

Curriculum



Nome Name:	Luca
Cognome Surname:	Dede'

ORCID:	0000000265588277
Scopus Author ID:	57218484374
WOS Author ID:	M92542014
Sito WEB WEB site:	n.d.

POSIZIONE PROFESSIONALE ATTUALE / CURRENT PROFESSIONAL POSITION:

Posizione attuale Current position:	In servizio
Qualifica Qualification:	Professore Associato (L. 240/10)
Ateneo/Ente/Azienda University/Institution/Company:	Politecnico di MILANO
Nazione Ateneo/Ente/Azienda University/Institution/Company Country:	ITA
Anno inizio Start Year:	2019
Anno fine End Year:	n.d.

PRECEDENTI ESPERIENZE LAVORATIVE (ULTIMI 10 ANNI) / PREVIOUS WORK EXPERIENCE (LAST 10 YEARS):

LINGUE / LANGUAGES:

Lingua Language:	Inglese
Scrittura Writing:	A1
Comunicazione Communication:	A1

AREA/SETTORE SCIENTIFICO-DISCIPLINARE / AREA/SECTOR SCIENTIFIC-DISCIPLINARY

Area scientifico-disciplinare Area scientific-disciplinary:	Scienze matematiche e informatiche
Area scientifico-disciplinare codice Area scientific-disciplinary code:	01
Settore scientifico-disciplinare codice Sector scientific-disciplinary code:	-Analisi numerica
Settore scientifico-disciplinare codice Sector scientific-disciplinary code:	-MATH-05/A

DESCRIZIONE DEI PRINCIPALI RISULTATI SCIENTIFICI CONSEGUITI NEGLI ULTIMI 10 ANNI (CON ANNESSO ELENCO DI MASSIMO 10 PUBBLICAZIONI) / DESCRIPTION OF THE MAIN SCIENTIFIC RESULTS ACHIEVED IN THE LAST 10 YEARS (WITH ATTACHED LIST OF MAXIMUM 10 PUBLICATIONS):

Descrizione Description:	<p><i>Over the past decade, Prof. Luca Dedè has made significant contributions to Scientific Computing, Numerical Analysis, and Computational Mechanics. His research centers on the mathematical modeling of differential problems described by PDEs, the development of advanced numerical methods, and large-scale simulations on high-performance computing (HPC) systems. His work bridges mathematics, engineering, and medicine, with international collaborations across Europe, the USA, and Asia. Prof. Dedè has played key roles in major projects, notably as scientific coordinator of the ERC-AdG iHEART project, contributing to the development of the most biophysically detailed simulator of the human heart to date. He also led the development of the open-source finite element library LifeV (now lifex), widely used for cardiovascular modeling. His scientific achievements span multiple domains: 1. High-order methods for PDEs: development and application of Isogeometric Analysis and Discontinuous Galerkin methods for accurate and efficient solutions. 2. Phase-field modeling and HPC simulations: study of two-phase flows and material interface dynamics via Cahn-Hilliard-type models, efficiently simulated on parallel architectures. 3. Computational Fluid Dynamics and turbulence modeling: contributions to stabilized methods and turbulence models, with applications in cardiovascular flows. 4. Multiphysics and multiscale modeling: numerical</i></p>
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	<p><i>strategies for strongly coupled problems in electromechanics, perfusion, and fluid-structure interaction, including reduced-order modeling techniques. 5. Computational epidemiology: mathematical modeling of COVID-19 spread and vaccination strategies, used to inform policy decisions at the national level. 6. Scientific machine learning and model order reduction: application of deep learning (e.g., Latent Neural ODEs, variational autoencoders) for real-time simulation, parameter estimation, and uncertainty quantification in complex PDE models. 7. Cardiovascular and cardiac modeling: leading advances in simulating heart function, including electromechanics and blood flow, validated against clinical data and extended to cardiac digital twin frameworks. 8. Model personalization and precision medicine: methods for data assimilation and patient-specific calibration, enabling predictive tools for diagnosis and treatment planning. He has authored over 120 peer-reviewed publications (Scopus h-index 32, >3500 citations), including award-winning works recognized as Highly Cited Papers by Clarivate and selected among the best in top journals (CMAME, Nature Communications). He is Fellow of EAMBES and PI or team member in numerous national and European research projects (Horizon Europe, EuroHPC, PRIN, FAIR). His interdisciplinary expertise, scientific leadership, and computational innovations have positioned him among the leading researchers in applied mathematics and computational medicine.</i></p>
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PUBBLICAZIONI / PUBLICATIONS:

Anno della pubblicazione Year of publication:	2023
Citazione Citation:	Fedele, Marco, Piersanti, Roberto, Regazzoni, Francesco, Salvador, Matteo, Africa, Pasquale Claudio, Bucelli, Michele, Zingaro, Alberto, Dede', Luca, Quarteroni, Alfio (2023). A comprehensive and biophysically detailed computational model of the whole human heart electromechanics. COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING, vol. 410, p. 1-45, ISSN: 0045-7825, doi: 10.1016/j.cma.2023.115983

Anno della pubblicazione Year of publication:	2024
Citazione Citation:	Regazzoni, Francesco, Pagani, Stefano, Salvador, Matteo, Dede', Luca, Quarteroni, Alfio (2024). Learning the intrinsic dynamics of spatio-temporal processes through Latent Dynamics Networks. NATURE COMMUNICATIONS, vol. 15, p. 1-16, ISSN: 2041-1723, doi: 10.1038/s41467-024-45323-x

Anno della pubblicazione Year of publication:	2024
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Citazione Citation:	Zingaro, Alberto, Bucelli, Michele, Piersanti, Roberto, Regazzoni, Francesco, Dede', Luca, Quarteroni, Alfio (2024). An electromechanics-driven fluid dynamics model for the simulation of the whole human heart. JOURNAL OF COMPUTATIONAL PHYSICS, vol. 504, p. 1-29, ISSN: 0021-9991, doi: 10.1016/j.jcp.2024.112885
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Anno della pubblicazione Year of publication:	2023
Citazione Citation:	Zingaro A., Vergara C., Dede' L., Regazzoni F., Quarteroni A. (2023). A comprehensive mathematical model for cardiac perfusion. SCIENTIFIC REPORTS, vol. 13, p. 1-14, ISSN: 2045-2322, doi: 10.1038/s41598-023-41312-0

Anno della pubblicazione Year of publication:	2021
Citazione Citation:	Fresca, Stefania, Dede', Luca, Manzoni, Andrea (2021). A Comprehensive Deep Learning-Based Approach to Reduced Order Modeling of Nonlinear Time-Dependent Parametrized PDEs. JOURNAL OF SCIENTIFIC COMPUTING, vol. 87, p. 1-36, ISSN: 0885-7474, doi: 10.1007/s10915-021-01462-7

Anno della pubblicazione Year of publication:	2019
Citazione Citation:	Regazzoni, F., Dedè, L., Quarteroni, A. (2019). Machine learning for fast and reliable solution of time-dependent differential equations. JOURNAL OF COMPUTATIONAL PHYSICS, vol. 397, p. 1-26, ISSN: 0021-9991, doi: 10.1016/j.jcp.2019.07.050

Anno della pubblicazione Year of publication:	2015
Citazione Citation:	Bartezzaghi, Andrea, DEDE', LUCA, QUARTERONI, ALFIO MARIA (2015). Isogeometric Analysis of high order Partial Differential Equations on surfaces. COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING, vol. 295, p. 446-469, ISSN: 0045-7825, doi: 10.1016/j.cma.2015.07.018

Anno della pubblicazione Year of publication:	2015
Citazione Citation:	DEDE', LUCA, C. Jäggli, QUARTERONI, ALFIO MARIA (2015). Isogeometric numerical dispersion analysis for two-dimensional elastic wave propagation. COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING, vol. 284, p. 320-348, ISSN: 0045-7825, doi: 10.1016/j.cma.2014.09.013

Anno della pubblicazione Year of publication:	2020
Citazione Citation:	Gervasio P., Dede L., Chanon O., Quarteroni A. (2020). A Computational Comparison Between Isogeometric Analysis and Spectral Element

