PERSONAL INFORMATION

Lamberto Ballan, Ph.D.

(Last Update: 2025/5)

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RESEARCH PROFILE

My primary research area is computer vision, closely integrated with machine learning and multimedia, and specifically focused on exploiting big data for visual recognition problems. I am currently an Associate Professor of Computer Science at the University of Padova, Italy, where I lead the Visual Intelligence and Machine Perception (VIMP) group. Previously, I was a Senior Postdoctoral Researcher in the Artificial Intelligence Lab at Stanford University, working with Fei-Fei Li and Silvio Savarese, and Univ. of Florence, Italy, supported by a prestigious Individual Marie Curie Fellowship from the European Commission. I received my Ph.D. in Computer Engineering from the University of Florence in 2011, advised by Alberto Del Bimbo, and I was a visiting scholar at Telecom ParisTech, France, in 2010. I have published more than 70 papers in the most prestigious journals and conferences in computer vision, pattern recognition, multimedia and image processing. I received the IVC best paper award 2021, and I have been an ELLIS member since 2021.

WORK EXPERIENCE

2020/10 – present

Associate Professor
University of Padova, Italy – CS, Dipartimento di Matematica "Tullio Levi-Civita"
P.I. of the *Visual Intelligence and Machine Perception (VIMP) group*   (2017/10 -)
Study program Director, *M.Sc. Program in Data Science (LM-Data)*   (2024/10 -)

2017/10 – 2020/09

Assistant Professor (Tenure Track / RTDb L.240/2010)
University of Padova, Italy – CS, Dipartimento di Matematica "Tullio Levi-Civita"
P.I. (and founder) of the *Visual Intelligence and Machine Perception (VIMP) group*
Director of the *Data Science Joint-Lab UniPD-FBK* (a joint lab between UniPD & FBK, Trento)

2016/10 – 2017/09

Marie Curie Fellow / Senior Postdoctoral Researcher
University of Florence, Italy – Media Integration and Communication Center (MICC)
P.I. of the *EC-MSCA EAGLE project* | Advisor: Prof. A. Del Bimbo

2014/10 – 2016/09

Marie Curie Fellow / Senior Postdoctoral Researcher
Stanford University, CA, USA – AI Lab, Computer Science Department
P.I. of the *EC-MSCA EAGLE project* | Advisors: Profs. L. Fei-Fei, S. Savarese

2011/01 – 2014/09

Postdoctoral Researcher
University of Florence, Italy – Media Integration and Communication Center (MICC)
Advisor: Prof. A. Del Bimbo

2010/04 – 2010/07

Visiting Scholar
Telecom ParisTech, France – Image, Data & Signal Department (Advisor: Dr. Hichem Sahbi)

2007/03 – 2010/12

Research Assistant / Ph.D. Student
University of Florence, Italy – Media Integration and Communication Center (MICC)

EDUCATION AND TRAINING

2011/04

Ph.D. in Computer Engineering, Multimedia and Telecommunication
University of Florence – Media Integration and Communication Center (MICC)
Thesis: "Object and event recognition in multimedia archives using local visual features"
Advisor: Prof. A. Del Bimbo

2006/12

Laurea Degree (M.Sc. equivalent) in Computer Engineering
University of Florence, Italy

HONORS, AWARDS AND SCHOLARSHIPS

2019/09, 2021/05	<u>ASN – Italian Habilitation as Full Professor of Computer Science</u> (01/B1), and Computer Engineering and Information Processing Systems (09/H1)
2021/12	Outstanding Associate Editor Award, IEEE Transactions on Multimedia 2021
2021/05	<u>Image and Vision Computing Best Paper Award 2021</u> (best paper among the works published in the journal over the past three years) [A14]
2020/12	Outstanding Associate Editor Award, IEEE Transactions on Multimedia 2020
2015/01, 2017/04	ASN – Italian Habilitation as Associate Professor of Computer Engineering and Information Processing Systems (09/H1), and Computer Science (01/B1)
2014/10 – 2017/09	<u>Marie Curie IOF</u>, International Outgoing Fellowship, European Commission FP7-2013 *Marie Curie individual fellowships are highly prestigious and competitive and are meant to support the best, most promising European researchers (accept. rate 12%)*
2010/10	<u>Best Paper Award</u>: 2nd ACM SIGMM International Workshop on Social Media (WSM), in conjunction with ACM Multimedia 2010 [C13]
2008/01 – 2010/12	MIUR Scholarship, Ph.D. in Computer Engineering, Multimedia and Telecommunication at University of Florence

TEACHING EXPERIENCE

University of Padova (Italy)

A.Y. 2024/25	***Vision and Cognitive Systems*** 🇬🇧 (<u>Lecturer</u> – *6/6 CFU Credits*) M.Sc. in Computer Science, Data Science, Cybersecurity [ongoing – 1st semester]
A.Y. 2023/24	***Vision and Cognitive Systems*** 🇬🇧 (<u>Lecturer</u> – *6/6 CFU Credits*) M.Sc. in Computer Science, Data Science, Cybersecurity, Physics of Data [Enrollment: 133; Stud. Eval.: Overall=8.65, Teaching Quality=8.81, Organization=8.97]
A.Y. 2023/24	***Introduction to Machine Learning*** 🇮🇹 (<u>Lecturer</u> – *6/6 CFU*) Bachelor's in Computer science [Enrollment: 90; Stud. Eval.: Overall=8.02, Teaching Quality=7.96, Organization=8.2]
A.Y. 2023/24	***Computer Programming*** 🇮🇹 (<u>Lecturer</u> – *3/9 CFU, co-instructors: G. Da San Martino, F. Gavazzo*) Bachelor's in Computer science [Enrollment: 110; Stud. Eval.: Overall=7.84, Teaching Quality=7.77, Organization=8]
A.Y. 2022/23	***Vision and Cognitive Systems*** 🇬🇧 (<u>Lecturer</u> – *6/6 CFU Credits*) M.Sc. in Computer Science, Data Science, Cybersecurity, Physics of Data [Enrollment: 117; Stud. Eval.: Overall=7.93, Teaching Quality=8.34, Organization=8.29]
A.Y. 2022/23	***Introduction to Machine Learning*** 🇮🇹 (<u>Lecturer</u> – *6/6 CFU*) Bachelor's in Computer science [Enrollment: 76; Stud. Eval.: Overall=8.26, Teaching Quality=8.41, Organization=8.5]
A.Y. 2022/23	***Computer Programming*** 🇮🇹 (<u>Lecturer</u> – *3/9 CFU, co-instructor: G. Da San Martino*) Bachelor's in Computer science [Enrollment: 109; Stud. Eval.: Overall=7.79, Teaching Quality=7.75, Organization=8.1]
A.Y. 2021/22	***Vision and Cognitive Systems*** 🇬🇧 (<u>Lecturer</u> – *6/6 CFU*) M.Sc. in Computer Science, Data Science, Cybersecurity, Physics of Data [Enrollment: 38; Stud. Eval.: Overall=9, Teaching Quality=8.67, Organization=8.79]
A.Y. 2021/22	***Introduction to Machine Learning*** 🇮🇹 (<u>Lecturer</u> – *6/6 CFU*) Bachelor's in Computer science [Enrollment: 104; Stud. Eval.: Overall=7.92, Teaching Quality=7.91, Organization=8.04]
A.Y. 2021/22	***Computer Programming*** 🇮🇹 (<u>Lecturer</u> – *3/9 CFU, co-instructor: G. Da San Martino*) Bachelor's in Computer science [Enrollment: 187; Stud. Eval.: Overall=7.58, Teaching Quality=7.42, Organization=7.44]
A.Y. 2020/21	***Vision and Cognitive Services*** 🇬🇧 (<u>Lecturer</u> – *6/6 CFU*) M.Sc. Computer Science, Data Science, Cybersecurity, Physics of Data, Comp. Engineering [Enrollment: 94; Stud. Eval.: Overall=8.29, Teaching Quality=8.71, Organization=8.99]
A.Y. 2020/21	***Machine Learning*** 🇬🇧 (<u>Lecturer</u> – *5/6 CFU, co-instructor: F. Aiolli*) M.Sc. in Data Science [Enrollment: 75; Stud. Eval.: Overall=8.16, Teaching Quality=8.06, Organization=8.79]
A.Y. 2020/21	***Introduction to Machine Learning*** 🇮🇹 (<u>Lecturer</u> – *6/6 CFU*)

Bachelor's in Computer science
[Enrollment: 62; Stud. Eval.: Overall=8.45, Teaching Quality=8.63, Organization=9.06]

A.Y. 2019/20   ***Vision and Cognitive Services*** 🇬🇧 (*Lecturer* – 6/6 CFU)
M.Sc. Computer Science, M.Sc. Data Science
[Enrollment: 44; Stud. Eval.: Overall=7.27, Teaching Quality=7.67, Organization=7.4]

A.Y. 2019/20   ***Machine Learning*** 🇬🇧 (*Lecturer* – 5/6 CFU, co-instructor: F. Aiolli)
M.Sc. in Data Science
[Enrollment: 65; Stud. Eval.: Overall=7.02, Teaching Quality=7.62, Organization=7.88]

A.Y. 2018/19   ***Cognitive Services*** 🇬🇧 (*Lecturer* – 3/6 CFU, co-instructor: A. Sperduti)
M.Sc. Computer Science, M.Sc. Data Science
[Enrollment: 29; Stud. Eval.: Overall=7.02, Teaching Quality=7.15, Organization=7.13]

