

PERSONAL INFORMATION

Raffaella Brumana

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🌐 <http://www.gicarus.polimi.it> 🌐 <http://www.atlas.polimi.it> <https://www.linkedin.com/in/raffaella-brumana-3a619232/>

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POSITION

Full Professor (Geomatics)

WORK EXPERIENCE

07/01/2016–Present

Full Professor (Class 08/04 Geomatics) - Politecnico di Milano

Politecnico Milano - Department of Architecture, Built environment and Construction engineering (DABC), Milano, Italy, Milan (Italy)

- Professor of Innovative Advanced Surveying techniques, Surveying&Modelling Techniques at the M.Sc.Arch and Ms.Building Engineering/Architecture (School of Architecture - Urban Planning - Construction Engineering – AUIC, 7th position in the Int. QS University Ranking 2020
- Board Member - Post-Graduate School in Architectural and Landscape heritage SSBAP (1996-2020)
- Member of the Scientific Board of the POLIMI School of DABC Doctoral Studies (2009-2018).

Research: Surveying, Heritage Building Information Model, BIM-GIS modelling

Main research activities: surveying, processing, modelling and data management in the domain of Architectural Heritage, Built Environment, Landscape, Archaeological and Historical Site and Virtual Museums.

- 4D HBIM Heritage Building Information Model&management of monuments.
- HBIM specifications and protocols implementation of different LODs (Level of Details), LOGs (Level of Geometry), LOA (Level of Accuracy), LOI (Level of Information).
- HBIM repertoires and object libraries of architectural components (vaults, walls, domes, ceilings).
- n-D multi-scale-modelling and monitoring in complex scenarios, complex Object Recognition-Reconstruction (ORR);
- multi-resolution data acquisition (Laser scanning, mobile fast TLS, Photogrammetry), multi-spectral (RGB, Thermal Infrared IRT and NIR) images from different platforms (UAV/ground - on site/satellite).
- SCANtoBIM data processing; HBIM enabling complex model data management. Grade of Generation from simplex to complex (GOG1-10)
- HBIM addressing for the different uses (BIMtoFEA, Energy Efficiency Data management).
- eXtended Reality, XR (AR-MR-VR),
- Geoinformation data processing and management for the Societal Benefit Areas
- WEB GIS, BIM-GIS OpenData, GEODB HUB linked HBIM, SDI
- Open Data, Geographic Open Data (GOD), Linked Data, Linked BIM data
- Virtual Hub Discovery Access Brokering System based on Open Data (Temporal and Spatial Tile subsetting).
- Geocustering for Building District Urban Environmental.
- Common Data Environment co-working platform implementation

- Application implementation (Androids and IOS)
- Data formats : BIM modelling Data interoperability HBIM- IFC2x3, IFC4.

Teaching: Advanced Surveying techniques, 3D Surveying&Modelling Techniques, HBIM and GIS

01/01/2004–Present

Politecnico di Milano
Via Ponzio 31, 20133 Milan (Italy)
www.polimi.it

Scientific Responsible of **dABClab - Gicarus (4D BIM - GIS - SDI)**

Geospatial Information & Content modeling: Architectural heritage and built environment, eUrbanAtl@s, Surveying and Monitoring

Gicarus Surveying and Modelling - Via Ponzio, 31 20133 - Milan, Italy (Ph. +39 02 2399 6513)

Gicarus Surveying and Monitoring - Via Previati 1/c, 23900 - Lecco, Italy (Ph. +39 02 2399 8778)

Technical equipment (owned by dABClab Gicarus, R.Brumana Sc Resp): Mobile Mapping System SLAM ZEB, Terrestrial Laser Scanners (N.2 Faro Focus3D, RIEGL), Monitoring Total Station Leica TCA2003, GPS, UAV Falcon8 with IRT/RGB sensors, microdrones (Phantom, Dji) for fast3D sceneries in archeological and landscape contexts, Digital Cameras (Nikon, Canon), IRT FLIR Camera. Modelers, BIM-GIS- Augmented Reality SW licences (Autodesk REVIT®, Archicad (C), Rhinoceros ©, Bentley, Esri ARCGIS®, Intergraph®), 3D Image reconstructions sw for (i.e. Photoscan AGISOFT®, BENTLEY Context Capture ©); Open Source softwares : OPENBIM, RDF, QGIS opensource. Workstations and Laptops for HBIM-GIS, data modeling, processing and management, AR-VR-XR, Oculus, Smartphone and I-devices for AR.

