

UNIVERSITÀ DEGLI STUDI DI MILANO

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[Nome e cognome] CURRICULUM VITAE

INFORMAZIONI PERSONALI (NON INSERIRE INDIRIZZO PRIVATO E TELEFONO FISSO O CELLULARE)

COGNOME	ZOPPELLO
NOME	MARTA
DATA DI NASCITA	[06, 08, 1988]

INSERIRE IL PROPRIO CURRICULUM
(non eccedente le 30 pagine)

Education

- **Abilitazione Scientifica Nazionale di II Fascia**, Settore Concorsuale 01/A4 Fisica Matematica valid from 9/11/2020 to 9/11/2029.
- **Phd in mathematics** degree from the University of Padua with a thesis entitled: "Controllability and optimization of deformable bodies in fluids: from biology to robotics". Supervisor: prof. Franco Cardin. Title obtained the 9 March 2016.
- **Master of science in mathematics** at the University of Padua with score 110/110 cum laude with thesis: "Self-propulsion by shape changes, and controllability of biological and artificial systems: some case studies." Supervisors: prof. Antonio De Simone (SISSA) prof. Frano Cardin (University of Padua). Title obtained on 5 June 2012.
- **Bachelor's degree in mathematics** at the University of Padua with a thesis on "Ideal and viscous Fluid Dynamics Problems relative to the motion of amphibians: fish and swimmers. " Score: 106/110. Supervisor: prof. Franco Cardin. Title obtained 22 July 2010.

Scientific interests

Modellization and control of deformable bodies in fluids, swimmers and micro-swimmers. Geometrical control theory and optimal control. Systems with hysteresis and their controllability. Trajectory generation and motion planning for mechanical control systems with symmetry. Toy models for mitral valve obtained in the framework of interacting elastic slender bodies.

Research positions

- 16 July 2020 to present, **Ricercatrice di tipo A** in Fisica Matematica at Politecnico di Torino.
- 16 July 2019-15 July 2020 **post doctoral research fellowship** at Politecnico di Torino with theme: “Modelli matematici per la dinamica di sistemi attivi in fluidi: descrizione matematica, controllo e analisi” under the supervision of prof. Davide Ambrosi.
- April 2019-15 July 2019 **post doctoral research fellowship** at the University of Verona within the project “Teoria geometrica del controllo e teoria della ricostruzione su fibrati principali per sistemi meccanici di controllo”
- January 2017-December 2018: **Junior post doctoral Research Fellowship in mathematics** at the University of Padua. Title: "Controllability and Optimization Techniques for Mechanical Systems: from Biology to Robotics". Supervisors: Franco Cardin and Franco Rampazzo.
- January to December 2016: **post doctoral research fellowship** at the University of Trento within the project "OptHySYS: Optimization techniques for hybrid dynamical systems: from theory to applications". Supervisor: Fabio Bagagiolo.
- August-September 2012: **postgraduate scholarship** at Sissa in Trieste within applied mathematics. Supervisor Antonio DeSimone.

Conferences, summer school and research collaborations

- Invited Talks
- 09 July 2020 invited by the University of Glasgow to give the online seminar “Rods in contact under pressure”

- 06-08 June 2019 Invited speaker at the workshop “Math from the Body” Venice, with seminar: “A model for magnetic microrobots for drug delivery”
- 04-08 February 2019 Invited speaker in the special session “Estructuras geométricas aplicadas a mecánica clásica, teoría de control e ingeniería” at the *Congreso Bienal de la Real Sociedad Matematica Espanola* with seminar: “Microswimmer robots and their control”.
- 25-29 September 2017 Invited speaker at the conference “Control of state constrained dynamical systems” Padova with seminar: “Controllability properties of dynamical systems with hysteresis”.
- January 2017 Seminar “Controllability properties of dynamical systems with hysteresis” at the workshop “Hybrid dynamical systems: optimization stability and applications”
- 14-17 September 2015 Seminar at XXII Congresso - Associazione Italiana di Meccanica Teorica e Applicata (AIMETA) entitled: “Planar swimming in ideal fluids”

- Contributed talks

- 11-13 December 2019 presentation of the proceeding “Optimal motion of a scallop, some case studies” at the 58th conference on Decision and Control (CDC) Nice-France 2019.
- 17-20 September 2019 seminar “Optimal motion of a scallop, some case studies” at French German Swiss conference on Optimization Nice 2019.
- 3-10 June 2018 seminar “Motion Planning via Reconstruction Theory” at conference Symmetry and Perturbation Theory (SPT) 2018 Pula
- 2-6 July 2018 seminar “Motion Planning via Reconstruction Theory” at 12th International ICMAT Summer School on Geometry, Mechanics and Control
- 22-24 January 2018 seminar “Controllability of the hydro-Chaplygin sleigh” at 12th young researcher workshop on Geometry Mechanics and Control
- 17-21 September 2017 Seminar “Design and steering of a magneto-elastic micro-swimmer inspired by the motility of sperm cells “ within the workshop “Mathematical Modeling and Self-Organization in Medicine, Biology and Ecology: from Micro to Macro” Giardini di Naxos .
- 9-13 July 2017 participation to 20th World Congress of the International Federation of Automatic Control with presentation of the proceeding: “*Purcell magneto-elastic swimmer controlled by an external magnetic field*”

