Curriculum Vitae

Personal Information

Name Emanuele Vignali

Date of Birth

Email

Education

Jan 2017 – Apr 2020 **University of Pisa** *Pisa, Italy*
PhD degree in Biomedical Engineering (excellent cum laude)

Thesis title: "Aneurysms in ascending thoracic aorta through experimental and computational analysis"

(Supervisors: Prof. Luigi Landini, Prof. Simona Celi (s.celi@ftgm.it)), with period abroad at Universitè de Mines (Saint - Etienne, France), in collaboration with Prof. Stéphane Avril

Sept 2012 – Apr 2016 **University of Pisa** *Pisa, Italy*
Master of Science in Biomedical Engineering (110/110 magna cum laude)

(Supervisor: Prof. Giuseppe Barillaro) with master thesis period abroad at Rutgers University (New Brunswick, New Jersey, USA), in collaboration with Prof. Howon Lee

Sep 2009 – Sept 2012 **University of Pisa** *Pisa, Italy*
Bachelor of Science in Biomedical Engineering (110/110 magna cum laude)

Current Position

Jan 2017 – Present **BioCardioLab, Fondazione Monasterio** *Massa, Italy* , – Research engineer

- Biological/cardiovascular tissue mechanical modeling
- Finite Element Model computation for structural, fluid dynamics and fluid -structure interaction simulations in the cardiovascular field
- Design of experimental setup for in-vitro tests for endovascular devices validation
- Design of experimental setup for soft tissues opto-mechanical characterization
- Additive manufacturing for biomedical applications
- Clinical image processing for cardiovascular applications

Current Projects (Role)

- Contribution to the **SmartCare** - Regional funding from 'bando a cascata "THE" - Tuscany Health Ecosystem- Spoke 10'
- Contribution to the **ROMed2VR** (Realtà Virtuale potenziata da Modelli a Ordine Ridotto di Fluidodinamica Computazionale per supportare la pianificazione medica pre-chirurgica)
  - Regional funding from 'bando a cascata "iNEST" - Spoke 9'
- Contribution to the **SimCardioTest** EU-funded project (Research engineer)
  - Manufacturing of heart phantoms
  - Immage processing for Particle Image Velocimetry analysis
  - Development of fluid dynamic setup for evaluation of cardiovascular devices
- Contribution to the **Repair - H2020 (Restoring cardiac mechanical function by polymeric artificial muscular tissue)** project (Research engineer)
  - Development of fluid dynamic setup for evaluation of cardiovascular contractile patches
- Adjunct professor for the course "Strumenti di Analisi Numerica per l'Ingegneria Biomedica" at faculty of Biomedical Engineering, University of Pisa (2021 - today)

Past Projects (Role)

- Contribution to the numerical simulations of orthopedic prosthesis as a service for the **GPI company**

- Contribution to the **MEDITATE - Horizon 2020** project (Research engineer)
  - Development of mechanical / microstructural setup for evaluation of cardiovascular tissues
  - 3D printing manufacturing of heart structures models
  - Development of fluid dynamic setup for evaluation of cardiovascular devices
- Winner of the competitive selection for the **MyBreathingHeart - (Development of a smartphone application for remote monitoring of breathing kinematics during a pandemic crisis)** project as a Research engineer
  - Acquisition and processing of pulmonary kinematics via wearable sensors
- Contribution to the **COPERNICUS project FF4HPC (Cloud-based HPC platform to support systemic-pulmonary shunting procedures)** (Research engineer)
  - Numerical simulations of cardiovascular structures in Finite Element environment
  - Segmentation of biomedical images with focus on cardiovascular structures
- Winner of the competitive selection for the **DIVINE (High-speed 3D-imaging of blood vessels based on optical signal processing)** (2017-2019) project as a Research engineer
  - Development of mechanical / microstructural setup for evaluation of cardiovascular tissues
- Winner of the competitive selection for the **VIVIR (Virtual and Augmented Reality Support for Transcatheter Valve Implantation by using Cardiovascular MRI)** (2017-2019) project as a Research engineer
  - Numerical simulations of cardiovascular structures in Finite Element environment
  - Segmentation of biomedical images
  - 3D printing manufacturing of heart structures models
  - Development of fluid dynamic setup for evaluation of cardiovascular devices
- Contribution to the **4R Tender (Reviews on Non-animal Methods in Use for Biomedical Research)**(2020) project (Research engineer)
  - Investigation of non-animal methods for the research in the cardiovascular field
  - Evaluation of engineering techniques for the replacement of animal experimentation
- Contribution to the development of the gait analysis algorithm for the Q-Walk device of the **QuicklyPRO startup** (2021)
- Contribution to the **Valvetech project** by fulfilling the following tasks:
  - Development of an hydraulic piston pulsatile pump able to reproduce the physiological cardiac flows
  - Hydrodynamic and mechanical testing of developed heart valve materials and aortic root tissues.
  - Designing of tensile machine updated with laser system to fully characterize the mechanical properties of soft tissues.

Abroad Work Experiences

Oct 2019 – Nov 2019 **École des Mines de Saint-Etienne** *Saint-Etienne, France* – Abroad period for PhD research s under the supervision of Prof. Stéphane Avril.

- Development of new numerical methods for cardiovascular Fluid-Structure Interaction simulations

Aug 2015 – Feb 2016 **Rutgers University** *New Brunswick, New Jersey, USA,* – Master research student at Mechanical and Aerospace Engineering department under the supervision of Prof. Howon Lee.

- Fabrication and design of bio-inspired microneedle structures for biomedical applications
- Finite Element simulations of swelling hydrogels

Awards

Best Oral Presentation IX Annual Meeting of the Italian Chapter of European Society of Biomechanics, September 30 – October 1, 2019, Bologna, Italy

Student Travel Grant Award European Society of Cardiology Conference, August 26 - 30, 2017, Barcelona, Spain

Publications

Journal Articles

[1] J. Anatol, **E. Vignali**, E. Gasparotti, F. Castro-Ruiz, M. Rubio, C. Barrios-Collado, J. Sierra-Pallares, and S. Celi. "A Novel Valveless Pulsatile Flow Pump for Extracorporeal Blood Circulation". In: *Annals of Biomedical Engineering* (2025), pp. 1–14.

