# Emiliano Votta - Curriculum vitae

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## Personal Data

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|---|---|
| First Name | Emiliano |
| Family Name | Votta |
| Place of Birth | Sondrio (SO), Italy |
| Date of Birth | March 29th, 1976 |
| Gender | Male |
| C.F. | VTTMLN76C29I829R |


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|---|---|---|
| **Address** | Office | Politecnico di Milano, Department of Electronics, Informatics and Bioengineering (DEIB), Via Ponzio, 34/5, 20133 Milano (MI), Italy |
| **Contacts** | Mobile | +39-334-7754414 |
| | Office | +39-02-2399-3461 |
| | e-mail | emiliano.votta@polimi.it |
| | website | www.biomech.polimi.it/people?id=43:votta&catid=34:bios |
| | ORCID | https://orcid.org/0000-0001-7115-0151 |


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| **Languages** | Italian | (mother tongue) |
| | English | (fluent in writing and speaking) |
| | German | (basic knowledge) |
| | Spanish | (basic knowledge) |

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## Biosketch

I am an Associate Professor at Politecnico di Milano, in the Department of Electronics, Information and Bioengineering (DEIB), where I work within the Biomechanics Research Group as an expert in finite element modelling and cardiovascular biomechanics, and I teach two courses in the Biomedical Engineering Masters track. I coordinate the activities of the Computational Biomechanics Laboratory at DEIB, where I currently mentor five PhD candidates and ten graduate students. I also coordinate the activities of the 3D and Computer Simulation Laboratory at IRCCS Policlinico San Donato, a center of excellence in cardiology, interventional cardiology, and cardiac surgery. I am currently the coordinator of the EU-funded project ARTERY, the local PI of the MERLIN project funded by the Italian Ministry of Education, Universities and Research, and the local co-PI of the CAL.HUB.RIA. project funded by the Italian Ministry of Health. My research activity leverages numerical modelling, image analysis, artificial intelligence techniques and mixed reality to develop pre- and intra-procedural support tools for clinicians. It has produced around 190 publications, including 82 full papers accepted or published in international peer-reviewed scientific journals (7 as first author, 13 as second author, 12 as last author). These were cited around 2800 times, leading to an h-index of 28. I am one of the co-founders of Artiness srl, a spin-off company stemmed from Politecnico di Milano and devoted to the development of mixed reality solutions for interventional cardiology. I am also one of the co-inventors of a filed Italian patent.

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## Education

*May 2006* **PhD in Biomedical Engineering *cum laude*** at Politecnico di Milano, Milano, Italy, with a final dissertation on "Evaluation of innovative devices for the surgical correction of the mitral valve:

finite element analysis and in vitro models".

*July 2001* — Qualifying examination to the regional engineers registry.

*April 2001* — **Master of Science in Biomedical Engineering** at Politecnico di Milano, Milano, Italy. Final score: 98/100. Title of the master thesis: "Mitral valve repair through the edge-to-edge technique: biomechanical analysis of leaflets stresses".

**Study and Research Experiences Abroad**

*November 2005-March 2006* — Visiting researcher at the **Institute for Complex Engineered Systems (I.C.E.S.), Carnegie Mellon University, Pittsburgh, Pennsylvania, USA,** where I further developed my previous work on atrial biomechanics (see below).

*November 2004-March 2005* — Visiting researcher at the **Institute for Complex Engineered Systems (I.C.E.S.), Carnegie Mellon University, Pittsburgh, Pennsylvania, USA**, where I worked on the experimental characterization of atrial wall mechanical properties via bi-axial testing, and on the implementation of computational models of the left atrium.

*November 2003* — Visiting collaborator at the R&D Department of **Edwards Lifesciences, Irvine, CA, USA**, one of the market leaders in the field of medical devices for heart valves repair and replacement.

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## Professional Experience

**Most Recent Position**

*Since September 2016* — Associate Professor at Politecnico di Milano, Department of Electronics, Informatics and Bioengineering.

**Past Positions**

*May 2015-August 2016* — Assistant Professor at Politecnico di Milano, Department of Electronics, Informatics and Bioengineering.

*September 2013-April 2015* — Post-doc research fellow at Politecnico di Milano, Department of Electronics, Information and Bioengineering

*September 2011-June 2013* — Assistant Professor at Politecnico di Milano, Bioengineering Department.

*September 2010-August 2011* — Post-doc research fellow at Politecnico di Milano, Bioengineering Department.

*May 2006- April 2010* — Post-doc research fellow at Politecnico di Milano, Bioengineering Department. Main responsible for the finite element modelling of heart valves within the Biomechanics Research Group (www.biomech.polimi.it) for the evaluation of valvular diseases and associated surgical repair.

*July 2001 – February 2003* — Research fellow at Politecnico di Milano, Bioengineering Department, working on the computational modelling of diffusion processes through polymers and bio-polymers at the molecular level.

**Appointments and Institutional Services**

| | |
|---|---|
| *Since June 2022* | Member of the Board of the Bioengineering PhD Programme at Politecnico di Milano |
| *Since 2019* | Head of the 3D and Computer Simulation Laboratory at IRCCS Policlinico San Donato, San Donato Milanese, Milan, Italy. IRCCS Policlinico San Donato is a research-oriented hospital recognized as the largest and most renowned Italian center specialized in the field of cardiovascular treatments. |
| *Since 2017* | Coordinator of the International Mobility Committee for the Biomedical Engineering Bachelor and Master tracks at Politecnico di Milano |
| *Since 2017* | Responsible for study transfers from other faculties or universities to the Biomedical Engineering Bachelor track at Politecnico di Milano |

**Memberships**

- ESC Working Group on e-Cardiology
- ESB, European Society of Biomechanics

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## Research Activity

**General description**

My main and most long-lasting research activities are in the field **cardiovascular biomechanics** at the tissue and organ length-scale, applied to clinically relevant problems in cardiovascular surgery and cardiology. These activities include:

- the **non-invasive in vivo quantification of endocardial local strains from 3D ultrasound imaging** as a surrogate measure of local contractility of endocardial fibres, applied the understanding of the effects of severe post-ischemic disease and of its treatment via surgical ventricular restoration, as well as to the quantification of conduction disorders;
- the **non-invasive in vivo quantification of intracardiac and intravascular fluid dynamics from time-resolved 3D phase-contract magnetic resonance imaging**, applied to quantify the fluid-dynamic aberrations in the thoracic aorta associated to bicuspid aortic valve disease, the effects of grafting procedures on the fluid dynamics in the thoracic aorta, the impact of different cardiomyopathies on fluid dynamics in the left ventricle;
- the **patient-specific finite element modelling of mitral valve structural mechanics** to assess the biomechanical impact of valve prolapse and of its correction via surgical repair;
- the **prediction, through patient-specific element modelling, of the effects of the transcatheter replacement of the pulmonary valve or of the aortic valve**, and of the related peri-procedural risks, as a means to support procedural planning.

My current activities also include the development of different technologies for pre- and intra-procedural support:

- **mixed reality** solutions for percutaneous cardiovascular procedures and for neurosurgery
- **artificial intelligence** techniques for the automated segmentation of medical imaging
- **robotic technologies** for structural interventional cardiology procedures

My past activities have included the study of **respiratory mechanics**, namely in the field of mechanical ventilation and **prevention of ventilation-induced lung injury**, as well as the use of finite element modelling to support the design of microfluidic systems for 3D cell cultures.

**Participation to Funded Research Projects**

I am currently involved in four national or international funded projects, with roles that span from collaborator to project coordinator. In the past, I have collaborated to five EU-funded projects, five Italian national projects, and one regional project funded by Regione Lombardia and Fondazione Cariplo.