	Methods: Accuracy and Spectral Properties. JOURNAL OF SCIENTIFIC COMPUTING, vol. 83, p. 1-18, ISSN: 0885-7474, doi: 10.1007/s10915-020-01204-1
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Anno della pubblicazione Year of publication:	2022
Citazione Citation:	Regazzoni, F., Salvador, M., Africa, P. C., Fedele, M., Dede', L., Quarteroni, A. (2022). A cardiac electromechanical model coupled with a lumped-parameter model for closed-loop blood circulation. JOURNAL OF COMPUTATIONAL PHYSICS, vol. 457, p. 1-35, ISSN: 0021-9991, doi: 10.1016/j.jcp.2022.111083

DESCRIZIONE DEI PRINCIPALI PROGETTI DI RICERCA E PREMI CONSEGUITI NEGLI ULTIMI 10 ANNI (CON ANNESSO ELENCO DI MASSIMO 10 RISULTATI, INCLUDENDO, A TITOLO DI ESEMPIO, PRINCIPAL INVESTIGATOR O COORDINATORE LOCALE DI PROGETTI DI RICERCA COMPETITIVI NAZIONALI O INTERNAZIONALI, SIGNIFICATIVI PREMI CONSEGUITI PER LA PROPRIA ATTIVITÀ DI RICERCA)/ DESCRIPTION OF THE MAIN RESEARCH PROJECTS AND AWARDS AWARDED IN THE LAST 10 YEARS (WITH ATTACHED LIST OF MAXIMUM 10 ACHIEVEMENTS, INCLUDING, FOR EXAMPLE, PRINCIPAL INVESTIGATOR OR LOCAL COORDINATOR OF NATIONAL OR INTERNATIONAL COMPETITIVE RESEARCH PROJECTS, SIGNIFICANT AWARDS AWARDED FOR YOUR RESEARCH ACTIVITY):

Descrizione Description:	
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Descrizione Description:	"Best deal.II-based paper award" 2024. The award is attributed to the following paper that showcases the complexity of applications that can be realized with deal.II. Fedele, Piersanti, Regazzoni, Salvador, Africa, Bucelli, Zingaro, Dede', Quarteroni, "A comprehensive and biophysically detailed computational model of the whole human heart electromechanics", Computer Methods in Applied Mechanics and Engineering 2023; 410:115983. https://dealii.org/community/best_paper_award/
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Descrizione Description:	First "Oden-Hughes award" for the best paper published in the Journal CMAME in the years 2022--2023. Fedele, Piersanti, Regazzoni, Salvador, Africa, Bucelli, Zingaro, Dede', Quarteroni, "A comprehensive and biophysically detailed computational model of the whole human heart electromechanics", Computer Methods in Applied Mechanics and Engineering 2023; 410:115983.
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Descrizione Description:	PI (3 units, 5 participants) of the PRIN 2022 (MUR Italy) research project 202232A8AN ``Computational modeling of the human heart: from efficient numerical solvers to cardiac digital twins"; 10.2023--09.2025, Politecnico di Milano (111'394 EUR for the unit, 245'838 EUR total).
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Descrizione Description:	Local PI (16 units, 5 participants to the unit) of the HORIZON-EUROHPC-JU-2023-COE-03 project dealii-X "an Exascale Framework for Digital Twins of the Human Body" (no. 101172493); 10.2024--12.2026, Politecnico di Milano (299'368 EUR for the unit, 50% cofund, 3.9M EUR total).
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DESCRIZIONE DEI PRINCIPALI RISULTATI CONSEGUITI NEGLI ULTIMI 10 ANNI IN TERMINI DI SVILUPPO DI RETI E RELAZIONI SCIENTIFICHE NAZIONALI E INTERNAZIONALI (CON ANNESSO ELENCO DI MASSIMO 5 RISULTATI, INCLUDENDO, A TITOLO DI ESEMPIO, PARTECIPAZIONE O ORGANIZZAZIONE DI CONVEGNI NAZIONALI E INTERNAZIONALI; CONTRIBUTI A CONSORZI DI RICERCA) / DESCRIPTION OF THE MAIN RESULTS ACHIEVED IN THE LAST 10 YEARS IN TERMS OF DEVELOPMENT OF NATIONAL AND INTERNATIONAL SCIENTIFIC NETWORKS AND RELATIONS (WITH ATTACHED LIST OF MAXIMUM 5 RESULTS, INCLUDING, FOR EXAMPLE, PARTICIPATION OR ORGANIZATION OF NATIONAL AND INTERNATIONAL CONFERENCES; CONTRIBUTIONS TO RESEARCH CONSORTIA):

