BIOGRAPHICAL SKETCH

NAME: **Aldinucci, Marco**

eRA COMMONS USER NAME (credential, e.g., agency login): **n/a**

POSITION TITLE: **Full Professor at the Computer Science Department, University of Torino, Italy**

Education/Training

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
University of Pisa, Italy	MSc summa cum laude	04/1997	Computer Science - Theoretical CS
Lipari intl. sum. school, Italy	School Certificate "A"	07/1999	Computer Science - Distributed Systems
Lipari intl. sum. school, Italy	School Certificate "A"	07/2000	Computer Science - Bioinformatics
University of Pisa, Italy	PhD	12/2003	Computer Science – Parallel Computing
University of Pisa, Italy	MSc summa cum laude	06/2004	Computer Technologies - HPC
Queen's University Belfast, UK	CoreGRID Excellence grant	02/2006	Computer Engineering – Distributed Computing
University of Edinburgh, UK	HPCEuropa3 grant	04/2010	School of Informatics – Parallel Computing

A. Personal Statement

Marco Aldinucci is a full professor and the **head of the "alpha" Parallel Computing research group** at the Computer Science Department of the University of Torino. He received his Ph.D. from the University of Pisa (2003), and he has been a researcher at the Italian National Research Council (CNR). He is the author of over a hundred papers in international journals and conference proceedings. He is the recipient of the **HPC Advisory Council University Award 2011, the NVidia Research award 2013, the IBM Faculty Award 2015.** He has been participating in over 15 EU-funded research projects concerning parallel computing attracting in the last **eight years over 6M€ of research funds.** He currently the coordinator of the 4.5M€ HPC4AI project and the dissemination manager of the 14.8M€ H2020 IA Deephealth. He serves as Director of the "data-centric computing" laboratory at ICxT@UNITO innovation center, and Vice-President of the C3S@UNITO competency center. **He is the Italian National delegate at the Governing Board of the 4B€ EuroHPC Joint Undertaking EU programme.** His research is focused on methods and tools for Parallel and Distributed Computing. He a co-designer of the FastFlow programming framework (150K downloads, 100+ papers) and several other programming frameworks and libraries for parallel computing; a sample of new tools is at https://github.com/alpha-unito. In the last three years, he is dealing with the performance-accuracy-privacy trade-off in **distributed and federated learning**.

A) My Scholarly accomplishments (h-index=28, i10-index=62): I have **120+ peer-reviewed publications,** in top-tier venues including both technical journals and other journals such as **Medical Image Analysis, Future Generation Computer Systems,** Journal of Parallel and Distributed Systems, BMC Bioinformatics, Briefings on Bioinformatics, etc. I have received several recognitions with my scholarly accomplishments such as being **ranked 1st over 481 lectures in the research evaluation exercise** across the 28 departments of University of Torino (2009-2012), receiving the HPC Advisory Council University Award 2011, the NVidia Research award 2013, the "outstanding leadership award" at 16th IEEE International Conference on High-Performance Computing and Communications (Paris, France, Aug 2014), the IBM Faculty Award 2015. I have given 8 keynote

talks in international Parallel Computing conferences and 40+ invited talks in international scientific venues (workshops, symposiums, etc.).

B) At the University of Torino: My primary motivation for moving from the University of Pisa to the University of Torino (UNITO) was to open a new research group on Parallel computing. In the city of Torino, where there are two large universities (3000+ professors overall) and no research groups in Parallel Computing. The University of Torino is the largest (2000+ professors, 80000+ students, 28 departments, established 1404). The Computer Science department of the University of Torino is ranked among the top 5 in Italy. In ten years, **I have brought to UNITO over 6M€ by way of highly competitive (8-10% success rate) EU projects.** I have started my group in 2011, where I grep up several MSc and PhD students. **Three of my MSc students got the best annual thesis award at UNITO**. All my six former PhD students are nowadays researchers overseas. Among them Claudia Misale and Maurizio Drocco are scientists at IBM TJ Watson; Claudia is leading the design team of the next-gen IBM cloud. Guillerme Peretti Pezzi is leading the user support group at CSCS ETH Zurich; Filippo Spiga is "HPC relation manager" at NVidia corp. As a lecturer, in 2011, I created a new course on Parallel Computing at MSc in Computer Science, and MSc in Physics that is still active.