The detailed list of the projects is reported here below. In each project, I have been directly involved in conceiving, planning, and writing the project proposal, as well as in developing in the actual research activity. The only exception to this general statement consists in the last project of the list, dated 2001: in that case, I was the main responsible for the modelling activity within the project, but I did not play any role in conceiving it nor in writing the proposal.

In all of the listed projects I am affiliated to Politecnico di Milano, unless elsewise specified.

**Funded Projects as PI or co-PI**

| | |
|---|---|
| *October 2023-September 2025* | **As Local PI – Italian Project - PRIN 2022 Programme – Project Title:** MixEd ReaLIty in Neurosurgery - MERLIN: development of a new neuronavigation platform based on mixed reality (PI: Luca Massimi, Università Cattolica del Sacro Cuore, Roma, Italy). Total budget: 205 k€; local budget: 105 k€ |
| *January 2023-December 2026* | **As Local co-PI at IRCCS Policlinico San Donato – Italian Project – POS Programme – Project Title:** CAL.HUB.RIA - CALabria HUB per Ricerca Innovativa ed Avanzata, codice progetto T4 – AN – 09. (PI: Daniele Torella, Università "Magna Graecia" di Catanzaro, Catanzaro, Italy). Local Budget: 1.455 M€. |
| *January 2021-September 2024* | **As project coordinator and PI - EU Project – Horizon2020; Project Title:** ARTERY: Autonomous Robotics for Transcatheter dEliveRy sYstems, grant nr. 101017140, https://www.artery-project.eu/). Total budget: 3 M€; local budget: 559 k€ |

**Funded Projects as collaborator**

| | |
|---|---|
| *July 2023-June 2028* | **NIH-funded project – Project Title:** Towards Personalized Prosthetic Graft Replacement for Genetically Triggered. (PIs: Jonathan Weinsaft, Mario Gaudino, Weill Cornell Medical College, New York, US) |
| *2019-2021* | **Italian Project – Fondazione Cariplo and Regione Lombardia - Project Title:** SILKELASTOGRAFT - A novel compliance-matching silk fibroin/polyurethane graft for in situ vascular tissue engineering (PI: Alberto Redaelli, Politecnico di Milano, Milano, Italy, https://www.silkelastograft.polimi.it/) |
| *2015-2019* | **EU Project – Horizon2020; Project Title:** MUSICARE: MUltiSectoral Integrative approaches to CArdiac care (PI: Alberto Redaelli, Politecnico di Milano, Milano, Italy, https://www.musicare-2020.eu/) |
| *2015-2019* | **EU Project – Horizon2020, Marie Sklodowska-Curie Research and Innovation Staff Exchange Programme; Project Title:** AMMODIT: Approximation Methods for Molecular Modelling and Diagnosis Tools (PI: Jurgen Prestin, University of Lübeck, Lübeck, Germany) |
| *2012-2016* | **EU Project - 2011 IRSES, PEOPLE EU 7th Framework Programme; Project Title:** "EUMLS: EU-Ukrainian Mathematicians for Life Sciences" (PI: Jurgen Prestin, University of Lübeck, Lübeck, Germany) |
| *2012-2015* | **Italian Project – Italian Health Ministry Program 2009; Project Title:** "Multidisciplinary translational biomedics approach to bicuspid aortic valve-related aortopathy for the development of new clinical diagnostic and prognostic tools" (PI: Alessandro Della Corte, Università degli Studi della Campania "Luigi Vanvitelli", Napoli, Italy) |
| *2008-2010* | **Italian Project - PRIN Programme; Project Title:** ''SurgAid: new integrated methods for the diagnosis and the support to surgical heart valves repair, based on finite element modelling and |

advanced processing of 4D echocardiographic images" (PI: Enrico Gianluca Caiani, Politecnico di Milano, Milano, Italy)

*2008-2011* **EU Project - FP7-ICT Programme; Project Title:** "VPH2 - Virtual pathological heart of the virtual physiological human" (PI: Marco Carenini, NoemaLife SPA, Bologna, Italy)

*2006 – 2008* **Italian Project - PRIN Programme; Project Title:** "A novel integrated approach to the pathogenetic question of ascending aortic disease with congenital bicuspid aortic valve: post-valvular flow dynamics, computational biomechanics and microstructural study on cell-matrix interactions in the aortic wall." (PI: Maurizio Cotrufo, Seconda Università degli Studi di Napoli, Napoli, Italy)

*2003-2006* **EU Project - FP6–NMP Programme; Project Title:** "MULTIMATDESIGN - Computer aided molecular design of multifunctional materials with controlled permeability properties" (PI: Dieter Hofmann, Max Planck Institute, Berlin, Germany)

*2003* **Italian Project - PRIN Programme; Project Title:** "Design and realization of intelligent support structures (scaffolds) for cell culture by means of the molecular imprinting technique" (PI: Paolo Giusti, Università di Pisa, Pisa, Italy)

*2001* **Italian Project – MURST Programme; Project Title:** "Analysis of the interaction between synthetic and biological systems for the design of new biomaterials" (PI: Paolo Giusti, Università di Pisa, Pisa, Italy)

**Collaborations with Italian Partners**

*Since 2013* **IRCCS Policlinico San Donato, San Donato Milanese, Italy.** Subject: biomechanical modelling of cardiovascular tissues based on clinical images; ultrasound-based quantification of ventricular wall function, quantification of in vivo intracardiac and intravascular fluid-dynamics from 4DFlow imaging, prediction of the peri-procedural risks in percutaneous pulmonary valve implantations, planning of endovascular stenting procedures.

*2012-2019* **Anesthesia and Emergency-Urgency Department, Ospedale Maggiore Policlinico di Milano, Milan, Italy.** Subject: biomechanical mechanisms underlying ventilator-induced lung injury and identification of improved mechanical ventilation protocols.

*2012-2018* **Department of Cardiac Surgery, University of Verona, Verona, Italy.** Subject: biomechanical effects of different neochordoplasty techniques in the treatment of mitral valve degenerative diseases.

*2008-2011* **CNR (Italian National Research Center) - Clinical Physiology Institute and G. Monasterio Foundation, Pisa, Italy.** Subject: development of automated tools for the analysis of left ventricular function and mitral function from cardiac magnetic resonance images.

*Since 2008* **Department of Cardiothoracic and Respiratory Sciences, Second University of Naples, Napoli, Italy.** Subject: biomechanics of the aortic root and thoracic aorta in case of bicuspid aortic valve disease; patient stratification based on the risk of aortic dissection.

*Since 2007* **ForCardioLab Laboratory**, at the **LITA Pre-clinical Sciences Department of Università degli Studi di Milano, Milano, Italy**. The Laboratory is funded by an Italian no-profit foundation (Fondazione per la Ricerca in Cardiochirurgia) and is mainly focused on the development of new techniques and devices for the surgical repair of the aortic root.

*Since 2006* **Cardiovascular Surgery Division, IRCCS Istituto Cardiologico Monzino, Milano Italy,** to develop semi-automated tools for the patient-specific biomechanical modelling of the mitral valve from echocardiographic data.

*Since 2003* **Cardiac Surgery Division of Luigi Sacco Hospital, Milano, Italy.** Subject: finite element modelling of aortic root biomechanics following surgical repair.

*Since 2000* **Cardiac Surgery Division, IRCCS San Raffaele Hospital, Milano, Italy** on the finite element modelling of mitral valve repair through the edge-to-edge techniques and through annuloplasty, as well as on the development of in vitro mock loops for the testing of annuloplasty devices.

**Collaborations with International Partners**

*Since 2022* **Center for Medical Image Science and Visualization, Linköping University, Linköping, Sweden.** Subject: quantification of intracardiac fluid-dynamics from 4DFlow imaging.

*Since 2020* **Department of Electrical and Computer Engineering - Biomedical Engineering at Aahrus University, Aahrus, Denmark**. Subject: analysis of aortic root dynamics from in vivo data acquired on animal models.

