetry (V-Echo-PIV), 68<sup>th</sup> Annual Meeting of the APS Division of Fluid Dynamics, November 22-24 2015, Boston, MA, USA.
- C60. Falahatpisheh A and **Kheradvar A.** "Volumetric Echocardiographic Particle Image Velocimetry", 6<sup>th</sup> Tsukuba Global Science Week (TGSW), University of Tsukuba, 2015, September 28-30, Tsukuba, Ibaraki, Japan.
- C59. Falahatpisheh A, Lie GR, Hansen G, **Kheradvar A.** Contrast Agent-Free Volumetric Echocardiographic Particle Image Velocimetry (V-Echo-PIV). 26th Annual ASE Scientific Sessions in Boston, Massachusetts on June 12-16, 2015
- C58. Groves EM, Tseng EE and **Kheradvar A.** "Preclinical Testing of FOLDA VALVE: a Totally Repositionable and Retrievable Transcatheter Aortic Valve with a 14Fr Delivery System". Heart Valve Society 2015 Annual Scientific Meeting ▪ 7-9 May 2015 Monte-Carlo ▪ Monte Carlo, Monaco.
- C57. Sinha A and **Kheradvar A.** "The Effect of Stent-Crimping of Transcatheter Heart Valves on Premature Leaflet Calcification". Heart Valve Society 2015 Annual Scientific Meeting ▪ 7-9 May 2015 Monte-Carlo ▪ Monte Carlo, Monaco.
- C56. Alavi SH, Sinha A, Steward E, Milliken JC and **Kheradvar A.** AV Valves Matrix Remodeling in Response to Mechanical Loading. Heart Valve Society 2015 Annual Scientific Meeting ▪ 7-9 May 2015 Monte-Carlo ▪ Monte Carlo, Monaco.
- C55. Groves EM, Tseng EE, **Kheradvar A.** Feasibility of a 14F Fully Retrievable and Repositionable Transcatheter Aortic Valve in an Ovine Model. Dallas-Leipzig Valve 2014, Dallas, TX, USA.

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- C54. Alavi SH, Sinha A, **Kheradvar A**. Matrix Remodeling in Native Atrioventricular Valves' Leaflets in Response to Mechanical Loading. 2014 AHA Scientific Sessions, November 15-19, Chicago, IL, USA
- C53. Falahatpisheh A, **Kheradvar A**. Volumetric Echocardiographic Particle Image Velocimetry (V-Echo-PIV). 2014 AHA Scientific Sessions, November 15-19, Chicago, IL, USA
- C52. **Kheradvar A**, Groves EM, Tseng E. Transfemoral Aortic Implantation of Repositionable and Retrievable Foldavalve: A Proof of Concept in Animals. 2014 AHA Scientific Sessions, November 15-19, Chicago, IL, USA
- C51. Falahatpisheh A, **Kheradvar A**. Axisymmetry Index: A Measure for Asymmetry of Vortex Rings, 10th European Fluid Mechanics Conference (EFMC10), September 14-18, 2014, Copenhagen, Denmark.
- C50. Falahatpisheh A and **Kheradvar A**. Significance of Bernoulli Equation's Unsteady Term for Pressure Drop Estimation in Cardiovascular System, 7<sup>th</sup> World Congress of Biomechanics, Boston, July 6-11, 2014.
- C49. Alavi SH, **Kheradvar A**. Non-degradable scaffolding approach for creation of self-regenerative heart valves. 5th International Conference on Mechanics of Biomaterials and Tissues, December 8-12, 2013 Sitges, Spain.
- C48. Alavi SH, Groves EM, **Kheradvar A**. Examining the effects of crimping on pericardial leaflets during transcatheter aortic valve replacement by quantitative microscopy. 5th International Conference on Mechanics of Biomaterials and Tissues, December 8-12, 2013 Sitges, Spain.
- C47. Alavi SH, **Kheradvar A**. Development of Self-Regenerative Heart Valves based on Non-Degradable Scaffolding Approach. AHA Scientific Sessions, November 16-20, 2013 Dallas, TX, USA.
- C46. Alavi SH, Groves EM, **Kheradvar A**. Damage Analysis of Crimping Pericardial Leaflets in TAVI. AHA Scientific Sessions, November 16-20, 2013 Dallas, TX, USA.
- C45. Alavi SH and **Kheradvar A**. A Novel Hybrid Self Regenerative Heart Valve. Society for Heart Valve Disease, Society for heart valve disease & heart valve society of America, 7th biennial meeting • 22-25 June, 2013, Venice, Italy.
- C44. Falahatpisheh A, Groves E, Su JL, **Kheradvar A**. Quantification of Flow Characteristics for Varying Implantation Positions in Transcatheter Aortic Valve Implantation In-Vitro. Society for Heart Valve Disease, Society for heart valve disease & heart valve society of America, 7th biennial meeting • 22-25 June, 2013, Venice, Italy.
- C43. Alavi SH, **Kheradvar A**. Growing Self-Regenerating Hybrid Heart Valves. Dallas-Leipzig 2012 International Valve Conference, December 5-7, 2012 Dallas, Texas, USA.
- C42. Alavi SH, **Kheradvar A**. Effect of Stent Crimping on Superficial and Deep Layers of Pericardial Leaflets. Dallas-Leipzig 2012 International Valve Conference, December 5-7, 2012 Dallas, Texas, USA.
- C41. Falahatpisheh A, Pedrizzetti G, **Kheradvar A**. 'Multi-planar velocimetry for 3D reconstruction of the flow. 65<sup>th</sup> Annual Meeting of the APS Division of Fluid Dynamics, November 18-20 2012, San Diego, CA, USA.
- C40. **Kheradvar A** and Alavi SH. Immediate and Delayed Effects of Stent Crimping on Pericardial Leaflets of Transcatheter Valves. TCT 2012, *Journal of the American College of Cardiology*, 2012; 60: 17 S: B241-B241.
- C39. Alavi SH and **Kheradvar A**. TGF- $\beta$ 1 Positively Modulates Cell-Metal Interaction in Cardiovascular Applications. American Heart Association Basic Cardiovascular Sciences 2012 Scientific Sessions, New Orleans, Louisiana.
- C38. Falahatpisheh A., Su JL, Alavi SH., **Kheradvar A**. First-Time Flow Visualization of Transcatheter Aortic Valve-in-Valve. *ASAIO J* 2012 Apr 58 (7) p33.
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- C36a. Alavi SH, Ruiz V, Krasieva T, Botvinick E, **Kheradvar A**. Characterization of Load-Induced fiber orientation in Pericardial Leaflet Tissue. EBR 2012, May 3-4, Marseille, France.
- C36. Falahatpisheh A., Dueitt B., Pahlevan N., **Kheradvar A**. "3D Characterization of Transmitral Vortex using Defocusing Digital Particle Image Velocimetry", 64<sup>th</sup> Annual Meeting of the APS Division of Fluid Dynamics Volume 56, Number 18, November 20-22 2011, Baltimore, MD, USA



