Davide Boscaini, Ph.D.

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About

I'm a tenure-track research scientist at the Technologies of Vision research unit of the Fondazione Bruno Kessler in Trento, Italy. I received a PhD in Computational Science from the Università della Svizzera italiana in Lugano, Switzerland, in 2017. During my PhD, under the supervision of prof. Michael Bronstein, my research focused on extending deep learning techniques to geometric domains such as 3D shapes and graphs, contributing to the birth of a new research direction called Geometric Deep Learning. Prior to that, I obtained an M.S. in Mathematics from the University of Verona, Italy, in 2013, and a B.S. in Applied Mathematics from the same institution in 2010.

My research interests are in 3D perception and understanding, with a focus on object 6D pose estimation. According to Google Scholar, I have an h-index of 13, an i10-index of 14 and my papers have been cited more than 5000 times.

Education

Ph.D. in Computational Science — Sep. 2013 – Sep. 2017
Università della Svizzera italiana — *Lugano, Switzerland*
Dissertation on "Geometric Deep Learning for Shape Analysis". Advisor: M.M. Bronstein. Co-advisor: J. Masci. Examiners: J. Schmidhuber, M. Ovsjanikov, P. Vandergheynst, K. Hormann

M.S. in Mathematics — Oct. 2010 – Mar. 2013
University of Verona — *Verona, Italy*
Dissertation on "Spectral Methods for Shape Analysis". Advisor: G. Orlandi. Co-advisor: U. Castellani

B.S. in Applied Mathematics — Sep. 2007 – Oct. 2010
University of Verona — *Verona, Italy*
Dissertation on "Existence and multiplicity of the solutions of the Plateau problem". Advisor: S. Baldo

Publications

Wild Berry image dataset collected in Finnish forests and peatlands using drones — ECCV-W 2024
L. Riz, S. Povoli, A. Caraffa, D. Boscaini, M.L. Mekhalfi, P. Chippendale, M. Turtiainen, B. Partanen, L.S. Ballester, F.B. Noguera, A. Franchi, E. Castelli, G. Piccinini, L. Marchesotti, M.S. Couceiro, F. Poiesi

FreeZe: Training-free zero-shot 6D pose estimation with geometric and vision foundation models — ECCV 2024
A. Caraffa, D. Boscaini, A. Hamza, F. Poiesi
An early version of this work won the "Best method on TUD-L dataset" award at the BOP Challenge 2023

Exploring fine-grained retail product discrimination with zero-shot object classification using Vision-Language Models — RTSI 2024
A. Tur, A. Conti, C. Beyan, D. Boscaini, R. Larcher, S. Messelodi, F. Poiesi, E. Ricci

Open-vocabulary object 6D pose estimation — CVPR 2024
J. Corsetti, D. Boscaini, C. Oh, A. Cavallaro, F. Poiesi
First open-vocaulary setting for object 6D pose estimation. Highlight poster (acceptance rate 2.8%)

Tracciamento 3D della palla da punti di vista multipli nella pallavolo — Ital-IA 2024
L. Riz, S. Povoli, D. Boscaini, S. Messelodi, F. Poiesi
Selected for oral presentation

Detect, Augment, Compose, and Adapt: Four steps for unsupervised domain adaptation in object detection — BMVC 2023
M.L. Mekhalfi, D. Boscaini, F. Poiesi

Revisiting Fully Convolutional Geometric Features for object 6D pose estimation — ICCV-W 2023
J. Corsetti, D. Boscaini, F. Poiesi

PatchMixer: Rethinking network design to boost generalization for 3D point cloud understanding — IMAVIS, 2023
D. Boscaini, F. Poiesi
Novel network design that is intrinsically effective in generalisation across datasets unseen at training time

Supervised tractogram filtering using geometric deep learning MIA, 2023
P. Astolfi, R. Verhagen, L. Petit, E. Olivetti, S. Sarubbo, J. Masci, D. Boscaini, P. Avesani

The MONET dataset: Multimodal drone thermal dataset recorded in rural scenarios CVPR-W 2023
L. Riz, A. Caraffa, M. Bortolon, M.L. Mekhalfi, D. Boscaini, A. Moura, J. Antunes, A. Dias, H. Silva, A. Leonidou, C. Constantinides, C. Keleshis, D. Abate, F. Poiesi