*2020-2022* Living Heart Project, run by Dessault Systèmes, and active member of the Living Heart Community as expert in the finite element modeling of the mitral valve.

*2016-2017* **Department of Cardiovascular Diseases, Mayo Clinic, Rochester, MN, USA.** Subject: development of robust tools for the semi-automated quantification of mitral valve functional anatomy from ultrasound imaging. The collaboration also involved Siemens Healthcare, Medical Imaging Technologies, Princeton, NJ (U.S.A).

*Since 2015* **Leiden University Medical Centre, Leiden, Netherlands.** Subject: mitral valve computational modeling in Barlow disease from ultrasound imaging. The collaboration also involves GE Healthcare, Cardiovascular Ultrasound, Oslo, Norway.

*Since 2015* **Weill Cornell Medical College, Cornell University, New York, NY, USA.** Subject: impact of grafting on thoracic aorta structural mechanics and fluid dynamics.

*2012-2013* **Computational Hydrodynamics and Biofluids Laboratory, University of Minnesota, Minneapolis, MN, USA**. Subject: mitral valve and left ventricular biomechanics.

*2008-2012* **Miller's Lab, Stanford University School of Medicine, Stanford, CA, USA**. Subject: mitral valve biomechanics.

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## Scientific Production and Dissemination

**Overview**

My research activity led to about 190 publications, which can be summarized as follows (the complete list of publications is reported at the end of the present document):

- **82** Full papers accepted or published in international peer reviewed journals
- **5** Chapters in international books
- **3** Chapters in Italian books
- **4** Short Communications on International Peer Reviewed Journals
- **91** Contributions at international conferences
- **10** Contributions at Italian conferences
- **1** PhD Thesis

**Number of citations:** 2804 (source: Scopus)

**H-index:** 28 (source: Scopus)

**Activity as Reviewer (international journals)**

- American Journal of Physiology - Heart and Circulatory Physiology (ISI, HighWire Press)
- Annals of Biomedical Engineering (ISI, Springer)
- Annals of Thoracic Surgery (ISI, Elsevier)
- APL Bioengineering (ISI, AIP Publishing)
- Biomechanics and Modeling in Mechanobiology (ISI, Springer)
- Cardiovascular Engineering and Technology (Scopus, Springer)
- Computational and Mathematical Methods in Medicine (Scopus, Hindawi Publishing Corporation)
- IEEE Transactions on Biomedical Engineering (ISI, IEEE Publishing)
- Journal of Biomechanical Engineering (ISI, American Society of Mechanical Engineering)
- Journal of Biomechanics (ISI, Elsevier)
- Journal of Cardiothoracic Surgery (ISI, BioMed Central)
- Journal of Cardiovascular Medicine (ISI, Wolters Kluwer)
- Journal of the Royal Society Interface (ISI, Royal Society Publishing)
- Medical Image Analysis (ISI, Elsevier)
- MICCAI Conference Proceedings (Springer)
- Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine
- Frontiers in Physiology (ISI, Frontiers)

**Contributions to Editorial Activities and Congress Organization**

- 7th International Conference on Computational and Mathematical Biomedical Engineering (CMBE22), Milano (Italy), June 27$^{th}$-29$^{th}$, 2022 - Member of the organizing committee and co-organizer (together with Prof. Christian Vergara and Prof. Alberto Redaelli) of the mini-symposium "Image-based computational models for predicting disease progression and for risk stratification"
- Hamlyn Symposium on Medical Robotics 2022, 26-29 June 2022, Royal Geographical Society, London (UK). Co-organizer of the full-day Workshop "Autonomy and shared autonomy in endoluminal approaches for soft surgical robots" (Full list of Organizers: Alice Segato, Mouloud Ourak, Elena De Momi, Arianna Menciassi, Emmanuel Vander Poorten, Emiliano Votta, Arnau Garriga Casanovas, Enrico Franco).

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## Technological Transfer Activity

**Past collaborations with companies**

1. Tecnomare SpA (Gruppo Eni, Italy) – numerical simulations for the design of a novel probe for soil analysis
2. Sorin Group (Italy) – development of modelling tools for the design and optimization of mitral annuloplasty devices
3. CID (Carbostent & Implantable Devices) – numerical simulation of in vitro tests on coronary stents
4. Edwards Lifesciences (USA) – mitral valve numerical modelling
5. CUBE Srl (Italy) – analysis of mitral annulus local tensions for the development of a novel annuloplasty device
6. Valtech Cardio Ltd (Israel) - numerical simulations for the refinement of the Cardioband Annuloplsty System for percutaneous annuloplasty procedures

7. Epygon sasu (France/Italy) – numerical simulations for the development of a novel trans-catheter prosthetic mitral valve

**Participation to start-up/spin-off companies**

1. Co-founder and scientific advisor of Artiness srl, an innovative start-up company located in Milan (Italy) and devoted to the development of mixed-reality technologies to support the planning and the execution of percutaneous procedures, as well as to support highly specialized medical education and procedural training. Artiness srl has been certified as a spin-off company by Politecnico di Milano. Currently, it is a PMI where 16 people work, including three operative co-founders and 13 employees.

**Patents**

1. Filed Italian Patent - "SISTEMA E METODO PER LA VALUTAZIONE MORFO-FUNZIONALE DEL DISTRETTO VASCOLARE TORACICO", Patent application number 102023000010473. Inventors: Simone Saitta, Alessandro Caimi, Alberto Cesare Luigi Redaelli, Emiliano Votta, Francesco Sturla, Alessandro Della Corte

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## Teaching Activity

**General description**

Since the academic year 2001/2002 I have been teaching every year at Politecnico di Milano.

Until the academic year 2015/2016, I mainly acted as teaching assistant for biomechanics courses for undergraduate students at Politecnico di Milano, Milano, Italy. I was responsible for classes focused on worked-out examples and for lab activities within the courses, and I was involved in the preparation and grading of tests. My classes (35 to 40 hours within every course) were attended by 150 to 200 students.

Since the academic year 2016/2017, I started teaching to graduate students in the Biomedical Engineering Masters track. In 2016 I started the novel course in *Advanced Modeling Approaches for Cardiovascular Surgery* together with another professor. The course is attended by 50 to 100 students every year. Since 2017 I am also the professor of the *Computational Biomechanics Laboratory* course, which is focused on teaching students the real use of commercial finite element and finite volume solvers for stress analysis and computational fluid dynamics. This course is attended by 30 to 40 students every year.

For two years I was also in charge, as adjunct professor, of courses related to the field of cellular and tissue engineering for undergraduate and graduate students at Politecnico di Torino, Torino, Italy. In those cases, I had to handle every single activity related to the courses, from the definition of their content to managing exams and assessments. Each course included approximately 55 class hours and was attended by 15 to 30 students.

The complete list of the courses I taught is reported below. When available, the opinion of the students who attended the course is reported.