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- C35. **Kheradvar A.** and Falahatpisheh A. “3D Reconstruction of the Vortex in a Human Right Ventricle Model using High Speed PIV”, 64<sup>th</sup> Annual Meeting of the APS Division of Fluid Dynamics Volume 56, Number 18, November 20-22 2011, Baltimore, MD, USA
- C34. Ghafourian, K, Falahatpisheh, A, Goldstein, SA, Pichard, AD, **Kheradvar, A.** Outcome Analysis of Percutaneous Balloon Mitral Valvotomy through Vortex Formation Time Index, *Circulation*, 124:A13854.
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- C32. Falahatpisheh A. and **Kheradvar A.** Computational Modeling to Reduce the Collapsed Stent Size: Case Study of FOLDAVALVE™ Percutaneous Aortic Valve, ASME 6th Frontiers in Biomedical Devices Conference and Exhibition, September 2011, Irvine, CA.
- C31. Falahatpisheh A. and **Kheradvar A.** The Effect of Leaflet Length and Dynamic Annulus on Peak Stress Distribution over the Leaflet, ASME 6th Frontiers in Biomedical Devices Conference and Exhibition, September 2011, Irvine, CA.
- C30. Alavi SH, **Kheradvar A.** A Novel Approach to Heart Valve Replacement; Hybrid Self-Regenerative Engineered Tissue, ASME 6th Frontiers in Biomedical Devices, September 2011, Irvine, CA
- C29. Abe H, Caracciolo G, **Kheradvar A,** Narula J, Sengupta, PP. Effects of Programmed Atrio-Ventricular Time Delay on the Sequence of Left Ventricular Intracavitary Vortex Formation. American Society of Echocardiography meeting, Quebec, Canada, 2011.
- C28. Alavi SH and **Kheradvar A.** A Hybrid Self-Renewal Engineered Tissue for Heart Valve Leaflets, Society for heart valve disease & heart valve society of America, 6th biennial meeting ▪ 25-28 June, 2011, Barcelona, Spain.
- C27. Falahatpisheh, A, **Kheradvar, A.** Quantitative Assessment of Leaflet Failure: Computational Modeling of the Wrinkling Effect, Society for heart valve disease & heart valve society of America, 6th biennial meeting ▪ 25-28 June, 2011, Barcelona, Spain.
- C26. Falahatpisheh, A, **Kheradvar, A.** The Effect of Mitral Leaflets' Length on Transmitral Flow, Society for heart valve disease & heart valve society of America, 6th biennial meeting ▪ 25-28 June, 2011, Barcelona, Spain.
- C25. Alavi, SH, **Kheradvar, A.** A Self-Regenerative Hybrid Tissue Structure for 3D fabrication of Heart Valves, Blood Vessels and Other Constructs, ASAIO 57<sup>th</sup> annual conference, June 2011, Washington, DC
- C24. Falahatpisheh, A, **Kheradvar, A.** A Quantitative Method to Assess the Wrinkling Effect of the Bioprosthetic Heart Valve's Leaflets, ASAIO 57<sup>th</sup> annual conference, June 2011, Washington, DC
- C23. Abe H, Caracciolo G, **Kheradvar A,** Narula J, Sengupta, PP. Determinants of Left Ventricular Vortex Ring Circulation in Remodeled Hearts: Improved Visualization of Cardiac Fluid-Structure Interactions by Echo Contrast Particle Imaging Velocimetry, *Journal of the American College of Cardiology* 57(14) supplement A: 54, 1127-184, April 2011.
- C22. **Kheradvar A,** and Gharib M. FOLDAVALVE: A Novel Self-Expandable Percutaneous Aortic Valve Technology with No Leaflet Compression when Collapsed, Dallas-Leipzig International Valve Conference, December 9-11, 2010. Dallas, Texas
- C21. **Kheradvar A,** Falahatpisheh A. In-vitro Assessment of a Novel Bi-leaflet Mitral Bioprosthesis with Dynamic Annulus, Dallas-Leipzig International Valve Conference, December 9-11, 2010. Dallas, Texas
- C20. **Kheradvar A.** Correlation between Transmitral Vortex Formation and Mitral Valve's Leaflet Length. *Circulation*, 23 November 2010; 122: A20561.
- C19. **Kheradvar A,** Assadi RA, Sengupta, PP. Characterization of Transmitral Vortex Formation Time index in Patients with Varying Grades of Diastolic Dysfunction. *Circulation*, 23 November 2010; 122: A20785.
- C18. Falahatpisheh, A and **Kheradvar A.** Finite Element Analysis of a Mitral Bioprosthesis with Dynamic Saddle-Shape Annulus 6<sup>th</sup> World Congress of Biomechanics, Singapore 2010
- C17. Moraveji SJ, **Kheradvar A.** Computational Modeling of Nitinol Stents for Percutaneous Heart Valves. *ASAIO J* Vol 56(2) pg 93 March/April 2010.
- C16. Falahatpisheh, A, **Kheradvar A.** A Computational Approach To Assess the Effect of Dynamic Annulus on Mitral's Leaflet Stress Distribution. *ASAIO J* Vol 56(2) pg 94 March/April 2010.

