Curriculum Vitae Marco Tezzele

Personal data

- Name: Marco Tezzele

- Status: Married

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Research and Education

2021-pres. Postdoctoral fellow at the University of Texas at Austin, Oden Institute for Computational Engineering and Sciences, under the supervision of Prof. Karen E. Willcox.

2018-2021 Ph.D. in Mathematical Analysis, Modelling, and Applications at SISSA, International School for Advanced Studies, Mathematics Area, mathLab. Industrial Ph.D. grant financed by Fincantieri S.p.A.. Advisor Prof. Gianluigi Rozza. Ph.D. thesis defended on 24/09/2021.

2015-2018 Assistant Researcher at SISSA, International School for Advanced Studies, Mathematics Area, mathLab. Supervisor Prof. Gianluigi Rozza.

2014-2015 Master in High Performance Computing, International School for Advanced Studies (SISSA) and ICTP, Trieste, Italy. Advisor Prof. Luca Heltai.

2010-2014 M.Sc. in Mathematics, Università degli studi di Milano, Italy, 104/110, (6 months ERASMUS LLP exchange program at Technische Universität Kaiserslautern, Germany). Advisor Prof. Lourenco Beirao da Veiga, co-advisor Prof. Luca Heltai.

2006-2010 B.Sc. in Mathemattics, Università degli studi di Pavia, Italy, 102/110. Advisor Prof. Daniele Boffi, co-advisor Prof. Luca Heltai.

Awards and Funding

A1. Winner of DSWeb 2019 Software Contest (webpage) – Tutorials on Dynamical Systems Software - Junior Faculty Category - PyDMD Package, in collaboration with N. Demo. Announced at SIAM Conference on Applications of Dynamical Systems in Snowbird.

A2. 2018–2020 MISTI MIT-Italy FVG Project: Multi-disciplinary Ship Design by Reduced Order Models and Machine Learning at MIT and SISSA.

A3. Ph.D scholarship at SISSA, financed by Fincantieri S.p.A..

A4. Master in HPC scholarship at SISSA & ICTP, financed by Nvidia.

A5. SISSA: Master thesis fellowship for pre-graduate students (2014).

Research Projects I have been involved in

R1. **H2020 ERC CoG 2015 AROMA-CFD** project 681447 "Advanced Reduced Order Methods with Applications in Computational Fluid Dynamics" P.I. Gianluigi Rozza, supported by European Union Funding for Research and Innovation — Horizon 2020 Program — in the framework of European Research Council Executive Agency.

R2. **SOPHYA**, "Seakeeping Of Planing Hull YAchts", supported by Regione FVG, POR-FESR 2014-2020, Piano Operativo Regionale Fondo Europeo per lo Sviluppo Regionale.

R3. **PRELICA**, "Advanced methodologies for hydro-acoustic design of naval propulsion", supported by Regione FVG, POR-FESR 2014-2020, Piano Operativo Regionale Fondo Europeo per lo Sviluppo Regionale.

R4. **HEaD - Higher Education and Development**, "Shape optimization of bow and stern by mean of parametric algorithms and reduced order methods" in collaboration with Fincantieri S.p.A., supported by Regione FVG, European Social Fund FSE 2014-2020.

R5. **INdAM GNCS 2019**: "Advanced intrusive and non-intrusive model order reduction techniques and applications".

R6. **INdAM GNCS 2018**: "Tecniche di riduzione di modello per le applicazioni mediche".

R7. **TRIM-OPT**, Cluster Trasporti Italia 2020, main partner CNR-INSEAN.

List of Publications

According to **Scopus**: 19 indexed documents, 191 citations from 67 documents, H-Index 9. Author webpage.

Publications in International Journals

J1. M. Tezzele, M. Sidari, M. Sicchiero, and G. Rozza. A multi-fidelity approach coupling parameter space reduction and non-intrusive POD with application to structural optimization of passenger ship hulls. *arXiv preprint arXiv:*, Submitted, 2021

J2. F. Romor, M. Tezzele, M. Mrosek, C. Othmer, and G. Rozza. Multi-fidelity data fusion through parameter space reduction with applications to automotive engineering. *arXiv preprint arXiv:2110.14396*, Submitted, 2021

J3. F. Romor, M. Tezzele, and G. Rozza. A local approach to parameter space reduction for regression and classification tasks. *arXiv preprint arXiv:2107.10867*, Submitted, 2021

J4. N. Demo, M. Tezzele, and G. Rozza. A Supervised Learning Approach Involving Active Subspaces for an Efficient Genetic Algorithm in High-Dimensional Optimization Problems. *SIAM Journal on Scientific Computing*, 43(3):B831–B853, 2021. `doi:10.1137/20M1345219`