**Courses as professor**

| | |
|---|---|
| *Academic Years 2012/2013 and 2020/2021-2021/2022* | Professor of the course *Corso Progetto: Biomeccanica e Biomacchine* (5 CFU) for undergraduate students, Biomedical Engineering Bachelor track at Politecnico di Milano, Milano, Italy. Most recent students' opinion (A.Y. 2021/2022): 3.3/4. |
| *Academic Years 2017/2018-now* | Professor of the course *Computational Biomechanics Laboratory* (5 CFU) for graduate students, Biomedical Engineering Masters track at Politecnico di Milano, Milano, Italy. Most recent students' opinion (A.Y. 2022/2023): 3.3/4. |
| *Academic Years 2016/2017-now* | Professor of the course *Advanced Modeling Approaches for Cardiovascular Surgery [I.C.]* (5 CFU) for graduate students, Biomedical Engineering Masters track at Politecnico di Milano, Milano, Italy. Most recent students' opinion (A.Y. 2022/2023): 3.7/4. |
| *Academic Year 2009/2010* | Adjunct professor for the course *Tissue Engineering and Biotechnological Applications (5 CFU)* for graduate students, Biomedical Engineering Master track at |

| | |
|---|---|
| | Politecnico di Torino, Torino, Italy. |
| *Academic Year 2008/2009* | Adjunct professor for the course *Cellular Bioengineering and nano-biotechnologies (5 CFU)* for undergraduate students, Biomedical Engineering Bachelor track at Politecnico di Torino, Torino, Italy. |

**Courses as teaching assistant**

| | |
|---|---|
| *Academic Years 2013/2014-2015/2016* | Teaching assistant within the course *Biomechanics (10 CFU)* for undergraduate students, Biomedical Engineering Bachelor track at Politecnico di Milano, Milano, Italy. |
| *Academic Years 2009/2010-2010/2011* | Teaching assistant within the course *Biomechanics (10 CFU)* for undergraduate students, Biomedical Engineering Bachelor track at Politecnico di Milano, Milano, Italy. |
| *Academic Year 2007/2008* | Teaching fellow for the course *Design of tools and devices for vascular and cardiac surgery* for master students at Politecnico di Milano, Milano, Italy. |
| *Academic Years 2002/2003 2008/2009* | Teaching assistant within the course *Biomeccanica I (5 CFU)* for undergraduate students, Biomedical Engineering Bachelor track at Politecnico di Milano, Milano, Italy. |
| *Academic Year 2001/2002* | Teaching assistant within the course *Fundamentals in Biomeccanichs (5 CFU)* for undergraduate students, Biomedical Engineering Bachelor track at Politecnico di Milano, Milano, Italy. |
| *Academic Years 2001/2002 2002/2003* | Seminars and tutoring within the course *Materials in Industrial Design* for undergraduate students, Industrial Design Bachelor track at Politecnico di Milano, Milano, Italy. |

**Activity as Supervisor in Thesis Projects**

In the Biomedical Engineering Masters track at Politecnico di Milano, I have co-supervised 36 master thesis projects and I have supervised 55 master thesis projects. In the Bioengineering PhD track at Politecnico di Milano, I have co-adivised 10 PhD candidates and I am currently the advisor of 6 PhD candidates, listed here below:

<u>Past PhD candidates mentored as co-advisor</u>

1. Carlo Angelo Conti - PhD in Bioengineering obtained in 2009, Politecnico di Milano - Numerical modeling of the healthy and pathological aortic root: application to the analysis of BAV-related alterations
   - Current position: Pre-sales manager at Siemens Digital Industries Software

2. Marco Stevanella - PhD in Bioengineering obtained in 2010, Politecnico di Milano - Implementation of finite element models for the biomechanical analysis of the atrioventricular heart valves
   - Current position: Business Development Senior Consultant at Dassault Systèmes Italy
   - Recipient of the Doctoral Thesis Award "Paolo Durst" 2011, Issued by Italian National Bioengineering Group (GNB)

3. Francesco Sturla - PhD in Cardiovascular Sciences obtained in 2015, University of Verona - An image–based framework for the biomechanical analysis of mitral valve prolapse repair
   - Current position: Post-Doctoral Researcher at IRCCS Policlinico San Donato
   - Recipient of the ESB Travel Award at the 2016 Conference of the European Society of Biomechanics

4. Filippo Piatti - PhD in Bioengineering obtained in 2017, Politecnico di Milano - Flow encoding magnetic resonance imaging: development of advanced computational methods for the assessment of in vivo fluid dynamics
   - Current position: CEO and co-founder at Artiness srl

5. Omar Antonio Pappalardo - PhD in Cardiovascular Sciences obtained in 2018, University of Verona - Novel strategies for the morphological and biomechanical analysis of the cardiac valves based on volumetric clinical images
   - Current position: CTO and co-founder at Artiness srl

6. Giovanni Rossini - PhD in Bioengineering obtained in 2019, Politecnico di Milano - Development of computational methods for the analysis of AV biomechanics: a multiscale approach
   - Current position: COO and co-founder at Artiness srl
   - Recipient of the ESB Travel Award at the 8th World Congress of Biomechanics, 2018

7. Alessandro Caimi - PhD in Bioengineering obtained in 2019, Politecnico di Milano - In-silico 3D modeling strategies for the patient-tailored planning of percutaneous procedures
   - Current position: Project manager, Università degli Studi di Pavia
   - Recipient of the Mimics Innovation Award 2019 - EMEA & Global Winner

8. Matteo Selmi - PhD in Cardiovascular Sciences obtained in 2019, University of Verona - Development and implementation of novel strategies to exploit 3d ultrasound imaging in cardiovascular computational biomechanics
   - Current position: R&D Manager at TT3A srl
   - Recipient of the ESB Travel Award at the 2018 Conference of the European Society of Biomechanics

9. Silvia Pozzi - PhD in Mathematical Models and Methods in Engineering obtained in 2021, Politecnico di Milano - Image-based fluid-structure interaction mathematical models for the simulation of atherosclerosis
   - Current position: Research and clinical activities manager at Artiness srl

10. Alessandra Riva – PhD in Bioengineering, Politecnico di Milano - final defence planned in June 2024 - Advanced computational methods for the in vivo quantification of intracardiac fluid dynamics based on 4D Flow MRI
   - Current position: Research fellow at IRCCS Policlinico San Donato

<u>Current PhD candidates mentored as advisor or co-advisor</u>

1. Riccardo Munafò – PhD track in Bioengineering at Politecnico di Milano started in 2020 - AI-based segmentation of transesophageal 3D ultrasound imaging for the automated detection of intracardiac structures and catheters in percutaneous interventions (advisor)
2. Veronica Ruozzi – PhD track in Bioengineering at Politecnico di Milano started in 2022 - Mixed reality and in vitro platforms to simulate percutaneous procedures (advisor)
3. Alessandro Albanesi - PhD track in Bioengineering at Politecnico di Milano started in 2023 - Mixed Reality applications for neurosurgery (advisor)
4. Davide Astori – PhD track in Bioengineering at Politecnico di Milano started in 2023 - Image-based finite element modelling for the planning of transcatheter valve replacement procedures (advisor)
5. Davide Tondi – PhD track in Bioengineering at Politecnico di Milano started in 2023 - Image-based finite element modelling of the biomechanics of atrioventricular valves (advisor)
6. Ione Ianniruberto – PhD track in Bioengineering at Politecnico di Milano to be started started on May 1st, 2024 - computational modelling of thoracic aorta biomechanics (co-advisor)

**Activity as External Reviewer of PhD Theses**

*2024* Sajjadinia Seyed Shayan, "Hybrid Machine Learning and Numerical Analysis of Cartilage Biomechanics", PhD Computer Science, Faculty of Engineering, **Libera Università di Bolzano**, Bolzano, Italy.

*2023* Zhen LI, "Deformation Prediction and Autonomous Path Planning for Robot-assisted Endovascular Interventions", **Delft University of Technology**, Delft, The Netherlands and Politecnico di Milano, Milano, Italy.

*2019* Lachlan James Kelsey, "Insights into Coronary Artery Disease and Plaque Morphology: A New Framework for Merging Multimodal Imaging with Computational Haemodynamics", **University of Western Australia**, Department of Mechanical Engineering in the School of Engineering, Perth, Australia.

## Honors and Awards

**Awards for Scientific Manuscripts**

1. **March, 2024** – The work "*Comparison of Four-Dimensional Magnetic Resonance Imaging Analysis of Left Ventricular Fluid Dynamics and Energetics in Ischemic and Restrictive Cardiomyopathies*", by Riva et al., was ranked in the top 10% most downloaded manuscripts, among those published in the Journal of Magnetic Resonance Imaging in 2022, in the first year after publication.