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- C14. **Kheradvar A**. Development and Testing a Dynamic Bi-leaflet Mitral Prosthesis. *Circulation* 120(18) Supp 2 S929, 2009
- C13. **Kheradvar A**, Houle H, Pedrizzetti G, Tonti G, Belcik T, Ashraf M, Linder JR, Gharib M, Sahn DJ. Quantification of Left Ventricular Blood Vorticity Pattern by the novel method of Echocardiographic Particle Image Velocimetry. 2009 Society for Experimental Mechanics Fall Symposium and Workshop, Columbia, SC.
- C12. Burnside J and **Kheradvar A**. Progress on Design and Development of a Bi-leaflet Mitral Bioprosthetic Valve. *ASAIO Journal*. 55(2):144, March/April 2009.
- C11. **Kheradvar A** and Gharib M. Vortex formation time in progression of Cardiac dysfunction. Bulletin of American Physical Society, DFD08 meeting, 35(15) p76, San Antonio, TX.
- C10. Grosberg A, **Kheradvar A**, Gharib M. Helical contraction: an efficient mean for pulsatile ventricular assist devices. *ASAIO Journal*. 54(2):44A, March/April 2008.
- C09. Saber NR, Wood JC, **Kheradvar A**. A computational methodology for stent-leaflet interactions in minimally-invasive heart valves. *ASAIO Journal*. 54(2):3A, March/April 2008.
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- C05. **Kheradvar A**, Gorman RC, Gorman III, JH, Zeeshan A, Gharib M. Evaluation of Isovolumic Relaxation Phase in the process of Ventricular Remodeling following Myocardial Infarction. Proceedings of 26th Annual International Conference of the IEEE-EMBS, Volume: 2 , 1-5 Sept. 2004 Pages:3654-7
- C04. Gharib M, Rambod E, **Kheradvar A**, Sahn D. On the Issue of Optimal Trans-Mitral Flow. *XXI International Congress of Theoretical and Applied Mechanics* Warsaw, Poland, August 15-21, 2004
- C03. Amirzargar AA, Abodolreza T, Farideh K, **Kheradvar A**, et al. Human leukocyte antigen association in optic neuritis and progression to multiple sclerosis: The results of a four-year follow up study. *Tissue Antigens* 64 (4): 368-368 Oct 2004
- C02. Nikbin B, Tabasi AR, **Kheradvar A**, Khosravi F, Naroueynejad M, Danesh A, Amirzargar AA. Optic neuritis and HLA association in Iranian patients. *Tissue Antigens* 59: 71-71 Suppl. 2, 2002
- C01. Sadighi A, **Kheradvar A**. Gubernaculopexy; A novel technique for placement of the undescended testis in the scrotum. *3<sup>rd</sup> International Conference of the Egyptian Association of Pediatric Surgeons* (May 5-7, 1999).

### Conference Presentations at Biomedical Engineering Society (BMES)

- CP30. Ali Pour P, Zareian R and **Kheradvar A**. Mitochondrial Transplantation through Co-incubation into Cardiomyocyte. BMES 2017 Annual Scientific Meeting, October 11-14, Phoenix, AZ.
- CP29. Zuke S, Alavi SH and **Kheradvar A**. Biocompatibility tests on a Carbothane scaffold for hybrid tissue engineered heart valve applications. BMES 2016 Annual Scientific Meeting, October 5-8, Minneapolis, MN.
- CP28. Razaz Zadeh M, Falahatpisheh A, **Kheradvar A**, May-Newman K. Reynolds Stress Assessment in the LVAD-Assisted Heart using High-Speed PIV. BMES 2014 Annual Scientific Meeting, October 22-25, San Antonio, TX.
- CP27. Alavi SH, Kheradvar A. An Index for Assessing the Crimping Damage of Pericardial Leaflets in Transcatheter Heart Valves. BMES 2013 Annual Scientific Meeting, September 25-28, Seattle, WA.
- CP26. Falahatpisheh A and **Kheradvar A**. Novel Computational Model for Optimal Reduction of the Stent Collapsed Profile: Applications in Transcatheter Aortic Valve Implantation. BMES Annual Meeting, October 2012, Atlanta, GA.