[2] J. Coveliers, P. Meani, E. Huizinga, K. Gutta, G. Piccirillo, E. Gasparotti, **E. Vignali**, M. Mazzoli, M. Kowalewski, W. Huberts, et al. "Large-scale computed tomography study of aortic arch and supra-aortic artery morphology: Variations and potential implications for arterial extracorporeal life support access". In: *Perfusion* (2025), p. 02676591251370074.

[3] B. M. Fanni, E. Gasparotti, **E. Vignali**, F. Giovannini, G. B. Semplici, G. Vozzi, and S. Celi. "Mechanical testing of rubber-like 3D printing materials for cardiovascular modeling applications". In: *Journal of the Mechanical Behavior of Biomedical Materials* (2025), p. 107075.

[4] F. Galbiati, K. Capellini, **E. Vignali**, C. Angeletti, F. R. Parente, M. Cioffi, S. Avril, E. Costa, and S. Celi. "Assessment of the Combined Effects of Valve Phenotype and Aneurysm Progression on Ascending Thoracic Aortic Hemodynamics". In: *Fluids* 10.10 (2025), p. 251.

[5] E. Gasparotti, **E. Vignali**, M. Scolaro, D. Haxhiademi, and S. Celi. "A computational and experimental study of veno-arterial extracorporeal membrane oxygenation in cardiogenic shock: defining the trade-off between perfusion and afterload". In: *Biomechanics and Modeling in Mechanobiology* (2025), pp. 1–14.

[6] M. Mazzoli, E. Gasparotti, **E. Vignali**, D. Haxhiademi, and S. Celi. "Impact of Aortic Morphology on VA-ECMO Performance: A Combined Statistical Shape Modeling and CFD Approach". In: *Frontiers in Bioengineering and Biotechnology* 13 (2025), p. 1620897.

[7] L. Simone, L. Miglior, V. Gervasi, L. Moroni, **E. Vignali**, E. Gasparotti, and S. Celi. "Deep learning framework for cardiorespiratory disease detection using smartphone IMU sensors". In: *Computers in Biology and Medicine* 196 (2025), p. 110595.

[8] **E. Vignali**, E. Gasparotti, F. Frijia, P. Losi, G. Ferrazzi, A. Monteleone, and S. Celi. "Detecting aortic fiber architecture in ex-vivo arteries: A feasibility study with clinical 3T MRI". In: *Journal of Biomechanics* (2025), p. 112795.

[9] F. Bardi, E. Gasparotti, **E. Vignali**, M. N. Antonuccio, E. Storto, S. Avril, and S. Celi. "A Hybrid Mock Circulatory Loop integrated with a LED-PIV system for the investigation of AAA compliant phantoms". In: *Frontiers in Bioengineering and Biotechnology* 12 (2024), p. 1452278.

[10] K. Capellini, L. Ait-Ali, V. Pak, M. Cantinotti, M. Murzi, **E. Vignali**, B. F. Fanni, A. Clemente, S. Celi, and E. Gasparotti. "Three-dimensional printed models as an effective tool for the management of complex congenital heart disease". In: *Frontiers in Bioengineering and Biotechnology* 12 (2024), p. 1369514.

[11] K. Capellini, F. Dell'Agnello, E. Gasparotti, **E. Vignali**, M. Mazzoli, M A. Scarpolini, F. Cademartiri, and S. Celi. "Towards a digital twin for aorta: An in-silico image-based approach coupling numerical simulations and CT-gated images to assess patients specific aortic hemodynamics". In: *Vascular pharmacology* 155 (2024), p. 107305.

[12] **E. Vignali**, E. Gasparotti, L. Miglior, V. Gervasi, L. Simone, D. Haxhiademi, L. Frediani, G. Borelli, S. Berti, and S. Celi. "A New Smartphone-Based Method for Remote Health Monitoring: Assessment of Respiratory Kinematics". In: *Electronics (Switzerland)* 13.6 (2024).

[13] F. Bardi, E. Gasparotti, **E. Vignali**, S. Avril, and S. Celi. "A Hybrid Mock Circulatory Loop for Fluid Dynamic Characterization of 3D Anatomical Phantoms". In: *IEEE Transactions on Biomedical Engineering* 70.5 (2023), pp. 1651–1661.

[14] S. Celi, E. Gasparotti, K. Capellini, F. Bardi, M.A. Scarpolini, C. Cavaliere, F. Cademartiri, and **E. Vignali**. "An image-based approach for the estimation of arterial local stiffness in vivo". In: *Frontiers in Bioengineering and Biotechnology* 11 (2023).

[15] **E. Vignali**, E. Gasparotti, D. Haxhiademi, and S. Celi. "Fluid dynamic model for extracorporeal membrane oxygenation support and perfusion in cardiogenic shock". In: *Physics of Fluids* 35.11 (2023).

[16] **E. Vignali**, E. Peña, M. Aguirre, and S. Celi. "Editorial: New experimental and numerical insights on cardiovascular biomechanics through in-vivo and ex-vivo methods". In: *Frontiers in Physiology* 14 (2023).

[17] B.M. Fanni, E. Gasparotti, **E. Vignali**, C. Capelli, V. Positano, and S. Celi. "An integrated in-vitro and in-silico workflow to study the pulmonary bifurcation hemodynamics". In: *Computers and Fluids* 260 (2023).

[18] E. Gasparotti, **E. Vignali**, S. Quartieri, R. Lazzeri, and S. Celi. "Numerical investigation on circular and elliptical bulge tests for inverse soft tissue characterization". In: *Biomechanics and Modeling in Mechanobiology* 22.5 (2023), pp. 1697–1707.