<http://www.gicarus.polimi.it>; <http://www.atlas.polimi.it>;

01/09/2001–06/01/2016

Associate Professor

Politecnico Milano - Department of Architecture, Built environment and Construction engineering (DABC), Milano, Italy, Milan (Italy)

- Since 2000, **Board Member, Post-Graduate School** (SBAP-Scuola di Specializzazione in Beni Architettonici e Paesaggio), Teaching of Applied Photogrammetry.
- Since 2006, **Board Member, Research Doctorate programme**, for Ph.D. students in Geodesy and Geomatics (5 credits), GIS for cultural Heritage.

16/10/1995–31/08/2001

Assistant Professor (Class 08/04 Geomatics)

Politecnico di Milano - Dept. of Hydraulic, Environmental, Surveying and Infrastructure Engineering, Milan (Italy)

EDUCATION AND TRAINING

1989–1993

PhD on Geodetic and Topographic Sciences - (cycle V 1989-1992)

Politecnico di Milano - Dept. of Hydraulic, Environmental, Surveying and Infrastructure Engineering, Milan (Italy)

PhD Dissertation: 'Metodologie e tecniche avanzate di rappresentazione nel rilevamento del patrimonio architettonico'. Advanced Methodologies and Techniques of Heritage Documentation

1983–1988

MSc on Architecture (5 years programme) - with Honour

Politecnico di Milano - Faculty of Architecture

1977–1982 **High School Humanistic Maturity (Liceo Classico) - Ancient Greek and Latin**

Liceo Classico Alessandro Manzoni (Lecco)

PERSONAL SKILLS

Mother tongue(s) Italian

Foreign language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C2	C2	C2	C2	C2
	C2				
Greek	A1				

Levels: A1 and A2: Basic user - B1 and B2: Independent user - C1 and C2: Proficient user
 Common European Framework of Reference for Languages - Self-assessment grid

Digital skills

SELF-ASSESSMENT				
Information processing	Communication	Content creation	Safety	Problem-solving
Proficient user	Proficient user	Proficient user		

Digital skills - Self-assessment grid

ADDITIONAL INFORMATION

Editorial activities

Editor / Co-Editor / Associate Editor/ Guest Editor

- Brumana, Tucci, Lerma (Eds), 2019, Special Issue: Informative Models and Systems for Virtual Museums. In: Virtual Archaeology Review, 10(21): 2019, pp.1-131, <https://polipapers.upv.es/index.php/var/issue/view/908/showToc>.
- Brumana, R., Pracchi, V., Rinaudo, F., Grimoldi, A., Scaioni, M., Cantini, L., and Previtali, M. (Eds). GEORES2019. Geomatics and restoration. Cultural heritage: challenges, new perspectives and technology innovation. Toward informative content models and beyond, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLII-2/W11, <https://doi.org/10.5194/isprs-archives-XLII-2-W11-1-2019>, 2019, pp.1-1198, <https://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XLII-2-W11/>.
- Ioannides, M., Fink, E., Brumana, R., Patias, P., Doulamis, A., Martins, J., Wallace, M. (Eds.). Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection, EuroMed 2018, Nicosia, Cyprus, Proceedings , LNCS 11196 and LNCS 11197. Springer.

Peer reviewer for the following journals:

- Journal of Cultural Heritage (ISSN: 1296-2074)
- Virtual Archaeology Review (ISSN 19899947) – SCOPUS INDEXED
- Cipa Ottawa 2017 – 26th International Symposium on Digital Workflows for Heritage

Conservation

- Euromed 2018 Digital Heritage - International Conference on Digital Heritage focusing on Documentation, Preservation and Protection.
- GEORES 2019 - 2nd International Conference of Geomatics and Restoration ISPRS WG II/8, WG III/5, WG V/1

Steering committee, International Committee, Advisory Board

- 2017-on course, Partnership Board Member of the EU ECTP platform - Public Private Partnership (PB ECTP EEB PPP)
- 2019 - on course Advisory Board Member ERACHAIR, CUT Cyprus (Prof. Marinos Ioannides)
- 2017- on course Copernicus Academy Member– Network Selection (Copernicus Academy Network Applicant Call for expression of interest to join the Copernicus Academy Network) – DG GROW, Space Data for Societal Challenges and Growth.
- 2017-2019 Advisory Board Member - VIMM (CSA H2020)
- 2012-14, member of the E2BA STEERING COMMITTEE,
- 2015-16 SCIENTIFIC COUNCIL E2BA (Energy Efficient Building Association)