A.Y. 2018/19   ***Artificial Intelligence*** 🇮🇹 (*Lecturer* – 3/6 CFU, co-instructor: A. Sperduti)
M.Sc. Computer Science
[Enrollment: ~50; Stud. Eval.: Overall=8.11, Teaching Quality=8.69, Organization=8.01]

A.Y. 2018/19   ***Web Technologies*** 🇮🇹 (*Lecturer* – 6/9 CFU, co-instructor: O. Gaggi)
Bachelor's in Computer science

A.Y. 2017/18   ***Cognitive Services*** 🇬🇧 (*Lecturer* – 3/6 CFU, co-instructor: A. Sperduti)
M.Sc. Computer Science, M.Sc. Data Science

A.Y. 2017/18   ***Web Technologies*** 🇮🇹 (*Lecturer* – 6/9 CFU, co-instructor: O. Gaggi)
Bachelor's in Computer science

A.Y. 2016/17   ***Automata and Formal Languages*** 🇮🇹 (*Lecturer* – 4/8 CFU, co-instructors: G. Filè, D. Bresolin)
Bachelor's in Computer science

Guest Lecturer at Stanford University (CA, USA)

A.Y. 2015/16   ***Computer Vision: from 3D Reconstruction to Recognition***   (2 hours, instructor: S. Savarese)
Bachelor's in Computer Science

A.Y. 2014/15   ***Computer Vision: Foundations and Applications***   (2 hours, instructor: Fei-Fei Li)
Bachelor's in Computer Science

Teaching Assistant at University of Florence (Italy)

A.Y. 2013/14   ***Visual and Multimedia Recognition***   (20 hours, Prof. A. Del Bimbo)
M.Sc. in Computer Engineering

A.Y. 2007/08 – A.Y. 2012/13   ***Multimedia Databases***   (20 hours, Prof. A. Del Bimbo)
M.Sc. in Computer Engineering

SHORT COURSES FOR PHD PROGRAMS ▬

A.Y. 2020/21 – A.Y 2024/25   ***Human and Machine Vision***   (8/16 hours, co-instructor: G. Campana)
University of Padova, Ph.D. in Brain, Mind and Computer Science (BMCS)

A.Y. 2016/17   ***Visual Recognition: from Handcrafted Features to End-to-End Learning***   (with L. Seidenari)
University of Florence, Ph.D. in Smart Computing & Ph.D. in Information Engineering

A.Y. 2013/14   ***Recognition and Classification of Visual Content***   (with L. Seidenari, A. Del Bimbo)
University of Florence, Ph.D. in Smart Computing & Ph.D. in Information Engineering

TUTORIALS AT INTERNATIONAL CONFERENCES AND SCHOOLS ▬

"*Image Tag Assignment, Refinement and Retrieval*"
– IEEE Int'l Conf. on Computer Vision and Pattern Recognition (CVPR), *2016/06*
– ACM International Conference on Multimedia (ACM-MM), *2015/10*

"*Hands on Advanced Bag-of-Words Models for Visual Object Recognition*"
– Int'l Conference on Pattern Recognition (ICPR), *2014/08*
– Int'l Conference on Image Analysis and Processing (ICIAP), *2013/09*

ADVISING AND MENTORING
(Current Students and Postdocs) ▬

Note: Since I moved to Univ. of Padova I am the P.I. (and founder) of the Visual Intelligence and Machine Perception (VIMP) group which counts approx. 5-10 people.

Ph.D. Students and Postdocs (as primary advisor):
– Enrico Cancelli, *2021/10 – present* (PhD, Univ. of Padova) [C41,C48]
– Sourav Das, *2021/10 – present* (PhD, Univ. of Padova) [C42,C49]

– Elena Izzo, *2022/02 – present* (PhD, U. Padova / Research Assistant until 2022/09) [C45]
– Luca Parolari, *2022/12 – present* (PhD, U. Padova / Research Assistant until 2023/10) [C47]
– Filippo Ziliotto, *2023/10 – present* (PhD, U. Padova)
– Jing Mi, *2024/11 – present* (PhD, U. Padova)

Ph.D. Students and Postdocs (as co-advisor):
– Tommaso Campari, *2023/01 – present* (Postdoc, FBK, with *L. Serafini*)
– Yanis Diallo, *2024/01 – present* (PhD, U. Padova, with *A. Sperduti*)

ADVISING AND MENTORING
(Alumni)

Ph.D. Students and Postdocs (as primary advisor):
– Nada Osman, *2020/10 – 2024/04* (PhD, Univ. of Padova) [C39,C41,C46,A20,A21]
  Thesis: "Human Action Anticipation: Deep Learning Approaches Across Diverse Domains"
  Next: Postdoc at Univ. of Padova, Italy

– Guglielmo Camporese, *2019/10 – 2022/12* (PhD, Univ. of Padova) [C37,C39,C40,C41,C45,C46, C49,A40]
  Thesis: "Prediction of Activities and Visual Concepts Under Complex and Changing Conditions"
  Next: Research Scientist at Disney Research Studios, Zurich, CH

– Tommaso Campari, *2019/10 – 2022/12* (PhD, Univ. of Padova) [C38,C44,C48]
  Thesis: "Embodied AI with Common-Sense"
  Next: Postdoc at FBK, Trento, Italy

– Luigi Filippo Chiara, *2020/12 – 2022/04* (Research Assistant, U. Padova) [C42]
  Next: Data Scientist at UBS Bank, Zurich, CH

– Pasquale Coscia, *2019/02 – 2022/01* (Postdoc, U. Padova) [A14,A16,C26,C31,C36,C37,C39,C42, C43, B3] / *Next: Assistant Professor (RTDa) at Univ. of Milan, Italy*

Ph.D. Students and Postdocs (as co-advisor):
– Rita Donato, *2017/10 – 2020/12* (PhD, Univ. of Padova, *with G. Campana*) [A17]
– Tiberio Uricchio, *2012 – 2016* (PhD, Univ. Florence, *with A. Del Bimbo*) [A9,A11,C19,C21,C23,C24]

Visiting Scholars from other Universities / Research institutions:
– Shaokang Cheng, *2022/10 – 2023/09* (Visiting PhD, NPU, Xi'an, China – *CSC Fellowship*) [C49, A21]
– Yunrui Guo, *2019/10 – 2021/03* (Visiting PhD, NUDT, Changsha, China – *CSC Fellowship*) [C40]
– Pasquale Coscia, *2017/10 – 2017/12* (Visiting PhD, Univ. of Campania "L. Vanvitelli")

International interns and Erasmus students:
– Sergi Espinosa Llandrich, *2023/03 – 2023/06* (Erasmus B.Sc. Thesis, UPC Barcelona)
– Dennis Hernando Nunez Fernandez, *2019/12 – 2020/03* (M.Sc. Intern, UPCH Peru)
– Aditya Singhal, *2019/06 – 2019/09* (M.Sc. Intern, Delhi Technological University, India)

Graduate Students (selected), M.Sc. Thesis / Research projects:
– M. Ghahramani, 2024 (CS, Univ. of Padova) – *next: PhD student at INSAIT, Sofia, Bulgaria*
– Sara Repetto, 2023 (DS, Univ. of Padova) – *next: PhD student at Univ. of Genoa, Italy*
– Sara Buttau, 2023 (CS, Univ. of Padova) – *next: research assistant at Univ. of Verona, Italy*
– Filippo Ziliotto, 2023 (PD, Univ. of Padova) – *next: research assistant at Univ. of Padova, Italy*
– Pavel Ianko, 2023 (DS, Univ. of Padova) – *next: UNOX S.p.A., Padova, Italy*
– Eleonora Brasola, 2022 (DS, Univ. of Padova) – *next: research assistant at FBK Trento, Italy*
– Luca Scattolaro, 2022 (CEng, Univ. of Padova) – *next: Leonardo S.p.A., Italy*
– Luca Parolari, 2021 (CS, Univ. of Padova) [C47] – *next: research assistant at Univ. of Padova, Italy*
– Elena Izzo, 2021 (DS, Univ. of Padova) [C45] – *next: PhD student at Univ. of Padova, Italy*
– Giovanni Cavallin, 2021 (CS, Univ. of Padova) [A17] – *next: Studiomapp, Ravenna, Italy*
– Enrico Cancelli, 2021 (CS, Univ. of Padova) – *next: PhD student at Univ. of Padova, Italy*
– Matteo Rizzo, 2020 (CS, Univ. of Padova) – *next: PhD student at Univ. of British Columbia, Canada*
– Paolo Eccher, 2020 (CS, Univ. of Padova) [C38] – *next: CORE Reply, Milan, Italy*
– Tommaso Campari, 2019 (CS, Univ. of Padova) – *next: PhD student at Univ. of Padova, Italy*
– Tobia Tesan, 2019 (CS, Univ. of Padova) [C36] – *next: Quantexa, London, UK*
– Matteo Lisotto, 2019 (CS, Univ. of Padova) [C31] – *next: Redwood Solutions, London, UK*
– Tiberio Uricchio, 2012 (CEng, Univ. of Florence) [C17,C18] – *next: PhD stud. at Univ. Florence, Italy*
– Luca Del Tongo, 2011 (CEng, Univ. of Florence) [A8]