[19] M. Koch, C. Arlandini, G. Antonopoulos, A. Baretta, P. Beaujean, G.J. Bex, M.E. Biancolini, S. Celi, E. Costa, L. Drescher, V. Eleftheriadis, N.A. Fadel, A. Fink, F. Galbiati, I. Hatzakis, G. Hompis, N. Lewandowski, A. Memmolo, C. Mensch, D. Obrist, V. Paneta, P. Papadimitroulas, K. Petropoulos, S. Porziani, G. Savvidis, K. Sethia, P. Strakos, P. Svobodova, and **E. Vignali**. "HPC+ in the medical field: Overview and current examples". In: *Technology and Health Care* 31.4 (2023), pp. 1509–1523.

[20] A. Mariotti, **E. Vignali**, E. Gasparotti, M. Morello, J. Singh, M.V. Salvetti, and S. Celi. "In Vitro Analysis of Hemodynamics in the Ascending Thoracic Aorta: Sensitivity to the Experimental Setup". In: *Applied Sciences (Switzerland)* 13.8 (2023).

[21] S. Scalera, A. Clemente, A. Pizzuto, E. Gasparotti, B.M. Fanni, **E. Vignali**, K. Capellini, S. Celi, and G. Santoro. "3D Printed Model-Guided Neonatal Transcatheter Closure of Left Main Coronary Artery-to-Right Ventricle Fistula". In: *JACC: Case Reports* 16 (2023).

[22] **E. Vignali**, E. Gasparotti, A. Mariotti, D. Haxhiademi, L. Ait-Ali, and S. Celi. "High-Versatility Left Ventricle Pump and Aortic Mock Circulatory Loop Development for Patient-Specific Hemodynamic in Vitro Analysis". In: *ASAIO Journal* 68.10 (2022), pp. 1272–1281.

[23] E. Gasparotti, **E. Vignali**, M. Mariani, S. Berti, and S. Celi. "Image-based modelling and numerical simulations of the Cardioband® procedure for mitral valve regurgitation repair". In: *Computer Methods in Applied Mechanics and Engineering* 394 (2022).

[24] E. Kardampiki, **E. Vignali**, D. Haxhiademi, D. Federici, E. Ferrante, S. Porziani, A. Chiappa, C. Groth, M. Cioffi, M.E. Biancolini, E. Costa, and S. Celi. "The Hemodynamic Effect of Modified Blalock–Taussig Shunt Morphologies: A Computational Analysis Based on Reduced Order Modeling". In: *Electronics (Switzerland)* 11.13 (2022).

[25] A. Mariotti, E. Gasparotti, **E. Vignali**, P. Marchese, S. Celi, and M.V. Salvetti. "Integrating in-vivo Data in CFD Simulations and in in-vitro Experiments of the Hemodynamic in Healthy and Pathologic Thoracic Aorta". In: *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* 13347 LNBI (2022), pp. 208–219.

[26] F.D. Bartolo, **E. Vignali**, E. Gasparotti, A. Malacarne, L. Landini, and S. Celi. "Numerical simulations of light scattering in soft anisotropic fibrous structures and validation of a novel optical setup from fibrous media characterization". In: *Electronics (Switzerland)* 10.5 (2021), pp. 1–14.

[27] A. Cavallo, E. Gasparotti, P. Losi, I. Foffa, T. Al Kayal, **E. Vignali**, S. Celi, and G. Soldani. "Fabrication and in-vitro characterization of a polymeric aortic valve for minimally invasive valve replacement". In: *Journal of the Mechanical Behavior of Biomedical Materials* 115 (2021).

[28] S. Celi, **E. Vignali**, K. Capellini, and E. Gasparotti. "On the Role and Effects of Uncertainties in Cardiovascular in silico Analyses". In: *Frontiers in Medical Technology* 3 (2021).

[29] S. Celi, E. Gasparotti, K. Capellini, **E. Vignali**, B.M. Fanni, L.A. Ali, M. Cantinotti, M. Murzi, S. Berti, G. Santoro, and V. Positano. "3d printing in modern cardiology". In: *Current Pharmaceutical Design* 27.16 (2021), pp. 1918–1930.

[30] **E. Vignali**, E. Gasparotti, K. Capellini, B.M. Fanni, L. Landini, V. Positano, and S. Celi. "Modeling biomechanical interaction between soft tissue and soft robotic instruments: importance of constitutive anisotropic hyperelastic formulations". In: *International Journal of Robotics Research* 40.1 (2021), pp. 224–235.

[31] **E. Vignali**, E. Gasparotti, S. Celi, and S. Avril. "Fully-Coupled FSI Computational Analyses in the Ascending Thoracic Aorta Using Patient-Specific Conditions and Anisotropic Material Properties". In: *Frontiers in Physiology* 12 (2021).

[32] **E. Vignali**, E. Gasparotti, L. Landini, and S. Celi. "Development and realization of an experimental bench test for synchronized small angle light scattering and biaxial traction analysis of tissues". In: *Electronics (Switzerland)* 10.4 (2021), pp. 1–16.

[33] K. Capellini, P. Tripicchio, **E. Vignali**, E. Gasparotti, L.A. Ali, M. Cantinotti, D. Federici, G. Santoro, F. Alfonzetti, C. Evangelista, C. Tanca, and S. Celi. "3D printing and 3D virtual models for surgical and percutaneous planning of congenital heart diseases". In: *VISIGRAPP 2020 - Proceedings of the 15th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications* 3 (2020), pp. 281–287.

[34] **E. Vignali**, F. di Bartolo, E. Gasparotti, A. Malacarne, G. Concistré, F. Chiaramonti, M. Murzi, V. Positano, L. Landini, and S. Celi. "Correlation between micro and macrostructural biaxial behavior of ascending thoracic aneurysm: a novel experimental technique". In: *Medical Engineering and Physics* 86 (2020), pp. 78–85.

[35] **E. Vignali**, E. Gasparotti, B.M. Fanni, L. Ait-Ali, V. Positano, L. Landini, and S. Celi. "Development of a fully controllable real-time pump to reproduce left ventricle physiological flow". In: *Lecture Notes in Mechanical Engineering* (2020), pp. 908–919.

[36] B.M. Fanni, E. Sauvage, S. Celi, W. Norman, **E. Vignali**, L. Landini, S. Schievano, V. Positano, and C. Capelli. "A Proof of Concept of a Non-Invasive Image-Based Material Characterization Method for Enhanced Patient-Specific Computational Modeling". In: *Cardiovascular Engineering and Technology* 11.5 (2020), pp. 532–543.