- May 2017 seminar "Swimming by switching" at Assemblea Nazionale of National Group of Mathematical Physics
- 28-30 september 2015 seminar at l'International Workshop Multiscale Models in Mechano and Tumor Biology: Modeling, Homogenization, and Applications entitled: "Modelization, controllability and optimal strokes for N-link Microswimmer".
- December 2014 seminar "Planar swimming in ideal fluids" in Trento and Bressanone within the workshop "Current Problems in fluid-dynamics and non-equilibrium thermodynamics".
- October 2014 seminar "Controllability and Optimal strokes for N-link Microswimmer" within the trimester in sub-Riemannian Geometry in Paris
- December 2013 seminar "Locomotion in fluids" at SISSA Trieste.

- Summer schools

- 02-06 July 2018 participation at 12th ICMAT International summer School on Geometry, Mechanics and Control in Santiago de Compostela
- 04-16 September 2017 Participation to the XLII "Summer School of Mathematical Physics" in Ravello
- 26-30 June 2017 participation at 11th ICMAT International summer School on Geometry, Mechanics and Control in Madrid
- 4-8 July 2016 participation at 22° CISM-IUTAM International Summer School on "Biological and Bio-inspired Fluid Mechanics"
- September 2012 participation at "Summer School of Mathematical Physics" in Ravello.
- September 2011 participation at "Summer School of Mathematical Physics" in Ravello.

- Posters

- Poster entitled "Scalloping with friends" at the workshop "Micro-Swimmers and Soft Robotics" Israel 3-5 February 2020.

- Organization of workshops

- 11 December 2020 organization of the online workshop: "Understanding locomotion: Nature-inspired mathematical models".
- 22-24 January 2018 member of the organizing committee of the 12th young researcher workshop on Geometry Mechanics and Control

- 4 November 2016 organization of the workshop “Controllability and Hysteresis” in Trento
- Research collaborations abroad
 - July 2013 visiting guest of F. Alouges at l'École Polytechnique in Paris
 - February 2017 visiting guest of J.B. Pomet and L. Giraldi at l'INRIA Sophia Antipolis in Nice
 - August 2018 visiting guest for one week of Cesare Tronci at l'University of Surrey in Guildford.

Projects:

- From March 2016 to March 2017 coordinator of the Indam Group GNAMPA project: “Controllability of ordinary differential systems with hysteresis and application to control of micro-swimmers.”
- From November 2016 to 2018 member of the CNRS project: “Control and Optimality of Magnetic Micro-robot (C.O.M.M.)”
- From June 2017 to June 2018 coordinator of the Indam group GNFM project: “Controllo Geometrico e Pianificazione di Traiettorie di Sistemi Dinamici con Simmetria su Fibrati Principali”
- From July 2019 to December 2020 member of the Indam group GNFM project: “Controllability and trajectory generation and nonholonomic mechanics “

Teaching experience:

- October 2020-January 2021 2020 teaching assistant for the course Probability and statistics of Prof Silvio Mercadante Politecnico di Torino
- October 2019-January 2020 teaching assistant for the course Istituzioni di Matematiche of prof. Patrizia Semeraro Politecnico di Torino
- March- June 2019 holder of the course of Dynamical Systems for the bachelor degree in mathematics at Università di Verona.
- From March to June 2019 teaching assistant for the course of *Fisica Matematica* of Prof. Franco Cardin University of Padova.
- October 2018-January 2019 holder of the course of Calculus I for the bachelor degree in computer science at University of Verona
- From March to June 2018 teaching assistant for the course of *Fisica Matematica* of Prof. Franco Cardin University of Padova.
- From March to June 2018 teaching assistant for the course of *Istituzioni di Fisica Matematica* of Prof. Francesco Fassò University of Padova.

- November 2017 holder of the PhD course "Geometric control theory and self-propulsion in fluids" at University of Padova
- From March to June 2017 teaching assistant for the course of *Fisica Matematica* of Prof. Franco Cardin University of Padova.
- From March to June 2015 teaching assistant for the course of *Fisica Matematica* of Prof. Franco Cardin University of Padova.
- From March to June 2014 teaching assistant for the course of *Fisica Matematica* of Prof. Franco Cardin University of Padova.