2. **August, 2017** – The work "*Mitral Valve Patient-Specific Finite Element Modeling from Cardiac MRI: Application to an Annuloplasty Procedure*", by Stevanella et al., was determined to be the most cited article to that date, from papers published in Cardiovascular Engineering Technologies (CVET) since its inception in March 2010. As such, it was the recipient of the 2017 CVET Most Cited Article Award, jointly awarded by the Biomedical Engineering Society and Springer Nature.

3. **January, 2017** – The work "*Beating heart on a chip: a novel microfluidic platform to generate functional 3D cardiac microtissues*", by Marsano et al., was included in the Lab on a Chip 2016 Most Downloaded Articles as one of the top 25 most downloaded articles published in the journal in 2016.

4. **November, 2016** - Elsevier Highly Cited Research Certificate for the work "*Toward patient-specific simulations of cardiac valves: state-of-the-art and future directions*. Journal of Biomechanics 2013 January; 46(2):217-228", by Votta E et al. The referred work was among the top five most cited manuscripts in years 2014/2015 up to June, 2016.

**Awards at conferences as co-author**

5. **October 2019** - co-author of the work "Prediction of stenting related adverse events through patient-specific finite element modelling", by A. Caimi, F. Sturla, F.R. Pluchinotta, L. Giugno, F. Secchi, E. Votta, M. Carminati, A. Redaelli, presented at the 30$^{th}$ ESB Conference, September, 9$^{th}$-13$^{th}$, 2019, Dublin, Ireland, and awarded with the EMEA & Global Winner of the Mimics® Innovation Award.

6. **July 2018** - co-author of the work "Cartilage on chip: hyper-physiological compression in a microscale platform triggers osteoarthritic traits in a cartilage model", by A. Mainardi, P. Occhetta, E. Votta, M. Ehrbar, I. Martin, A. Barbero, M. Rasponi, presented at the 8$^{th}$ World Congress of Biomechanics, July, 8$^{th}$-12$^{th}$, 2018, Dublin, Ireland, and awarded with the ESB Student Award.

7. **July 2018** - co-author of the work "Subject-specific multiscale modeling of aortic valve biomechanics", by G. Rossini, A. Caimi, A. Redaelli, E. Votta, presented at the 8$^{th}$ World Congress of Biomechanics, July, 8$^{th}$-12$^{th}$, 2018, Dublin, Ireland, and awarded with the ESB Travel Award.

8. **July 2018** - co-author of the work "A novel imaged-based approach for tricuspid valve biomechanical evaluation through finite element modelling", by M. Selmi, O.A. Pappalardo, A. Aversa, E. Careddu, M. Jaworek, R. Vismara, G.B. Luciani, G. Faggian, A. Redaelli, E. Votta, presented at the 8$^{th}$ World Congress of Biomechanics, July, 8$^{th}$-12$^{th}$, 2018, Dublin, Ireland, and awarded with the ESB Travel Award.

9. **January 2018** - co-author of the work "4D-Flow Cardiovascular Magnetic Resonance Imaging: Quantitative Insight into Aortic Fluid Dynamics After Valve Sparing Root Replacement" by M. Palumbo, F. Sturla, F. Piatti, N. Galea, J. W. Weinsaft, C. Lau, E. Votta, I. Chirichilli, R. De Paulis, L. N. Girardi, A. Redaelli, M. Gaudino, which was ranked among the top 5% of submitted abstracts at the AATS Aortic Symposium, April 26$^{th}$-27$^{th}$, 2018, New York, US.

10. **June 2016** - co-author of the work "Numerical analysis of the influence of aortic calcific deposits on transcatheter aortic valve implantation" by Sturla F, Ronzoni M, Vitali M, Dimasi A, Vismara R, Preston-Maher G, Burriesci G, Votta E, Redaelli A, presented at the 22$^{nd}$ International Congress of the European Society of Biomechanics, July, 10$^{th}$-13$^{th}$, 2016, Lyon, France, and awarded with the ESB Travel Award.

11. **September 2015** - co-author of the work "Phase Contrast MRI: Development of a User-Friendly Platform for Fast Automated Segmentation and Fluid-Dynamic Post-Processing" by Pirola S, Piatti F, Sturla F, Votta E, Nesteruk I,

Lombardi M, Della Corte A, Bissell M, Redaelli A, Caiani EG, presented at the Computing in Cardiology (CINC) 42nd Annual Conference, September 6th-9th, 2015, Nice, France, and semi-finalist for the Rosanna Degani Young Investigators' Award.

12. **July 2015** - co-author of the work "Mitral valve repair techniques: mass-spring approach for surgical planning" by Pappalardo O, Onorati F, Sturla F, Votta E, Puppini G, Redaelli A, Faggian G, presented at the 21th International Congress of the European Society of Biomechanics, July, 5th-8th, 2015, Prague, Czech Republic, and awarded with the Honorable Mention for the Best Poster Award.

13. **October 2012** – co-author of the work "Healthy and BAV-affected aortic root dynamics: Fluid-Structure Interaction simulations from MRI-based 3D models" by Stevanella M, Sturla F, Conti CA, Votta E, Della Corte A, Redaelli A, presented at the 2012 International CAE Conference, Lazise (VR), Italy, October 22nd-23rd 2012, and awarded with the International CAE Poster Award in the Academy category.

14. **February 2012** – co-author of the work "A lumped-parameter model for the study of cerebrospinal venous flow" by Marcotti S, Marchetti L, Laganà MM, Fiore GB, Barberio A, Viotti S, **Votta E**, Redaelli A, Cecconi P, presented Marcotti S at The 2nd Annual ISNVD Scientific Meeting, Orlando, Florida, US, February, 18th-22nd 2012, and awarded with the first prize in The Young Investigators Abstract Awards.

15. **June 2010** – co-author of the work "Mitral Valve Finite Element Modeling from Cardiac Magnetic Resonance Imaging: Patient-Specific Quantitative Analysis", by Stevanella M, Maffessanti F, **Votta E**, Caiani EG, Redaelli A., presented at the 2010 European Society of Biomechanics (ESB) Conference, Edinburgh (UK) July, 5th-8th 2010, and awarded with the "SIMULIA® Travel Award for Bioengineering Researchers and Students".

16. **July 2001** – co-author of the poster "3-D computational models for the simulation of the suture stress after mitral valve edge-to-edge repair", by M. Soncini, A. Redaelli, E. Votta, A. Sormani, which received the Best Poster Award in the Cardiovascular Mechanics Session at the ASME 2001 Summer Bioengineering Conference, June, 27th – July, 1st, Snowbird, Utah, US.

**Awards to Artiness srl**

17. **Selected** to pitch during the MedTech Innovator Road Tour 2024 in Dublin, April 15th 2024, during the International Pitch Event
18. **Mention** in the European HealthTech Market Map 2023 by AlbionVC
19. Global Startup Award 2023 – **Finalists**
20. South Europe Startup Awards (SESA) 2022 - **Winner** of Startup of the Year, Italy" award
21. Endeavor Eleveator 2020 - **Finalists** of the acceleration program
22. NTT DATA Open Innovation Contest 2020 - **Winner** of the European edition with access to the global event (29.01.2021)
23. B Heroes 2020/2021 - **Finalists** of the acceleration program
24. Berkeley SkyDeck Accelerator Program 2020 -**Finalists** of the acceleration program, edition GIP - Fall 2020
25. Unicredit Start Lab 2020 - **Finalists** of the acceleration program
26. Vodafone Italia ActionFor5G 2019 - **Winner** of the second edition (1M€ funding)

**Personal Awards**

27. **September 2008** - Rosanna Degani Young Investigator's Award for the best oral and written presentation in the "Young Investigators Competition" within Computers in Cardiology 2008, Bologna (Italy), September 15th-18th 2008. The award was received for the work "From Real Time 3-D Echocardiography to Mitral Valve Finite Element Analysis: A Novel Modeling Approach", by **E. Votta**, A. Arnoldi, M. Stevanella, F. Veronesi, G. Tamborini, F. Alamanni, E.G. Caiani, A. Redaelli.