Conferences

Organization of Scientific events and International Conferences

- GEORES2021 (Co-Chair) - 3rd Int. Conf. of 'Geomatics and Restoration', April 2021 (Valencia, Spain) EUROMED2018 (Co-chair.)
- GEORES2019 (Chair) - 2nd Int. Conf. of 'Geomatics and Restoration', Milan 8-10 May 2019 (ISPRS and CIPA-ICOMOS event)
- EUROMED2018 (Co-chair)
- 2017 CIPA Ottawa 2017 26th International Symposium (ICOMOS and ISPRS), Member of the Scientific Board (double peer review process management Conference Software - ConfTool Pro 2.6.106+TC © 2001 - 2017 by H. Weinreich, Hamburg, Germany<https://www.conftool.pro/cipaottawa/>).

Publications

Author of more than 200 publications

See Annex 1 "Publication record"

Bibliometrics:

Scopus

- No. of total indexed publications: 89
- H-Index 18,
- 964 Citations

ISI Web of Science (WoS)

- No. of total indexed publications: 89
- H-Index 18,
- 964 Citations

Memberships

International Collaboration, roles in scientific and technical committees, Ws organization:

-Since 2010 she collaborates as Polimi Associate Member of Lombardy Region within NEREUS (Network of the EU Regions for Using Space technologies), WGs GMES and CET Programme, to performs scientific and technologic research for Space GMES services development devoted to downstream services deployment.

-2012-14, member of the STEERING COMMITTEE, 2015 SCIENTIFIC COUNCIL E2BA (Energy Efficient Building Association, PPP Private Public Partnership), of the E2B EI, Energy Efficient Building

European Initiative (Eu2020 objectives, Horizon2020 Challenge, Decarbonization2050), supported by GI, BIM-EM-GIS.

- RSCY2014-15 Member of the international committee of the International Conference On Remote Sensing and Geo-Information of The Environment <http://www.cyprusremotesensing.com/rscy2015/> (proceedings published by SPIE Eds).

- ASITA2015 (29-30-1 Oct, Lecco IT) - Member of the Organizer Hosting Committee of the XIX National Conference and Scientific Responsible of the WS BIM Special Session.

- Scientific Responsible of the Conference 'Il portale Atl@nte e i catasti storici' for the presentation of the Open Source Geoportal multi-temporal map series www.atlas.polimi.it (Cariplo Foundation), 14-05-2012, Milano.

-2006-09, International Scientific Board of UNESCO-OPEN FORUM Mesopotam Saranda (Albania), SR of the surveying campaign (2006-09 with Univ.Ca' Foscari, Koc University, Istanbul).

-ICOMOS Member (International Council on Monuments and Sites).

Honours and awards

European Heritage Award/Europa Nostra Award 2020 The Basilica of Santa Maria di Collemaggio

European Heritage Award/Europa Nostra Award 2020 - The Basilica of Santa Maria di Collemaggio, May 07, 2020 | Conservation | Italy | L'Aquila. S. Della Torre Coordinator of the Preservation project, Superintendence of L'Aquila Responsible for the Design Project and Preservation Construction Site, R.Brumana responsible of the Scan-to-HBIM consultancy contract to support the preservation design project and on site management, and video production.

Best Paper Award GEORES 2019

GEORES 2019 - 2nd International Conference of Geomatics and Restoration

For the paper: Banfi, F., Brumana, R., & Stanga, C. (2019). a Content-Based Immersive Experience of Basilica of SANT'AMBROGIO in Milan: from 3d Survey to Virtual Reality. ISPRS-International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 4211, 159-166.

2018 European Commission - RADAR INNOVATION AWARD

EU ENERGIC OD (CIP N. 620400) – For the best APPlication using a Virtual Hub to access Open Data and historical maps heritage

The Werner Weber award - Best Full paper CIPA 2016

EuroMed 2016 Euromed Digital heritage: progress in cultural heritage documentation, preservation and protection

For the paper: Barazzetti, L., Banfi, F., & Brumana, R. (2016, October). Historic BIM in the Cloud. In Euro-Mediterranean Conference (pp. 104-115). Springer, Cham.