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- CP25. Falahatpisheh A, Pahlevan N, Dueitt B, **Kheradvar A**. Effect of the Mitral Valve Leaflet Asymmetry on the Shape of Transmitral Vortex. BMES Annual Meeting, October 2012, Atlanta, GA.
- CP24. Su JL, Falahatpisheh A, and **Kheradvar A**. Development of a TAVI Catheter System for Percutaneous Repositioning and Retrieval of the Valve. BMES Annual Meeting, October 2012, Atlanta, GA.
- CP23. Alavi SH, Ruiz V, Krasieva T, Botvinick EL, and **Kheradvar A**. Characterization of Fiber Orientation under Cyclic Load: Correlation to Bioprosthetic Valve Failure. BMES Annual Meeting, October 2012, Atlanta, GA.
- CP22. Alavi SH and **Kheradvar A**. Self-Regenerative Engineered Heart Valves: From Conception to Performance. BMES Annual Meeting, October 2012, Atlanta, GA
- CP21. Falahatpisheh A., **Kheradvar A.**, Vortex Instability of Transmitral Flow, BMES 2011, October 2011, Hartford, CT.
- CP20. Alavi SH, Botvinick E, **Kheradvar A**. Characterization of Collagen Fiber Orientation by Multiphoton Imaging in Loading-Unloading Phases, BMES Annual Fall Scientific Meeting, October 2011, Hartford, CT
- CP19. Alavi SH, Nazemi L, Liu W, **Kheradvar A**. Effect of Co-Culture on Immunogenicity of a Tissue Engineered Construct, BMES Annual Fall Scientific Meeting, October 2011, Hartford, CT
- CP18. Alavi SH, **Kheradvar A**. A Hybrid Self-Regenerative Engineered Tissue for Heart Valve Leaflets, BMES Annual Fall Scientific Meeting, October 2011, Hartford, CT
- CP17. Falahatpisheh A, **Kheradvar A**. A Computational Model to Quantify Leaflet Wrinkling: Road to Assess Tissue Fatigue & Leaflet Tearing, BMES 2010 Annual Fall Scientific Meeting, October 6-9, Austin, TX.
- CP16. Falahatpisheh A, Alavi SH, Stinson SJ, Junor L, Goodwin RL, **Kheradvar A**. Numerical Study of Fluid-Structure Interaction in a Developing Chick Heart, BMES 2010 Annual Fall Scientific Meeting, October 6-9, Austin, TX.
- CP15. Alavi SH, Junor L, Goodwin RL, **Kheradvar A**, A Hybrid, Tissue Engineered Leaflet for Bioprosthetic Heart Valves. BMES 2010 Annual Fall Scientific Meeting, October 6-9, Austin, TX, USA.
- CP14. Biechler S, Moraveji SJ, Weidner J, Goodwin RL, **Kheradvar A**. A Computational Study of the Early Heart Tube: Paving the Way for Regenerative Medicine? BMES 2010 Annual Fall Scientific Meeting, October 6-9, Austin, TX.
- CP13. Moraveji SJ, Biechler S, Weidner J, Goodwin RL, **Kheradvar A**. Multiscale Modeling of Blood Rheology in a Developing Heart: When Granularity Becomes Remote? BMES 2010 Annual Fall Scientific Meeting, October 6-9, Austin, TX.
- CP12. Biechler S, Moraveji SJ, Weidner J, Goodwin RL, **Kheradvar A**. Determination of Atrioventricular Cushion Material Properties in a Developing Chick Embryo. BMES 2010 Annual Fall Scientific Meeting, October 6-9, Austin, TX.
- CP11. Moraveji SJ, Biechler S, Weidner J, Goodwin RL, **Kheradvar A**. Pumping During Fetal Cardiac Development: Peristaltic or Impedance? BMES 2010 Annual Fall Scientific Meeting, October 6-9, Austin, TX.
- CP10. Biechler SV, Weidner J, Goodwin R, **Kheradvar A**. The Morphogenesis of Atrioventricular Valves Due to Flow-Induced Forces. *BMES 2009 Annual Fall Meeting*, Pittsburgh, PA, October 2009.
- CP09. **Kheradvar A** and Gharib M. Formation of a Bioprosthetic Heart Valve within the Ventricle: A Percutaneous approach. *BMES 2009 Annual Fall Meeting*, Pittsburgh, PA, October 2009.
- CP08. Mangual JO, Jung B and **Kheradvar A**. Modeling Radial Viscoelastic Behavior of the Left Ventricle in a Cardiac Cycle. *BMES 2009 Annual Fall Meeting*, Pittsburgh, PA, October 2009.
- CP07. Falahatpisheh A., Burnside J. and **Kheradvar A**. Design Optimization of a Dynamics Mitral Bioprosthetic via Computational Modeling. *BMES 2009 Annual Fall Meeting*, Pittsburgh, PA, October 2009.
- CP06. Falahatpisheh A and **Kheradvar A**. Computational Modeling of repaired Tetralogy of Fallot. *BMES 2009 Annual Fall Meeting*, Pittsburgh, PA, October 2009.
- CP05. **Kheradvar A** and Gharib M. How ventricular pressure drop can affect the mitral valve dynamics. *BMES 2007 Annual Fall Meeting*, Los Angeles, CA, September 2007.
- CP04. **Kheradvar A**, Milano M, Gharib M. Assessment of myocardial global viscoelastic behavior by MR imaging. *BMES 2006 Annual Fall Meeting*, Chicago, IL, October 2006.