J5. N. Demo, M. Tezzele, A. Mola, and G. Rozza. Hull Shape Design Optimization with Parameter Space and Model Reductions, and Self-Learning Mesh Morphing. *Journal of Marine Science and Engineering*, 9(2):185, 2021. `doi:10.3390/jmse9020185`

J6. M. Gadalla, M. Cianferra, M. Tezzele, G. Stabile, A. Mola, and G. Rozza. On the comparison of LES data-driven reduced order approaches for hydroacoustic analysis. *Computers & Fluids*, 216:104819, 2021. `doi:10.1016/j.compfluid.2020.104819`

J7. M. Tezzele, N. Demo, G. Stabile, A. Mola, and G. Rozza. Enhancing CFD predictions in shape design problems by model and parameter space reduction. *Advanced Modeling and Simulation in Engineering Sciences*, 7(40), 2020. `doi:10.1186/s40323-020-00177-y`

J8. F. Romor, M. Tezzele, A. Lario, and G. Rozza. Kernel-based Active Subspaces with application to CFD parametric problems using Discontinuous Galerkin method. *arXiv preprint arXiv:2008.12083*, Submitted, 2020

J9. N. Demo, M. Tezzele, and G. Rozza. A non-intrusive approach for reconstruction of POD modal coefficients through active subspaces. *Comptes Rendus Mécanique de l'Académie des Sciences, DataBEST 2019 Special Issue*, 347(11):873–881, November 2019. `doi:10.1016/j.crme.2019.11.012`

J10. M. Tezzele, F. Salmoiraghi, A. Mola, and G. Rozza. Dimension reduction in heterogeneous parametric spaces with application to naval engineering shape design problems. *Advanced Modeling and Simulation in Engineering Sciences*, 5(1):25, Sep 2018. `doi:10.1186/s40323-018-0118-3`

Conference Proceedings/Papers

C1. F. Romor, M. Tezzele, and G. Rozza. Multi-fidelity data fusion for the approximation of scalar functions with low intrinsic dimensionality through active subspaces. In *Proceedings in Applied Mathematics & Mechanics*, volume 20. Wiley Online Library, 2021. `doi:10.1002/pamm.202000349`

C2. M. Tezzele, N. Demo, and G. Rozza. Shape optimization through proper orthogonal decomposition with interpolation and dynamic mode decomposition enhanced by active subspaces. In R. Bensow and J. Ringsberg, editors, *Proceedings of MARINE 2019: VIII International Conference on Computational Methods in Marine Engineering*, pages 122–133, 2019

C3. N. Demo, M. Tezzele, A. Mola, and G. Rozza. A complete data-driven framework for the efficient solution of parametric shape design and optimisation in naval engineering problems. In R. Bensow and J. Ringsberg, editors, *Proceedings of MARINE 2019: VIII International Conference on Computational Methods in Marine Engineering*, pages 111–121, 2019

C4. A. Mola, M. Tezzele, M. Gadalla, F. Valdenazzi, D. Grassi, R. Padovan, and G. Rozza. Efficient reduction in shape parameter space dimension for ship propeller blade design. In R. Bensow and J. Ringsberg, editors, *Proceedings of MARINE 2019: VIII International Conference on Computational Methods in Marine Engineering*, pages 201–212, 2019

C5. G. Rozza, M. H. Malik, N. Demo, M. Tezzele, M. Girfoglio, G. Stabile, and A. Mola. Advances in Reduced Order Methods for Parametric Industrial Problems in Computational Fluid Dynamics. In R. Owen, R. de Borst, J. Reese, and P. Chris, editors, *ECCOMAS ECFD 7 - Proceedings of 6th European Conference on Computational Mechanics (ECCM 6) and 7th European Conference on Computational Fluid Dynamics (ECFD 7)*, pages 59–76, Glasgow, UK, 2018

C6. N. Demo, M. Tezzele, G. Gustin, G. Lavini, and G. Rozza. Shape optimization by means of proper orthogonal decomposition and dynamic mode decomposition. In *Technology and Science for the Ships of the Future: Proceedings of NAV 2018: 19th International Conference on Ship & Maritime Research*, pages 212–219. IOS Press, 2018. `doi:10.3233/978-1-61499-870-9-212`

C7. M. Tezzele, N. Demo, M. Gadalla, A. Mola, and G. Rozza. Model order reduction by means of active subspaces and dynamic mode decomposition for parametric hull shape design hydrodynamics. In *Technology and Science for the Ships of the Future: Proceedings of NAV 2018: 19th International Conference on Ship & Maritime Research*, pages 569–576. IOS Press, 2018. `doi:10.3233/978-1-61499-870-9-569`