28. **September 2001** - "Rosanna Degani" Award for the best Master Thesis in biomedical engineering and medical informatics applied to cardiovascular applications, academic year 1999/2000.

**Invited podium presentations at international conferences and workshops**

1. **2023** – "Robotics and AI to revolutionise interventional cardiology", SOMIRO School on Miniaturized and soft robots, October 9th-12th, 2023, Marina di Castagneto Carducci (Italy).
2. **2021** – "The ARTERY project: reinventing transcatheter cardiac procedures by shared autonomy robotics", Hamlyn Symposium on Medical Robotics 2021, Workshop on Autonomous Intraluminal Robotics, July 13th, 2021, on-line event.
3. **2021** – "The ARTERY project: autonomous robotics for structural interventional cardiology", 1st DIH-HERO Knowledge Conference, May 19th-20th, 2021, on-line event.
4. **2020** - "Computational biomechanics for cardiovascular surgery and interventional cardiology", 30th Annual Meeting of the SSRCTS – Scandinavian Society for Research in CardioThoracic Surgery, February 6th-8th, 2020, Geilo, Norway. Invited **Keynote** Talk.
5. **2019** – "This is how we quantify and visualize WSS in Milan", 4th 4DFlow MRI Workshop, June 17th-18th, 2019, York, UK.
6. **2019** – "Innovating the planning of CHD treatment", IPC, XII International Workshop on Interventional Pediatric and Adult Congenital Cardiology, March 28th – 30th, 2019, San Donato Milanese (MI), Italy.
7. **2018** – "Searching for early biomechanically-driven indexes of aortic remodeling: where are we at?", 6th International Meeting on Aortic Diseases, September 12th-14th, 2016, Liège, Belgium
8. **2018** – "Clinically driven numerical models in cardiovascular surgery", INdAM Workshop "Mathematical and Numerical Modeling of the Cardiovascular System", April 16th-19th, 2018, Roma, Italy
9. **2017** – "Quantitative in vivo fluid dynamics: the 4D flow opportunity", IPC, XI International Workshop on Interventional Pediatric and Adult Congenital Cardiology, March 28th – 30th, 2019, San Donato Milanese (MI), Italy.
10. **2016** – "Structural finite element modelling of the bicuspid root to understand disease progression", 5th International Meeting on Aortic Diseases, September 15th-17th, 2016, Liège, Belgium
11. **2016** – "Towards the comprehensive analysis of the in vivo biomechanics of the BAV-affected aortic root", 8th Bio-fluid Symposium, February 12th-14th 2016, Pasadena, CA, US
12. **2015** – "Planning of surgical interventions using patient-specific finite element modelling", 1st International Congress Innovations in Cardiology, October 15th–17th, 2015, Fermo, Italy
13. **2014** – "Numerical modeling of in vivo mitral valve biomechanics to optimize surgical repair: preliminary application to the simulation of eptfe neochordae implantation in prolapsing valves", World Congress of Biomechanics, July 6th-11th 2014, Boston, MA, US

**Invited podium presentations at Italian conferences and workshops**

1. **2024** – "Il mondo dei modelli e le simulazioni delle strutture cardiache", XXI Congresso Nazionale SIECVI "FUTURE READY SINCE DAY ONE", April 4th-6th, Milano, IT.
2. **2023** – "Patient-specific numerical models: how far are we from a real and widespread exploitation in clinics?", 2nd Workshop "Biomeccanica dei trattamenti endovascolari", May 9th, 2023, Pavia, IT. Invited **Keynote** Talk.

I agree with the use of my personal data in compliance with the Italian law 196/2003.

I am aware of the legal consequences of declaring false information according to the Italian laws and I declare that all the information herein reported is true.

Milano, April 30th, 2024 Emiliano Votta

## Complete List of Publications

### PhD Thesis

T1. **Votta, E.** "Evaluation of innovative devices for the surgical correction of the mitral valve: finite element analysis and in vitro models", PhD Thesis, March 2006.

### Full Papers Under Review in International Peer Reviewed

IFPUR1. Riva A, Saitta S, Sturla F, Disabato G, Tondi L, Camporeale A, Giese D, Castelvecchio S, Menicanti L, Redaelli A, Lombardi M, **Votta E**. Left ventricle diastolic vortex ring characterization in ischemic cardiomyopathy: insight into atrio-ventricular interplay. Under Review in Medical & Biological Engineering & Computing.

### Accepted and Published Full Papers on International Peer Reviewed

IFP1. Gorla R, Oliva OA, Arzuffi L, Milani V, Saitta S, **Votta E**, Squillace M, Poletti E, Tusa M, Brambilla N, Testa L, Bedogni F, Sturla F. Angulation and Curvature of Aortic Landing Zone Affect Implantation Depth in Transcatheter Aortic Valve Implantation. **Accepted** in Scientific Reports.

IFP2. Zhang X, Sridhar A, Ha XT, Mehdi SZ, Fortuna A, Magro M, Peloso A, Bicchi A, Ourak M, Aliverti A, **Votta E**, Vander Poorten E, De Momi E. Path Tracking Control of a Steerable Catheter in Transcatheter Cardiology Interventions. International Journal of Computer Assisted Radiology and Surgery 2024;19(4):757-766. https://doi.org/10.1007/s11548-024-03069-3

IFP3. Munafò R, Saitta S, Ingallina G, Denti P, Maisano F, Agricola E, Redaelli A, **Votta E**. A Deep Learning-Based and Fully Automated Pipeline for Regurgitant Mitral Valve Anatomy Analysis from 3D Echocardiography. IEEE Access. 2024;12:5295-5308. https://doi.org/10.1109/ACCESS.2024.3349698.

IFP4. Saitta S, Sturla F, Gorla R, Oliva OA, **Votta E**, Bedogni F, Redaelli A. A CT-based deep learning system for automatic assessment of aortic root morphology for TAVI planning. Computers in Biology and Medicine. 2023; 163:107147. https://doi.org/10.1016/j.compbiomed.2023.107147.

IFP5. Giugno L, Formato GM, Chessa M, **Votta E**, Carminati M, Sturla F. Case report: Personalized transcatheter approach to mid-aortic syndrome by in vitro simulation on a 3-dimensional printed model. Frontiers in Cardiovascular Medicine. 2023;9:1076359. https://doi.org/10.3389/fcvm.2022.1076359. eCollection 2022.

IFP6. Saitta S, Maga L, Armour C, **Votta E**, O'Regan DP, Salmasi MY, Athanasiou T, Weinsaft JW, Xu XY, Pirola S, Redaelli A. Data-driven generation of 4D velocity profiles in the aneurysmal ascending aorta. Computer Methods and Programs in Biomedicine 2023:233:107468. https://doi.org/10.1016/j.cmpb.2023.107468

IFP7. Riva A, Eriksson J, Viola F, Sturla F, **Votta E**, Ebbers T, Carlhäll CJG, Dyverfeldt P. Impact of dobutamine stress on diastolic energetic efficiency of healthy left ventricle: an in vivo kinetic energy analysis. Frontiers in Cardiovascular Medicine 2023:10:1103751. https://doi.org/10.3389/fcvm.2023.1103751

IFP8. Chessa M, Van De Bruaene A, Farooqi K, Valverde I, Jung C, **Votta E**, Sturla F, Diller GP, Brida M, Sun Z, Little SH, Gatzoulis MA. Three-dimensional printing, holograms, computational modelling, and artificial intelligence for adult congenital heart disease care: an exciting future. Eur Heart Journal. 2022;43(28):2672-2684. https://doi.org/10.1093/eurheartj/ehac266.