C) As President of HPC4AI, Vice-president of C3S and Director of the data-centric lab at ICxT: Two milestones of my service at UNITO has been the establishment of two novel competency centres I have advocated: **C3S** and **HPC4AI**, that form a hybrid cloud-HPC system with 4000+ cores, 100+GPUs, 3PB of storage in multiple tiers. Underneath both of them the aim of matching the growing demand for computational power in Scientific Computing and AI, respectively, making the internal competences growing rather than acquiring HPC as a commodity. C3S and HPC4AI behave as laboratories serving the whole university and the technological transfer on the local industries. **C3S**: In 2014, I gathered 16 departments of UNITO in the application to a 1M€ competitive grant from San Paolo Foundation to create a novel competence centre on Scientific Computing. My idea was to propose a novel HPC platform designing it rather than buying it. We ranked 1st proposing what is nowadays known as **modular computing**. **HPC4AI**: In 2018, I launched a similar challenge for AI designing a centre across the two universities of Torino. We ranked 1st in the competitive call for projects (4.5M€ grant). We advocated HPC4AI, a new federated AI-on-demand platform across four different data centres. HPC4AI started in September 2019 and today it supports 15+ research projects on AI. It is becoming the reference platform for several medical departments that are inventing on HPC4AI (pathology, oncology, neurosciences, veterinary, etc.). HPC4AI implements several novel tools for AI that are under development at UNITO, inter-alia: 1) **HPC secure multi-tenancy** that make it possible to manage critical data for the training on shared infrastructures (cloud, HPC), 2) **Hybrid HPC-cloud** workflows (streamflow), 3) **Federated learning simulator** to test novel federated learning architectures.

D) As Italian National delegate at EuroHPC Governing Board: In 2019-2020, I achieved three main objectives: 1) The co-funding (EU-Italy) of a novel HPC pre-exascale **modular machine code-named "Leonardo"** to be installed in Italy at CINECA in 2021 (>200PFLOPS, 230M€ investment). 2) The co-funding of EU research projects on HPC with 24M€ (that is the highest national rate in Europe), that make it possible **to double the penetration (in term of success rate and absolute grant volumes) of Italian industrial and academic partners of EU research projects on HPC.** 3) Last but not least, I am trying t**o bridge the gap between HPC and AI on a pan-European level by establishing a new pan-European resource and data sharing model.** AI to HPC need one another, but they are profoundly different. The secret dream of HPC specialists is to build a machine that can be seen from orbit. AI's is to have an exascale computing power that is easy to use and always available as a laptop. This work is in progress.

B. Positions and Employment

1997-1998	Compiler designer and developer at Quadrics Supercomputing World ltd.
2003-2006	Researcher at the National Research Council (CNR), Pisa, Italy
2006-2008	Postdoctoral research associate, University of Pisa, Italy
2008-2014	Assistant Professor, University of Torino, Italy
2014-2019	Associate Professor, University of Torino, Italy
2019-now	Full Professor, University of Torino, Italy

Other Experience and Professional Memberships

2020-now	Coordinator of the of the research group on ''COVID19 medical images'' for the ''Confederation of Laboratories for Artificial Intelligence Research in Europe'' (CLAIRE)
2019-now	Delegate of the University of Torino in the scientific advisory board of CSI Piedmont
2019-now	Dissemination Manager of the 14.8M€ DeepHealth project
2018-now	National delegate (Italy) at the EuroHPC governing board, EuroHPC Joint Undertaking
2018-now	Member of the Scientific Committee of the ''Industry4.0'' master programme at the University of Torino
2018-now	Delegate of the Univ. of Turin in the working group of the city of Turin on ''free software & open data''
2018-now	Coordinator of HPC4AI 4.5M€ project (The Turin's High-Performance Computing for Artificial Intelligence Centre)
2016-now	Vice-President of the Competency Centre on Scientific Computing (C3S), University of Torino
2016-2019	Director at data-centric Laboratory of the Innovation Centre of University of Torino (ICxT)
2015-2019	Leader of the Working Group on ''Programming Model for Big Data'' of the cHiPSet EU COST Action IC1406.
2016-2017	Member of the GARR task force on cloud and service federation
2015-now	Director of the University of Torino research unit in the National Inter-university Consortium for Informatics (CINI)
2013-2016	P.I. of the NVidia CUDA Research center at the University of Torino
2011-2014	Leader of the Working Group on ''Compilers'' of the 4.2M€ ParaPhrase EU STREP project