17° MEDIARC Festival Internazionale di Architettura in Video – 2° Premio

For the video: Ponte Azzone Visconti – Campagna di rilevamento e modello BIM (Building Information Modelling) *Glarus Lab (4D BIM – HBIM – WEBGIS – SDI) Geospatial Information Content Modelling: Architectural heritage&built einvironment, eUrbanAtlas, data Surveying*

Courses & teaching activities

Official lecturer at Politecnico Milano:

Courses held in the last 5 years at the School of Architecture - Urban Planning - Construction Engineering – AUIC (Scuola di Architettura Urbanistica Ingegneria delle Costruzioni), 9th position in the Int. QS University Ranking 2018, 11th 2018, 7th 2019

- **AA 2015/2020 Arc - Urb - Cost (Mag.)(ord. 270) - MI (1195) ARCHITETTURA - AMBIENTE COSTRUITO - INTERNI - ARCHITECTURE - BUILT ENVIRONMENT – INTERIORS**

051566 - ARCHITECTURAL PRESERVATION STUDIO

051568 - ADVANCED SURVEY AND REPRESENTATION TECHNIQUES (4cfu)

- **AA 2017/18 - Arc - Urb - Cost (Quinq.)(ord. 270) - LC (1144) INGEGNERIA EDILE - ARCHITETTURA**

099698 - DISEGNO DELL'ARCHITETTURA 2 + LABORATORIO DI RILIEVO FOTOGRAMMETRICO DELL'ARCHITETTURA

099705 - DISEGNO DELL'ARCHITETTURA 2 (DISEGNO) – *Topografia (3cfu)*

99704 – LABORATORIO DI RILIEVO FOTOGRAMMETRICO DELL'ARCHITETTURA (3CFu)

- **AA 2015/2020, Arc - Urb - Cost (Mag.)(ord. 270) - MI (1217) ARCHITETTURA E DISEGNO URBANO - ARCHITECTURE AND URBAN DESIGN**

051502 - LABORATORIO DI RESTAURO

051504 - TECNICHE INNOVATIVE DEL RILEVAMENTO (4cfu)

- **AA 2017/18, Arc - Urb - Cost (1 liv.)(ord. 270) - MI (1094) PROGETTAZIONE DELL'ARCHITETTURA**

097304 - LABORATORIO DI PROGETTAZIONE ARCHITETTONICA 2

097331 - TOPOGRAFIA E RILEVAMENTO (4cfu)

- **AA 2016/2017, Arc - Urb - Cost (Quinq.)(ord. 270) - LC (1144) INGEGNERIA EDILE - ARCHITETTURA**

099698 - DISEGNO DELL'ARCHITETTURA 2 + LABORATORIO DI RILIEVO FOTOGRAMMETRICO DELL'ARCHITETTURA

- **099705 - DISEGNO DELL'ARCHITETTURA 2 (DISEGNO) – Topografia (3cfu)**

- **99704 – LABORATORIO DI RILIEVO FOTOGRAMMETRICO DELL'ARCHITETTURA (3CFu)**

Arc - Urb - Cost (1 liv.)(ord. 270) - MI (1094) PROGETTAZIONE DELL'ARCHITETTURA

097304 - LABORATORIO DI PROGETTAZIONE ARCHITETTONICA 2

097331 - TOPOGRAFIA E RILEVAMENTO (4cfu)

Arc - Urb - Cost (Mag.)(ord. 270) - MI (1136) ARCHITETTURA

093333 - LABORATORIO DI RESTAURO ARCHITETTONICO

091446 - TECNICHE INNOVATIVE DEL RILEVAMENTO (4cfu)

AA 2015/2016

Arc - Urb - Cost (Quinq.)(ord. 270) - LC (1144) INGEGNERIA EDILE - ARCHITETTURA

083568 - DISEGNO DELL'ARCHITETTURA 2 + LABORATORIO DI RILIEVO FOTOGRAMMETRICO DELL'ARCHITETTURA

- **083566 - DISEGNO DELL'ARCHITETTURA 2 (DISEGNO) – Topografia (3cfu)**

Arc - Urb - Cost (1 liv.)(ord. 270) - MI (1094) PROGETTAZIONE DELL'ARCHITETTURA

097304 - LABORATORIO DI PROGETTAZIONE ARCHITETTONICA 2

097331 - TOPOGRAFIA E RILEVAMENTO (4cfu)

Arc - Urb - Cost (Mag.)(ord. 270) - MI (1136) ARCHITETTURA

093333 - LABORATORIO DI RESTAURO ARCHITETTONICO

091446 - TECNICHE INNOVATIVE DEL RILEVAMENTO (4cfu)

