

MARIO MEZZANZANICA

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CURRENT POSITIONS

Full Professor of Computer Engineering (ING-INF/05) Department of Statistics and Quantitative Methods (DISMEQ) University of Milano-Bicocca, Italy	<i>2021 (May) - present</i>
Vice-Rector of Advanced Training and Job Placement University of Milano-Bicocca, Italy	<i>2019 - present</i>
Head of Department Department of Statistics and Quantitative Methods (DISMEQ) University of Milano-Bicocca, Italy	<i>2018 - present</i>
Scientific Director at CRISP Interuniversity Research Centre on Public Services at University of Milano-Bicocca, Italy	<i>2005 - present</i>

PAST POSITIONS

Associate Professor of Computer Engineering (ING-INF/05) University of Milano-Bicocca, Italy	<i>2005 - 2021</i>
Director at Master in Business Intelligence and Big Data Analytics University of Milano-Bicocca, Italy	<i>2012 - 2022</i>
Member of the Academic Senate University of Milano-Bicocca, Italy	<i>2015 - 2021</i>
Founder of Tabulaex, Spin-off of University of Milano-Bicocca University of Milano-Bicocca, Italy	<i>2005 - 2018</i>

RESEARCH INTERESTS

The main area of interest is Information Systems and Big Data Analytics. He has carried out several research activities that have been published in scientific journals, conference proceedings, and books both at international and national level. Specifically:

Business Intelligence and Decision Making

This research area studies and analyses the methodological aspects of design, management, and analysis of data derived from the business process and data external to the company for supporting decision-makers at different levels (e.g., operation, strategic and tactical). The approach and methodologies have been applied to several different uses focusing on the needs of individual organizations. Furthermore, particular attention is given to the “knowledge” needs of public services, which require specific methodologies and techniques to design Statistical Informative Systems for decision-making. In this setting, he has been developing a methodology for processing statistical and administrative data, focusing on the definition of KPI for supporting policy making. Here, he has been guiding several research projects at regional, national and European levels.

Big Data Analytics

The rapid diffusion of digitalisation has made available a huge amount of data that require the use of Big

Data techniques and methodologies for dealing with huge masses of data coming from several sources (structured and unstructured), as they represent a valuable value for enterprises and PAs for deeply understand social, economic and business phenomena. His research in this direction has covered all the main steps of the data cycle process, which includes data selection and integration; data preprocessing, transformation and cleaning; data mining and multidimensional data visualization. Specifically, he investigated AI-based techniques (i.e., machine learning, information extraction and knowledge representation, word embedding representation and reasoning), applying it successfully to the labour market domain for supporting decision making (aka *Labour Market Intelligence*). In the context of LMI, he has been guiding many national and international projects to put AI into Labour Market by processing millions of unstructured documents (Online Job Vacancies) to get knowledge about labour market phenomena for different stakeholders.

TEACHING ACTIVITIES

Master Degree and Bachelor Degree Courses

He taught the following courses at the University of Milano-Bicocca:

- *Big Data Analytics for Decision Making Processing*
- *Business Intelligence*
- *Databases*
- *Information Systems*
- *Management of Information and Knowledge*

SELECTED RESEARCH PROJECTS

In all the projects below (in the field of Labour Market), he has been involved as Scientific Supervisor and Senior Analyst for the following projects

- **Eurostat and Cedefop Big Data for Labour Market Intelligence (2020-ongoing):** "Towards the European Web Intelligence Hub - European system for collection and analysis of online job advertisement data (WIH-OJA)", EUROSTAT - CEDEFOP (European Centre for the Development of Vocational Training)

- **PILLARS: Pathways to inclusive labour market (2019-ongoing)** Apply AI techniques and eXplainable AI to mitigate skill mismatch by analysing the labour market demand through big data over Europe.

- **Eurofound: 2022-2023** "Collecting and analysing big quantitative data: statistical analysis and machine learning". The project's key objective is the drafting of a working paper on the state of the art of techniques and infrastructure needed to carry out big data collection and analysis.