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- CP03. **Kheradvar A.** Milano M, Gorman RC, Gorman III JH, Gharib M. LV dynamical model with time-varying coefficients resulted from annular plane displacement and LVP. *BMES 2005 Annual Fall Meeting*, Baltimore, MD, September 2005
- CP02. **Kheradvar A.** Gorman RC, Gorman III JH, Zeeshan A, Gharib M. Assessment of variations in Isovolumic Relaxation Phase during post MI cardiac remodeling, *BMES 2004 Annual Fall Meeting*, Philadelphia, PA, October 2004
- CP01. **Kheradvar A.** Gharib M. Correlation between Vortex Formation Number and the rate of change of left ventricular pressure in Diastole. *BMES 2003 Annual Fall Meeting*, Nashville, TN.

### Institutional Research Protocols

#### IACUC:

- 2012-3071. In Vivo Assessment of a Novel Self- Regenerating Hybrid Heart Valve
- 2014-3136. Testing of a Bio-Prosthetic Mitral Valve with Dynamic Annulus
- 2016-3195. Ultrasound-Guided Delivery System for Accurate Positioning/Repositioning of Transcatheter Aortic Valves

#### IRB:

- HS#2013-9355: Modeling the flow inside the right heart of patients with repaired tetralogy of Fallot
- HS#2014-9986: Assessment of the right ventricular flow in patients with RV dysfunction
- HS# 2011-8033 Development of 3D Echocardiographic Particle Image Velocimetry for Assessment of Right Ventricular Flow Pattern

### Professional Service

- Co-chair for cardiac biomechanics session at Society of Engineering Science 55<sup>th</sup> Annual Technical Meeting, October 10-12, 2018, Madrid, Spain.
- Co-chair for Cardiac MRI mini-symposium at the 40<sup>th</sup> Annual International Conference of the IEEE Engineering in Medicine and Biology Society, July 17-21, 2018, Honolulu, HI.
- Session chair for Cardiovascular Imaging session at BMES 2017 Annual Meeting on October 13, 2017, Phoenix, AZ.
- Associate Editor, *Annals of Biomedical Engineering* (2017-Present)
- Member of the organizing committee, The 8th International Bio-Fluid Symposium, Caltech, Pasadena, CA, February 12–14, 2016.
- Session chair for BMES 2016 Annual Meeting (Heart Valve Structure, Function and Disease I) on October 7, 2016, Minneapolis, MN.
- Member, Research Committee of the American Heart Association, Western States Affiliate.
- Session Chair, Biomaterials and implants at UC Systemwide Bioengineering Program, June 18-20, 2014, Irvine.
- Co-organizer, Mathematics Guiding Bioartificial Heart Valve Design (MBI Institute Ohio State University, Columbus, OH, October 2013). This NSF funded workshop address the development of mathematical and computational modeling techniques that can be used to facilitate the development and optimal design of heart valve prostheses and other cardiovascular devices.
- Track Chair, Structural Heart Disease, ASME 6th Frontiers in Biomedical Devices Conference & Exhibition
- Invited Track Chair, Mechanics of Heart Valves: from Structure to Flow”, European Mechanics Society (Euromech) Colloquium: Cardiovascular Fluid Mechanics, in Cagliari, Italy (June 27-29, 2011)
- Member, NHLBI Systems Biology Study Section (ZRG1 VH-D (50))
- Member, NICHD 3D Printing Study Section (ZHD1 DSR-K(51))
- Grant Review Panels:
  - National Institute of Health (NIH)

## Arash Kheradvar, M.D., Ph.D., FAHA

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- National Science Foundation (Biophotonics, Biosensing, Biotransport, Biomedical Engineering, ERC and MRI)
  - The Natural Sciences and Engineering Research Council of Canada (NSERC) and the Canadian Institutes of Health Research (CIHR)
  - National Medical Research Council, Ministry of Health, Singapore
  - Dutch Technology Foundation STW
  - Heart Research UK
  - American Heart Association
  - Scientific Review Committee member for Institute for Clinical & Translational Science at UC Irvine
  - The Science Foundation Ireland (SFI)
  - Health Research Council of New Zealand
  - Chilean Science Agency (CONICYT)
  - Editorial Board member:
    - ASAIO Journal (Journal of American Society of Artificial Internal Organs), 2005-2013.
    - International Journal of Medical Engineering and Informatics
  - Journal Article Reviewer:
    - Proceedings of the Royal Society of London A
    - Journal of American Heart Association
    - Scientific Reports
    - Circulation
    - Science
    - Journal of Cardiovascular Translational Research
    - International Journal of Cardiovascular Imaging
    - Journal of Mechanics in Medicine and Biology
    - Journal of Fluid Mechanics
    - Journal of Magnetic Resonance Imaging
    - Journal of Royal Society Interface
    - Journal of American College of Cardiology
    - Ultrasonics
    - Journal of Biomedical Materials Research: Part A
    - Tissue Engineering
    - Multiscale Modeling and Simulation (SIAM)
    - Cardiology
    - Journal of Tissue Engineering and Regenerative Medicine
    - The American Journal of Cardiology
    - Ultrasound in Medicine and Biology
    - American Journal of Physiology Heart and Circulatory Physiology
    - The Annals of Thoracic Surgery
    - Journal of American Society of Echocardiography
    - Annals of Biomedical Engineering
    - Cardiovascular Engineering and Technology
    - The Anatomical Record: Advances in Integrative Anatomy and Evolutionary Biology
    - Microscopy and Microanalysis
    - IEEE Transactions on Biomedical Engineering
    - IEEE Transactions of Medical Imaging
    - Applications and Applied Mathematics: An International Journal (AAM)
    - Experiments in Fluids
    - Echocardiography
    - European Journal of Mechanics/B Fluids
    - European Heart Journal Cardiovascular Imaging
    - Journal of Biomechanics