Arc - Urb - Cost (Mag.)(ord. 270) - MI (1136) ARCHITETTURA

093384 - ARCHITECTURAL PRESERVATION STUDIO

- **093420 - SURVEY ADVANCED TECHNIQUES**

Courses held at the Doctoral School :

- **ABC PHD POLIMI Doctoral School - MI (1367) BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING**

099065 - CULTURAL HERITAGE AND BUILT ENVIRONMENT SURVEYING, MODELLING AND MONITORING (R. Brumana) "Multi-Temporal, Multi-Source, Multi-Scale Remote Sensing Data for Built Environment, Cultural and Archaeological Heritage" **(5 cfu)**

Courses held at the Master post Master School :

- AA. 2011/12, 2013/14 2015/16, 2017/18, 2018/19, Scuola SSBAP Scuola di Specializzazione in Beni Architettonici e Paesaggio - Advanced Surveying Techniques - Tecniche avanzate di Rilevamento

International Workshops and Internship programmes

- Internship programmes: 2016-2020 Polimi Scientific responsible and Executive Committee Member of Partnered Research Training Initiative 'New Paradigm / New Tools', Canada SSHRC (Social Sciences and Humanities Research Council, Canadian Government, Partnership Grants - Partnered Research Training Initiative Program).
- 10-14/01/2011, KUL Leuven RLICC Be, 10thWS ARCHDOC (Architectural Heritage Documentation for Conservation), "Partnership in Learning, a training course designed for graduate students of Conservation and RLICC MANAMA (Unesco Chair on Preventive conservation of monuments and Sites, Master After Master in Conservation of Monuments and Sites). R. Brumana: Guest Lecturer on Heritage recording and Training Group Coordination providing practicum sessions about Historic Building's metric survey- 40hours; from 10-01-2011 to 14-01- 2011
- 14-19/11/2011, KUL Leuven RLICC Be, 11thWS ARCHDOC (Architectural Heritage Documentation for Conservation), "Partnership in Learning, a training course designed for graduate students of Conservation and RLICC MANAMA (Unesco Chair on Preventive conservation of monuments and Sites, Master After Master in Conservation of Monuments and Sites). R. Brumana: Guest Lecturer on Heritage recording and Training Group Coordination providing practicum sessions about Historic Building's metric survey - 40 hours ; from 14-11-2011 to 19-11- 2011
- 03-07/12/2012, KUL Leuven RLICC Be, invitata al 12thWS ARCHDOC (Architectural Heritage Documentation for Conservation), ERASMUS Teaching Staff Mobility, "Partnership in Learning, a training course designed for graduate students of Conservation and RLICC MANAMA (Unesco Chair on Preventive conservation of monuments and Sites, Master After Master in Conservation of Monuments and Sites)- 40 hours; from 03-12-2012 to 07-12-2012
- 08-12/12/2014, KUL Leuven RLICC Be, invitata al 12thWS ARCHDOC (Architectural Heritage Documentation for Conservation), ERASMUS Teaching Staff Mobility, "Partnership in Learning, a training course designed for graduate students of Conservation and RLICC MANAMA (Unesco Chair on Preventive conservation of monuments and Sites, Master After Master in Conservation of Monuments and Sites)- 40 hours; from 08-12-2014 to 12-12-2014
- 16-20/11/2015, KUL Leuven RLICC Be, invitata al 12thWS ARCHDOC (Architectural Heritage Documentation for Conservation), ERASMUS Teaching Staff Mobility, "Partnership in Learning, a training course designed for graduate students of Conservation and RLICC MANAMA (Unesco Chair on Preventive conservation of monuments and Sites, Master After Master in Conservation of Monuments and Sites)- 40 hours; from 16-11-2015 to 20-11-2015
- 2013 and 2014 FORMAT EO (FORmation of Multi-disciplinary Approaches to Training in Earth Observation), Funded ERASMUS IP, University of Leicester, UK.

Supervision of graduate students and postdoctoral fellows

- 2000 – 2020 Supervisor and Co-supervisor of graduate thesis students; Supervision of PHD candidates, more than 200 as board member and supervisor of 20, and round 60 Funded Grants Postdoc years.
- - 2009 – 2020 Supervision of Students coming from international universities, among which: Supervision of n.3 Graduate student thesis (KUL, RLICC centre, Leuven Be), 6 months, of n. 2 from NTUA Athens, 6 month, on Heritage web Atlas, HBIM and modelling, archaeological sites.
- - 2018 Supervision of an Eng. PHD Visiting researcher 6 months from the Academy of Science and Technology (Prague, CZ) on HBIM vault modelling for structural analysis and object libraries (2018)
- - 2015-2020 Supervision of granted Internship programme (NP/NT SSHRC programme funded by Canadian Government Social Science and Humanities) from Carleton University CIMS OTTAWA for under graduated and graduated MSC students (4 months period May-August).