[37] A. Mariotti, **E. Vignali**, E. Gasparotti, K. Capellini, S. Celi, and M.V. Salvetti. "Comparison between numerical and mri data of ascending aorta hemodynamics in a circulatory mock loop". In: *Lecture Notes in Mechanical Engineering* (2020), pp. 898–907.

[38] **E. Vignali**, Z. Manigrasso, E. Gasparotti, B. Biffi, L. Landini, V. Positano, C. Capelli, and S. Celi. "Design, simulation, and fabrication of a three-dimensional printed pump mimicking the left ventricle motion". In: *International Journal of Artificial Organs* 42.10 (2019), pp. 539–547.

[39] E. Gasparotti, **E. Vignali**, P. Losi, M. Scatto, B.M. Fanni, G. Soldani, L. Landini, V. Positano, and S. Celi. "A 3D printed melt-compounded antibiotic loaded thermoplastic polyurethane heart valve ring design: an integrated framework of experimental material tests and numerical simulations". In: *International Journal of Polymeric Materials and Polymeric Biomaterials* 68.1-3 (2019), pp. 1–10.

[40] K. Capellini, **E. Vignali**, E. Costa, E. Gasparotti, M.E. Biancolini, L. Landini, V. Positano, and S. Celi. "Computational Fluid Dynamic Study for aTAA Hemodynamics: An Integrated Image-Based and Radial Basis Functions Mesh Morphing Approach". In: *Journal of Biomechanical Engineering* 140.11 (2018).

Conference Contributions

[1] **E. Vignali**, E. Gasparotti, D. Haxhiademi, and S. Celi. "An Experimental-Computational Validation Of Perfusion And Afterload In Veno-Arterial ECMO". In: *Proceedings of 20th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering*. 2025.

[2] E. Gasparotti, **E. Vignali**, I. Verdirame, B. M. Fanni, F. Berti G. Pennati L. Petrini, and S. Celi. "Experimental Workflow For Patient Specific Left Atrial Appendage Hemodynamics Validation". In: *Proceedings of 20th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering*. 2025.

[3] E. Gasparotti, **E. Vignali**, R. Marangoni, J. Mill, A. L. Olivares, C. Albors, M. Barrouhou-Berrouhou, O. Camara, and S. Celi. "An Experimental Setup for the Analysis of Patient-Specific Left Atrial Appendage with Particle Image Velocimetry Investigation". In: *International Conference on Functional Imaging and Modeling of the Heart*. Springer. 2025, pp. 186–196.

[4] F. Dell'Agnello, **E. Vignali**, K. Capellini, M. Scarpolini, E. Gasparotti, and S. Celi. "A Dynamic CT Based Pipeline To Assess Hemodynamic Indexes and Wall Stiffness of the Aorta". In: *9th ECCOMAS Congress*. 2024.

[5] **E. Vignali**, E. Gasparotti, F. Bardi, S. Avril, and S. Celi. "Fluid dynamic analysis of AAA phantoms via LED-PIV in a hybrid mock circulatory loop". In: *29th Congress of the European Society of Biomechanics*. 2024.

[6] **E. Vignali**, E. Gasparotti, F. Dell'Agnello, C. Ferrantini, L. Sacconi, F. A. Recchia, and S. Celi. "LCE-based actuation of synthetic vessels: experimental and numerical approaches". In: *29th Congress of the European Society of Biomechanics*. 2024.

[7] **E. Vignali**, E. Gasparotti, M. Mazzoli, D. Haxhiademi, and S. Celi. "Extra Corporeal Membrane Oxygenation Support For Perfusion In Cardiac Shock: A Computational Analysis". In: *9th ECCOMAS Congress*. 2024.

[8] E. Gasparotti, B. M. Fanni, **E. Vignali**, M. Dell'Amico, R. Marangoni, F. Danielli, F. Berti, G. Parodi, S. Berti, Giancarlo Pennati, et al. "Design and Fabrication of 3D Printed Deformable Model of Patient-Specific Left Atrium for PIV Investigation". In: *National Congress of the Italian Digital Biomanufacturing Network*. Springer. 2024, pp. 81–94.

[9] M. Astore, E. Gasparotti, **E. Vignali**, S. Celi, and M. Marino. "Experimental and modelling analyses for understanding of the structure-mechanics relationship of aortic tissue". In: *XII Annual Meeting of the Italian Chapter of European Society of Biomechanics*. 2023.

[10] F. Bardi, M. N. Antonuccio, E. Gasparotti, **E. Vignali**, M. Aguirre, S. Avril, and S. Celi. "FSI computational model of a patient specific AAA validated by LED illumintaed PIV". In: *28th Congress of the European Society of Biomechanics*. 2023.

[11] F. Bardi, E. Gasparotti, **E. Vignali**, M. Aguirre, S. Avril, and S. Celi. "Validation of FSI simulations against a compliant aortic phantom in a Hybrid Mock Circulatory Loop". In: *Summer Biomechanics, Bioengineering, & Biotransport Conference (SB3C)*. 2023.

[12] K. Capellini, F. Dell'Agnello, E. Gasparotti, **E. Vignali**, M. Mazzoli, M. A. Scarpolini, F. Cademartiri, and S. Celi. "Towards a digital twin for aorta: an in-silico image-based approach coupling numerical simulations and CT-gated images to assess patients specific aortic hemodynamics". In: *XXIV CONGRESSO SIRC*. Vol. 2023, Imola, 18 -. Oct. 20, 2023.

[13] K. Capellini, F. Dell'Agnello, E. Gasparotti, **E. Vignali**, M. A. Scarpolini, E. Maffei, A. Clemente, F. Cademartiri, and S. Celi. "A moving boundary meshless method to investigate thoracic aorta hemodynamics based on CT images and mesh morphing technique". In: *Computational Fluids Conference*. 2023.