Descrizione Description:	
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DESCRIZIONE DEI PRINCIPALI RISULTATI CONSEGUITI NEGLI ULTIMI 10 ANNI IN TERMINI DI SUPPORTO ALLA COMUNITÀ SCIENTIFICA (CON ANNESSO ELENCO DI MASSIMO 5 RISULTATI, INCLUDENDO, A TITOLO DI ESEMPIO, RESPONSABILITÀ DI DIREZIONE DI COMITATI EDITORIALI; INCARICHI DI VALUTAZIONE DELLA RICERCA PRESSO ISTITUZIONI NAZIONALI O INTERNAZIONALI; RESPONSABILITÀ ISTITUZIONALI ALL'INTERNO DELL'ISTITUZIONE DI APPARTENENZA O DI ALTRE ISTITUZIONI) / DESCRIPTION OF THE MAIN RESULTS ACHIEVED IN THE LAST 10 YEARS IN TERMS OF SUPPORT TO THE SCIENTIFIC COMMUNITY (WITH ATTACHED LIST OF MAXIMUM 5 RESULTS, INCLUDING, FOR EXAMPLE, MANAGEMENT RESPONSIBILITIES OF EDITORIAL COMMITTEES; RESEARCH EVALUATION ROLES AT NATIONAL OR INTERNATIONAL INSTITUTIONS; INSTITUTIONAL

RESPONSIBILITIES WITHIN THE INSTITUTION OF AFFILIATION OR OTHER INSTITUTIONS):

Descrizione Description:	
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Descrizione Description:	Reviewer for: CSCS Swiss National Supercomputing Centre, 2025. European Science Foundation for Research Foundation Flanders' (FWO), 2024, 2025. European Science Foundation for Science Fund of the Republic of Serbia (SSF), 2023. European Research Council (ERC), Starting Grant Call, 2023. DFG, German Research Foundation, 2023. ANR, French National Research Agency, 2022. NWO, the Dutch Research Council, 2021, 2023. ISF, Israel Science Foundation, 2021.
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Descrizione Description:	Member of the editorial board of the Journals: Frontiers in Physiology and Frontiers in Bioengineering and Biotechnology, specialty sections in Computational Physiology and Medicine (from November 2021); AIMS Mathematics (from August 2020); MDPI Mathematics (from December 2020).
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DESCRIZIONE DEI PRINCIPALI RISULTATI CONSEGUITI NEGLI ULTIMI 10 ANNI IN TERMINI VALORIZZAZIONE DELLE CONOSCENZE (CON ANNESSO ELENCO DI MASSIMO 3 RISULTATI, RELATIVI ALLA PARTECIPAZIONE DEL CANDIDATO ALLE ATTIVITÀ DI VALORIZZAZIONE DELLE CONOSCENZE) / DESCRIPTION OF THE MAIN RESULTS ACHIEVED IN THE LAST 10 YEARS IN TERMS OF KNOWLEDGE VALORIZATION (WITH ATTACHED LIST OF MAXIMUM 3 RESULTS, RELATING TO THE CANDIDATE'S PARTICIPATION IN KNOWLEDGE VALORIZATION ACTIVITIES):

Descrizione Description:	
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Descrizione Description:	Patent. L. Dede', A. Quarteroni, F. Regazzoni. "Computer-implemented method for the generation of a mathematical model with reduced computational complexity" International patent filling; filing number: PCT/IB2021/055646; issue date: 2021/2022; International Classification: G06N 3/04; Politecnico di Milano; http://hdl.handle.net/11311/1214497
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Descrizione Description:	Patent. L. Dede', A. Quarteroni, F. Regazzoni. Metodo basato su reti neurali per costruire modelli surrogati di tipo differenziale e tempo-dipendenti, utilizzando in modo combinato dati e conoscenza a priori delle proprietà del fenomeno". Patent filling Italy; filing number: 10202000015619; issue date: 2020; patent
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	granted on March 10, 2023. Politecnico di Milano; http://hdl.handle.net/11311/1176225
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Informazioni aggiornate alla data di candidatura 21-05-2025

Luca Dede'

Il presente curriculum costituisce allegato e parte integrante dell'incarico sottoscritto