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- ASME Journal of Biomechanical Engineering
  - Journal of American College of Cardiology, Imaging
  - Transactions on Biomedical Engineering
  - Mathematical Biosciences and Engineering
  - Plos One
  - Computers in Medicine and biology
  - Computer Methods in Biomechanics and Biomedical Engineering
  - Bioinspiration & Biomimetics
  - Magnetic Resonance Imaging
  - Cellular and Molecular Bioengineering
  - Physics of Fluids
  - Biomechanics and Modeling in Mechanobiology
  - Book Reviewer
    - Springer Cardiology
    - Elsevier
    - John Wiley & Sons Ltd
  - University Service:
    - Member, UCI's Dean of Engineering's executive committee (2014-Present)
    - Advisor for National Society of Black Engineers, Chapter for University of South Carolina (2007-10)
    - Member of NSF-RII and NSF-FEI Faculty Search committees (2008-10)
    - Member Edwards Lifesciences Center' Director Search committee (2014-15)
    - Member of ELCACT faculty search committee
    - Member of BME Graduate Admission Committee
  - Community service
    - Invited speaker at the American Heart Association fund raising event, *The Kings of Heart* (06/15/2016)
    - Invited speaker at the Caltech's Career in Medicine event, (05/06/2016)
    - Invited speaker at the American Heart Association fund raising event, *Cor Vitae* (06/04/2015)
  - Consultant and Advisory Boards
    - *Ultrawave Labs, Inc* (2009- 2011)
    - *Siemens Healthcare* (2008-2010)
    - *Edwards Lifesciences*, (2004- 2011)
    - *CalHealth, Inc*, (2014-present)
  - Founder and co-founder
    - ENGcore, LLC
    - Folda, LLC
    - WALVE, Corp

### Invited Speaker

- S59. **The joint EuroCMR/SCMR Meeting**, Barcelona, Spain (February 3<sup>rd</sup>, 2018)
- S58. **Universitätsklinikum Schleswig-Holstein**, Kiel, Germany (August 16, 2017)
- S57. **Children Hospital of Los Angeles**, Los Angeles, CA (May 17, 2017)
- S56. **Children Hospital of Orange County**, Orange, CA (May 8, 2017)
- S55. **University of Southern California**, Los Angeles, CA (March 29, 2017).
- S54. **American College of Cardiology, 66<sup>th</sup> Annual Scientific Sessions**, Washington, DC (March 18, 2017)
- S53. **American Heart Association's annual Scientific Sessions conference**, New Orleans, LA (Nov 15, 2016)
- S52. **Society of Engineering Science 53<sup>rd</sup> Annual Technical Meeting**, College Park, MD (October 3<sup>rd</sup>, 2016)
- S51. **Medical Design & Manufacturing (MD&M) Minneapolis**, Minneapolis, MN (September 21, 2016)
- S50. **University of Toronto**, Department of Mechanical & Industrial Engineering (June 23, 2016)
- S49. **American Society of Echocardiography Scientific Sessions**, Seattle, WA (June 10-14, 2016)