Undergraduate Students (selected), B.Sc. Thesis / Research projects:
– Riccardo Toniolo, 2024 (Univ. of Padova)
– Leonardo Tredese, 2021 (Univ. of Padova) – *next: M.Sc. at Politecnico di Torino, Italy*
– Davide Liu, 2019 (Univ. of Padova) – *next: M.Sc. at Tsinghua University, China*
– Alessio Bazzica, 2008 (Univ. of Florence) [C8]

Advising: Overall Statistics

Number of Ph.D. Students, Postdocs and Research assistants supervised (as primary advisor)
– Ph.D. Students: 8
– Postdocs: 2
– Research assistants (pre-doctoral): 3
– International Visiting Ph.D. Students / Scholars: 3

Number of Students supervised for their Thesis (@UniPD, since 2018)**:**
– M.Sc. in Computer Science / Informatica: 37
– M.Sc. in Data Science: 22
– M.Sc. in Computer Engineering: 2
– M.Sc. in Physics of Data: 3
– B.Sc. in Informatica (CS): 56

PH.D. PROGRAM BOARD AND THESIS COMMITTEES

2018/10 – present

Member of Ph.D. Program Board
Brain, Mind and Computer Science (BMCS), University of Padova, Italy

2018/10 – present

Member of Ph.D. Students' Thesis Committee / External Reviewer (selected)
– Mariia Khan, 2025 (Edith Cowan Univ, Western Australia), *Advisor: Prof. J. Abu-Khalaf*
– Chiara Plizzari, 2024 (Politecnico di Torino, Italy), *Advisor: Prof. B. Caputo*
– Willi Menapace, 2024 (University of Trento, Italy), *Advisor: Prof. E. Ricci*
– Luca Franco, 2023 ("Sapienza" University of Rome, Italy), *Advisor: Prof. F. Galasso*
– Fabio Cermelli, 2023 (Politecnico di Torino, Italy), *Advisor: Prof. B. Caputo*
– Christian Joppi, 2022 (University of Verona, Italy), *Advisor: Prof. M. Cristani*
– Francesco Ragusa, 2021 (University of Catania, Italy), *Advisor: Prof. G. M. Farinella*
– Hao Xue, 2020 (Univ. of Western Australia), *Advisors: Profs. M. Reynolds, D. Huynh*
– Federico Bolelli, 2020 (Univ. of Modena and Reggio Emilia, Italy), *Advisor: Prof. C. Grana*
– Abhinaba Roy, 2019 (IIT / Univ. of Genoa, Italy), *Advisor: Prof. V. Murino*
– Dan Xu, 2018 (University of Trento, Italy), *Advisor: Prof. N. Sebe*
– Wei Wang, 2018 (University of Trento, Italy), *Advisor: Prof. N. Sebe*
– Eyasu Zemene, 2018 ("Ca' Foscari" University of Venice, Italy), *Advisor: Prof. M. Pelillo*

FUNDED RESEARCH PROJECTS

Note: My research is funded by national and international grants as well as by contracts and donations from private companies. I acquired over 800K € funding in projects where I have the role of PI or research unit coordinator. More details are provided below.

2021/10 – 2023/12

"Context-aware motion prediction and action anticipation"
Funding: Univ. of Padova, SID-BIRD 2021 Projects   (42.900 Euro)
Role: **Principal Investigator**

2019/09 – 2023/06

PREVUE: "PRediction of activities & Events by Vision in an Urban Environment"
Funding: Italian MUR, PRIN-2017   (172.000 Euro)
Role: **Principal Investigator** (UniPD unit)

2019/09 – 2021/12

"Urban Big Data for Economic Development"
Funding: Veneto Region, Italy, and European Social Fund POR FSE 2019   (171.000 Euro)
Role: **Co-Principal Investigator**; Co-P.I.: Profs. A. Pin, S. Suweis

2019/02 – 2021/01

"Learning models for human-movement anomaly detection and physical threat prediction using computer vision and digital traces"
Funding: Univ. of Padova, SID-BIRD 2018-2019 Grants   (47.600 Euro)
Role: **Principal Investigator**

2016/06 – 2017/07

"Webly-Supervised Deep Learning for Large-Scale Activity Recognition"
Funding: Bavaria California Technology Center (BaCaTeC), Germany   (6.000 Euro)

Role: **Co-Principal Investigator**; Co-P.I.: Dr. F. Tombari (TUM)

2014/10 – 2017/09   **EAGLE:** "Exploiting semAntic and social knowledGe for visuaL rEcognition"
Funding: <u>European Commission, Marie Curie IOF-2013 FP7</u>, no. 623930   (272.000 Euro)
Role: **Principal Investigator**; Advisors: Profs. A. Del Bimbo, Fei-Fei Li

PHD GRANTS AQUIRED FROM COMPETITIVE CALLS OR SPONSORED BY COMPANIES

2023/11 – present   *Industrial Ph.D. Grant,* "Deep Learning for Object Detection and Tracking in Noisy Scenarios"
Funding: NextGenerationEU, MUR DM117 2023 call; co-financing: Cosmo I.M.D. (72.000 Euro)

2022/10 – present   *Industrial Ph.D. Grant,* "Vision & AI for garden care"
Funding: UniSmart 2022 call; co-financing: STIGA S.p.A. (72.000 Euro)

PARTICIPATION IN RESEARCH PROJECTS

2024/04 – present   **GROUNDEEP**: "Grounded deep learning model for numerical cognition"
Funding: EU / Italian PNRR, FAIR Cascade Calls – Spoke 10 Bio-Socio-Cognitive AI
Role: participant; Local P.I. (UniPD): Prof. M. Zorzi

2023/03 – present   **TRAIL**: "TRAnsparent, InterpretabLe Robots"
Funding: European Commission, MSCA Doctoral Network
Role: participant; Local P.I. (UniPD): Prof. A. Sperduti

2015/06 – 2016/09   "Predicting human motion in complex real world environments"
Funding: Panasonic, Toyota and MURI, Department of Defense, USA
Role: participant; Local P.I. (Stanford): Prof. S. Savarese

2013/01 – 2014/09   **PITAGORA**: "Innovative technologies and processes for airport management"
Funding: Tuscany Region, Italy, and European Regional Development Fund
Role: **WP leader** (passenger experience); Local P.I. (UniFI): Prof. A. Del Bimbo

2012/11 – 2014/09   **AQUIS-CH**: "Innovative technologies for cultural heritage fruition"
Funding: Tuscany Region, Italy, and European Social Fund POR FSE 2007-2013
Role: **WP leader** (knowledge exploitation in social media); P.I. (UniFI): Prof. A. Del Bimbo

2011/01 – 2012/06   **euTV**: "euTV, adaptive media channels"
Funding: European Commission, IST FP7, no. 226248
Role: participant; Local P.I. (UniFI): Prof. A. Del Bimbo

2007/03 – 2009/12   **VIDI-Video**: "Semantic Video Search With a Large Thesaurus of Concepts"
Funding: European Commission, IST FP6, no. 045547
Role: participant; Local Principal Investigator (UniFI): Prof. A. Del Bimbo

MAJOR COLLABORATIONS

2022/09 – present   **Simon Fraser University, Vancouver, BC, Canada**
Collaborators: Profs. A. Chang, M. Savva
We have been collaborating on embodied AI and visual navigation since late 2022, and co-organizing the EAI workshops; two of my PhD students spent part of their third year in A. Chang's group [C48].

2019/09 – present   **Fondazione Bruno Kessler (FBK), Trento, Italy**
Collaborators: Dr. L. Serafini, B. Lepri, P. Traverso
I have been closely collaborating with FBK since 2020, co-supervising PhD students and coordinating the activities of the Data Science Joint-Lab UniPD-FBK [A18,C48,C47,C44,C38,C32-35].

2014/10 – 2018/09   **Stanford University, Stanford, CA, USA**
Collaborators: Profs. L. Fei-Fei, S. Savarese, B. Girod
I have been appointed as postdoc in Fei-Fei's VisionLab, who has been the advisor of my Marie Curie project, in October 2014 [C25]. Since early 2015, I established collaborations with S. Savarese –Vision & Geometry lab [C26,C27], and B. Girod - Image, Video and Multimedia Systems group [C29].

2016/01 – 2017/06   **Technical University of Munich, Germany**
Collaborators: F. Tombari, C. Rupprecht
I have established a collaboration between Stanford and TUM on webly supervised deep learning for large-scale activity recognition [A13]. I was the co-principal investigator at Stanford and co-supervisor of a team of four researchers. This project was also supported with a mini-grant from BaCaTeC.