IFP9. Frigelli M, Sturla F, Milani V, Citarella M, Menicanti L, **Votta E**, Castelvecchio S. Prognostic value of left atrial strain quantification from 2D ultrasound imaging in post-ischemic heart failure patients: evidence from the REMODEL-HF study. International Journal of Cardiology. 2022:362; 183-189. https://doi.org/10.1016/j.ijcard.2022.04.071.

IFP10. Sturla F, Caimi A, Romarowski RM, Nano G, Glauber M, Redaelli A, **Votta E**, Marrocco-Trischitta MM. Fast approximate quantification of endovascular stent graft displacement forces in the bovine aortic arch variant. Journal of Endovascular Therapy. 2023;30(5):756-768. https://doi.org/10.1177/15266028221095403.

IFP11. Castelvecchio S, Frigelli M, Sturla F, Milani V, Pappalardo OA, Citarella M, Toso A, Menicanti L, **Votta E**. Elucidating the mechanisms underlying left ventricular function recovery in ischemic heart failure patients undergoing surgical remodelling: a 3D ultrasound analysis. Journal of Thoracic and Cardiovascular Surgery. 2023;165(4):P1418-1429.E4. https://doi.org/10.1016/j.jtcvs.2021.02.067

IFP12. Cappelletti S, Caimi A, Caldiroli A, Baroni I, **Votta E**, Riboldi SA, Marrocco-Trischitta MM, Redaelli A, Sturla F. Non-invasive estimation of vascular compliance and distensibility in the arm vessels: a novel ultrasound-based protocol. Quantitative Imaging in Medicine and Surgery. 2022;12(7):3515-3. https://dx.doi.org/10.21037/qims-21-987.

IFP13. Riva A, Sturla F, Pica S, Camporeale A, Tondi L, Saitta S, Caimi A, Giese D, Palladini G, Milani P, Castelvecchio S, Menicanti L, Redaelli A, Lombardi M, **Votta E**. Comparison of Four-Dimensional Magnetic Resonance Imaging Analysis of Left Ventricular Fluid Dynamics and Energetics in Ischemic and Restrictive Cardiomyopathies. Journal of Magnetic Resonance Imaging, 2022;56(4):1157-1170. https://doi.org/10.1002/jmri.28076

IFP14. Saitta S, Sturla F, Caimi A, Riva A, Palumbo MC, Nano G, **Votta E**, Della Corte A, Glauber M, Chiappino D, Marrocco-Trischitta MM, Redaelli A. A deep learning-based and fully automated pipeline for thoracic aorta geometric analysis and planning for endovascular repair from computed tomography. Journal of Digital Imaging 2022;35(2):226-239. https://doi.org/10.1007/s10278-021-00535-1

IFP15. Riva A, Sturla F, Caimi A, Pica S, Giese D, Milani P, Palladini G, Lombardi M, Redaelli A, **Votta E**. 4D Flow evaluation of blood non-Newtonian behavior in left ventricle flow analysis. Journal of Biomechanics 2021 Feb 8;119:110308. https://doi.org/10.1016/j.jbiomech.2021.110308

IFP16. Rossini G, Caimi A, Redaelli A, **Votta E**. Subject-specific multiscale modeling of aortic valve biomechanics. Biomech Model Mechanobiol. 2021 Jun;20(3):1031-1046. https://doi.org/10.1007/s10237-021-01429-5.

IFP17. Pozzi S, Domanin M, Forzenigo L, **Votta E**, Zunino P, Redaelli A, Vergara C. A surrogate model for plaque modeling in carotids based on Robin conditions calibrated by cine MRI data. Int J Numer Method Biomed Eng. 2021 May;37(5):e3447. https://doi.org/10.1002/cnm.3447

IFP18. Pozzi S, Redaelli A, Vergara C, **Votta E**, Zunino P. Mathematical and numerical modeling of atherosclerotic plaque progression based on fluid-structure interaction. J. Math. Fluid Mech. 2021 23: article 74. https://doi.org/10.1007/s00021-021-00598-8

IFP19. Redaelli A and **Votta E**. Cardiovascular patient-specific modeling: Where are we now and what does the future look like? APL Bioeng. 2020 4:040401. https://doi.org/10.1063/5.0031452

IFP20. Jaworek M, Mangini A, Maroncelli E, Lucherini F, Rosa R, Salurso E, **Votta E**, Antona C, Fiore GB, Vismara R. Ex-vivo beating heart model of functional mitral regurgitation using deer hearts. J Cardiovasc Transl Res. 2020 Sep 21. https://doi.org/10.1007/s12265-020-10071-y. Online ahead of print.

IFP21. Pappalardo OA, **Votta E**, Selmi M, Luciani G, Redaelli A, Delgado V, Bax JJ, Ajmone Marsan N. 4D MDCT in the assessment of the tricuspid valve and its spatial relationship with the right coronary artery: a customized tool based on computed tomography for the planning of percutaneous procedures. J Cardiovasc Comput Tomogr. 2020 Apr 11:S1934-5925(20)30133-7. DOI: https://doi.org/10.1016/j.jcct.2020.04.003

IFP22. Caimi A, Pasquali M, Sturla F, Pluchinotta FR, Giugno L, Carminati M, Redaelli A, **Votta E**. Prediction of post-stenting biomechanics in coarcted aortas: a pilot finite element study. Journal of Biomechanics. 2020 May 22. Volume 105, 109796. DOI: https://doi.org/10.1016/j.jbiomech.2020.109796

IFP23. Sturla F, Pluchinotta FR, Caimi A, Giugno L, Chessa M, Giamberti A, **Votta E**, Redaelli A, Carminati M. 3-Dimensional Personalized Planning for Transcatheter Pulmonary Valve Implantation in a Dysfunctional Right Ventricular Outflow Tract. Int J Cardiol. 2019 Dec 6. pii: S0167-5273(19)34925-3. **DOI:** https://doi.org/10.1016/j.ijcard.2019.12.006.

IFP24. Pappone C, Mecarocci V, Manguso F, Ciconte G, Vicedomini G, Sturla F, **Votta E**, Mazza B, Pozzi P, Borrelli V, Anastasia L, Micaglio E, Locati E, Monasky M, Lombardi M, Calovic Z, Santinelli V. New Electro-Mechanical Substrate Abnormalities in High-Risk Patients with Brugada Syndrome. Heart Rhythm. 2020 Apr;17(4):637-645. **DOI:** https://doi.org/10.1016/j.hrthm.2019.11.019.

IFP25. Jaworek M, Pappalardo OA, Selmi M, Gelpi G, Romagnoni C, Lucherini F, Ajmone-Marsan N, Redaelli A, Fiore GB, **Votta E**, Antona C, Vismara R. Treatment of tricuspid regurgitation at subvalvular level: hemodynamic and morphological assessment in ex-vivo beating heart model. 2019. Accepted in Structural Heart. **DOI:** https://doi.org/10.1080/24748706.2019.1686555

IFP26. Tasca G, Selmi M, Riva B, Lobiati E, Gamba A, Redaelli A, **Votta E**. Aortic Root Dynamics in Sleeve Aortic Sparing Procedure: Echocardiographic and Computational Studies. Semin Thorac Cardiovasc Surg. 2019 Jul 26. pii: S1043-0679(19)30204-7. **DOI:** https://doi.org/10.1053/j.semtcvs.2019.07.010

IFP27. Saitta S, Pirola S, Piatti F, **Votta E**, Lucherini F, Pluchinotta F, Carminati M, Lombardi M, Geppert C, Cuomo F, Figueroa CA, Xu XY, Redaelli A. Evaluation of 4D flow MRI-based non-invasive pressure assessment in aortic coarctations. J Biomech. 2019 Sep 20;94:13-21. **DOI:** https://doi.org/10.1016/j.jbiomech.2019.07.004