[14] F. Dell'Agnello, **E. Vignali**, M. A. Scarpolini, K. Capellini, E. Gasparotti, F. Cademartiri, S. Celi, and M. Marino. "A mesh morphing tool for moving boundaries CFD simulations and wall stiffness estimation of the aorta". In: *XII Annual Meeting of the Italian Chapter of European Society of Biomechanics*. 2023.

[15] F. Dell'Agnello, M. A. Scarpolini, K. Capellini, **E. Vignali**, E. Gasparotti, F. Cademartiri, and S. Celi. "A combined CFD and mesh morphing technique to investigate thoracic aorta hemodynamics". In: *28th Congress of the European Society of Biomechanics, July*. 2023.

[16] F. Dell'Agnello, M. A. Scarpolini, K. Capellini, **E. Vignali**, E. Gasparotti, F. Cademartiri, and S. Celi. "Effects of wall motion on the hemodynamics of the aorta". In: *WECM'23 - 2nd Workshop on Experimental and Computational Mechanics*. Italy: Pisa, 2023.

[17] **E. Vignali**, E. Gasparotti, F. Dell'Agnello, K. Capellini, M. A. Scarpolini, F. Cademartiri, and S. Celi. "Image-based in vivo estimation of regional strain and stiffness properties of the whole aortic vessel". In: *28th Congress of the European Society of Biomechanics*. 2023.

[18] **E. Vignali**, L. Miglior, E. Gasparotti, A. Ceni, C. Zirafa, D. Haxiademi, L. Frediani, F. Melfi, S. Berti, V. Gervasi, and S. Celi. "An application for remote respiratory patterns detection in post-surgery patients". In: *28th Congress of the European Society of Biomechanics*. 2023.

[19] F. Galbiati, C. Angeletti, K. Capellini, **E. Vignali**, C. Morin, S. Avril, E. Costa, and S. Celi. "Aortic hemodynamics evaluation based on reduced order models: effect of inlet conditions". In: *28th Congress of the European Society of Biomechanics, July*. 2023.

[20] F. Galbiati, **E. Vignali**, K. Capellini, C. Morin, S. Avril, E. Costa, and S. Celi. "Assessment of the combined effects of valve phenotype and aneurysm progression on aTAA hemodynamics". In: *28th Congress of the European Society of Biomechanics, July*. 2023.

[21] F. Galbiati, **E. Vignali**, K. Capellini, C. Morin, S. Avril, E. Costa, and S. Celi. "Investigating the role of eccentric inlet conditions on hemodynamic results at different stages of aneurysm growth". In: *Summer Biomechanics, Bioengineering, & Biotransport Conference (SB3C)*. 2023.

[22] F. Bardi, M. N. Antonuccio, E. Gasparotti, M. Aguirre, S. Avril, **E. Vignali**, and S. Celi. "LED illuminated PIV velocity field characterization in a patient specific aortic aneurysm phantom". In: *XI Annual Meeting of the Italian Chapter of European Society of Biomechanics*. 2022.

[23] F. Bardi, E. Gasparotti, **E. Vignali**, M. Aguirre, S. Avril, and S. Celi. "A high-power led illuminated piv setup to characterize the flow behaviour in abdominal aortic aneurysm models". In: *27th Congress of the European Society of Biomechanics*. 2022.

[24] F. Bardi, E. Gasparotti, **E. Vignali**, M. Aguirre, S. Avril, and S. Celi. "Mechanics and fluid dynamics characterization of a compliant patient specific aortic phantom in a Hybrid Mock Circulatory Loop". In: *9th World Congress of Biomechanics*. 2022.

[25] K. Capellini, E. Gasparotti, **E. Vignali**, B. M. Fanni, M. A. Scarpolini, F. Cademartiri, and S. Celi. "Image-based in vivo estimation of aortic local stiffness and hemodynamics". In: *27th Congress of the European Society of Biomechanics*. 2022.

[26] K. Capellini, E. Gasparotti, **E. Vignali**, M. A. Scarpolini, E. Costa, M. E. Biancolini, U. Cella, F. Cademartiri, and S. Celi. "A comparative study between CFD, FSI and radial basis functions mesh morphing technique based on biomedical images for aortic hemodynamic studies". In: *9th World Congress of Biomechanics*. 2022.

[27] **E. Vignali**, E. Gasparotti, S. Avril, and S. Celi. "Linearization of material behavior for patient-specific aTAA fluid-structure analysis: the Small on Large deformation approach". In: *9th World Congress of Biomechanics*. 2022.

[28] **E. Vignali**, E. Gasparotti, F. Bardi, S. Prizio, D. Haxhiademi, P. Del Sarto, and S. Celi. "Development of a physical twin for cardiovascular life-support devices analysis and comparison". In: *27th Congress of the European Society of Biomechanics*. 2022.

[29] **E. Vignali**, E. Gasparotti, F. Bardi, M. Scolaro, D. Haxhiademi, P. Del Sarto, and S. Celi. "An experimental analysis of cardiovascular support devices for cardiogenic shock: a mock-circulatory loop for ECMO and Impella devices". In: *9th World Congress of Biomechanics*. 2022.

[30] **E. Vignali**, E. Gasparotti, K. Capellini, F. Bardi, M. A. Scarpolini, F. Cademartiri, and S. Celi. "In-vivo estimation of local aortic stiffness via ECG-gated CT data". In: *11th European Solid Mechanics Conference*. 2022.

[31] E. Gasparotti, **E. Vignali**, D. Haxiademi, F. Bardi, M. Scolaro, P. A. Del Sarto, and S. Celi. "Bench to bedside: in-silico and in-vitro evaluation of shocked patients under the ECMO support". In: *XI Annual Meeting of the Italian Chapter of European Society of Biomechanics*. 2022.

[32] E. Gasparotti, **E. Vignali**, M. Mariani, S. Berti, and S. Celi. "Effects of the Cardioband procedure on the regurgitant mitral valve". In: *11th European Solid Mechanics Conference*. 2022.

[33] E. Gasparotti, **E. Vignali**, M. Scolaro, D. Haxhiademi, P. Del Sarto, and S. Celi. "In vitro and in silico evaluation of effects of ecmo treatment on patient specific aorta under cardiogenic shock conditions". In: *9th World Congress of Biomechanics*. 2022.

