Giuseppe Alessio D'Inverno

Curriculum Vitae

August 19, 2023

Personal data

Birth Date: December 27, 1993
Gender: M
Nationality: Italian
Address: Via Tirso 10, Grosseto (GR), 58100,

Italy
Scopus Author ID: 57350946700
ORCID ID: 0000-0001-7367-4354
✉ dinverno@diism.unisi.it

Education

17/04/2020 **Master Degree in Applied Mathematics**, *University of Siena*, Italy, 110/110 cum laude
Thesis: "*Towards the determination of threshold in neural networks*"

22/02/2018 **Bachelor Degree in Mathematics**, *University of Siena*, Italy, 110/110 cum laude
Thesis: "*Studio della decomposizione ai valori singolari applicata alla ricostruzione di modelli 3D (A study on singular value decomposition and its application on 3D Models Reconstruction)*"

26/11/2015 **Bachelor Degree in Violin**, *Conservatorio "R. Franci"*, Italy, 106/110
Thesis: "*La seconda sonata per violino BWV 1003 di J. S. Bach: Isotropia polifonica e sintassi tonale. (J.S.Bach Second Violin Sonata BWV 1003: Polyphonical isotropy and tonal syntax)*"

04/07/2012 **Upper secondary school diploma**, *Liceo Scientifico "P. Aldi" of Grosseto*, Italy, 100/100 cum laude

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Grants and Fellowships

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18-22/10/2023 **Grant "Organizzazione Convegni Scuole e Workshop" (CUP E53C22001930001), Gruppo Nazionale Calcolo Scientifico, INdAM**, *Italy*

11/2020–10/2023 **Ph.D. Full Scholarship in Information Engineering & Science (XXXVI cycle)**, *Department of Information Engineering and Mathematics, University of Siena*, Italy

Research interests

Mathematical Foundations of Deep Learning - Graph Representation Learning - Numerical modeling for PDEs - Physics Informed Neural Networks

Publications

Peer–reviewed Journals

1. Falini, A., D'Inverno, G. A., Sampoli, M. L., Mazzia, F., **2023**. "Splines Parameterization of Planar Domains by Physics-Informed Neural Networks", *Mathematics*, 11(10), 2406, https://doi.org/10.3390/math11102406

2. D'Inverno, G. A., Brunetti, S., Sampoli, M. L., Muresanu, D. F., Rufa, A., Bianchini, M., **2021**. "Visual Sequential Search Test Analysis: An Algorithmic Approach", *Mathematics*, 9(22), 2952, https://doi.org/10.3390/math9222952

Submitted

1. "Weisfeiler–Lehman goes Dynamic: An Analysis of the Expressive Power of Graph Neural Networks for Attributed and Dynamic Graphs" (with Beddar-Wiesing, S., Graziani, C., Lachi, V., Moallemy-Oureh, A., Scarselli and F., Thomas, J. M.) *Revise and resubmit,* Neural Networks

2. "On the approximation capability of GNNs in node classification/regression tasks" (with Sampoli M.L., Bianchini M. and Scarselli F.) *Under review,* Soft Computing

3. "Generalization Limits of Graph Neural Networks in Identity Effects Learning" (with Brugiapaglia S. and Ravanelli M.). *Under review,* IEEE Transaction on Neural Networks & Learning Systems, Special Issue: Graph Learning

Teaching experience

Bachelor and master level

16/04/2019	**Invited lesson for the course of "Numerical Analysis" for the Master in Applied Mathematics**, *University of Siena*, Siena,Italy
10/2020–02/2022	**Teaching Assistant for the Linear Algebra undergraduate course (Fall 2020, 2021, 2022)**, *Department of Information Engineering and Mathematics, University of Siena*, Siena, Italy
10/2021–02/2022	**Teaching Assistant for the Numerical Calculus undergraduate course (Fall 2021, 2022)**, *Department of Information Engineering and Mathematics, University of Siena*, Siena, Italy
03/2021–07/2022	**Teaching Assistant for the Mathematical Analysis 2 undergraduate course (Spring 2021, 2022)**, *Department of Information Engineering and Mathematics, University of Siena*, Siena, Italy

Research Stays

02/2023–05/2023	**Visiting scholar**, *Montréal Institute for Learning Algorithms (MILA) & Université de Montréal , Montréal*, Canada, hosts Prof. Mirco Ravanelli & Simone Brugiapaglia

05/2022–09/2022 **Visiting scholar**, *Biomedical Imaging Group, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne*, Switzerland, host Prof. Michael Unser

Conferences, workshops and seminars

Invited talks

05/08/2023 **Seminar "Learning Identity Effects with Graph Neural Networks"**, *AI Trento Journal Club, University of Trento*, Trento, Italy

23/05/2023 **Seminar "Learning Identity Effects with Graph Neural Networks"**, *CMR, Concordia University*, Montréal, Canada

16/05/2022 **Seminar "The expressive power of Graph Neural Networks – A unifying point of view"**, *Biomedical Imaging Lab, EPFL*, Lausanne, Switzerland

23/02/2022 **Seminar "The expressive power of Graph Neural Networks – A unifying point of view"**, *University of Kassel* , Kassel, Germany

16/02/2022 **Seminar "The expressive power of Graph Neural Networks – A unifying point of view"**, *University of Roma "La Sapienza"*, Roma, Italy

Organizer

18–22/09/2023 **Third Young Applied Mathematicians Conference**, *University of Siena*, Italy, with G. Auricchio, C. Graziani, V. Lachi, F. Locatelli, G. Loli, L. Zambon

