

Iacopo Colonnelli

Personal information

Birth year 1992
Nationality Italian

Education

PH.D. IN MODELING AND DATA SCIENCE | 10/05/2022 | UNIVERSITÀ DEGLI STUDI DI TORINO

Thesis: Workflow models for heterogeneous distributed systems

Description: Definition of a novel methodology for distributed modular applications, allowing topology-aware scheduling and data management while separating business logic, data dependencies, parallel patterns and execution environments. Introduction of computational notebooks as a high-level and user-friendly interface to this new kind of workflow, aiming to flatten the learning curve and improve the adoption of such methodology.

Final grade: Summa cum Laude

MASTER'S DEGREE IN COMPUTER ENGINEERING | 10/26/2017 | POLITECNICO DI TORINO

Thesis: Design of a high-performance tracking algorithm optimised for the Inner Tracking System of the ALICE experiment

Description: Optimisation of the particle tracking algorithm for the Inner Tracking System (ITS) the innermost detector of ALICE experiment at CERN. Starting from an existing algorithm implementation, both an optimised serial CPU version and a brand-new GPU parallelised version have been realised for this thesis work

Final grade: 110/110 cum laude

BACHELOR'S DEGREE IN COMPUTER ENGINEERING | 10/28/2014 | POLITECNICO DI TORINO

Final grade: 110/110 cum laude

HIGH SCHOOL DIPLOMA MATURITÀ DI LICEO SCIENTIFICO P.N.I. | 2011 | LICEO SCIENTIFICO STATALE NICCOLÒ COPERNICO

Final grade: 100/100

Research visits

BARCELONA SUPERCOMPUTING CENTER | 02/02/2019 – 26/03/2019 | PROF. ROSA M. BADIA SALA

Description: Visiting researcher under the HPC-Europa3 grant programme

Doctoral schools

- 15th International Summer School on Advanced Computer Architecture and Compilation for High-Performance Embedded Systems (ACACES 2019), Fiuggi, Italy
- Summer School: Behavioural Approaches for API-Economy with Applications (BehApi 2019), Leicester, England, United Kingdom

- 5th International Winter School on Big Data (BigDat 2019), Cambridge, England, United Kingdom

Professional experience

TEACHING SUPPORT (ART. 76) | 02/05/2022 – 30/06/2022 | UNIVERSITÀ DI TORINO

Description: 40 hours of teaching support for the “Architetture Degli Elaboratori” exam, academic year 2021/2022

RESEARCH FELLOW | 01/02/2022 – PRESENT | UNIVERSITÀ DI TORINO

Description: research in the field of Workflow Management Systems, with a specific focus on distributed workflow modelling, in the context of the ACROSS European Project (G.A. n.955648)

RESEARCH SCHOLARSHIP | 12/11/2021 – 31/01/2022 | UNIVERSITÀ DI TORINO

Description: research in the field of Workflow Management Systems, with a specific focus on distributed workflow modeling

TEACHING SUPPORT (ART. 76) | 19/04/2021 – 19/05/2021 | UNIVERSITÀ DI TORINO

Description: 40 hours of teaching support for the “Architetture Degli Elaboratori” exam, academic year 2020/2021

TEACHING SUPPORT (ART. 76) | 30/04/2020 – 30/06/2020 | UNIVERSITÀ DI TORINO

Description: 40 hours of teaching support for the “Architetture Degli Elaboratori” exam, academic year 2019/2020

PH.D. STUDENT IN MODELING AND DATA SCIENCE | 11/01/2018 – 30/10/2021 | UNIVERSITÀ DI TORINO

Description: research in structured parallel and distributed computing with a specific focus on the domain of distributed workflow modeling

DEVELOPER | 02/09/2015 – 09/14/2018 | AKTIVE REPLY SRL

Description: Implementation of Java based LMS (Learning Management System) web applications on top of Liferay, a modular framework mainly based on OSGi standard.

Employment relationship: Permanent employment

DEVELOPER | 07/07/2014 - 02/06/2015 | CONSULMAN SRL

Description: Development of a web application for automatic creation and correction of questionnaires

Employment relationship: External collaboration contract

DEVELOPER | 03/25/2014 - 06/12/2014 | CONSULMAN SRL

Description: Implementation of a set of Microsoft Office macros for automatic .doc and .xls processing

Employment relationship: Internship

Language skills

Mother tongue: Italian

Other languages:

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	B2	B2	B1	B1	B2

Language certificates:

- Preliminary English Test: Pass with Merit (92/100)