[34] E. Gasparotti, S. Quartieri, **E. Vignali**, F. Bardi, R. Lazzeri, and S. Celi. "Numerical and experimental evalaution of the bulge test In the characterisation of the biological soft tissues". In: *27th Congress of the European Society of Biomechanics*. 2022.

[35] E. Gasparotti, S. Quartieri, **E. Vignali**, F. Bardi, R. Lazzeri, and S. Celi. "Numerical simulations to evaluate the performance of the bulge test technique in the mechanical characterization of soft biological tissues". In: *9th World Congress of Biomechanics*. 2022.

[36] Emanuele Gasparotti, Emanuele Vignali, Massimiliano Mariani, Sergio Berti, and Simona Celi. "Finite element simulations of the cardioband procedure For the treatment of the regurgitant mitral valve". In: *27th Congress of the European Society of Biomechanics*. 2022.

[37] A. Mariotti, **E. Vignali**, E. Gasparotti, P. Marchese, M. Morello, M. V. Salvetti, and S. Celi. "Hemodynamics in healthy and pathological thoracic aorta: integration of in-vivo data in CFD simulations and in-vitro experiments". In: *8th World Congress in Computational Mechanics and ECCOMAS Congress*. 2022.

[38] A. Mariotti, E. Gasparotti, **E. Vignali**, P. Marchese, S. Celi, and M. V. Salvetti. "Integrating in-vivo Data in CFD Simulations and in in-vitro Experiments of the Hemodynamic in Healthy and Pathologic Thoracic Aorta". In: *9th International Work-Conference on Bioinformatics and Biomedical Engineering, IWBBIO*. 2022.

[39] F. Bardi, E. Gasparotti, **E. Vignali**, M. Aguirre, S. Avril, and S. Celi. "A hardware-in-the-loop strategy for fluid dynamic characterization of cardiovascular systems". In: *26th Congress of the European Society of Biomechanics*. 2021.

[40] K. Capellini, E. Gasparotti, **E. Vignali**, L. Ait Ali, M. Cantinotti, P. Tripicchio, M. Murzi, and S. Celi. "A clinical trial to assess the effectiveness of 3D models for complex cardiac surgical planning". In: *26th Congress of the European Society of Biomechanics*. 2021.

[41] K. Capellini, E. Gasparotti, **E. Vignali**, B. M. Fanni, U. Cella, E. Costa, M. E. Biancolini, and S. Celi. "An image-based CFD and RBF mesh morphing approach: an alternative for standard FSI technique". In: *26th Congress of the European Society of Biomechanics, July*. 2021.

[42] **E. Vignali**, S. Avril, and S. Celi. "Fully-Coupled Fluid-Structure Interaction simulation of Ascending Thoracic Aorta based on the Small On Large Theory". In: *32nd Parallel Computational Fluid Dynamics Conference*. 2021.

[43] **E. Vignali**, S. Avril, and S. Celi. "Patient-Specific linearization of anisotropic hypereleastic models for FSI analyses of Aortic Aneurysms". In: *26th Congress of the European Society of Biomechanics*. 2021.

[44] **E. Vignali**, E. Gasparotti, A. Mariotti, M. V. Salvetti, and S. Celi. "In-silico and In-vitro uncertainty quantification of inlet conditions of the aortic complex". In: *26th Congress of the European Society of Biomechanics*. 2021.

[45] B. M. Fanni, **E. Vignali**, C. Capelli, V. Positano, and S. Celi. "An integrated in-vitro and in-silico workflow to study the pulmonary bifurcation hemodynamics". In: *32nd Parallel Computational Fluid Dynamics Conference*. May 2021.

[46] B. M. Fanni, **E. Vignali** E. Gasparotti, C. Capelli, V. Positano, and S. Celi. "An MRI-based patient-specific RCR estimation of pulmonary bifurcation using in-vitro and in-silico approaches". In: *26th Congress of the European Society of Biomechanics, Milan – Online*. July 2021.

[47] B. M. Fanni, E. Gasparotti, **E. Vignali**, C. Capelli, V. Positano, and S. Celi. "A parametric equation for the non-invasive estimation of the elastic properties of materials". In: *26th Congress of the European Society of Biomechanics*. 2021.

[48] E. Gasparotti, **E. Vignali**, E. Cerone, S. Berti, and S. Celi. "Digital twin of the CardioBand procedure for mitral valve regurgitation: in silico approach and validation". In: *26th Congress of the European Society of Biomechanics*. 2021.

[49] E. Gasparotti, **E. Vignali**, M. Scolaro, P. A. Del Sarto, S. Celi, and D. Haxhiademi. "In vitro study of effects of ECMO on patient specific aorta under cardiogenic shock conditions". In: *26th Congress of the European Society of Biomechanics*. 2021.

[50] F. Di Bartolo, **E. Vignali**, A. Malacarne, E. Gasparotti, V. Positano, L. Landini, and S. Celi. "Optomechanical characterization of soft biological tissues: an integration of biaxial test and sals technique". In: *Proceedings of European Society of Biomechanics*. 2019.

[51] K. Capellini, U. Cella, E. Costa, E. Gasparotti, **E. Vignali**, B. M. Fanni, and S. Celi. "A novel FSI approach for the study of the aorta hemodynamics: an integrated imaged based and RBF mesh morphing technique". In: *International CAE Conference, Vicenza, Italy*. 2019.

[52] **E. Vignali**, F. Di Bartolo, E. Gasparotti, A. Malacarne, V. Positano, L. Landini, and S. Celi. "In-silico evaluation of a patient-specific ATAA case through experimental mechano-microstructural characterization". In: *International CAE Conference, Vicenza, Italy*. 2019.

[53] **E. Vignali**, E. Gasparotti, A. Mariotti, K. Capellini, D. Haxhiademi, G. Bianchi, B. M. Fanni, V. Positano, L. Landini, M. V. Salvetti, and S. Celi. "Development of a custom mock circulatory loop for in-vitro study of patient specific aortic branches". In: *International Society for Mechanical Circulatory Support -27th annual meeting*. 2019.