Projects

Scientific Responsible, PI (Principle Investigator) of international European and IT funded projects and tenders:

- **EC tender VIGIE 2020/654** - "Study on quality in 3D digitisation of tangible cultural heritage: mapping parameters, formats, standards, benchmarks, methodologies, and guidelines" - Negotiated procedure with 5 candidates (Point 14.2 Annex I to FR2018 for procedures below

- EUR 139 000) – CUT (Cy) coordinator - POLIMI Subcontractor (R. Brumana PI, Sc. Resp.).
- **ALDREN H2020 2018-20** – Polimi Partner - Participant as responsible of Data Acquisition and Processing Protocols for the building booklet.
- **FESR HomeBIM 2017-2019** (Sc. Res. POLIMI); 2017-2019_ “HOMeBIM liveAPP: VR multi-user Live APP BIM-sensor integration – ID 379270” “Smart Living:” d.d.u.o. n.11672 15.11. 2016 Development and Innovation projects (S&I) “Smart Living”. POLIMI PI. *APP implementation for the visualization of monitoring data on 3DBIM through smart devices (smarthphones).*
- 2014-2017, **ENERGIC-OD 620400, European Network for Redistributing Geospatial Information to user Communities - Open Data** (Head CNR-IIA) CIP-ICT-PSP-13-7Theme 2 - Digital content, OD creativity. Polimi R. Brumana, in charge for GEOPANAPP implementation, Multisource OD-GOD access&semantic profiling. POLIMI PI. Awarded by the EC-ICT Radar Innovation.
- **2012-2014, FP7-2011-NMP-ENV-ENERGY-ICT, GE2O, “Geo-clustering to deploy the potential of EEB across EU” (Head: CSTB, R. Brumana Polimi) GA 285501, 1-31-2012. Open source geoportal Data Access).** POLIMI PI, in charge for UAV-RGB-IRT-Scan-to-BIM-on site-automation, BIM User Planner Tool of precast structural panels for retrofitting and energy efficiency, controlled high precision installation of anchors and panels without scaffolding. Awarded as one the best projects (EC2017, Bruxelles).
- **EASEE (2011-13), FP7 Large scale project (R. Brumana Sc. Resp Polimi in charge for BIM User Planner Tool, Surveying to BIM automation).** POLIMI Scientific Coordinator and Programme Manager
- **PORL EU FESR (2007-13) ‘Multimedia system for the presentation and participated recognizing of the environmental values of the landscape of the Lake of Como’.** Virtual Museum. Polimi: Prof. Della Torre. R. Brumana Scientific Responsible of the Multimedia Museum (Polimi Scientific Support).
- **EU FESR CPRE (2013-2014) Planned Preservation in the Retic Alps' - R. Brumana Scientific Responsible of the SCANtoHBIM of the Masegra Castle**

IT projects

- 2017-2019, PRIN2015 GAMHer - GEOMATICS DATA ACQUISITION AND MANAGEMENT FOR LANDSCAPE AND BUILT HERITAGE IN A EUROPEAN PERSPECTIVE; R. Brumana PI POLIMI Partner.
- 2010-2012, PRIN 2008, 20088WBZFP, National Scientific Coordinator: R. Brumana. ICT and Cultural Heritage. Information Technologies and Cognitive system for 3D representation. (Total Budget 540 K€, Budget Polimi, 130k€)
- 2009-2012, OPEN ATL @S GEOPORTAL (Water&territory)”, 2009-2012; www.atlantestoricolombardia.it (Atl@nte dei catasti storici e delle carte topografiche della Lombardia. Navigare oggi il tempo del territorio di domani). Project Head: Prof. R. Brumana (Funding Source, Fondazione Cariplo, rif 009.n.2006). (Total Budget 695.K€). 2009-2012, 36 months.
- 2002-2006, SIDART project 'Sistema Integrato per la Diagnostica dei Beni Artistici', PON Technologic Research Development and High Education program (PON Programma Operativo Nazionale “Ricerca Sviluppo Tecnologico e Alta Formazione” 2002-2006), Head of Consortium CETMA, Research City of Brindisi, involving ENEA-Frascati, Partner Politecnico di Milano, ISUFI (Università degli Studi di Lecce), Politecnico di Bari, INOA (Istituto Nazionale dell'Ottica Applicata), EL.EN. S.p.a., ATS S.r.l.). Scientific Coordinator of Politecnico di Milano, Prof. S. Della Torre, BEST, Prof. R. Brumana DIAR, Responsible for sw developing (MiMoLSP, Multi scale Modeling for Object reconstruction from Laser Scanner and Photogrammetry) to support LS Prototype developed by ENEA to generate 3DOrtophotoModel from Laser Scanner Point Clouds with modules of virtual animation and navigation (applies: Tarquinia' Etruscan Tomb of Demone Azzurro, Imperial Forum in Roma Basilica of S. Maria Antiqua with Paleo-Christian frescos) (total Budget POLIMI-Prof. Della Torre 1.200 k€, Budget DIAR Brumana 691.k€).
- PRIN 2004-06, National Research Programme, Evolved structure of digital-mapping for the GIS and the web. Responsible of Polimi UB Prof. R. Brumana, WEBGIS: GeoDBase sharing and system interoperability to support service distribution at the urban scale. Funding Source: Italian Ministry of University and Research-PRIN (DIAR Budget 148.80 k€).