C8. D. Cangelosi, A. Bonvicini, M. Nardo, A. Mola, A. Marchese, M. Tezzele, and G. Rozza. SRtP 2.0 — The Evolution of the Safe Return to Port Concept. In *Technology and Science for the Ships of the Future: Proceedings of NAV 2018: 19th International Conference on Ship & Maritime Research*, pages 665 – 672. IOS Press, 2018. `doi:10.3233/978-1-61499-870-9-665`

C9. N. Demo, M. Tezzele, A. Mola, and G. Rozza. An efficient shape parametrisation by free-form deformation enhanced by active subspace for hull hydrodynamic ship design problems in open source environment. In *Proceedings of ISOPE 2018: The 28th International Ocean and Polar Engineering Conference*, volume 3, pages 565–572, 2018

C10. F. Salmoiraghi, F. Ballarin, G. Corsi, A. Mola, M. Tezzele, and G. Rozza. Advances in geometrical parametrization and reduced order models and methods for computational fluid dynamics problems in applied sciences and engineering: Overview and perspectives. *ECCOMAS Congress 2016 - Proceedings of the 7th European Congress on Computational Methods in Applied Sciences and Engineering*, 1:1013–1031, 2016. `doi:10.7712/100016.1867.8680`

Proceedings in Invited Books as Chapters, Special Volumes and Chapters in Books

I1. G. Rozza, M. Hess, G. Stabile, M. Tezzele, and F. Ballarin. Basic Ideas and Tools for Projection-Based Model Reduction of Parametric Partial Differential Equations. In P. Benner, S. Grivet-Talocia, A. Quarteroni, G. Rozza, W. H. A. Schilders, and L. M. Silveira, editors, *Model Order Reduction*, volume 2, chapter 1, pages 1–47. De Gruyter, Berlin, Boston, 2020. `doi:10.1515/9783110671490-001`

I2. F. Garotta, N. Demo, M. Tezzele, M. Carraturo, A. Reali, and G. Rozza. Reduced Order Isogeometric Analysis Approach for PDEs in Parametrized Domains. In M. D'Elia, M. Gunzburger, and G. Rozza, editors, *Quantification of Uncertainty: Improving Efficiency and Technology: QUIET selected contributions*, volume 137 of *Lecture Notes in Computational Science and Engineering*, pages 153–170. Springer International Publishing, Cham, 2020. `doi:10.1007/978-3-030-48721-8_7`

I3. M. Tezzele, N. Demo, A. Mola, and G. Rozza. An integrated data-driven computational pipeline with model order reduction for industrial and applied mathematics. *Special Volume ECMI, In Press*, 2021

I4. M. Tezzele, F. Ballarin, and G. Rozza. Combined parameter and model reduction of cardiovascular problems by means of active subspaces and POD-Galerkin methods. In D. Boffi, L. F. Pavarino, G. Rozza, S. Scacchi, and C. Vergara, editors, *Mathematical and Numerical Modeling of the Cardiovascular System and Applications*, volume 16 of *SEMA-SIMAI Series*, pages 185–207. Springer International Publishing, 2018. `doi:10.1007/978-3-319-96649-6_8`

Software Papers

S1. F. Romor, M. Tezzele, and G. Rozza. ATHENA: Advanced Techniques for High dimensional parameter spaces to Enhance Numerical Analysis. *Software Impacts*, 10:100133, 2021. `doi:10.1016/j.simpa.2021.100133`

S2. M. Tezzele, N. Demo, A. Mola, and G. Rozza. PyGeM: Python Geometrical Morphing. *Software Impacts*, 7:100047, 2021. `doi:10.1016/j.simpa.2020.100047`

S3. M. Gadalla, M. Tezzele, A. Mola, and G. Rozza. BladeX: Python Blade Morphing. *The Journal of Open Source Software*, 4(34):1203, 2019. `doi:10.21105/joss.01203`

S4. N. Demo, M. Tezzele, and G. Rozza. PyDMD: Python Dynamic Mode Decomposition. *The Journal of Open Source Software*, 3(22):530, 2018. `doi:10.21105/joss.00530`

S5. N. Demo, M. Tezzele, and G. Rozza. EZyRB: Easy Reduced Basis method. *The Journal of Open Source Software*, 3(24):661, 2018. `doi:10.21105/joss.00661`

Conferences and Workshops

C1. SIMAI 2020+2021 (talk): Bi-annual Congress of the Italian Society of Industrial and Applied Mathematics, 30 August – 3 September 2021, Parma, Italy.