Open Source Software

- Creator and maintainer of **StreamFlow** (<https://streamflow.di.unito.it/>), a container-native Workflow Management System written in Python 3 and based on the Common Workflow Language (CWL) standard, which supports hybrid workflows and their execution on cloud/HPC infrastructures
- Creator and maintainer of **Jupyter Workflow** (<https://jupyter-workflow.di.unito.it>), an extension of the IPython kernel designed to support distributed literate workflows and to execute them in a distributed fashion on cloud/HPC infrastructures

Publications

JOURNAL ARTICLES

1. G. Agosta, M. Aldinucci, C. Alvarez, R. Ammendola, Y. Arfat, O. Beaumont, M. Bernaschi, A. Biagioni, T. Boccali, B. Bramas, C. Brandolese, B. Cantalupo, M. Carrozzo, D. Cattaneo, A. Celestini, M. Celino, **I. Colonnelli**, P. Cretaro, P. D'Ambra, M. Danelutto, R. Esposito, L. Eyraud-Dubois, A. Filgueras, W. Fornaciari, O. Frezza, A. Galimberti, F. Giacomini, B. Goglin, D. Gregori, A. Guermouche, F. Iannone, M. Kulczewski, F. Lo Cicero, A. Lonardo, A. R. Martinelli, M. Martinelli, X. Martorell, G. Massari, S. Montangero, G. Mittone, R. Namyst, A. Oleksiak, P. Palazzari, P. S. Paolucci, F. Reghenzani, C. Rossi, S. Saponara, F. Simula, F. Terraneo, S. Thibault, M. Torquati, M. Turisini, P. Vicini, M. Vidal, D. Zoni, G. Zummo, "Towards EXtreme scale technologies and accelerators for euROhpc hw/Sw supercomputing applications for exascale: The TEXTAROSSA approach," *Microprocessors and Microsystems*, vol. 95, p. 104679, 2022, ISSN 0141-9331. doi:10.1016/j.micpro.2022.104679.
2. **I. Colonnelli**, M. Aldinucci, B. Cantalupo, L. Padovani, S. Rabellino, C. Spampinato, R. Morelli, R. Di Carlo, N. Magini and C. Cavazzoni, "Distributed workflows with Jupyter", in *Future Generation Computer Systems*, doi: 10.1016/j.future.2021.10.007
3. O. D. Filippo, J. Kang, F. Bruno, J. Han, A. Saglietto, H. Yang, G. Patti, K. Park, R. Parma, H. Kim, L. D. Luca, H. Gwon, M. Iannaccone, W. J. Chun, G. Smolka, S. Hur, E. Cerrato, S. H. Han, C. di Mario, Y. B. Song, J. Escaned, K. H. Choi, G. Helft, J. Doh, A. T. Giachet, S. Hong, S. Muscoli, C. Nam, G. Gallone, D. Capodanno, D. Trabattoni, Y. Imori, V. Dusi, B. Cortese, A. Montefusco, F. Conrotto, **I. Colonnelli**, I. Sheiban, G. M. de Ferrari, B. Koo, and F. D'Ascenzo, "Benefit of extended dual antiplatelet therapy duration in acute coronary syndrome patients treated with drug eluting stents for coronary bifurcation lesions (from the BIFURCAT registry)," *The american journal of cardiology*, 2021. doi:10.1016/j.amjcard.2021.07.005
4. M. Aldinucci, V. Cesare, **I. Colonnelli**, A. R. Martinelli, G. Mittone, B. Cantalupo, C. Cavazzoni, and M. Drocco, "Practical parallelization of scientific applications with OpenMP, OpenACC and MPI," *Journal of parallel and distributed computing*, vol. 157, pp. 13-29, 2021. doi:10.1016/j.jpdc.2021.05.017
5. F. D'Ascenzo, O. De Filippo, G. Gallone, G. Mittone, M. A. Deriu, M. Iannaccone, A. Ariza-Solé, C. Liebetrau, S. Manzano-Fernández, G. Quadri, T. Kinnaird, G. Campo, J. P. Simao Henriques, J. M. Hughes, A. Dominguez-Rodriguez, M. Aldinucci, U. Morbiducci, G. Patti, S. Raposeiras-Roubin, E. Abu-Assi, G. M. De Ferrari, F. Piroli, A. Saglietto, F. Conrotto, P. Omedé, A. Montefusco, M. Pennone, F. Bruno, P. P. Bocchino, G. Boccuzzi, E. Cerrato, F. Varbella, M. Sperti, S. B. Wilton, L. Velicki, I. Xanthopoulou, A. Cequier, A. Iniguez-Romo, I. Munoz Pousa, M. Cespon Fernandez, B. Caneiro Queija, R. Cobas-Paz, A. Lopez-Cuenca, A. Garay, P. F. Blanco, A. Rognoni, G. Biondi Zoccai, S.