Foreign Languages

Good knowledge of English language both written and oral certificated:

- 2009 certificate of attendance of an English course of Advanced level at EC Cambridge school in Cambridge.
- May 2007 First Certificate in English (Council of Europe Level B2) released by Cambridge ESOL Examinations, Grade B;
- June 2005 Preliminary English Test (Council of Europe Level B1) released by Cambridge ESOL Examinations, Pass with Merit;

Basic knowledge of French.

Computer skills:

Knowledge of C e C++ programming languages and basic knowledge of objects programming C++. Use of : Mathematica, Matlab, Latex.

Papers:

- Journal papers
 - F. Alouges, A. DeSimone, L. Giraldi, and M. Zoppello.
Self-propulsion of slender micro-swimmers by curvature control: N-link swimmers.
International Journal of Non-Linear Mechanics, 56: 132-141
November (2013).
 - L. Giraldi, P. Martinon, M. Zoppello
Optimal Design of the Three-link Purcell Swimmer.
Physical Review E 91, 023012 (2015)
 - F. Alouges, A. DeSimone, L. Giraldi, M. Zoppello.
Can magnetic multilayers propel artificial micro-swimmers mimicking sperm cells?
Soft Robotics 2(3): 117-128 (2015)
 - F. Bagagiolo, R. Maggistro, M. Zoppello
Swimming by switching
Meccanica (2017) doi:10.1007/s11012-017-0620-6

- D. Bauso, F. Bagagiolo, R. Maggiro, M. Zoppello
Game theoretic decentralized feedback controls in Markov jump Processes
J Optim Theory Appl 173: 704 (2017).
- M. Menci, G. Oliva, M. Papi, R. Setola, M. Zoppello
Distributed Utility Estimation With Heterogeneous Relative Information
IEEE Control Systems Letters 2(2): 248-253 (2018)
- M. Zoppello, A. DeSimone, F. Alouges, L. Giraldi
Modeling and steering magneto-elastic micro-swimmers inspired by the motility of sperm cells
Atti dell'Accademia Peloritana dei Pericolanti-Classe di Scienze Fisiche, Matematica e Naturali 96, A12 (2018)
- M. Zoppello, F. Cardin
Swim-like motion of bodies immersed in an ideal fluid
ESAIM: COCV 25(16) (2019)
- R. Maggiro, M. Zoppello
Optimal motion of a scallop: some case studies
[IEEE Control Systems Letters](#) 3(4), 872-882, 841-846 (2019)
- F. Bagagiolo, R. Maggiro, M. Zoppello
A differential game with exit cost
Dynamic Games and Applications 10(2), pp. 297-327 (2020)
- F. Bagagiolo, R. Maggiro, M. Zoppello
A hybrid differential game with switching thermostatic-type dynamics and cost
Minimax Theory and its Applications 5(2), 1-30, (2020)
- F. Bagagiolo, M. Zoppello
Hysteresis and controllability of driftless affine systems: some case studies
Mathematical Modelling of Natural Phenomena 15(55) (2020)
- F. Fassò, S. Passarella, M. Zoppello
Control of locomotion systems and dynamics in relative periodic orbits.
Journal of Geometric Mechanics 12(3), 395-420, (2020)
- N. Sansonetto, M. Zoppello
On the trajectory generation of the Hydrodynamic Chaplign sleigh
IEEE Control Systems Letters 4(4), 909-917, 922-927 (2020)
- S. Turzi, M. Zoppello, D. Ambrosi
Equilibrium of two rods in contact under pressure
Quarterly Journal of Mechanics and Applied Mathematics, hbaa016 (2021)

- Proceedings:

- L. Giraldi, P. Martinon, M. Zoppello.
Controllability and Optimal Strokes for N-link Microswimmer
52nd IEEE Annual Conference on Decision and Control Florence
(2013)
- F. Alouges, A. DeSimone, L. Giraldi, M. Zoppello
Purcell Magneto-Elastic Swimmer Controlled by an External Magnetic Field
20th IFAC Conference Tolosa (2017)

- Book Chapters:

- M. Zoppello, A. DeSimone, F. Alouges, L. Giraldi, P. Martinon
Optimal control of slender microswimmers
Book chapter in Gerisch A., Penta R., Lang J. Multiscale Models in Mechano and Tumor Biology: Modeling, Homogenization, and Applications.
Lecture Notes in Computational Science and Engineering Springer Verlag Heidelberg vol 122, chap 8 (2017)

- Preprints:

- D. Ambrosi, S.S. Turzi, M. Zoppello
Elementary mechanics of the mitral valve
- R. Marchello, M. Morandotti, H. Shum, M. Zoppello
The N-link swimmer in three dimensions: controllability and optimality results

Data

05/03/2021

Luogo

Torino