- Hosting Server POLIMI-ASICT. Open Source Infrastructure developed to manage Open Data, Geographical Open Data redistribution using the Italian Virtual Hub
- GeopanAtlas APP implementation (Architectural Components: Open Layer, WTS, and others). 3Terabyte capability.
- Infrastructure for the On site Museum and Outside access: The Virtual Museum of the Landscape of Como Lake: SDI, with different devices, Smartphones, tablets. Hosting Server Polimi ASICT, www.atlas.polimi.it (Gicarus LAB, R.Brumana Sc Resp.).
- ATL@S GEOPORTAL Geoportal open source Infrastructure. Geoportal open source test web site Infrastructure for multi-temporal Geodata access and sharing map series and HBIM repository; Typo4.4.5, Geoserver, WMTS, A360. GEOPAN-APP managing the HBIM-GEODB HUB discovery and access to open data. www.atlas.polimi.it (Gicarus LAB, R.Brumana Sc Resp.)

Consultancy contracts

Responsibilities in Research and Consultancy Contracts, Consultancy Contracts and products

She has been responsible of research contracts on survey data acquisition, processing and management on Environmental and Cultural Heritage domain, among which:

- 2019-2020, Arquata del Tronto (IT), The Rocca and the San Francesco Basilica, hamlet and cloister surveying (TLS, MMS SLAM and multi-image acquisition) for crack detection and HBIM (volume stratigraphy) - Consulency Contract for the preliminary design project of the Rocca and San Francesco (Municipality of Arquata del Tronto and POLIMI-Dastu)
- 2014-2016, Masegra Castle Surveying and HBIM;
- 2015-2018, Azzone Visconti Bridge – 3D Photogrammetry, LIDAR data and ZEB SLAM data integration for HBIM modelling, BIMtoFEA and BIM monitoring;
- 2014-2018 Palazzo Magio HBIM-GEODB HUB Vault repository;
- 2012-2014, HBIM LOD LOG LOA protocols definition, Basilica di Sant’Ambrogio HBIM based Virtual Museum tuned to XR, . Surveying to HBIM of the Basilica di Collemaggio funded by ENI National Energy Agency after the Earthquake in L’Aquila;
- 2013-2017 - Virtual MultiMedia Museum of the Landscape of Como Lake
- 2007-8 Guglia Maggiore of Milan Cathedral (UAV surveying and modelling). Cathedral of Milan Spire surveying with UAV flight and fast continuous image block acquisition-orientation-adjustment to support the dome monitoring and crack analysis detection.
- 2004-2008 E-VMV Surveying, Modeling and Virtual Museum of the Royal Villa in Monza Park
- 2001-2008, Basilica of San Marco, Venice (Consultancy contracts for the realization of the 3D-Orthophoto, mosaic floor and domes; Precision Levelling for GIS water rising management and monitoring of the Place of San Marco and the Basilica).
- 2009-2012, “Progetto GUGLIA. Progetto di Rilievo della Guglia Maggiore del Duomo di Milano”, scientific Responsible with Prof. C. Monti and collaboration to the survey till the 1st year of the Research Contracts (2009) for the UAV/RC (Radio Controlled/Unmanned Aerial Vehicle) experimental survey with the photogrammetric platform developed for Cultural heritage purposes. Research Contract BEST Dept., Funding Source: Veneranda Fabbrica del Duomo. (Total Budget BEST 522. K€).
- 2003-2008, Villa Reale di Monza. Funding Source: Agenzia del Territorio. Project Heads: Prof. C. Monti and Prof. R. Brumana. 2003-2005, Topographic and photogrammetric survey of the Villa Reale di Monza to support of the international design competition for restoration - I ,II,III Lotto. (Budget 488.5 k€). 2006-2007, IV Lotto E- VMV Virtual Museum Villa for remote access of 3Dphotogrammetric survey to support planned conservation and divulgation programme, Project Heads: Prof. C. Monti and Prof. R. Brumana (Budget 270. k€). 2008, V Lotto, 3DOrthophoto integrated by Laser Scanner Surveys of the Halls sited at the I and II Noble Floor of the Central and North Building. Project Heads: Prof. C. Monti, Prof. R. Brumana (Budget 276. K€).
- 2003-06, Basilica of San Marco, Venice. High precision general levelling, Laser Scanner Survey and 3D-Orthophoto of the mosaic floor, Venice. Project Heads: Prof. C. Monti, Prof. R. Brumana. Funding Source: Procuratoria di San Marco (Budget 211.0 k€).
- 2006-2007, ‘Andrea Mantegna Project.. Madonna in Gloria tra i Santi...’ (Canvas Painting Milan, Trivulzio Collection), Multimedia communication on the interdisciplinary results of an innovative monitoring scientific approach’, Copyright reserved Politecnico Monti/Brumana©2006, displayed at the Museum of Castelvecchio, Verona and in the Pinacoteca del Castello, Milan, in occasion of the celebrations of the 500th year of the death. Credits: Project Head Coordinator: L. Toniolo, Politecnico (DEI, DIIAR, Fisica), Centro conservazione e valorizzazione dei Beni Culturali, Opificio