Biscaglia, I. Nunez-Gil, T. Fujii, A. Durante, X. Song, T. Kawaji, D. Alexopoulos, Z. Huczek, J. R. Gonzalez Juanatey, S. Nie, M. Kawashiri, **I. Colonnelli**, B. Cantalupo, R. Esposito, S. Leonardi, W. Grosso Marra, A. Chieffo, U. Michelucci, D. Piga, M. Malavolta, S. Gili, M. Mennuni, C. Montalto, L. Oltrona Visconti, and Y. Arfat, "Machine learning-based prediction of adverse events following an acute coronary syndrome (PRAISE): a modelling study of pooled datasets," *The Lancet*, vol. 397, iss. 10270, pp. 199-207, 2021. doi:10.1016/S0140-6736(20)32519-8

6. **I. Colonnelli**, B. Cantalupo, I. Merelli and M. Aldinucci, "StreamFlow: cross-breeding cloud with HPC," in *IEEE Transactions on Emerging Topics in Computing*, doi: 10.1109/TETC.2020.3019202.

CONFERENCE PROCEEDINGS

7. I. Colonnelli and M. Aldinucci, "HPC07 – Hybrid workflows for large – scale scientific applications," in *Sixth EAGE high performance computing workshop*, Milano, Italy, 2022, p. 1–5. doi:10.3997/2214-4609.2022615029
8. **I. Colonnelli**, B. Cantalupo, C. Spampinato, M. Pennisi, and M. Aldinucci, "Bringing ai pipelines onto cloud-hpc: setting a baseline for accuracy of covid-19 diagnosis," in *Enea cresco in the fight against covid-19*, 2021. doi:10.5281/zenodo.5151511
9. G. Agosta, W. Fornaciari, A. Galimberti, G. Massari, F. Reghenzani, F. Terraneo, D. Zoni, C. Brandolese, M. Celino, F. Iannone, P. Palazzari, G. Zummo, M. Bernaschi, P. D’Ambra, S. Saponara, M. Danelutto, M. Torquati, M. Aldinucci, Y. Arfat, B. Cantalupo, **I. Colonnelli**, R. Esposito, A. R. Martinelli, G. Mittone, O. Beaumont, B. Bramas, L. Eyraud-Dubois, B. Goglin, A. Guermouche, R. Namyst, S. Thibault, A. Filgueras, M. Vidal, C. Alvarez, X. Martorell, A. Oleksiak, M. Kulczewski, A. Lonardo, P. Vicini, F. L. Cicero, F. Simula, A. Biagioni, P. Cretaro, O. Frezza, P. S. Paolucci, M. Turisini, F. Giacomini, T. Boccali, S. Montangero, and R. Ammendola, "TEXTAROSSA: towards extreme scale technologies and accelerators for eurohpc hw/sw supercomputing applications for exascale," in *Proc. of the 24th euromicro conference on digital system design (DSD)*, Palermo, Italy, 2021. doi:10.1109/DSD53832.2021.00051
10. **I. Colonnelli**, B. Cantalupo, R. Esposito, M. Pennisi, C. Spampinato, and M. Aldinucci, "HPC Application Cloudification: The StreamFlow Toolkit," in *12th workshop on parallel programming and run-time management techniques for many-core architectures and 10th workshop on design tools and architectures for multicore embedded computing platforms (parma-ditam 2021)*, Dagstuhl, Germany, 2021, p. 5:1–5:13. Invited paper. doi:10.4230/OASICS.PARMA-DITAM.2021.5
11. V. Cesare, **I. Colonnelli** and M. Aldinucci, "Practical Parallelization of Scientific Applications," *2020 28th Euromicro International Conference on Parallel, Distributed and Network-Based Processing (PDP)*, Västerås, Sweden, 2020, pp. 376-384, doi: 10.1109/PDP50117.2020.00064.
12. 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.
13. M. Drocco, P. Viviani, **I. Colonnelli**, M. Aldinucci, and M. Grangetto, Accelerating spectral graph analysis through wavefronts of linear algebra operations, in *Proc. of 27th euromicro intl. conference on parallel distributed and network-based processing (pdp)*, Pavia, Italy, 2019, pp. 9-16.