[54] **E. Vignali**, F. Poli, F. Di Bartolo, E. Gasparotti, A. Malacarne, V. Positano, L. Landini, and S. Celi. "Biaxial and optomechanical characterization of soft tissues: a novel setup and experimental tests". In: *Proceedings of the IX Annual Meeting of the Italian Chapter of European Society of Biomechanics (awarded with the prize of Best Oral Presentation*. 2019.

[55] B. M. Fanni, K. Capellini, E. Gasparotti, **E. Vignali**, V. Positano, Cerone E. Landini, S. Berti, and S. Celi. "L'in-silico e l'in-vitro per il planning clinico della procedura di chiusura percutanea dell'auricola sinistra". In: *Italian Digital Biomanufacturing Network*. Vol. 3rd National Congress, Pisa. Oct. 2019.

[56] B. M. Fanni, E. Gasparotti, K. Capellini, C. Capelli, **E. Vignali**, V. Positano, and S. Celi. "A novel image-based formulation for enhanced patient-specific in silico simulations of cardiovascular structures". In: *International CAE Conference, Vicenza, Italy*. Oct. 2019.

[57] B. M. Fanni, E. Sauvage, C. Capelli, E. Gasparotti, **E. Vignali**, S. Schievano, L. Landini, V. Positano, and S. Celi. "A numerical and 3D printing framework for the in vivo mechanical assessment of patient-specific cardiovascular structures". In: *2nd International Conference on Simulation for Additive Manufacturing, Sim-AM*. 2019.

[58] E. Gasparotti, U. Cella, **E. Vignali**, E. Costa, G. Soldani, A. Cavallo, P. Losi, M. E. Biancolini, and S. Celi. "A combined approach of numerical simulation and additive manifacturing technique for in-silico and in-vitro testing of a 3D printing-based aortic polymeric heart valve". In: *2nd International Conference on Simulation for Additive Manufacturing, Sim-AM*. 2019.

[59] E. Gasparotti, M. Cioffi, V. Positano, **E. Vignali**, B. M. Fanni, K. Capellini, D. Haxhiademi, E. Costa, S. Berti, L. Landini, and S. Celi. "Analysis of alternative methods and models for research in cardiovascular disease". In: *2nd Centro*. Vol. 3R Annual Meeting. June 2019.

[60] E. Gasparotti, **E. Vignali**, K. Capellini, D. Haxhiademi, G. Bianchi, B. M. Fanni, L. Landini, V. Positano, and S. Celi. "Sviluppo di un banco prova paziente specifico per lo studio in-vitro della fluidodinamica dell'arco aortico". In: *Italian Digital Biomanufacturing Network*. Vol. 3rd National Congress, Pisa. Oct. 2019.

[61] E. Gasparotti, **E. Vignali**, U. Cella, L. Geronzi, E. Costa, and S. Celi. "A novel FSI-RBF mesh morphing environment to design a new polymeric aortic valve". In: *International CAE Conference, Vicenza, Italy*. 2019.

[62] E. Gasparotti, **E. Vignali**, E. Cerone, S. Berti, V. Positano, L. Landini, and S. Celi. "In-silico healthcare: first human simulations of Cardioband® procedure for mitral regurgitation". In: *Proceedings of Italian Chapter of the European Society of Biomechanics*. 2019.

[63] K. Capellini, B. M. Fanni, E. Gasparotti, **E. Vignali**, D. Sabatino, M. Di Leonardo, S. Berti, L. Landini, V. Positano, and S. Celi. "The role of simulations for LAA closure procedure: from planning to post-procedural analysis". In: *International CAE Conference, Vicenza*. 2018.

[64] S. Celi, B. M. Fanni, E. Gasparotti, K. Capellini, **E. Vignali**, M. Di Leonardo, E. Cerone, L. E. Pastormerlo, U. Paradossi, V. Positano, L. Landini, and S. Berti. "A computational framework for personalized blood flow analysis and device implantation to optimize LAA closure procedure". In: *CSI Focus LAA*. Vol. 2018, Frankfurt. Nov. 2018.

[65] **E. Vignali**, E. Gasparotti, K. Capellini, P. Losi, M. Murzi, P. A. Farneti, L. Landini, V. Positano, and S. Celi. "Ascending thoracic aortic FE simulation by integrating patient-specific data from imaging, mechanical properties and histological data". In: *Proceedings of the 8th World Congress of Biomechanics*. 2018.

[66] **E. Vignali**, E. Gasparotti, and Z. Manigrasso. "A numerical and experimental approach for the design of a novel 3D printed bioinspired cardiac pneumatic pump". In: *International CAE Conference, Vicenza, Italy*. 2018.

[67] **E. Vignali**, E. Gasparotti, M. Scatto, P. Losi, B. M. Fanni, K. Capellini, L. Landini, V. Positano, and S. Celi. "3D Printing of an antibiotic-loaded heart valve ring prosthesis in thermoplastic polyurethane: fabrication, testing and simulation". In: *Proceeedins of Italian Digital Biomanufacturing Network Congress*. 2018.

[68] **E. Vignali**, N. Martini, P. Losi, K. Capellini, D. Della Latta, F. Di Bartolo, L. Landini, V. Positano, and S. Celi. "Towards non-invasive assessment of human aortic tissue microstructure: Diffusion Tensor Imaging for collagen fiber detection". In: *Proceedings of National Congress of Bioengineering GNB*. 2018.

[69] B. M. Fanni, S. Celi, E. Gasparotti, **E. Vignali**, K. Capellini, S. Schievano, L. Landini, C. Capelli, and V. Positano. "A combined in silico and in vitro image-based approach for the mechanical characterization of patient-specific cardiovascular structures". In: *International CAE Conference, Vicenza, Italy*. 2018.

[70] B. M. Fanni, E. Gasparotti, **E. Vignali**, K. Capellini, G. Vivoli, M. Mariani, M. Rezzaghi, L. Landini, V. Positano, S. Celi, and S. Berti. "Importance of left atrium fluid dynamics for the planning of LAA closure procedure: an integrated computational fluid dynamics and morphological study". In: *European Heart booktitle*. Vol. 39 (Issue Supplement 1):1290 (ESC Best Poster Awards). 2018.