2014/01 – 2016/12	**University of Amsterdam, NL, and Renmin University of China, Beijing** Collaborators: C. Snoek (Univ. Amsterdam), X. Li (Renmin Univ. China) *Our joint work is a thorough review/comparison about image tagging techniques on a novel large-scale benchmark (ACM CSUR [A11]); we also co-organized tutorials at ACM-MM'15 and CVPR'16.*

RESEARCH VISITS
(at least one month)

2010/03 – 2010/07	**Telecom ParisTech, France** Research visit; working with Dr. H. Sahbi *I spent four months at Telecom ParisTech as visiting scholar, working on Context-Dependent Kernels for image retrieval. We collaborated until the end of 2012 and we published a paper on IEEE-TIP [A8].*

INDUSTRIAL COLLABORATIONS AND ADVISORY BOARDS

2023/09 – present	**Industrial Collaboration**, Cosmo Intelligent Medical Devices, Milan, Italy *Ongoing collaboration and joint Ph.D. fellowship on vision and deep learning for medical imaging.*
2022/09 – present	**Industrial Collaboration**, STIGA Group, Castelfranco Veneto, Italy *Ongoing collaboration and joint Ph.D. fellowship on vision-based navigation for robot mowers.*
2018/01 – present	**Advisory Board Member**, Swiss Innovation Valley, Switzerland

PROFESSIONAL ACTIVITIES AND ACADEMIC SERVICE

Journal Editor
- **Editorial board member**, Machine Vision and Applications – Springer *(2017/03 – present)*
- **Editorial board member**, Multimedia Tools and Applications – Springer *(2016/09 – present)*
- **Associate editor**, IEEE Transactions on Multimedia (TMM) *(2019/09 – 2024/08)*
- **Lead guest editor**, Computer Vision and Image Understanding – Elsevier, *Special Issue on "Computer Vision and the Web" (published on 2018/08)*

General Chair
- CVPL/IAPR Int'l Summer School on Machine Vision (VISMAC), Padova, 2023

Program Chair
- ACM Int'l Conference on Multimedia Retrieval (ICMR), Chicago, US, 2025

Workshop Organizer
- **Co-organizer**, Embodied AI (EAI) Workshops, *CVPR 2023, CVPR 2024, CVPR 2025*
- **Lead organizer**, Workshop on Benchmarking Trajectory Forecasting Models (BTFM), *ECCV 2020, ICCV 2021*
- **Co-organizer**, Workshop on Deep Learning for Human-Centric Activity Understanding, *ICPR'20*
- **Lead organizer**, Workshops on Web-scale Vision and Social Media (VSM), *ECCV 2012, CVPR 2014, ICCV 2015, ECCV 2016, ICCV 2017*

Student Volunteer Chair
- IEEE International Conference on Computer Vision (ICCV), 2017

Conference Organizing Committee Member
- European Conference on Computer Vision (ECCV), 2012
- ACM Int'l Conference on Multimedia (ACM-MM), 2010

Area Chair
- IEEE/CVF Int'l Conference on Computer Vision and Pattern Recognition (CVPR), 2023, 2024, 2025
- European Conference on Computer Vision (ECCV), 2022, 2024
- International Conference on Neural Information Processing Systems (NeurIPS), 2024, 2025
- British Machine Vision Conference (BMVC), 2021, 2022, 2023, 2024
- IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), 2016, 2024
- International Conference on Pattern Recognition (ICPR), 2020, 2022
- ACM International Conference on Multimedia (ACM-MM), 2017, 2018, 2019, 2020, 2021, 2022
- International Conference on Image Analysis and Processing (ICIAP), 2019, 2021, 2025

Session Chair
- IEEE/CVF Int'l Conf. on Computer Vision and Pattern Recognition (CVPR), 2025 – *"Embodied AI" oral track*
- European Conference on Computer Vision (ECCV), 2024 – *"Video Understanding" oral track*

Program Committee Member / Reviewer (selected)
- IEEE/CVF Int'l Conf. on Computer Vision and Pattern Recognition (CVPR), 2014, 2015, 2016, 2017, 2018, 2019, 2021, 2022
- IEEE/CVF Int'l Conference on Computer Vision (ICCV), 2015, 2017, 2019, 2021, 2023, 2025
- European Conference on Computer Vision (ECCV), 2012, 2016, 2020
- International Conference on Neural Information Processing Systems (NeurIPS), 2018, 2019, 2020, 2021, 2022

- International Conference on Learning Representations (ICLR), 2021
- AAAI Conference on Artificial Intelligence (AAAI), 2019, 2020, 2021
- International Joint Conference on Artificial Intelligence (IJCAI), 2018, 2019, 2020
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2024
- ACM International Conference on Multimedia (ACM-MM), 2012, 2014, 2015, 2016
- ACM Int'l Conference on Multimedia Retrieval (ICMR), 2011, 2015, 2016, 2017, 2019, 2020
- IEEE Int'l Conference on Multimedia and Expo (ICME), 2013, 2014, 2015, 2016, 2017
- International Conference on Pattern Recognition (ICPR), 2012, 2014, 2016, 2018
- IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), 2017, 2018
- Asian Conference on Computer Vision (ACCV), 2016
- Workshop on Large Scale Visual Recognition and Retrieval (BigVision), at CVPR 2015, 2016
- Workshop on Assistive Computer Vision and Robotics (ACVR), at ECCV/ICCV 2016, 2017, 2019

Reviewer for International Journals (selected)

- Science Robotics, 2023
- IEEE Trans. on Pattern Analysis and Machine Intelligence (TPAMI), 2012–2018, 2023–2024
- IEEE Transactions on Multimedia (TMM), 2010, 2012–2019, 2023–2024
- IEEE Transactions on Image Processing (TIP), 2016
- IEEE Transactions on Information Forensics and Security (TIFS), 2012–2013, 2015–2016
- IEEE Trans. on Circuits and Systems for Video Technology (TCSVT), 2011–2013, 2015–2016
- Journal of Machine Learning Research (JMLR), 2011
- International Journal of Computer Vision (IJCV) - Springer, 2015
- Computer Vision and Image Understanding (CVIU) - Elsevier, 2013–2016, 2021
- Pattern Recognition (PR) - Elsevier, 2008–2014, 2016
- Pattern Recognition Letters (PRL) - Elsevier, 2010–2013, 2016
- Image and Vision Computing - Elsevier, 2014
- Journal of Visual Communication and Image Representation - Elsevier, 2013–2016
- Multimedia Tools and Applications (MTAP) - Springer, 2009–2014, 2016

Reviewer for Funding Agencies

- European Commission: evaluator for the HORIZON-CL4-2024-HUMAN-03 call (AI & robotics)
- European Commission: evaluator for the HORIZON-CL4-2022-HUMAN-02 call (AI & robotics)
- European Commission: evaluator for the H2020-SU-SEC-2020 call (security)
- Dutch Research Council (NWO): reviewer for the talent programme Veni, 2020
- Academy of Finland: project proposals, faculty and postdoc applications – *"AI and ML" review panel*, 2019, 2020
- National Institute of Standards and Technology (NIST), USA: project proposal for the USA–Israel Binational Industrial Research and Development (BIRD) Foundation, 2015
- Italian MUR: reviewer for project proposals; PRIN 2020, FISR 2020, PRIN 2022
- Italian PR Puglia FESR FSE+ 2021-27: project proposal under the call PIA 2023

Faculty Hiring Committees

University of Padova

- Tenure Track Assistant Professor (RTDb), Dept of Mathematics (DM) – 2023RUB06
- "Junior" Assistant Professor (RTDa), Dept of Mathematics (DM) – 2022RUAPNRR_CN_EI_01
- Tenure Track Assistant Professor (RTDb), Dept of Mathematics (DM) – 2021RUB03
- Tenure Track Assistant Professor (RTDb), Dept of Psychology (DPG) – 2021RUB07

Other Italian Universities

- "Junior" Assistant Professor (RTDa), Univ. of Pisa – 2024/02
- "Junior" Assistant Professor (RTDa), "Sapienza" Univ. of Rome – 2023/01

Tenure Hire Reviews

International Universities / Institutions

- Associate Professor Candidate, Dept of Statistics and Data Science, Southern University of Science and Technology, China – 2022/05

SERVICE TO UNIV. OF PADOVA

Departmental Committees

- Member, Evaluation and Research Quality Committee   *(2022/11 – present)*
- Member, VQR 2020-24 Focus Group / CS representative   *(2024/07 – present)*
- Member, ICT and Computing Services Committee   *(2018/11 – 2022/10)*
- Member, Teaching Committee of the Dept. of Mathematics   *(2019/11 – 2022/10)*
- Member, "Giunta" (Steering Committee) of the Dept. of Mathematics   *(2018/12 – 2020/09)*

Graduate/Undergraduate Program Administration and Committees

– **Study program Director**, M.Sc. Program in Data Science (LM-Data) *(2024/10 – present)*
– **Vice Director**, M.Sc. Program in Data Science (LM-91) *(2019/10 – 2024/09)*
– **Vice Director**, M.Sc. Program in Cybersecurity (LM-66) *(2020/06 – 2021/10)*
– Member, "Comitato ordinatore" (founding/steering committee): M.Sc. Program in Data Science (LM-Data) *(2019/06 – 2024/09)* - *"transition" from LM-91 to the new LM-Data*
– Member, "Comitato ordinatore" (founding/steering committee): M.Sc. Program in Cybersecurity (LM-66) *(2019/06 – 2021/10)*
– Member, "Gruppo per l'accreditamento e la valutazione (GAV)": M.Sc. Program in Data Science *(2020/02 – present)*
– Member, Evaluation Committee for International Students Admission: M.Sc. Program in Data Science *(2020/02 – present)*
– Member, Evaluation Committee for International Students Admission: M.Sc. Program in Cybersecurity *(2020/02 – 2022/09)*

Interdepartmental Centers and Ph.D. Program Boards / Committees

– **Vice Coordinator**, Ph.D. Program in Brain, Mind and Computer Science (BMCS) *(2022/11 – present)*
– **Director**, Data Science Joint-Lab UniPD-FBK *(2018/09 – 2021/09)*
– Member, Steering Committee of the BMCS Ph.D. Program *(2024/04 – present)*
– Member, Internationalization Committee of the BMCS Ph.D. Program *(2019/10 – 2021/09)*

School of Science Committees

– Member, Student Orientation Committee *(2019/10 – present)*

University Committees

– Member, High Performance Computing (HPC) Focus Group *(2023/03 – present)*

PROFESSIONAL MEMBERSHIPS AND AFFILIATIONS

2021/08 – present   **ELLIS Member**, European Laboratory for Learning and Intelligent Systems

ELLIS involves the very best European academics and researchers from industry working in ML

2008/01 – present   **IEEE Senior Member**, Institute of Electrical and Electronics Engineers

IEEE Senior Membership is an honor bestowed only to those who have made significant contributions to the profession (elevated to Senior Member in October 2021)

2008/01 – present   ACM Member, Association for Computing Machinery

2013/03 – present   CVF Member, The Computer Vision Foundation

2008/09 – present   CVPL Member, Italian chapter of the Int'l Association for Pattern Recognition

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INVITED TALKS (selected)

Note: This section contains a selected list of invited talks or keynote speeches at major international events (e.g. conferences, summer schools, etc.). Additionally, every year I regularly attend major conferences and present my work as oral/poster presentations.