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- S48. **University of Minnesota Design of Medical Devices Conference**, Minneapolis, MN (04/13/2016)  
S47. **Western Institute of Nursing 59<sup>th</sup> Annual Communication Research Conference**, Anaheim, CA (04/07/2016)  
S46. **Heart Valve Society 2016 Annual Scientific Meeting**, Marriott Marquis ▪ New York, NY (03/19/2016).  
S45. **University of California, Los Angeles**, Cardiovascular Research Initiative, David Geffen School of Medicine (10/21/2015)  
S44. **Tsukuba Global Science Week**, University of Tsukuba, Tsukuba, Japan (09/29/2015)  
S43. **CSI 2015**, Catheter Interventions in Congenital, Structural and Valvular Heart Disease, Frankfurt, Germany (06/25/2015)  
S42. **American Society of Echocardiography Scientific Sessions**, Boston, MA (June 12-16, 2015)  
S40. **Cardiovascular Institute, Stanford University**, Cardiovascular Tissue Engineering Symposium (05/22/2015)  
S39. **University of California, Riverside**, Department of Bioengineering (04/15/2015)  
S38. **Center for Complex Biological Systems Retreat**, Omni Hotel Los Angeles (03/28/2015)  
S37. **California Institute of Technology**, Department of Medical Engineering (01/22/2015)  
S36. **Edwards Lifesciences Corporation** (06/10/2014)  
S35. **GE Vingmed Ultrasound, Horten, Norway** (08/16/2013)  
S34. **University of Florence, Florence, Italy**, Interdepartmental Research Unit BioFlow (06/26/2013).  
S33. **University of California, Riverside**, Department of Mechanical Engineering (05/31/2013)  
S32. **University of California, Irvine**, Department of Radiological Sciences (04/10/2013)  
S31. **Northwestern University**, Department of Radiology (03/06/2013)  
S30. **University of California Los Angeles**, Department of Mechanical and Aerospace Engineering (02/13/2013)  
S29. **Institut Químic de Sarrià-Universitat Ramon Llull**, Bioengineering Group, Barcelona, Spain (09/21/2012).  
S28. **Royal Brompton Hospital**, Cardiac MR Unit, London, UK (09/13/2012)  
S27. **Endocardiovascular Biomechanics Research International Symposium**, Marseille France (05/03/2012)  
S26. **University of Houston**, Departments of Mathematics and Biomedical Engineering (03/29/2012)  
S25. **University Hospital Schleswig-Holstein, Kiel, Germany**, Department of Pediatric Cardiology (12/05/2011)  
S24. **San Diego State University**, Department of Aerospace Engineering & Engineering Mechanics (10/14/2011)  
S23. **Politecnico di Milano, Milan, Italy**, Department of Structural Engineering, (06/30/2011)  
S22. **Cardiff University, Cardiff, UK**, Wales Heart Research Institute (06/22/2011)  
S21. **University of California, Irvine**, Division of Cardiology (03/24/2011)  
S20. **University of California, Irvine**, Department of Mechanical & Aerospace Engineering (03/11/2011)  
S19. **Second Annual Carolina Cardiovascular COBRE Conference**, USC School of Medicine (11/05/2010)  
S18. **6<sup>th</sup> World Congress on Biomechanics: Symposium on Innovative Experimental Techniques to Assess Prosthetic Heart Valve Structure-Function Performance**, Singapore, August 1-5, 2010.  
S17. **University of California, Irvine**, Department of Biomedical Engineering (04/13/2010)  
S16. **Vanderbilt University**, Department of Biomedical Engineering (03/17/2010)  
S15. **Fondation Leducq**, Mitral Network Autumn Meeting in Charleston, SC on November 12-13, 2009.  
S14. **Medical University of South Carolina**, Department of Cell Biology and Anatomy (11/05/2008)  
S13. **Carolina Cardiovascular COBRE Conference**, USC School of Medicine (10/16/2008)  
S12. **Arizona State University**, Department of Mechanical & Aerospace Engineering (11/02/2007)  
S11. **Rice University**, Department of Bioengineering (3/21/2007)  
S10. **University of Michigan**, Department of Biomedical Engineering (3/15/2007)  
S09. **University of California, San Diego**, Department of Mechanical & Aerospace Engineering (2/28/2007)  
S08. **University of Connecticut**, Department of Biomedical Engineering (2/19/2007)  
S07. **Virginia Tech**, Department of Engineering Science and Mechanics (2/12/2007)  
S06. **University of Chicago**, Department of Surgery, Section of Cardiothoracic Surgery (12/11/2006)  
S05. **University of California, San Francisco**, Department of Surgery (07/06/2006)  
S04. **Illinois Institute of Technology**, Department of Biomedical Engineering (06/27/2006)  
S03. **University of Minnesota**, Department of Biomedical Engineering (04/10/2006)  
S02. **University of South Carolina**, Department of Mechanical Engineering (04/03/2006)  
S01. **ASAIO 51st Annual Conference** scientific session, invited moderator (06/11/2005)

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### Honors and Awards

- Visiting Professor, University Hospital Schleswig-Holstein, Kiel, Germany June 2017- Present
- Recipient of Humboldt Research Fellowship for Experienced Researchers from the Alexander von Humboldt Foundation (11/2016)
- News release from Society of Thoracic Surgeons on development of the first Hybrid Tissue-Engineered Heart Valve Technology (June 01, 2015).
- Elected member, Lillehei Heart Institute, University of Minnesota.
- News coverage at the American Heart Association's 2013 scientific session on our hybrid self-regenerating heart valve.
- 2013 CVSA (Cardiovascular Surgery and Anesthesia) Travel Stipend Award for the AHA Scientific Sessions in Dallas, TX
- My business plan entitled "HValve: The First Self-Regenerative Hybrid Heart Valve" was selected as third (among 85 submitted) for presentation in the ASAIO New Venture Forum (2013) in Chicago June 14, 2013.
- C. Walton Lillehei Award Finalist, nominated by The Society of Heart Valve Disease at the 7<sup>th</sup> Biennial Congress 2013, in Venice, Italy.
- Fellow, American Heart Association
  - Council on Cardiovascular Radiology and Intervention (CVRI)
  - Council on Cardiovascular Surgery and Anesthesia (CVSA)
- Endorsed by *Royal Academy of Engineering* as an "exceptional promise" (person with potential to be a world leader in Medical Devices and Medical Imaging areas of research). This endorsement provided a Tier-1 exceptional talent UK visa to unrestrictedly work in UK institutions for the next three years starting on July 1, 2012.
- Honorary Research Fellow, Royal Brompton Hospital, London, UK July 2012- July 2015
- Honorary Research Associate, California Institute of Technology July 2011- present
- Vivien Thomas Young Investigator Award Finalist nominated by American Heart Association at the AHA Scientific Sessions 2009 in Orlando, Florida.
- Granted United States permanent residency by USCIS as an immigrant with extraordinary abilities in science in October 2009.
- The heart-valve model I made based on Leonardo's manuscript, represents the "first scientific flow visualization of impulsive vortex formation" was featured in the exhibit: Leonardo da Vinci: Experience, Experiment and Design, at the *Victoria and Albert Museum* in London (09/14/06 – 01/07/07).
- Finalist for the 2010 Outstanding Freshman Advocate Award from University of South Carolina.
- Honored with a "Two Thumbs Up" Award for making a difference in the education of a student with a disability sponsored by the Delta Alpha Pi, University of South Carolina, 2010.
- My business plan entitled "Dynamitral: The Only Dynamic Mitral Valve Bioprosthesis" was selected as the first of the three (among 85 submitted) for presentation in the ASAIO New Venture Forum (2010) in Baltimore May 29, 2010.
- *Benjamin M Rosen Graduate Fellowship* for graduate study toward the Doctor of Philosophy degree in Bioengineering/Engineering science at Caltech
- Being awarded the *first prize* of the 6<sup>th</sup> National Iranian Student's Book Competition for the best medical translation for the book Cellular and Molecular Immunology (2000).