Technical Program Committee (PC) Membership, and Services

2019-now	Member of the Hyperion Research ''HPC Technical Computing Advisory Panel.
2018-now	Member of the supervisory board of doctoral programme in Modelling and Data Science
2018-now	Member of Steering Committee of Euro-Par conference series
2017-2018	Member of the supervisory board of doctoral programme in Innovation for the Circular Economy
2017-now	Member of the board of advisors of Swiss innovation valley fintech firm
2017-now	Member of the IEEE Special Technical Community on Parallel Model & system Dataflow and Beyond (IEEE-DFSTC).
2017-now	Member of the editorial board of Parallel Computing, Elsevier
2017-now	Member of the editorial board of Scientific Programming
2016-now	Member of the IEEE SW-IT task force, i.e. Smart World (SW-TF), in the Emergent Technologies Technical Committee (ETTC) of the Computational Intelligence Society (CIS) of IEEE
2012-now	Member of the European Network of Excellence HiPEAC: High Performance and Embedded Architecture and Compilation (2012-2016)
2014-now	I have served as program and general chair of 4 International conferences: Euro-Par 2018, IEEE ScalCom 2016 and 2015, IEEE PDP 2014
2010-now	I have served as track chair of 8 International conferences: IEEE HiPC 2020, ACM CF 2020, IEEE ScalCom 2017, IEEE ICA3PP 2016, Euro-Par 2015, IEEE IC2E 2015, IEEE IPTA 2014, IEEE PDP 2010

Honors

2015 IBM Faculty Award 2015 (spark optimisation).

2014 Ranked 1st over 481 candidates in the evaluation exercise of lecturers of University of Torino for the years period 2009-2012

2014 *Outstanding leadership award at*
16th IEEE Intl. Conf. on High-Performance Computing and Communications, Paris, France, Aug 2014

2011 *HPC Advisory Council University award 2011. Announced at SuperComputing 2011*

1997 *MSc Thesis price "Credito cooperativo del Valdarno", 1997*

C. Contribution to Science

1. *Parallel and Distributed Computing*

a. P. Metzger, M. Cole, C. Fensch, M. Aldinucci, and E. Bini, "Enforcing deadlines for skeleton-based parallel programming," in 26th IEEE real-time and embedded technology and applications symposium (RTAS), Sydney, Australia, 2020. doi:10.1109/RTAS48715.2020.000-7

b. J. D. Garcia, J. D. del Rio, M. Aldinucci, F. Tordini, M. Danelutto, G. Mencagli, and M. Torquati, "Challenging the abstraction penalty in parallel patterns libraries," The journal of supercomputing, 2019. doi:10.1007/s11227-019-02826-5

c. M. Torquati, D. De Sensi, G. Mencagli, M. Aldinucci, and M. Danelutto, "Power-aware pipelining with automatic concurrency control," Concurrency and computation: practice and experience, vol. 31, iss. 5, 2019. doi:10.1002/cpe.4652

d. M. Torquati, G. Mencagli, M. Drocco, M. Aldinucci, T. De Matteis, and M. Danelutto, "On dynamic memory allocation in sliding-window parallel patterns for streaming analytics," The journal of supercomputing, vol. 75, iss. 8, p. 4114–4131, 2019. doi:10.1007/s11227-017-2152-1

e. G. Mencagli, M. Torquati, F. Lucattini, S. Cuomo, and M. Aldinucci, "Harnessing sliding-window execution semantics for parallel stream processing," Journal of parallel and distributed computing, vol. 116, pp. 74–88, 2018. doi:10.1016/j.jpdc.2017.10.021

f. C. Misale, M. Drocco, G. Tremblay, A. R. Martinelli, and M. Aldinucci, "PiCo: high-performance data analytics pipelines in modern c++," Future generation computer systems, vol. 87, pp. 392–403, 2018. doi:10.1016/j.future.2018.05.030

2. *Machine Learning / Deep Learning for Image-Based Diagnosis Studies*

a. P. Viviani, M. Drocco, D. Baccega, I. Colonnelli, and M. Aldinucci, "Deep learning at scale," in Proc. of 27th Euromicro intl. conference on parallel distributed and network-based processing (PDP), Pavia, Italy, 2019, pp. 124–131. doi:10.1109/EMPDP.2019.8671552

b. M. Aldinucci, S. Rabellino, M. Pironti, et al. "HPC4AI, an AI-on-demand federated platform endeavour," in ACM computing frontiers, Ischia, Italy, 2018. doi:10.1145/3203217.3205340

c. P. Viviani, M. Drocco, and M. Aldinucci, "Pushing the boundaries of parallel deep learning — A practical approach," Corr, vol. abs/1806.09528, 2018.

d. C. Spampinato, S. Palazzo, D. Giordano, M. Aldinucci, and R. Leonardi, "Deep learning for automated skeletal bone age assessment in x-ray images," Medical image analysis, vol. 36, pp. 41–51, 2017. doi:10.1016/j.media.2016.10.010