Learning general and distinctive 3D local deep descriptors for point cloud registration TPAMI, 2023
F. Poiesi, D. Boscaini
State-of-the-art performance for point cloud registration in the transfer learning setting across 3DMatch, ETH, and Kitti datasets

Localisation of defects in volumetric CT scans of valuable wood logs ICPR-W 2020
D. Boscaini, F. Poiesi, S. Messelodi, A. Younes, D. Grande
Selected for oral presentation

Joint supervised and self-supervised learning for 3D real-world challenges ICPR 2020
A. Alliegro, D. Boscaini, T. Tommasi
Selected for oral presentation (4.4% accaptance rate)

Distinctive 3D local deep descriptors ICPR 2020
F. Poiesi, D. Boscaini

Shape consistent 2D keypoint estimation under domain shift ICPR 2020
L.O. Vasconcelos, M. Mancini, D. Boscaini, S. Rota Bulò, B. Caputo, E. Ricci

Novel-view human action synthesis ACCV 2020
M. Lakhal, D. Boscaini, F. Poiesi, O. Lanz, A. Cavallaro

Clustered dynamic graph CNN for biometric 3D hand shape recognition IJCB 2020
J. Svoboda, P. Astolfi, D. Boscaini, J. Masci, M.M. Bronstein

Tractogram filtering of anatomically non-plausible fibers with geometric deep learning MICCAI 2020
P. Astolfi, R. Verhagen, L. Petit, E. Olivetti, J. Masci, D. Boscaini, P. Avesani

Self-supervision for 3D real-world challenges ECCV-W 2020
A. Alliegro, D. Boscaini, T. Tommasi

Deciphering interaction fingerprints from protein molecular surfaces Nature Methods, 2020
P. Gainza, F. Sverrisson, F. Monti, E. Rodolà, D. Boscaini, M.M. Bronstein, B.E. Correira
Advertised on the cover of the Feb 2020 issue of the journal

Learning interaction patterns from surface representations of protein structure NeurIPS-W 2019
P. Gainza, F. Sverrisson, F. Monti, E. Rodolà, D. Boscaini, M.M. Bronstein, B.E. Correira

Structured domain adaptation for 3D keypoint estimation 3DV 2019
L.O. Vasconcelos, M. Mancini, D. Boscaini, B. Caputo, E. Ricci
Selected for oral presentation

3D shape segmentation with geometric deep learning ICIAP 2019
D. Boscaini, F. Poiesi
Selected for spotlight presentation

Geometric deep learning on graphs and manifolds using mixture model CNNs CVPR 2017
F. Monti*, D. Boscaini*, J. Masci, E. Rodolà, J. Svoboda, M.M. Bronstein
Selected for oral presentation. First unified framework able to generalize CNN architectures to non-Euclidean domains such as shapes and graphs. Also available as technical report: arXiv:1611.08402. (indicates equal contribution)*

Geometric deep learning SIGGRAPH Asia Courses 2016
J. Masci, E. Rodolà, D. Boscaini, M.M. Bronstein, H. Li

Learning shape correspondence with anisotropic convolutional neural networks NeurIPS 2016
D. Boscaini, J. Masci, E. Rodolà, M.M. Bronstein
Presented also as a poster at the 3D Deep Learning Workshop (3DLL) 2016. Also available as technical report: arXiv:1605.06437

Anisotropic diffusion descriptors CGF, 2016
D. Boscaini, J. Masci, E. Rodolà, M.M. Bronstein, D. Cremers
Oral presentation at EUROGRAPHICS 2016

Geodesic convolutional neural networks on Riemannian manifolds ICCV-W 2015
J. Masci*, D. Boscaini*, M.M. Bronstein, P. Vandergheynst
Oral presentation at 3DRR 2015. It represents the first intrinsic extension of the popular CNN paradigm to non-Euclidean domains. An early version of this work was published as the technical report: arXiv:1501.06297 on January 2015. (indicates equal contribution)*

Learning class-specific descriptors for deformable shapes using localized spectral convolutional networks CGF, 2015
D. Boscaini, J. Masci, S. Melzi, M.M. Bronstein, U. Castellani, P. Vandergheynst
Oral presentation at SGP 2015