### Professional Memberships

- Member, Society of Heart Valve Disease
- Member, American Physiological Society
- Member, American Physical Society
- Fellow, American Heart Association
- Member, Biomedical Engineering Society



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- Member, Medical Image Computing and Computer Assisted Intervention Society (MICCAI)
  - Member, American Society for Artificial Internal Organs
  - Member, American Society of Echocardiography
  - Member, Engineering in Medicine and Biology Society
  - Member, Iranian Council of Medicine
  - Member, European Mechanics Society

### Teaching

- University of California, Irvine, CA
  - BME110A: Biomechanics I
  - BME110B: Biomechanics II
  - BME110C: Biomechanics III
  - BME295/MAE295: Biofluid Mechanic
  - BME298/197A, B, C: Seminars in Biomedical Engineering
  - BME222: Biofluid Mechanic
  - BME195/295: Cardiovascular Devices
- University of South Carolina, Columbia, SC
  - BMEN211: Modeling and Simulation of Biomedical Systems
  - BMEN589a: Introduction to Cardiovascular Engineering
  - EMCH561a: Biofluid Mechanics
- GEM4 Summer School at Caltech, July 21-25, 2008
  - Summer 2008: Invited instructor: Mechanics of Heart Failure
- California Institute of Technology, Pasadena, California.
  - Summer 2007: Invited research mentor for Minority Freshman Summer Institute

### Students and Scholars

#### *Current*

- Medical Students:
- Postdoctoral Scholars:
  - Daisuke Morisawa, M.D., Ph.D.
  - Ramin Zareian, Ph.D.
- Graduate students:
  - Arghavan Arafati
  - Sam Zuke
  - Joshua Yu
  - Paria Ali Pour
  - Ege Alkan

#### *Alumni*

- Medical Students:
  - Peggy Bui, M.D., MBA (currently internal medicine resident at UCSF)
  - S. Reed Plimpton, M.D. (currently radiology resident at UCLA)
- Undergraduate students:
  - Patrick Lo (currently design engineer in JenaValve, Inc)
  - Zach Gyugyi (currently a Product Development Engineer at Applied Medical)
  - Jason Burnside, M.Sc. (currently Lead Engineer at GE Power & Water)
  - Todd Gandy (currently Chief Resident of Internal Medicine at Carolinas Medical Center)
  - Matt Hill (currently a Senior Sales Representative at Biomet)

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- Myra Robinson (currently Biostatistician at Levine Cancer Institute)
  - Erik Frankforter (currently Research Engineer at CarboNix)
  - Brandon Dueitt (deceased)
  - Leila Nazemi (currently a System Engineer II at Beckman Coulter)
  - Sara Hariri, Ph.D. (currently a Research Scientist at Applied Medical).
  - Aimee Sanjose (currently an engineer in Illumina)
  - Postdoctoral Scholars:
    - S. Hamed Alavi, Ph.D.
    - Ahmad Falahatpisheh, Ph.D. (currently a Principal Scientist at Acutus Medical, Inc.)
    - Elliott Groves, M.D., M.Sc. (currently, Assistant Professor and Director of Structural Heart Disease at University of Illinois at Chicago)
    - S Javid Moraveji, Ph.D.
    - Jan Mangual, Ph.D. (currently a Principal Scientist at St. Jude Medical)
    - Jimmy Su, Ph.D. (currently a Senior Biomedical Engineer at InfraredX)
    - Aditi Sinha, Ph.D.
    - Michael R. Avendi, Ph.D. (currently a Senior Systems Engineer, R&D at Halyard Health)
  - Graduate students:
    - S Hamed Alavi, Ph.D. (currently a postdoctoral scholar at UCI)
    - Ahmad Falahatpisheh, Ph.D. (currently a Principal Scientist at Acutus Medical, Inc.)
    - Pamela Botero, M.Sc. (currently a graduate student at UCI)
    - Mahsa Razaz Zadeh, M.Sc. (currently a Quality/Valiation Engineering at Medtronic)
    - Mindy Feng, M.Sc. (currently R&D Engineer at Wallaby Medical)