BOOK CHAPTERS

14. E. Quiñones, J. Perales, J. Ejarque, A. Badouh, S. Marco, F. Auzanneau, F. Galea, D. González, J. R. Hervás, T. Silva, **I. Colonnelli**, B. Cantalupo, M. Aldinucci, E. Tartaglione, R. Tornero, J. Flich, J. M. Martinez, D. Rodriguez, I. Catalán, J. Garcia, and C. Hernández, "The DeepHealth HPC infrastructure: leveraging heterogenous HPC and cloud computing infrastructures for IA-based

medical solutions,” in *HPC, big data, and AI convergence towards exascale: challenge and vision*, O. Terzo and J. Martinovič, Eds., Boca Raton, Florida: CRC press, 2022, p. 191–216.

doi:10.1201/9781003176664

15. M. Aldinucci, D. Atienza, F. Bolelli, M. Caballero, **I. Colonnelli**, J. Flich, J. A. Gómez, D. González, C. Grana, M. Grangetto, S. Leo, P. López, D. Oniga, R. Paredes, L. Pireddu, E. Quiñones, T. Silva, E. Tartaglione, and M. Zapater, “The DeepHealth toolkit: a key european free and open-source software for deep learning and computer vision ready to exploit heterogeneous HPC and Cloud architectures,” in *Technologies and applications for big data value*, E. Curry, S. Auer, A. J. Berre, A. Metzger, M. S. Perez, and S. Zillner, Eds., Cham: Springer international publishing, 2022, p. 183–202. doi:10.1007/978-3-030-78307-5_9

Participation in research projects

EUROPEAN PROJECTS

- **European Pilot** (EC H2020 RIA, EuroHPC-02-2020, 42 months, total cost 30M€, G.A. n. 101034126)
- **EUPEX** (EC H2020 RIA, EuroHPC-02-2020): European Pilot for Exascale (2021, 48 months, total cost 41M€, G.A. n. 101033975).
- **TEXTAROSSA** (EC H2020 RIA, EuroHPC-01-2019): Towards EXtreme scale Technologies and Accelerators for euROhpc hw/Sw Supercomputing Applications for exascale (2021, 36 months, total cost 6M€, G.A. n. 956831).
- **ACROSS** (EC H2020 IA, EuroHPC-01-2019): HPC Big Data Artificial Intelligence cross-stack platform toward exascale (2021, 36 months, total cost 8M€, G.A. n. 955648). Role: Responsible for Task 4.4 (Improve reliability and productivity for upcoming exascale computing platform) on behalf of Università di Torino.
- **DeepHealth** (EC H2020 IA, ICT-2018-11): Deep-Learning and HPC to Boost Biomedical Applications for Health (2019, 36 months, total cost 14.8M€, G.A. 825111). Role: Responsible for Task 4.5 (Integration of libraries in OpenDeepHealth platform) on behalf of Università di Torino.

NATIONAL PROJECTS

- **HIWM** (CINECA IS CRA-C Project): Hybrid Interactive Workflow Models (2022, 9 months). Role: Principal Investigator
- **QWaaS** (CINECA IS CRA-C Project): Quantum Workflows as a Service (2021, 9 months). Role: Principal Investigator
- **HPC4AI** (Regione Piemonte, POR FESR Regione Piemonte): Turin’s centre in High-Performance Computing for Artificial Intelligence (2018, 24 months, total cost 4.5M€).

Program Committee Memberships

- 31st Euromicro International Conference on Parallel, Distributed, and Network-Based Processing (PDP 2023), Napoli, Italy
- 15th International Symposium on High-level Parallel Programming and Applications (HLPP 2022), Porto, Portugal
- 28th International European Conference on Parallel and Distributed Computing (Euro-Par 2022), Glasgow, Scotland, United Kingdom
- Malleability Techniques Applications in High-Performance Computing (HPCMALL 2022), Hamburg, Germany
- 11th International Conference on Image Processing Theory, Tools and Applications (IPTA 2022), Salzburg, Austria

- 27th International European Conference on Parallel and Distributed Computing (Euro-Par 2021), Lisbon, Portugal
- 27th IEEE International Conference on High Performance Computing, Data, and Analytics (HiPC 2020), Pune, India
- 9th International Conference on Image Processing Theory, Tools and Applications (IPTA 2019), Istanbul, Turkey

Review activity

- Reviewer for International Journal of Intelligent Systems, Hindawi, ISSN 1098-111X
- Reviewer for The Journal of Supercomputing, Springer, ISSN 1573-0484
- Reviewer for Parallel Computing, Elsevier, ISSN 0167-8191
- Reviewer for Software X, Elsevier, ISSN 2352-7110
- Reviewer for Software and Systems Modeling, Springer, ISSN 1619-1374
- Reviewer for Scientific Programming, Hindawi, ISSN 1875-919X