Shape-from-operator: Recovering shapes from intrinsic operators CGF, 2015
D. Boscaini, D. Eynard, D. Kourounis, M.M. Bronstein
Oral presentation at EUROGRAPHICS 2015. First approach able to synthesize the extrinsic geometry of a shape from intrinsic information. An early version of this work was published as the technical report: arXiv:1406.1925 on June 2014

Coulomb shapes: Using electrostatic forces for deformation-invariant shape representation EUROGRAPHICS-W 2014
D. Boscaini, R. Girdziusas, M.M. Bronstein
Oral presentation at 3DOR 2014. Presented also as a poster at the International Computer Vision Summer School (ICVSS), 2014

A sparse coding approach for local-to-global 3D shape description The Visual Computer, 2014
D. Boscaini, U. Castellani
Invited paper. Journal extension of the 3DOR 2013 conference paper

Local signatures quantization by sparse coding EUROGRAPHICS-W 2013
D. Boscaini, U. Castellani
Oral presentation at 3DOR 2013. Presented also as a poster at SGP 2013

Patents

US patent application No. 17675011
Clustered dynamic graph convolutional neural network for biometric 3D hand recognition
Inventors: J. Svoboda, P. Astolfi, D. Boscaini, J. Masci

US patent No. 10210430 Filed Feb. 19, 2019
System and a method for learning features on geometric domains (CIP)
Inventors: M.M. Bronstein, D. Boscaini, F. Monti • Acquired by Twitter Inc.

US patent No. 10013653 Filed Jul. 3, 2018
System and a method for learning features on geometric domains
Inventors: M.M. Bronstein, D. Boscaini, J. Masci, P. Vandergheynst • Acquired by Twitter Inc.

Invited talks

Object 6D pose estimation in the foundation models era Jun. 6, 2024
Politecnico di Torino, Torino, Italy • Invited by Francesca Pistilli

3D object understanding on the shoulders of 2D foundation models Mar. 28, 2024
École Polytechnique, Paris, France • Invited by Maks Ovsjanikov

3D deep learning to the test of real-world challenges Dec. 11, 2020
Ph.D. Event: Visions of Tomorrow; University of Pisa, Pisa, Italy

3D Deep Learning Dec. 11, 2019
Politecnico di Torino, Torino, Italy • Invited by Tatiana Tommasi

Geometric deep learning for 3D shape analysis May 13, 2019
Politecnico di Torino, Torino, Italy • Invited by Barbara Caputo

Geometric deep learning for shape analysis Sep. 2, 2017
EUSIPCO 2017, Kos, Greece

Geometric deep learning for shape analysis Apr. 4, 2017

TeV group (FBK), Trento, Italy • Invited by Samuel Rota Bulò and Stefano Messelodi

Geometric deep learning for shape analysis — Feb. 13, 2017
IMATI group (CNR), Genoa, Italy • Invited by Michela Spagnuolo

Deep learning on geometric data — Feb. 16, 2016
SSSTC RiC big data research workshop, Zurich, Switzerland

Deep learning on geometric data — Feb. 8, 2016
Embedded Vision Systems (eVS), Verona, Italy • Invited by Roberto Marzotto

Deep learning on geometric data — Feb. 4, 2016
Rainbow group, University of Cambridge, UK • Invited by Flora Tasse

Deep learning on geometric data — Feb. 3, 2016
C.A.K.E. seminar, University of Cambridge, UK • Invited by Simone Parisotto

Convolutional neural networks on non-Euclidean domains — Sep. 14, 2015
SciCADE 2015, Potsdam, Germany

Shape-from-operators: recovering shapes from intrinsic differential operators — Nov. 26, 2014
TUM, Munich, Germany • Invited by Emanuele Rodolà

Shape-from-operators: recovering shapes from intrinsic differential operators — Aug. 19, 2014
ICS retreat, Disentis, Switzerland

Teaching experience

Academic courses

Trends and Applications in Computer Vision — University of Trento, Fall 2023

Short courses and tutorials

Functional Maps: A Flexible Representation for Learning and Computing Correspondences — 3DV 2018
Geometric Deep Learning — SIGGRAPH Asia 2016
Deep Learning for Shape Analysis — EUROGRAPHICS 2016