Keynote speech, *"From context-aware motion prediction to embodied visual navigation"*
– Computer Vision Trento Symposium (CVTS) 2025, Trento, Italy, 2025/05
– ECCV Int'l Workshop on Assistive Computer Vision and Robotics (ACVR), *2024/09*

Invited talk, *"From context-aware motion prediction to embodied visual navigation"*
– ELLIS-VISMAC Winter School 2025, Brunico, Italy, 2025/01
– 7th Int'l Summer School on Artificial Intelligence (AI-DLDA), Udine, Italy, 2024/07

Invited talk, *"Teaching machines to see in the deep learning era"*
– 12th European Big Data Management Summer School (eBISS), Padova, Italy, 2024/07

"Context-aware motion prediction and embodied visual navigation"
– Univ. of Trento and ELLIS unit Trento, Italy – *hosted by Prof. E. Ricci, 2024/03*

Spotlight talk, *"Exploiting proximity-aware tasks for embodied social navigation"*
– CVPR 2023 Area Chair and Senior Area Chair Workshop, *2023/06*

Keynote speech, *"Distilling Knowledge for Short-to-Long Term Trajectory Prediction"*

－ ICRA Int'l Workshop on Long-term Human Motion Prediction (LHMP), *2023/05*

"Context-aware motion prediction and embodied social navigation"
－ Machine Learning Genoa Center (MaLGa) Colloquia at ELLIS unit Genoa & Univ. of Genova, Italy – *hosted by Prof. F. Odone, 2023/03*   *[https://www.youtube.com/watch?v=pf5ix8K4R7Y]*
－ Istituto Italiano di Tecnologia (IIT), Genova, Italy – *hosted by Dr. A. Del Bue, 2022/12*

Keynote speech, *"Under the hood of Big Data and Artificial Intelligence"*
－ Int. Conference on Laboratory Medicine "The Ethics of Quality and Artificial Intelligence in Laboratory Medicine", *Padova, Italy 2021/09*

"Context-aware motion prediction and human action anticipation"
－ Bosch Center for Artificial Intelligence (BCAI), Germany – *hosted by Dr. L. Palmieri, 2021/06*

Invited talk, *"What can we learn from brain about efficient algorithms and about brain from neural networks?"*
－ Summer School in Computational and Theoretical Models in Neuroscience, *Venice, Italy 2019/09*

Invited talk, *"Deep learning under the hood: algorithmic bias and fairness"*
－ Machine Learning and Security Summer School (MLS) 2019, *Padova, Italy, 2019/09*

"Exploiting contextual knowledge for large scale visual recognition"
－ Fondazione Bruno Kessler (FBK), Trento, Italy – *hosted by Dr. L. Serafini, 2019/02*

Invited talk, *"Visual Recognition in the Deep Learning Era"*
－ Int'l Summer School on Information Engineering (SSIE) 2018, *Brixen, Italy, 2018/07*

"Sharing knowledge for large scale visual recognition"
－ Istituto Italiano di Tecnologia (IIT), Genova, Italy – *hosted by Dr. A. Del Bue, 2018/07*
－ Istituto Italiano di Tecnologia (IIT), Milano, Italy – *hosted by Prof. B. Caputo, 2018/06*
－ University of Verona, Italy – *hosted by Prof. M. Cristani, 2018/03*

Panelist, *"Deep Learning, Pattern Recognition and Vision, which direction?"*
－ Italian CVPL Meeting: "Why is deep learning so cool?", *Modena, Italy, 2018/01*

Keynote speech, *"Exploiting noisy web data for large-scale visual recognition"*
－ CVPR Int'l Workshop on Visual Understanding by Learning from Web Data, *2017/07*

"Image understanding in social media by exploiting social-network metadata"
－ University of Catania, Italy – *hosted by Prof. G. M. Farinella, 2017/1*

"Sharing knowledge for large scale visual recognition"
－ "Ca' Foscari" University of Venice, Italy – *hosted by Prof. M. Pelillo, 2017/05* *[https://www.youtube.com/watch?v=drT64_O1qbg]*
－ Univ. of California, Santa Cruz, USA – *hosted by Prof. R. Manduchi, 2016/09*
－ Google Research, Mountain View, USA – *hosted by Dr. R. Sukthankar, 2016/08*
－ Aquifi Inc., Palo Alto, USA – *hosted by Dr. C. Dal Mutto, 2016/06*

Panelist, *"Visual recognition in the big data and deep learning era"*
－ ICCV Int'l Workshop on Web-scale Vision and Social Media (VSM), *2015/12*

Keynote speech, *"Data-driven tag refinement and localization in web videos"*
－ CVPR Int'l Workshop on Large-Scale Video Search and Mining (LSVSM), *2015/06*

"Love Thy Neighbors: Image Annotation by Exploiting Image Metadata"
－ Univ. of California, Berkeley, USA – *Stanford/UC Berkeley Vision Meeting 2015/05*

"Social media annotation: from images to videos"
－ Stanford University, USA – *hosted by Prof. L. Fei-Fei, 2013/07*

OUTREACH ACTIVITIES
(PUBLIC ENGAGEMENT / "TERZA MISSIONE")

Note: I am actively involved in a number of outreach and public engagement activities, mostly about the impact of AI technologies on society.

About teaching innovation in University education

2023/11   **Invited talk,** *"Intelligenza Artificiale: sfide e opportunità per la didattica"* , with Chris Dede (Harvard Univ.), Susanna Sancassani (Politecnico di Milano), Diletta Huyskes (Univ. of Milan)

"Settimana per il miglioramento continuo della didattica", Aula Magna Palazzo Bo, Univ. of Padova
[https://www.youtube.com/watch?v=rebX86fAbro&t=4430s]

2019/10 – 2020/12   **"A.I. Society and Teaching Innovation" project**: this is a teaching innovation project funded by UniPD (PMD 2019, 89.200 Euro) aiming to discuss and to experiment practical approaches about the massive social implications of AI.

– **Co-organizer / Co-P.I.** (with Profs. A. Pin, S. Suweis) of the interdisciplinary project, panelist and co-coordinator of a seminar series

Outreach activities with high school and middle school students

2024/01   **Invited lecture,** *"Dialogo sull'Intelligenza Artificiale e presentazione laboratorio robotica educativa"*
IC Selvazzano Dentro II (Padova), Middle School students and their teachers

2020/01 – present   **UniPadova Incontra**: Seminar series for high school students

– *"Intelligenza Artificiale: come insegnare alle macchine a vedere e parlare"*

IIS "Leon Battista Alberti" (Abano Terme, PD, 2022/10), Liceo "Duca degli Abruzzi" (Treviso, 2022/03), UniPD "Scegli con noi" (Online, 2021/02), ISIS "Gobetti - Volta" (Bagno a Ripoli, FI, 2020/12), Liceo "E. Fermi" (Padova, 2020/02), Liceo "A. Cornaro" (Padova, 2020/01)

2021/07, 2024/07   **Invited lecture,** *"Teaching machines to see: a quest to visual intelligence (in colors!)"*
Seminar Series for High School students within the "PLS Scuola di Scienze – stage multidisciplinare sui colori della natura" program, Univ. of Padova *(two editions: 2021, 2024)*

2015/08 – 2016/07   **SAILORS / AI4ALL**: The Stanford Artificial Intelligence Laboratory's OutReach Summer program is a two-week technically camp for high school girls aiming to increase diversity in the field of AI.

– **Project mentor**, *"Using computer vision to monitor hand hygiene in hospitals"*, 2016/07
– **Research instructor**, *"Nearest neighbors for image recognition and classification"*, 2015/08

Seminars and public engagement activities

2020/09   **Invited talk,** *"Intelligenza Artificiale: applicazioni e sfide"* , with Paolo Benanti (Pontificia Univ. Gregoriana / United Nations AI Advisory Body Member)
Centro Culturale Romano Guardini, Bolzano   *[https://www.youtube.com/watch?v=2xt5KAi-RkE]*

2019/09   **VenetoNight'19** – Researchers' Night event in Padova

– Speaker corner, *"Intelligenza Artificiale: come insegnare alle macchine a vedere e parlare"*

2018/11   **The Law of Big Data Colloquium:** Seminar Series, Physics of Data, U. Padova

– **Invited talk**, *"Under the hood of big data and A.I."*   *[https://www.youtube.com/watch?v=2VzvqWjwfZQ]*

2017/09   **Science is wonder-ful!** – EU Researchers' Night event in Bruxelles

– **Invited talk** / research corner, *"Visual illusion"*

PUBLICATIONS   ▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔ ■

Note: The three top-tier conferences in computer vision are CVPR, ICCV and ECCV. These conferences are very selective and their proceedings play a role which is as important as (or even more) the top journals, and they are consistently ranked among the very top venues in CS.