Conferences and workshops

1. Attended 21th AIxIA Conference, Udine (UD), November 28-30, 2022

2. Oral presentation, Workshop "Matematica per l'Intelligenza Artificiale ed il Machine Learning – Giovani Ricercatori", Torino (TO), November 24-26, 2022

3. Oral presentation, GIMC-SIMAI Young 2022, Pavia (PV), September 29-30, 2022

4. Oral presentation, SMART 2022, Rimini(RI), September 20-24, 2022

5. Oral presentation, 2nd Young Applied Mathematicians Conference, Arenzano(GE), September 18-19, 2022

6. Poster presentation, Isaac Newton Institute for Mathematical Sciences, Cambridge (UK), February 28 - March 2, 2022

7. Oral presentation, 20th International Conference of the Italian Association for Artificial Intelligence (online) , October 29, 2021

8. Oral presentation, ACDL 2021, Certosa di Pontignano (SI), July 19-23, 2021

Journal activities

Referee work

IEEE Transaction on Neural Network and Learning Systems, Neural Networks, Neurocomputing, Opuscula Mathematica, International Journal of Knowledge–Based and Intelligent Engineering Systems

Research projects

05–12/2022 **Collaboration on the project ""** , *Gruppo Nazionale di Calcolo Scientifico, INdAM*, Italy

Educational activities

18–30/07/2023 **Summer School on Physics Informed Neural Networks and Applications**, *KTH*, Stockholm, Sweden

29/06–01/07/2022 **Summer Research Institute 2022 - Learning: Optimization and Stochastics**, *EPFL*, Lausanne, Switzerland

28/02–04/03/2022 **Lectures on Mathematics of Deep Learning**, *Isaac Newton Institute for Mathematical Sciences*, Cambridge, United Kingdom

26–30/07/2021 **DeepLearn 2021**, Las Palmas di Gran Canaria, Spain

19–23/07/2021 **Advanced Course on Data science & Machine Learning (ACDL) 2021**, Certosa di Pontignano (SI), Italy

21–25/06/2021 **Regularization Methods for Machine Learning (RegML) 2021**, *MalGA, University of Genova*, online

Further information

Scientific Associations

○ *Società Italiana di Matematica Applicata e Industriale* (SIMAI), Young Member (2022-)

○ *"AI&ML&MATH Group", Unione Matematica Italiana* (UMI) (2021-)

○ *Gruppo Nazionale di Calcolo Scientifico (GNCS), Istituto Nazionale di Alta Matematica* (INdAM), Young Member (2020-)

Professional Experience

01/09/2021 –	**Maths & Physics Teacher**, *Liceo Statale "A. Rosmini"*, Grosseto, Italy
07/01 – 06/02 /2020	**Violin Teacher**, *Istituto di Istruzione Superiore Polo "Luciano Bianciardi"*, Grosseto, Italy
11/2019 – 06/2020	**Violin Teacher**, *Fondazione Grosseto Cultura*, Grosseto, Italy
2021 –	**Second Section violin player**, *Ensemble Symphony Orchestra*, Massa, Italy
2020 –	**First Section violin player**, *Orchestra AMAT*, Firenze, Italy
2018 –	**First Section violin player**, *Filharmonie Orchestra*, Campi Bisenzio (FI), Italy
2016–2023	**External adjoint violin player**, *Conservatorio "R. Franci"*, Siena, Italy
2012 –	**First Section violin player**, Orchestra Filarmonica di Lucca, Lucca, Italy
2010 –	**First Section violin player**, *Orchestra Città di Grosseto*, Grosseto, Italy

Professional activities and projects

10/2021	**Hackaton 4 Rare Diseases – Winner (Team "Power rAIngers")** , Firenze, Italy
2016 – 2023	**"Pint of Science", Local Team Collaborator(2016–2019), Local Team Leader (2020-2023)**, Siena, Italy
2011 – 2014	**Youth National Lead Collaborator Società "Dante Alighieri"**, Roma, Italy
2009-2011	**Olimpiadi della Matematica, National Round, Group Cathegory (2009-2011), Individual Cathegory (2011)** , Cesenatico (RI), Italy

Computer skills and competencies

○ R, HTML, Javascript, C, C++ : basic knowledge

○ Python, Matlab: proficient knowledge

○ Java: Experis Back-End developer course (06-07/2020)

○ ECDL certification

Language competences

Italian (Mother tongue), English (Proficient: C1 Cambridge Certificate, Grade: 198/210), French (Independent)

References

Prof. Dr. **Maria Lucia Sampoli**
  Associate Professor in Numerical Analysis
  Department of Information Engineering and Mathematics, University of Siena
  Via Roma 56, 53100 Siena, Italy
  ✉ marialucia.sampoli@unisi.it

Prof. Dr. **Simone Brugiapaglia**
    Associate Professor in Numerical Analysis
    Interim Director of the Applied Math Laboratory of the Centre de Recherches Mathématiques
        Department of Mathematics and Statistics, Concordia University
        1400 De Maisonneuve Blvd. W. Montreal, QC H3G IM8, Montréal, Canada
    ✉ simone.brugiapaglia@concordia.ca

Prof. Dr. **Mirco Ravanelli**
    Assistant Professor in Deep Learning
    Associate Member at Montréal Institute for Learning Algorithms (MILA)
        Gina Cody School of Engineering & Computer Science
        1455 De Maisonneuve Blvd. W. Montreal, QC H3G 1M8, Montréal, Canada
    ✉ mirco.ravanelli@gmail.com