C2. COUPLED 2021 (talk): 9th edition of the International Conference on Computational Methods for Coupled Problems in Science and Engineering, Virtual Conference (originally scheduled in Chia Laguna, Cagliari, Italy) 14–16 June 2021.

C3. MARINE 2021 (talk): IX International Conference on Computational Methods in Marine Engineering, 13–15 May 2019, Virtual Conference (originally scheduled in Edinburgh, Scotland) 2–4 June 2021.

C4. CSE 2021 (talk): SIAM Conference on Computational Science and Engineering, Virtual Conference (originally scheduled in Fort Worth, Texas, U.S.) 1–5 March 2021.

C5. WCCM ECCOMAS 2020 (talk): Virtual Congress (originally scheduled in Paris, France) 11–15 January 2021.

C6. CAE Conference 2020 (poster): 36th International CAE Conference and Exhibition, Virtual Conference (originally scheduled in Vicenza, Italy) 30 November–4 December.

C7. ROMs in CFD 2019 (co-lecturer): Summer School on Reduced Order Methods in Computational Fluid Dynamics, 8–12 July 2019, SISSA, Trieste, Italy.

C8. MARINE 2019 (talk): VIII International Conference on Computational Methods in Marine Engineering, 13–15 May 2019, Gothenburg, Sweden.

C9. NAV 2018 (talk): 19th International Conference on Ship & Maritime Research, 20–22 June 2018, Trieste, Italy.

C10. MoRePaS 2018 (poster): Model Reduction of Parametrized Systems IV, 10–13 April 2018, Nantes, France.

C11. QUIET 2017 (poster): Quantification of Uncertainty: Improving Efficiency and Technology, 18–21 July 2017, Trieste, Italy.

C12. MARS42 2017, Summer Entrepreneurship School, 10–23 July 2017, Trieste, Italy.

C13. ADMOS 2017 (talk): International Conference on Adaptive Modeling and Simulations, 26–28 June 2017, Verbania, Italy.

C14. ME3 Conference at Institut Henri-Poincaré (poster): Recent developments in numerical methods for model reduction, 7–10 November 2016, Paris, France.

C15. Introductory School at IESC: Numerical methods for PDEs, 5–9 September 2016, Cargese, France.

C16. COST EU-MORNET (talk): Reduced Order Methods in Computational Fluid Dynamics: state of the art and perspectives, 22–23 February 2016, SISSA, Trieste, Italy.

Software Libraries

L1. PyDMD: Python Dynamic Mode Decomposition. N. Demo, M. Tezzele, G. Rozza. (webpage | docs | DOI). Winner of DSWeb 2019 Software Contest.

L2. PyGeM: Python Geometrical Morphing. M. Tezzele, N. Demo, A. Mola, G. Rozza. (webpage | docs | DOI).

L3. ATHENA: Advanced Techniques for High dimensional parameter spaces to Enhance Numerical Analysis. F. Romor, M. Tezzele, G. Rozza. (webpage | docs | DOI).

L4. EZyRB: Easy Reduced Basis method. N. Demo, M. Tezzele, G. Rozza. (webpage | docs | DOI).

L5. BladeX: Python Blade Morphing. M. Gadalla, M. Tezzele, A. Mola, G. Rozza. (webpage | docs | DOI).

Minisymposia co-organizer

M1. SIMAI 2020+2021: Bi-annual Congress of the Italian Society of Industrial and Applied Mathematics, 30 August – 3 September 2021, Parma, Italy. Minisymposium titled: "Advanced Computational Fluid Dynamics and Applications (part I and II)".

M2. MARINE 2021: IX International Conference on Computational Methods in Marine Engineering, 2–4 June 2021, Edinburgh, Scotland. Minisymposium titled: "Model order reduction methods in marine engineering".

Master Theses as co-advisor

T1. E. Donadini. Master Thesis: A data-driven approach for time-dependent optimal control problems by dynamic mode decomposition, University of Trieste, Italy, 2021.

T2. M. Teruzzi. Master in HPC Thesis: Parallel implementations for complex graph analysis with application in modern passenger ship safety management, SISSA & ICTP, Trieste, Italy, 2020.

T3. F. Romor. Master Thesis: Reduction in Parameter Space for Problems approximated by Discontinuous-Galerkin Method in Computational Fluid Dynamics, University of Trieste, Italy, 2019.

T4. A. Maurizio. Master in HPC Thesis: Representation of distribution networks of ships using graph-theory, SISSA & ICTP, Trieste, Italy, 2018.

T5. F. Garotta. Master Thesis: Reduced Order Isogeometric Analysis approach for PDEs in parametrized domains, University of Pavia, Italy, 2018.