Bibliometric Indices (Academic Age: 18 / 2007-2025)

– <u>H-index</u>: 32 (Google Scholar), 27 (Scopus)
– <u>Number of citations</u>: 4930 (Google Scholar), 3190 (Scopus)

VQR 2015-19 Scientific Evaluation (Italian ANVUR):

Our department selected four of my works (the max number allowed for each Dept. member), i.e. [A12, A13, C25, C27], and they all got the max score: A.

Representative Publications (ten selected)

1. E. Cancelli*, T. Campari*, L. Serafini, A. Chang, **L. Ballan**. Exploiting Proximity-Aware Tasks for Embodied Social Navigation. *Proc. of IEEE/CVF International Conference on Computer Vision (ICCV), Paris, France, 2023* (* equal contribution) [SJR$_{23}$: 12.26, GGS/CORE: <u>1/A*</u> – Cited by: 5]

2. T. Campari, L. Lamanna, P. Traverso, L. Serafini, **L. Ballan**. Online Learning of Reusable Abstract Models for Object Goal Navigation. *Proc. of IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), New Orleans, LA, USA, 2022* [SJR$_{23}$: 10.33, GGS/CORE: <u>1/A*</u> – Cited by: 15]

3. A. Monti, A. Porrello, S. Calderara, P. Coscia, **L. Ballan**, R. Cucchiara. How many Observations are Enough? Knowledge Distillation for Trajectory Forecasting. *Proc. of IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR), USA, 2022* [SJR23: 10.33, GGS/CORE: 1/A* – Cited by: 39]

4. Y. Guo*, G. Camporese*, W. Yang, A. Sperduti, **L. Ballan**. Conditional Variational Capsule Network for Open Set Recognition. *Proc. of IEEE/CVF International Conference on Computer Vision (ICCV), Virtual, 2021* (* equal contribution) [SJR23: 12.26, GGS/CORE: 1/A* – Cited by: 50]

5. X. Li*, T. Uricchio*, **L. Ballan**, M. Bertini, C. Snoek, A. Del Bimbo. Socializing the semantic gap: A comparative survey on image tag assignment, refinement and retrieval. *ACM Computing Surveys, 49(1):14:1–14:39, 2016* (* equal contribution) [SJR23: 6.28, Q1 – Cited by: 230]

6. **L. Ballan**, F. Castaldo, A. Alahi, F. Palmieri, S. Savarese. Knowledge transfer for scene-specific motion prediction. *Proc. of European Conference on Computer Vision (ECCV), Amsterdam, Netherlands, 2016* [GGS/CORE: 1/A* – Cited by: 131]
    Press and media coverage: MIT Tech. Review, TechCrunch, ABC News & BBC News (May–July 2016)

7. J. Johnson*, **L. Ballan***, L. Fei-Fei. Love Thy Neighbors: Image Annotation by Exploiting Image Metadata. *Proc. of IEEE International Conference on Computer Vision (ICCV), Santiago, Chile, 2015* (*equal contribution) [SJR23: 12.26, GGS/CORE: 1/A* – Cited by: 150]

8. H. Sahbi, **L. Ballan**, G. Serra, A. Del Bimbo. Context-dependent logo matching and recognition. *IEEE Transactions on Image Processing, 22(3):1018–1031, 2013* [DOI:10.1109/TIP.2012.2226046] [SJR23: 3.56, Q1 – Cited by: 105]

9. **L. Ballan**, M. Bertini, A. Del Bimbo, L. Seidenari, G. Serra. Effective codebooks for human action representation and classification in unconstrained videos. *IEEE Transactions on Multimedia, 14(4):1234–1245, 2012* [DOI:10.1109/TMM.2012.2191268] [SJR23: 2.26, Q1 – Cited by: 56]

10. I. Amerini, **L. Ballan**, R. Caldelli, A. Del Bimbo, G. Serra. A SIFT-based forensic method for copy-move attack detection and transformation recovery. *IEEE Trans. on Information Forensics and Security, 6(3):1099–1110, 2011* [DOI:10.1109/TIFS.2011.2129512] [SJR23: 2.89, Q1 – Cited by: 1175]

FULL PUBLICATION LIST

Refereed Journals

[A21] S. Cheng, S. Qu, N. Osman, **L. Ballan**. FastSTI: A Fast Conditional Pseudo Numerical Diffusion Model for Spatio-temporal Traffic Data Imputation. *IEEE Transactions on Intelligent Transportation Systems, vol. 25 issue 12, 2024* [DOI: 10.1109/TITS.2024.3469240] [JCR IF: 7.9, SJR23: 2.58, Q1]

[A20] N. Osman, G. Camporese, **L. Ballan**. Multi-Modal Transformer with Language Modality Distillation for Early Pedestrian Action Anticipation. *Computer Vision and Image Understanding, 249:1–12, 2024* [DOI:10.1016/j.cviu.2024.104144] [JCR IF: 4.3, SJR23: 1.42, Q1]

[A19] A. De Biasio, M. Monaro, L. Oneto, **L. Ballan**, N. Navarin. On the Problem of Recommendation for Sensitive Users and Influential Items: Simultaneously Maintaining Interest and Diversity. *Knowledge-Based Systems, vol. 275, 2023* [DOI: 10.1016/j.knosys.2023.110699] [JCR IF: 7.2, SJR23: 2.22, Q1]

[A18] S. Dost, L. Serafini, M. Rospocher, **L. Ballan**, A. Sperduti. Aligning and linking entity mentions in image, text, and knowledge base. *Data & Knowledge Engineering, 138:1–18, 2022* [DOI:10.1016/j.datak.2021.101975] [JCR IF: 2.7, SJR23: 0.69, Q2]

[A17] R. Donato*, A. Pavan*, G. Cavallin, **L. Ballan**, L. Betteto, M. Nucci, G. Campana. Mechanisms underlying directional motion processing and form-motion integration assessed with visual perceptual learning. *Vision, 6(2):1-19, 2022* [DOI: 10.3390/vision6020029]

[A16] A. Bertugli, S. Calderara, P. Coscia, **L. Ballan**, R. Cucchiara. AC-VRNN: Attentive Conditional-VRNN for Multi-Future Trajectory Prediction. *Computer Vision and Image Understanding, 210:1–10, 2021* [DOI:10.1016/j.cviu.2021.103245] [JCR IF: 4.3, SJR23: 1.42, Q1]

[A15] F. Becattini, T. Uricchio, L. Seidenari, **L. Ballan**, A. Del Bimbo. Am I Done? Predicting Action Progress in Videos. *ACM Trans. on Multimedia Computing, Communications, and Applications (TOMM), 16(4):1–24, 2021* [DOI:10.1145/3402447] [JCR IF: 5.2, SJR23: 1.4, Q1]

[A14] P. Coscia, F. Castaldo, F. Palmieri, A. Alahi, S. Savarese, **L. Ballan**. Long-term path prediction in urban scenarios using circular distributions. *Image and Vision Computing, 69:81–91, 2018.* [DOI:10.1016/j.imavis.2017.11.006] [JCR IF: 4.2, SJR23: 1.2, Q1, IVC Best Paper Award 2021]

[A13] C. Rupprecht, A. Kapil, N. Liu, **L. Ballan**, F. Tombari. Learning without prejudice: Avoiding bias in webly-supervised action recognition. *Computer Vision and Image Understanding, 173:24–32, 2018* [DOI:10.1016/j.cviu.2017.08.006] [JCR IF: 4.3, SJR$_{23}$: 1.42, Q1]

[A12] T. Uricchio, **L. Ballan**, L. Seidenari, A. Del Bimbo. Automatic image annotation via label transfer in the semantic space. *Pattern Recognition, 71:144–157, 2017* [DOI:10.1016/j.patcog.2017.05.019] [JCR IF: 7.5, SJR$_{23}$: 2.73, Q1]

[A11] X. Li*, T. Uricchio*, **L. Ballan**, M. Bertini, C. Snoek, A. Del Bimbo. Socializing the semantic gap: A comparative survey on image tag assignment, refinement and retrieval. *ACM Computing Surveys, 49(1):14:1–14:39, 2016* (* equal contrib.) [DOI:10.1145/2906152] [JCR IF: 23.8, SJR$_{23}$: 6.28, Q1]

[A10] **L. Ballan**, M. Bertini, G. Serra, A. Del Bimbo. A data-driven approach for tag refinement and localization in web videos. *Computer Vision and Image Understanding, 140:58–67, 2015* [DOI:10.1016/j.cviu.2015.05.009] [JCR IF: 4.3, SJR$_{23}$: 1.42, Q1]

[A9] **L. Ballan**, M. Bertini, T. Uricchio, A. Del Bimbo. Data-driven approaches for social image and video tagging. *Multimedia Tools and Applications, 74(4):1443–1468, 2015* [DOI:10.1007/s11042- 014-1976-4] [JCR IF: 3.0, SJR$_{23}$: 0.8, Q2]

[A8] H. Sahbi, **L. Ballan**, G. Serra, A. Del Bimbo. Context-dependent logo matching and recognition. *IEEE Transactions on Image Processing, 22(3):1018–1031, 2013* [DOI:10.1109/TIP.2012.2226046] [JCR IF: 10.8, SJR$_{23}$: 3.56, Q1]