Grants and Achievements

- The article “Distributed workflows with Jupyter” has been selected by the Future Generation Computer Systems journal as **Fall 2002 Editor’s Choice**
- Member of the **Common Workflow Language (CWL) Technical committee**, responsible for approving new versions of the CWL standards before that proposal goes to the CWL Leadership Team for the final vote
- Selected as **HPC-Europa3 grant recipient** for a 13 weeks visit to Barcelona Supercomputing Center, Spain (then reduced to 56 days due to COVID-19 pandemic)
- Selected as **HiPEAC grant recipient** for attending the 15th International Summer School on Advanced Computer Architecture and Compilation for High-performance Embedded Systems (ACACES 2019) in Fiuggi, Italy

Talks

- **I. Colonnelli** and M. Aldinucci, Hybrid workflows for large-scale scientific applications, *6th EAGE High Performance Computing Workshop*, Milano, Italy, Sep, 2022.
- **I. Colonnelli**, B. Cantalupo, D. Medić, and M. Aldinucci, Hybrid workflows for heterogeneous distributed computing, *3rd Italian Workshop on HPC (ITWSHPC)*, Torino, Italy, Sep, 2022.
- **I. Colonnelli** and M. Aldinucci, CINI HPC-KTT: HPC Key Technologies and Tools national lab, *NVIDIA HPC Roundtable*, Casalecchio di Reno, Italy, Invited talk, Sep, 2022.
- **I. Colonnelli** and D. Tranchitella, Dossier: multi-tenant distributed Jupyter Notebooks, *DoK Talks 141*, Virtual event, Invited talk, July, 2022.
- **I. Colonnelli**, StreamFlow, *2nd HealthyCloud Workshop: Analysis of existing orchestration mechanisms for distributed computational analyses*, Virtual event, Invited talk, July, 2022.
- **I. Colonnelli** and M. Aldinucci, T4.1: streaming models, *TEXTAROSSA General Meeting*, Roma, Italy, June, 2022.
- **I. Colonnelli**, StreamFlow: a topology-aware WMS, *ELIXIR Cloud, Data & AAI Bi-weekly Technical Calls*, Virtual event, Invited talk, June, 2022.
- **I. Colonnelli**, StreamFlow: a framework for hybrid workflows, *EUPEX WP5 bi-weekly meeting*, Virtual event, April, 2022.
- **I. Colonnelli** and D. Tranchitella, OpenDeepHealth: crafting a deep learning platform as a service with Kubernetes, *Jon The Beach 2022*, Malaga, Spain, April, 2022.

- **I. Colonnelli**, Distributed workflows with Jupyter, *J on The Beach 2022*, Malaga, Spain, Workshop, April, 2022.
- **I. Colonnelli**, StreamFlow: a framework for hybrid workflows, *ACROSS WP4 meeting*, Virtual event, February, 2022.
- **I. Colonnelli**, The OpenDeepHealth toolkit, *DeepHealth Winter School*, Torino, Italy, January, 2022.
- **I. Colonnelli**, StreamFlow: a framework for hybrid workflows, *ACROSS WP4 meeting*, Virtual event, October, 2021.
- **I. Colonnelli**, HPC containers, *ACROSS WP4 meeting*, Virtual event, July, 2021.
- M. Aldinucci and **I. Colonnelli**, The universal cloud-HPC pipeline for the AI-assisted explainable diagnosis of COVID-19 pneumonia, *Nvidia GTC'21*, Virtual event, Invited talk, April, 2021.
- **I. Colonnelli**, StreamFlow: cross breeding cloud with HPC, *2021 CWL Mini Conference*, Virtual event, Invited talk, February, 2021.
- **I. Colonnelli** and S. Rabellino, JupyterFlow: Jupyter Notebooks su larga scala, *Workshop GARR 2020*, Virtual event, November, 2020.
- **I. Colonnelli**, StreamFlow: cross breeding cloud with HPC, *HPC-Europa3 2nd Transnational Access Meeting (TAM)*, Virtual event, Invited talk, October, 2020.
- **I. Colonnelli**, StreamFlow: un approccio dichiarativo a workflow e pipeline di micro-servizi, *Workshop GARR 2019*, Roma, Italy, October, 2019.
- **I. Colonnelli**, Deep learning at scale, *27th Euromicro International Conference on Parallel, Distributed and Network-based Processing (PDP 2019)*, Pavia, Italy: IEEE, February, 2019.
- **I. Colonnelli**, Accelerating spectral graph analysis through wavefronts of linear algebra operations, *27th Euromicro International Conference on Parallel, Distributed and Network-based Processing (PDP 2019)*, Pavia, Italy: IEEE, February, 2019.