delle Pietre Dure-Firenze, Istituto Nazionale di Fisica Nucleare, Istituto di Fisica Applicata-Università di Milano, INOA (Istituto Nazionale di Ottica Applicata), CNR&Gruppo Beni Culturali, R. Brumana the 'Global Shape Recognizing of the Mantegna's Madonna in Gloria'(DIAR), on which results the 'Opificio delle Pietre Dure di Firenze' carried out the canvas intervention. A 1:1 scale representation has been exposed at the Civici Musei del Castello Sforzesco di Milano to explain the experimented methodology.

- 2003–04, Laser Scanner and Photogrammetric Survey of the Basilica of San Lorenzo in Milan (50. K€).
- 2003-05, GISWEB Historical Centers of Municipality of Cantù, Project Heads: Prof. C. Monti, Prof. R. Brumana, Funding Source: Cantù Municipality (Budget 67.2 k€). 2005-07, Sistema informativo territoriale per il Comune di Gorgonzola, Project Heads: Prof. C.Monti, Prof. R. Brumana, Funding Source: Gorgonzola Municipality (Budget 102.0 k€).
- 2000-2001. Agreement (POLIMI-Osservatorio CIVIS per il Centro Storico, Genoa), for Research development to identify technical, methodological and organizational solutions to guarantee interoperability between GIS in an urban frame work (WEB-GIS prototype for data sharing of the historic Centre of Genoa). Convenzione per lo "Svolgimento di una ricerca volta ad individuare soluzioni tecniche, metodologiche ed organizzative a garanzia dell'interoperabilità dei sistemi informativi territoriali (SIT) in ambito urbano": realizzazione di un WEB-GIS per la distribuzione delle informazioni del Centro Storico di Genova.

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- 2002-2004. Field study and experimentation activities on the definition of methodologies, regulations, and technical specifications for geo-referencing ... of the monument heritage of Lombardy, for the Risk Map of the artistic and cultural heritage. Funding Source:IRER (Regional Institute Economic Research).
- Brumana R., Monti C., (a cura di), La carta del rischio del patrimonio culturale in Lombardia. Guida per la georeferenziazione dei beni storico-architettonici, 1-356, Guerini e Associati, Milano
- 2000. Collaboration at the Consultancy Contract on 'Guide line and analysis for the landscape insertion of the restoration and recovery design of marine water front, to guarantee the harmonic environment mitigation of the works: 3Dinteractive navigation map of the water front coast between Levanto and Bonassola (3Dpanoramic navigation-WaterFrontView-GIS)'.

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