[A7] I. Amerini, **L. Ballan**, R. Caldelli, A. Del Bimbo, L. Del Tongo, G. Serra. Copy-move forgery detection and localization by means of robust clustering with j-linkage. *Signal Processing: Image Communication, 28(6):659–669, 2013* [DOI:10.1016/j.image.2013.03.006] [SJR$_{23}$: 0.85, Q2]

[A6] **L. Ballan**, M. Bertini, A. Del Bimbo, L. Seidenari, G. Serra. Effective codebooks for human action representation and classification in unconstrained videos. *IEEE Transactions on Multimedia, 14(4):1234–1245, 2012* [DOI:10.1109/TMM.2012.2191268] [JCR IF: 8.4, SJR$_{23}$: 2.26, Q1]

[A5] I. Amerini, **L. Ballan**, R. Caldelli, A. Del Bimbo, G. Serra. A SIFT-based forensic method for copy-move attack detection and transformation recovery. *IEEE Trans. on Information Forensics and Security, 6(3):1099–1110, 2011* [DOI:10.1109/TIFS.2011.2129512] [JCR IF: 6.3, SJR$_{23}$: 2.89, Q1]

[A4] **L. Ballan**, M. Bertini, A. Del Bimbo, L. Seidenari, G. Serra. Event detection and recognition for semantic annotation of video. *Multimedia Tools and App., 51(1):279–302, 2011 (S.I. on Multimedia Surveys by World Experts)* [DOI:10.1007/s11042-010-0643-7] [JCR IF: 3.0, SJR$_{23}$: 0.8, Q2]

[A3] **L. Ballan**, M. Bertini, A. Del Bimbo, G. Serra. Video annotation and retrieval using ontologies and rule learning. *IEEE Multimedia, 17(4):80–88, 2010* [DOI:10.1109/MMUL.2010.4] [JCR IF: 2.3, SJR$_{23}$: 0.81, Q2]

[A2] **L. Ballan**, M. Bertini, A. Del Bimbo, G. Serra. Video event classification using string kernels. *Multimedia Tools and Applications, 48(1):69–87, 2010 (Special Issue on Content Based Multimedia Indexing)* [DOI:10.1007/s11042-009-0351-3] [JCR IF: 3.0, SJR$_{23}$: 0.8, Q2]

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International Conferences and Workshops

[C51] S. Das, G. Camporese, S. Cheng, **L. Ballan**. Distilling Knowledge for Short-to-Long Term Trajectory Prediction. *Proc. of IEEE/RSJ Int'l Conference on Intelligent Robots and Systems (IROS), Abu Dhabi, UAE, Oct 2024* [GGS/CORE: 1/A]

[C50] S. Das, G. Camporese, S. Cheng, **L. Ballan**. Distilling Knowledge for Short-to-Long Term Trajectory Prediction. *Proc. of IEEE International Symposium on Biomedical Imaging (ISBI), Abu Dhabi, UAE, Oct 2024*

[C49] S. Das, G. Camporese, S. Cheng, **L. Ballan**. Distilling Knowledge for Short-to-Long Term Trajectory Prediction. *Proc. of IEEE/RSJ Int'l Conference on Intelligent Robots and Systems (IROS), Abu Dhabi, UAE, Oct 2024* [GGS/CORE: 1/A]

[C48] E. Cancelli*, T. Campari*, L. Serafini, A. Chang, **L. Ballan**. Exploiting Proximity-Aware Tasks for Embodied Social Navigation. *Proc. of IEEE/CVF International Conference on Computer Vision (ICCV), Paris, France, Oct 2023* (* equal contribution) [GGS/CORE: 1/A*]

[C47]   D. Rigoni, L. Parolari, L. Serafini, A. Sperduti, **L. Ballan**. Weakly-Supervised Visual-Textual Grounding with Semantic Prior Refinement. *Proc. of British Machine Vision Conference (BMVC), Aberdeen, UK, Nov 2023* [GGS/CORE: 2/A]

[C46]   N. Osman, G. Camporese, **L. Ballan**. TAMFormer: Multi-Modal Transformer with Learned Attention Mask for Early Intent Prediction. *Proc. of IEEE Int'l Conference on Acoustics, Speech, and Signal Processing (ICASSP), Rhodes Island, Greece, Jun 2023* [GGS/CORE: 2/A, Oral]

[C45]   G. Camporese, E. Izzo, **L. Ballan**. Where are my Neighbors? Exploiting Patches Relations in Self-Supervised Vision Transformer. *Proc. of British Machine Vision Conference (BMVC), London, UK, Nov 2022* [Spotlight, GGS/CORE: 2/A, Oral Spotlight]

[C44]   T. Campari, L. Lamanna, P. Traverso, L. Serafini, **L. Ballan**. Online Learning of Reusable Abstract Models for Object Goal Navigation. *Proc. of IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), New Orleans, LA, USA, Jun 2022* [GGS/CORE: 1/A*]

[C43]   A. Monti, A. Porrello, S. Calderara, P. Coscia, **L. Ballan**, R. Cucchiara. How many Observations are Enough? Knowledge Distillation for Trajectory Forecasting. *Proc. of IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), New Orleans, LA, USA, 2022* [GGS/CORE: 1/A*]

[C42]   L. F. Chiara, P. Coscia, S. Das, S. Calderara, R. Cucchiara, **L. Ballan**. Goal-driven Self-Attentive Recurrent Networks for Trajectory Prediction. *Proc. of CVPR Int'l Workshop on Precognition: Seeing through the Future, New Orleans, LA, USA, Jun 2022*

[C41]   N. Osman, E. Cancelli, G. Camporese, P. Coscia, **L. Ballan**. Early Pedestrian Intent Prediction via Features Estimation. *Proc. of IEEE International Conference on Image Processing (ICIP), Bordeaux, France, Oct 2022* [GGS/CORE: 2/B]

[C40]   Y. Guo*, G. Camporese*, W. Yang, A. Sperduti, **L. Ballan**. Conditional Variational Capsule Network for Open Set Recognition. *Proc. of IEEE/CVF International Conference on Computer Vision (ICCV), Virtual, Oct 2021* (* equal contribution) [GGS/CORE: 1/A*]

[C39]   N. Osman, G. Camporese, P. Coscia, **L. Ballan**. SlowFast Rolling-Unrolling LSTMs for Action Anticipation in Egocentric Videos. *Proc. of ICCV Int'l Workshop on Egocentric Perception, Interaction and Computing (EPIC), Virtual, Oct 2021*

[C38]   T. Campari, P. Eccher, L. Serafini, **L. Ballan**. Exploiting Scene-specific Features for Object Goal Navigation. *Proc. of ECCV Int'l Workshop on Assistive Computer Vision and Robotics (ACVR), Glasgow, UK, Aug 2020*

[C37]   G. Camporese, P. Coscia, A. Furnari, G. M. Farinella, **L. Ballan**. Knowledge Distillation for Action Anticipation via Label Smoothing. *Proc. of Int'l Conference on Pattern Recognition (ICPR), Milan, Italy, 2020* [GGS/CORE: 2/B]

[C36]   T. Tesan, P. Coscia, **L. Ballan**. A CNN-RNN Framework for Image Annotation from Visual Cues and Social Network Metadata. *Proc. of Int'l Conference on Pattern Recognition (ICPR), Milan, Italy, 2020* [GGS: 2/A-]

[C35]   S. Dost, L. Serafini, M. Rospocher, **L. Ballan**, A. Sperduti. VT-LinKEr: Visual-Textual-Knowledge Entity Linker. *Proc. of European Conference on Artificial Intelligence (ECAI), Santiago de Compostela, Spain, 2020* [Highlight paper, GGS: 2/A-]

[C34]   S. Dost, L. Serafini, M. Rospocher, **L. Ballan**, A. Sperduti. VTKEL: A resource for Visual-Textual-Knowledge Entity Linking. *Proc. of ACM Symposium on Applied Computing (SAC), Brno, CR, 2020*

[C33]   S. Dost, L. Serafini, M. Rospocher, **L. Ballan**, A. Sperduti. Jointly linking visual and textual entity mentions with background knowledge. *Proc. of Int'l Conference on Natural Language & Information Systems (NLDB), Saarbrucken, Germany, Jun 2020*

[C32]   S. Dost, L. Serafini, M. Rospocher, **L. Ballan**, A. Sperduti. On Visual-Textual-Knowledge Entity Linking. *Proc. of IEEE Int'l Conference on Semantic Computing (ICSC), Laguna Hills, USA, Jan 2020*

[C31]   M. Lisotto, P. Coscia, **L. Ballan**. Social and scene-aware trajectory prediction in crowded spaces. *Proc. of ICCV Int'l Workshop on Assistive Computer Vision and Robotics (ACVR), Seoul, South Korea, Oct 2019*

[C30]   F. Bartoli, G. Lisanti, **L. Ballan**, A. Del Bimbo. Context-aware trajectory prediction. *Proc. Of Int'l Conference on Pattern Recognition (ICPR), Beijing, China, Aug 2018* [GGS: 2/A-]

[C29]   J.-B. Boin, A. Araujo, **L. Ballan**, and B. Girod. Pose-aware fisher vector aggregation for 3d object retrieval. *Proc. of IEEE Int'l Conference on Acoustics, Speech, and Signal Processing (ICASSP), New Orleans, LA, USA, March 2017* [GGS: 2/A]

[C28]   I. Amerini, T. Uricchio, **L. Ballan**, and R. Caldelli. Localization of jpeg double compression through multi-domain convolutional neural networks. *Proc. of CVPR Int'l Workshop on Media Forensics, Honolulu, HI, USA, July 2017*