Teaching Assistantships

Computer Vision and Pattern Recognition — Università della Svizzera italiana, Spring 2017
Computer Vision and Pattern Recognition — Università della Svizzera italiana, Spring 2016
Large Scale Optimization — Università della Svizzera italiana, Spring 2016
Computer Graphics — Università della Svizzera italiana, Fall 2014
Geometric Image Processing and Computer Vision — Università della Svizzera italiana, Spring 2014
Calculus — Università della Svizzera italiana, Fall 2013
Mathematical Analysis 1, Mathematical Analysis 2 — University of Verona, 2012–2013
Mathematical Analysis 1, Mathematical Analysis 2 — University of Verona, 2011–2012
Mathematical Analysis 1 — University of Verona, 2010–2011

Student supervision

Jaime Corsetti, PhD student at FBK, UNiTN — Nov. 2023–present
Role: PhD coadvisor

Matteo Minardi, Master student at UNiTN — Mar. 2024–present
Role: Internship advisor, Master thesis advisor

Mattia Nardon, Master student at UNiTN — Mar. 2024–present
Role: Internship advisor, Master thesis advisor

Alice Fasoli, Master student at UNiTN — Mar. 2024–present
Role: Internship advisor, Master thesis advisor

Jaime Corsetti, Master student at University of Trento — 2022–Oct. 2023
Projects: Open-vocabulary and Supervised object 6D pose estimation for RGBD images

Safa Abbes, Master student at University of Trento — 2022–2023
Role: Masther thesis coadvisor · Project: Self-supervised domain adaptation for RGB images

Antonio Alliegro, PhD student at Politecnico di Torino 2020–2021
Project: Self-Supervised domain adaptation for 3D point clouds
Pietro Astolfi, PhD student at FBK, UniTN, and IIT 2019–2021
Role: PhD coadvisor · Project: Geometric Deep Learning for brain structure analysis
Levi O. Vasconcelos, PhD student at UniTN and IIT 2019–2020
Project: Structured domain adaptation
Antonio Alliegro, Master student at Politecnico di Torino 2019–2020
Role: Masther thesis coadvisor
Piero Cavalcanti, Master student at Politecnico di Torino 2019–2020
Role: Masther thesis coadvisor
Myriam Bronstein, Master student at Università della Svizzera italiana 2016
Project: Machine learning methods on manifolds and graphs
Fatemeh Chegini, Master student at Università della Svizzera italiana 2014–2015
Project: Spectral methods for cross-modal retrieval

Academic service

Conferences revision activity

International Conference on Robotics and Automation (ICRA) 2022, 2020
International Conference on Pattern Recognition (ICPR) 2022, 2020
Symmetry and Geometry in Neural Representations (NeurIPS Workshops) 2022
International Conference on Image Analysis and Processing (ICIAP) 2022
International Conference on Machine Learning, Optimization, and Data Science (LOD) 2022
Symposium On Applied Computing (SAC) 2022
International Conference on 3D Vision (3DV) 2021, 2020, 2019, 2018
International Conference on Machine Learning, Optimization, and Data Science (LOD) 2021
International Conference on Machine Vision Applications (MVA) 2021, 2019
EUROGRAPHICS 2019, 2017, 2015
The British Machine Vision Conference (BMVC) 2018
Computer Vision and Pattern Recognition (CVPR) 2017
International Symposium on Vision, Modeling and Visualization (VMV) 2016
Neural Information Processing Systems (NeurIPS) 2016

Journal revision activity

Robotics and Automation Letters (RAL) 2022
Computer Graphics Forum (CGF) 2022
IEEE Transactions on Image Processing (TIP) 2022, 2021
IEEE Transactions on Transactions on Knowledge and Data Engineering (TKDE) 2022, 2021
Neural Processing Letters (NEPL) 2022
IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI) 2021, 2020
IEEE Transactions on Visualization and Computer Graphics (TVCG) 2020, 2018, 2017
Computers and Graphics 2019
Computer Vision and Image Understanding (CVIU) 2019, 2015
International Journal of Machine Learning and Cybernetics (JMCL) 2019
Pattern Recognition Letters 2019
The Visual Computer Journal (TVCJ) 2018, 2017, 2016
Computer Aided Geometric Design (CAGD) 2018
Computer-Aided Design (CAD) 2018
Sensors 2018
IPSJ Transactions on Computer Vision and Applications 2017

Area chair

British Machine Vision Conference (BMVC) 2024

Program committee

Graph Models for Learning and Recognition (GMLR) 2022

Organized within the 37th ACM Symposium on Applied Computing, Brno (Czech Republic)