IFP28. Della Corte A, Michelena HI, Citarella A, **Votta E**, Piatti F, Lo Presti F, Ashurov R, Cipollaro M, Forte A. Risk Stratification in Bicuspid Aortic Valve Aortopathy: Emerging Evidence and Future Perspectives. Curr Probl Cardiol. 2019 Jun 21. pii: S0146-2806(19)30101-X. **DOI:** https://doi.org/10.1016/j.cpcardiol.2019.06.002

IFP29. Occhetta P, Mainardi A, **Votta E**, Vallmajo-Martin Q, Ehrbar M, Martin I, Barbero A, Rasponi M. Hyperphysiological compression of articular cartilage induces an osteoarthritic phenotype in a cartilage-on-a-chip model. Nat Biomed Eng. 2019 Jul;3(7):545-557. **DOI:** https://doi.org/10.1038/s41551-019-0406-3

IFP30. Meskin M, Dimasi A, **Votta E**, Jaworek M, Fusini L, Muratori M, Montorsi P, Zappa E, Epifani I, Pepi M, Redaelli A. A novel multiparametric score for the detection and grading of prosthetic mitral valve obstruction in cases with different disc motion abnormalities. Ultrasound Med Biol. 2019 Jul;45(7):1708-1720. **DOI:** https://doi.org/10.1016/j.ultrasmedbio.2019.03.011

IFP31. Selmi M, Chiu WC, Chivukula VK, Melisurgo G, Beckman JA, Mahr C, Aliseda A, **Votta E**, Redaelli A, Slepian MJ, Bluestein D, Pappalardo F, Consolo F. Blood Damage in Left Ventricular Assist Devices (LVADs): Pump Thrombosis or LVAD System Thrombosis? Int J Artif Organs 2019 Mar;42(3):113-124. **DOI:** https://doi.org/10.1177/0391398818806162 [Epub ahead of print]

IFP32. Dimasi A, Piloni D, Spreafico L, **Votta E**, Vismara R, Fiore GB, Meskin M, Fusini L, Muratori M, Montorsi P, Pepi M, Redaelli A. Fluid-structure interaction and in vitro analysis of a real bileaflet mitral prosthetic valve to gain insight into Doppler-silent thrombosis. J Biomech Eng 2019 Oct 141(10): 101002 (9 pages). In press. **DOI:** https://doi.org/10.1115/1.4043664

IFP33. Gaudino M, Piatti F, Lau C, Sturla F, Weinsaft JW, Weltert L, **Votta E**, Galea N, Chirichilli I, Di Franco A, Francone M, Catalano C, Redaelli A, Girardi LN, De Paulis R. Aortic flow after valve sparing root replacement with or without

neosinuses reconstruction. J Thorac Cardiovasc Surg. 2019;157(2):455-465. **DOI:** https://doi.org/10.1016/j.jtcvs.2018.06.094

IFP34. Caimi A, Sturla F, Pluchinotta FR, Giugno L, Secchi F, **Votta E**, Carminati M, Redaelli A. Prediction of stenting related adverse events through patient-specific finite element modelling. Journal of Biomechanics Oct 2018. 79:135-146. **DOI:** https://doi.org/10.1016/j.jbiomech.2018.08.006

IFP35. Gaidulis G, **Votta E**, Selmi M, Aidietienė S, Aidietis A, Kačianauskas R. Numerical simulation of transapical off-pump mitral valve repair with neochordae implantation. Technol Health Care. 2018;26(S2):635-645. **DOI:** https://doi.org/10.3233/THC-182510

IFP36. Piatti F, Palumbo MC, Consolo F, Pluchinotta F, Greiser A, Sturla F, **Votta E**, Siryk S, Vismara R, Fiore GB, Lombardi M, Redaelli A. Experimental quantification of the fluid dynamics in blood-processing devices through 4D-flow imaging: a pilot study on a real oxygenator/heat-exchanger module. Journal of Biomechanics Feb 2018. 68:14-23. **DOI:** https://doi.org/10.1016/j.jbiomech.2017.12.014

IFP37. Galea N, Piatti F, Sturla F, Weinsaft JW, Lau C, Chirichilli I, Carbone I, **Votta E**, Catalano C, De Paulis R, Girardi LN, Redaelli A, Gaudino M. Novel Insights by 4D Flow Imaging on Aortic Flow Physiology after Valve Sparing Root Replacement with or without Neo-Sinuses. Interactive CardioVascular and Thoracic Surgery. 2018. ivx431. **DOI:** https://doi.org/10.1093/icvts/ivx431

IFP38. Pappalardo OA, Sturla F, Onorati F, Puppini G, Selmi M, Luciani G,Faggian G, Redaelli A, **Votta E**. Mass-spring models for the simulation of mitral valve function: looking for a trade-off between reliability and time-efficiency. Medical Engineering & Physics 2017 Sep;47:93-104. **DOI:** https://doi.org/10.1016/j.medengphy.2017.07.001

IFP39. Piatti F, Sturla F, Bissell M, Pirola S, Lombardi M, Nesteruk I, Della Corte A, Redaelli A, **Votta E**. 4D Flow analysis of BAV-related fluid-dynamic alterations and aortopathies: evidence of wall shear stress alterations in absence of clinically-relevant aortic remodeling. Frontiers in Physiology. 2017. 8:article 441. **DOI:** https://doi.org/10.3389/fphys.2017.00441

IFP40. Santini A, **Votta E**, Protti A, Mezidi M, Guérin C. Driving airway pressure: should we use a static measure to describe a dynamic phenomenon? Intensive Care Med. 2017 Oct;43(10):1544-1545. https://doi.org/10.1007/s00134-017-4850-9

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**Contributions to International Conferences: Conference Papers and Abstracts**

IC1. N D'Alessandro, S Tognarelli, I Tamadon, **E Votta**, A Menciassi. A Multi-DOF Tendon-Actuated Steerable Sheath for Precise Positioning in Percutaneous Left Atrial Appendage Closure. Accepted as podium presentation at the 16th Hamlyn Symposium on Medical Robotics, June 25-28, 2024, London, UK.

IC2. A Peloso, R Munafò, V Ruozzi, A Bicchi, X Zhang, E De Momi, **E Votta**. Towards autonomous robotic procedure for ultrasound-guided percutaneous cardiac interventions for mitral valve repair. European Robotics Forum 2024, March 13 - 15, 2024, Rimini, Italy.

IC3. A Riva, S Saitta, F Sturla, A Camporeale, L Tondi, S Pica, D Giese, S Castelvecchio, L Menicanti, M Lombardi, A Redaelli, **E Votta**. Diastolic vortex ring derangements in ischemic cardiomyopathy left ventricles: a 4D Flow MRI study. European Heart Journal - Cardiovascular Imaging, Volume 24, Issue Supplement_1, June 2023, jead119.079. EACVI 2023, May 10-12, 2023, Barcelona, Spain. https://doi.org/10.1093/ehjci/jead119.079

IC4. G Pasqualin, A Riva, F Sturla, F Bevilacqua, D Giese, M Chessa, A Redaelli, **E Votta**, M Lombardi. 4D Flow analysis of intracavitary blood flow dynamics and energetics in the systemic right ventricle. European Heart Journal - Cardiovascular Imaging (2023) 24 (Suppl 1). EACVI 2023, May 10-12, 2023, Barcelona, Spain. https://doi.org/10.1093/ehjci/jead119.233

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**Autorizzazione al trattamento dati**

I agree with the use of my personal data in compliance with the Italian law 196/2003.

I am aware of the legal consequences of declaring false information according to the Italian laws and I declare that all the information herein reported is true.

Milano, April 30th, 2024

Emiliano Votta