[C27]   **L. Ballan**, F. Castaldo, A. Alahi, F. Palmieri, and S. Savarese. Knowledge transfer for scene-specific motion prediction. *Proc. of European Conference on Computer Vision (ECCV), Amsterdam, Netherlands, Oct 2016* [GGS/CORE: 1/A*]

[C26]   P. Coscia, F. Castaldo, F. Palmieri, **L. Ballan**, A. Alahi, and S. Savarese. Point-based path prediction from polar histograms. *Proc. of International Conference on Information Fusion (FUSION), Heidelberg, Germany, Jul 2016*

[C25]   J. Johnson*, **L. Ballan***, and L. Fei-Fei. Love thy neighbors: Image annotation by exploiting image metadata. *Proc. of IEEE/CVF International Conference on Computer Vision (ICCV), Santiago, Chile, Dec 2015* (* equal contribution) [GGS/CORE: 1/A*]

[C24]   X. Li*, T. Uricchio*, **L. Ballan**, M. Bertini, C. G. M. Snoek, and A. Del Bimbo. Image tag assignment, refinement and retrieval. *Proc. of ACM International Conference on Multimedia (ACM-MM), Brisbane, Australia, Oct 2015* (* equal contribution) [Tutorial]

[C23]   **L. Ballan***, T. Uricchio*, L. Seidenari, and A. Del Bimbo. A cross-media model for automatic image annotation. *Proc. of ACM International Conference on Multimedia Retrieval (ICMR), Glasgow, UK, Apr 2014* (* equal contribution) [GGS: 2/A-]

[C22]   **L. Ballan** and L. Seidenari. Hands on advanced bag-of-words models for visual object recognition. *Proc. of Int'l Conference on Pattern Recognition (ICPR), Stockholm, Sweden, Aug 2014* [GGS: 2/A-]

[C21]   T. Uricchio, **L. Ballan**, M. Bertini, and A. Del Bimbo. An evaluation of nearest-neighbor methods for tag refinement. *Proc. of IEEE International Conference on Multimedia & Expo (ICME), San Jose, CA, USA, Jul 2013* [GGS: 2/A-]

[C20]   G. Serra, T. Alisi, M. Bertini, **L. Ballan**, A. Del Bimbo, L. W. Goix, and C. A. Licciardi. Stamat: A framework for social topics and media analysis. *Proc. of IEEE International Conference on Multimedia & Expo (ICME), San Jose, CA, USA, Jul 2013.* [Demo]

[C19]   T. Uricchio, **L. Ballan**, M. Bertini, A. Del Bimbo. Evaluating temporal information for social image annotation and retrieval. In *Proc. of International Conference on Image Analysis and Processing (ICIAP), Napoli, Italy, Sep 2013.*

[C18]   **L. Ballan**, M. Bertini, T. Uricchio, A. Del Bimbo. Social media annotation. *Proc. of IEEE Int'l Conference on Content-Based Multimedia Indexing (CBMI), Veszprem, Hungary, Jun 2013.* [Invited]

[C17]   T. Uricchio, M. Bertini, **L. Ballan**, A. Del Bimbo. MICC-UNIFI at ImageCLEF 2013 Scalable Concept Image Annotation. *Proc. of CLEF Workshop, Valencia, Spain, Sep 2013.*

[C16]   **L. Ballan**, M. Bertini, A. Del Bimbo, A. M. Serain, G. Serra, B. F. Zaccone. Combining generative and discriminative models for classifying social images from 101 object categories. *Proc. of Int'l Conference on Pattern Recognition (ICPR), Tsukuba, Japan, Nov 2012.* [GGS: 2/A-]

[C15]   R. Caldelli, I. Amerini, **L. Ballan**, G. Serra, M. Barni, A. Costanzo. On the effectiveness of local warping against SIFT-based copy-move detection. *Proc. of Int'l Symposium on Communications, Control and Signal Proc. (ISCCSP), Roma, Italy, May 2012.* [Invited]

[C14]   **L. Ballan**, M. Bertini, A. Del Bimbo, G. Serra. Enriching and localizing semantic tags in internet videos. *Proc. of ACM International Conference on Multimedia (MM), Scottsdale, AZ, USA, Nov 2011.* [GGS: 1/A++]

[C13]   **L. Ballan**, M. Bertini, A. Del Bimbo, M. Meoni, G. Serra. Tag suggestion and localization in user-generated videos based on social knowledge. *Proc. of ACM Multimedia International Workshop on Social Media (WSM), Firenze, Italy, Oct 2010.* [Best Paper Award]

[C12]   I. Amerini, **L. Ballan**, R. Caldelli, A. Del Bimbo, G. Serra. Geometric tampering estimation by means of a sift-based forensic analysis. *Proc. of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Dallas, TX, USA, Mar 2010.* [GGS: 2/A]

[C11]   **L. Ballan**, M. Bertini, A. Del Bimbo, L. Seidenari, G. Serra. Effective codebooks for human action categorization. *Proc. of ICCV Int'l Workshop on Video-oriented Object and Event Classification (VOEC), Kyoto, Japan, Sep 2009.*

[C10]   **L. Ballan**, M. Bertini, A. Del Bimbo, L. Seidenari, G. Serra. Recognizing human actions by fusing spatio-temporal appearance and motion descriptors. *Proc. of IEEE International Conference on Image Processing (ICIP), Cairo, Egypt, Nov 2009.* [GGS: 2/A-]

[C9]   **L. Ballan**, M. Bertini, A. Del Bimbo, G. Serra. Video event classification using bag of words and string kernels. *Proc. of International Conference on Image Analysis and Processing (ICIAP), Vietri sul Mare (SA), Italy, Sep 2009.*

[C8]   **L. Ballan**, A. Bazzica, M. Bertini, A. Del Bimbo, G. Serra. Deep networks for audio event classification in soccer videos. *Proc. of IEEE International Conference on Multimedia & Expo (ICME), New York, NY, USA, Jun 2009.* [GGS: 2/A-]

[C7]   **L. Ballan**, M. Bertini, A. Del Bimbo, G. Serra. Action categorization in soccer videos using string kernels. *Proc. of IEEE International Workshop on Content-Based Multimedia Indexing (CBMI), Chania, Crete, Jun 2009.*

[C6]   **L. Ballan**, M. Bertini, A. Del Bimbo, L. Seidenari, G. Serra. Human action recognition and localization using spatio-temporal descriptors and tracking. *Proc. of Int'l Workshop on Pattern Recog. & A.I. for Human Behaviour Anal. (PRAI*HBA), Reggio Emilia, Italy, Dec 2009.*

[C5]   **L. Ballan**, M. Bertini, A. Del Bimbo, A. Jain. Automatic trademark detection and recognition in sport videos. *Proc. of IEEE International Conference on Multimedia & Expo (ICME), Hannover, Germany, Jun 2008.* [GGS: 2/A-]

[C4]   **L. Ballan**, M. Bertini, A. Jain. A system for automatic detection and recognition of advertising trademarks in sports videos. *Proc. of ACM International Conference on Multimedia (MM), Vancouver, BC, Canada, Oct 2008.* [Demo]

[C3]   A. D. Bagdanov, **L. Ballan**, M. Bertini, A. Del Bimbo. Trademark matching and retrieval in sports video databases. *Proc. of ACM International Conference on Multimedia Information Retrieval (MIR), Augsburg, Germany, Sep 2007.* [GGS: 2/A-]

[C2]   **L. Ballan**, M. Bertini, A. Del Bimbo, W. Nunziati. Soccer players identification based on visual local features. *Proc. of ACM International Conference on Image and Video Retrieval (CIVR), Amsterdam, Netherlands, Jul 2007.* [GGS: 2/A-]

[C1]   **L. Ballan**, M. Bertini, A. Del Bimbo, W. Nunziati. Automatic detection and recognition of players in soccer videos. *Proc. of International Conference on Visual Information Systems (VISUAL), Shanghai, China, Jun 2007.*

Books and Book Chapters

[B3]   P. Coscia, **L. Ballan**, F. Palmieri, A. Alahi, S. Savarese. Neural Approaches to Dynamics of Signal Exchanges. In A. Esposito, M. Faundez-Zanuy, F. C. Morabito, and E. Pasero, editors, *Neural Approaches to Dynamics of Signal Exchanges. Springer, 2020.*

[B2]   **L. Ballan**, L. Seidenari, G. Serra, M. Bertini, A. Del Bimbo. Recognizing human actions by using effective codebooks and tracking. In R. Cipolla, S. Battiato, and G. M. Farinella, editors, *Advanced Topics in Computer Vision. Springer, 2013.* [Invited among the best students who attended ICVSS]

[B1]   **L. Ballan**, M. Bertini, A. Del Bimbo, W. Nunziati, G. Serra. Commercials and trademarks recognition. In Y. Kompatsiaris, B. Merialdo, and S. Lian, editors, *TV Content Analysis: Techniques and Applications. CRC Press, Mar 2012.*

PERSONAL SKILLS

Mother tongue   Italian

Other language(s)   English

UNDERSTANDING		SPEAKING		WRITING
Listening	Reading	Spoken interaction	Spoken production	
C1/C2	C1/C2	C1/C2	C1/C2	C1/C2

Levels: A1/A2: Basic user - B1/B2: Independent user - C1/C2 Proficient user / <u>European Framework of Reference for Languages</u>[1]