[71] E. Gasparotti, **E. Vignali**, K. Capellini, B. M. Fanni, A. G. Cerillo, S. Berti, L. Landini, V. Positano, and S. Celi. "Digital twin in healthcare: development of an integrated imaging and finite element model of Cardioband(r) procedure for the treatment of mitral regurgitation". In: *International CAE Conference, Vicenza, Italy*. 2018.

[72] E. Gasparotti, **E. Vignali**, G. Soldani, P. Losi, M. Scatto, and S. Celi. "Melt Compounded Biocompatible Thermoplastic Polyurethane (TPU) for the Engineering of $3\mathrm{D}$ printed Aortic Heart Valve Ring: Design, Fabrication, Testing and Simulation". In: *Proceedings of International Society for Biomedical Polymers and Polymeric Biomaterials*. 2018.

[73] E. Gasparotti, **E. Vignali**, G. Vivoli, A. G. Cerillo, S. Berti, L. Landini, V. Positano, and S. Celi. "Towards a patient-specific finite element simulation of Cardioband procedure for the treatment of mitral regurgitation". In: *Proceedings of 8th World Congress of Biomechanics*. 2018.

[74] Z. Manigrasso, E. Gasparotti, B. Biffi, **E. Vignali**, S. Schievano, L. Landini, V. Positano, C. Capelli, and S. Celi. "A novel 3D printed bioinspired cardiac pneumatic pump: from design to numerical and experimental study". In: *Proceedings of Virtual Physiology Human Conference*. 2018.

[75] Z. Manigrasso, E. Gasparotti, B. Biffi, **E. Vignali**, S. Schievano, L. Landini, V. Positano, C. Capelli, and S. Celi. "Design of a novel 3D printed mock cardiac pump: in-silico and experimental evaluation". In: *Proceeedins of 2th Italian Digital Biomanufacturing Network Congress*. 2018.

[76] K. Capellini, E. Costa, M. E. Biancolini, **E. Vignali**, V. Positano, L. Landini, and S. Celi. "An image-based and RBF mesh morphing CFD simulation for aTAA hemodynamics". In: *Proceedings of the VII Annual Meeting of the Italian Chapter of European Society of Biomechanics*. p. 25, Sept. 2017.

[77] **E. Vignali**, K. Capellini, S. Celi, P. Losi, G. Vivoli, E. Cerone, V. Positano, L. Landini, M. Murzi, and S. Berti. "A morphological and mechano-biological comparison between ascending thoracic aneurysms with bicuspid and tricuspid via in-vivo and ex-vivo investigation". In: *European Heart booktitle*. Vol. 38(Suppl. 1): (P3975). (Awarded with the student travel grant at the ESC congress). 2017, pp. 825–826.

[78] **E. Vignali**, K. Capellini, P. Losi, M. Murzi, P. Farneti, V. Positano, L. Landini, and S. Celi. "A morphological and histo-mechanical study for ascending aorta aneurysms in BAV and TAV patients". In: *Proceedings of 23rd Congress of European Society of Biomechanics*. 2017.

[79] E. Gasparotti, **E. Vignali**, K. Capellini, G. Vivoli, A. G. Cerillo, V. Positano, S. Berti, L. Landini, and S. Celi. "A FE tool to simulate a transcatheter anchor-based system for mitral valve regurgitation". In: *Proceedings of the VII Annual Meeting of the Italian Chapter of European Society of Biomechanics*. p. 57, Sept. 2017.

Additional Research Activities

- Member of the organizing committee for the seminar cycle and open day entitled 'My Breathing Heart: quanto è in forma il tuo respiro?', held in Pisa in February 2024
- Member of the organizing committee for the XI Annual Meeting of the Italian Chapter of European Society of Biomechanics, held in Massa in October 2022
- Chairman for the XI and XII Annual Meetings of the Italian Chapter of European Society of Biomechanics (2022 - 2023)
- Supervisor for Master thesis in Biomedical Engineering at University of Pisa with the following titles:
  - "Mechanical and microstructural local characterization of soft biological tissues integrating biaxial and SALS techniques" (2023)
  - "Valutazione della rigidezza di pareti vascolari attraverso l'analisi delle immagini CT gated" (2023)
  - "Mechanical properties of aortic tissue in vivo through the analysis of CT-ECG gated images" (2022)
  - "In-vitro fluid dynamic analysis of deformable 3D printed-based models through Particle Image Velocimetry technique" (2022)
  - "Simulazione mediante tecniche agli elementi finiti della fluidodinamica in pazienti sottoposti a circolazione extracorporea" (2022)
  - "Studio della fluidodinamica della procedura di shunt modificato di Blalock-Taussig mediante simulazioni CFD" (2021)
  - "Study of a cohort of patients affected by Tetralogy of Fallot: an integrated approach between numerical simulations and experimental activities" (2020)
  - "Simulazione numerica per la procedura ECMO" (2020)
  - "Project and development of an experimental setup for the optomechanical characterization of vascular tissue" (2019)
  - "Project and development of an experimental setup for the optomechanical characterization of vascular tissue" (2019)
  - "Development of an experimental fluid dynamic setup for the evaluation of valve prosthesis" (2018)

- Reviewer for scientific journals (International Journal of Artificial Organs, International Journal of Robotics Research, Biomedical Signal Processing and Control, Annals of Biomedical Engineering and Cardiovascular Engineering and Technology)
- Lecturer for the course "Principles for Diagnostic Methods" at faculty of Biomedical Engineering, University of Pisa (2019)

Skills & Background Knowledge

Technical skills

Ansys, Fluent, Python, Matlab, LabView, Office – *Advanced*

ANSA, Solidworks, C++, Java, FORTRAN – *Intermediate*

Languages

English – *Advanced*

Italian – *Native Language*

Personal skills

High level in communication skills

Sociable and proactive

High level in problem solving skills

20/05/2024

Date

Signature

In compliance with the Italian legislative Decree no. 196 dated 30/06/2003 and GDPR (EU Regulation 2016/679), I hereby authorize you to use and process my personal details contained in this document.