3. *Multi-disciplinary*

a. V. Amaral, B. Norberto, M. Goulão, M. Aldinucci, et al. "Programming languages for data-intensive HPC applications: a systematic mapping study," Parallel computing, p. 102584, 2020. doi:https://doi.org/10.1016/j.parco.2019.102584

b. I. Merelli, F. Fornari, F. Tordini, D. D'Agostino, M. Aldinucci, and D. Cesini, "Exploiting docker containers over grid computing for a comprehensive study of chromatin conformation in different cell types," Journal of parallel and distributed computing, vol. 134, pp. 116–127, 2019. doi:10.1016/j.jpdc.2019.08.002

c. F. Tordini, M. Drocco, C. Misale, L. Milanesi, P. Liò, I. Merelli, M. Torquati, and M. Aldinucci, "NuChart-II: the road to a fast and scalable tool for Hi-C data analysis," International journal of high performance computing applications, vol. 31, iss. 3, pp. 196–211, 2017. doi:10.1177/1094342016668567

d. F. Tordini, M. Aldinucci, L. Milanesi, P. Liò, and I. Merelli, "The genome conformation as an integrator of multi-omic data: the example of damage spreading in cancer," Frontiers in genetics, vol. 7, iss. 194, p. 1–17, 2016. doi:10.3389/fgene.2016.00194

Complete List of Published Works: http://alpha.di.unito.it/parallel-programming-papers/
Google Scholar webpage (h-index=28, i10-index=62): https://scholar.google.it/citations?user=Ip44EZwAAAAJ

D. Research Support

The complete list of over 30 research grants is at http://alpha.di.unito.it/parallel-computing-research-projects/

Ongoing Research Support

- DeepHealth (EC-IA, H2020, ICT-2018-11): Deep-Learning and HPC to Boost Biomedical Applications for Health (2019, 36 months, total cost 14.8M€, G.A. 825111).
- **CT-guided biopsy of NSCLC**: radiomic analysis of the CT images and correlation with NGS findings (Clinical trial, 2019). **Veltri P.I.**
- **Mnemocomputing** (Compagnia di San Paolo): In-Transit HPC computing (2019, 24 months, total cost 75K€). **Aldinucci P.I.**
- HPC4AI (Regione Piemonte, INFRA_P): Turin's centre in High-Performance Computing for Artificial Intelligence (2018, 24 months, total cost 4.5M €). **Aldinucci P.I.**

Completed Research Support (last 10 years)

- **cHiPSet** (EU COST Action IC1406): High-Performance Modelling and Simulation for Big Data Applications (2015, 48 months, 500k€). **Aldinucci P.I. of Programming models**
- **Toreador** (EU RIA, H2020, ICT-2015-16): TrustwOrthy model-awaRE Analytics Data platfORm (2015, 36 months, total cost 6.2M €).
- **OptiBike** (EU I4MS): Robust Lightweight Composite Bicycle design and optimization, an experiment of EU i4MS Fortissimo2 project (2017, 24 months, total cost 230K €). **Aldinucci P.I. at UNITO.**
- **C3S: Competence Center on Scientific Computing** (Compagnia di San Paolo, founding 900K€).
- **Rephrase** (EU RIA, H2020, ICT-2014-1): Refactoring Parallel Heterogeneous Resource-Aware Applications – a Software Engineering Approach (2015, 36 months, total cost 3.5M €). **Aldinucci P.I. at UNITO.**
- DIMA-HUB (EU I4MS): Regional Digital Manufacturing Innovation Hub (2016, 6 months).
- REPARA (EU STREP, 7th FP): Reengineering and Enabling Performance And poweR of Applications (2013, 36 months, total cost 3.5M €). **Aldinucci P.I. at UNITO**
- CINA (Italian MIUR PRIN): Compositionality, Interaction, Negotiation, Autonomicity for the future ICT society (2013, 36 months).
- ParaPhrase (EU STREP, 7th FP): Parallel Patterns for Adaptive Heterogeneous Multicore Systems (2011, 42 months, total cost 4.2M €). **Aldinucci P.I. at UNITO**
- SALT (founded by Compagnia di San Paolo): Self-adaptive, Autonomic, Light Types (2013-2015).
- IMPACT (founded by Compagnia di San Paolo): Innovative Methods for Particle Colliders at the Terascale (2012, 36 months).
- IPODS (Italian MIUR PRIN): Interacting Processes in Open-ended Distributed Systems (2009, 24 months).
- BioBITs (founded by Regione Piemonte): Developing white and green biotechnologies by converging platforms from biology and information technology towards metagenomics (2009, 36 months).
- MyMED (EU Italy-France cooperation (Alpi)): myMed: a transnational computer network for content sharing on desktop and mobile clients (2010, 36 months).