- **Real-time Labour Market information on Skill Requirements: Setting up the EU system for online vacancy analysis (2016-2020)**

Granted by CEDEFOP (European Centre for the Development of Vocational Training). The project aims to produce the methodological aspects investigated in the previous project, including all the 28 EU countries and respective 32 languages, building a real-time monitor of the European Web Labour Market.

- **The Observatory of Digital Competences (2016-2020)**

Granted by the Italian Unions of ICT (Assinform, Assintel, Assinter) with the support of AgiD (Agenzia Italia Digitale) and MIUR. The project aims at measuring the pervasiveness of digital skills (aka, digital skill rate) within occupations (both ICT and non-ICT) derived from the Web Italian Labour Market.

- **AI4ESCO: "A Data Driven Bridge Towards ESCO using AI Algorithms" (2020)**

Granted by EURES (call EaSI-EURES VP/2019/010). it aims at realising a mapping-table allowing

for matching job vacancies and CVs in the European Job Mobility Portal. Specifically, AI4ESCO employs AI algorithms (word-embeddings and machine learning) to achieve the following goals: (i) derive a machine-readable structure of the lexicon used within the Italian National Occupation Taxonomy (CP2011); (ii) connect ESCO to Italian National Taxonomy by means of AI algorithms.

- Digital innovation - Big Data and Labour Market Information Phase 2: Feasibility Study for two countries to identify, Validate, and Rank Web Job vacancy sources (2019)

Granted by ETF (The European Training Foundation). The project aims at synthesising a ranking of Web sources considering both qualitative and quantitative aspects to realise a Real-time labour market monitoring system.

- Digital innovation: Big Data and Labour Market Information - SP EMPL (2018-2019)

Granted by ETF. The project aims at putting the methodological basis to understand better how the adequate use of Big Data can enhance traditional labour market information and statistics (LMI) in the era of ubiquitous expansion of digital data of varied sources.

- Real-time labour market information on skill requirements: feasibility study and working prototype AO/RPA/VKVET-NSOFRO/Real-time LMI/010/14 (2014-2016)

Granted by CEDEFOP. The project aims at studying and realising a working prototype for collecting and classifying Web Job vacancies on a well-established international standard classifier (ESCO), extracting the requested skills from the data (5 EU Countries involved). The project aimed at (i) exploring the feasibility of using online sources of LMI to identify skills needs and changing skills requirements in Europe in real-time and (ii) developing, implementing and evaluating a functioning prototype system.

COLLABORATION WITH INSTITUTIONS AND ORGANISATIONS

He established several collaborations, being involved in many technical and scientific committees activated by public Institutions, aimed at studying new models and methodologies of design, monitoring and evaluating innovation projects with relevant impact on models of supply and management of public utility services.

European Network on Regional Labour Market Monitoring (ENRLMM). Since 2011 he has been a member of the scientific committee of the European Network on Regional Labour Market Monitoring. The network develops research initiatives on regional labour markets across European countries promoting methods for the study research and analysis of regional labour market monitoring. Within this network, he has also contributed to the “Initiative for Networking Regional and Local Labour Market Observatories” within which he has contributed to the analysis of data on regional and local employment and professional development, on unemployment and inactivity as well as vocational and further education. He yearly contributed in the ENRLMM Anthology, published by Rainer Hampp Verlag.

Committee Memberships and Advisory

- He was a member of the Coordination Committee of the “Borsa Continua Nazionale del Lavoro (BCNL)” of Lombardy Region, Veneto Region and The Italian Ministry of Labour and Social Security
- He was chair and organiser of the KomIS special session (Knowledge Discovery meets Information Systems: Experiences and lessons learned dealing with real-life scenarios) since 2015 (editions: 2015, 2016, 2018, 2019, and 2020)
- He has partnered as a consultant and coordinator in several projects for innovation of public services at both national and regional level. He collaborated with the Italian Presidency of the Council of Ministers, the Italian Ministry of Labour and Social Security, the ISTAT (Italian National Institute for Statistics), the AIPA (Authority for Information Technology in Italian Public Administration), the Italian Ministry of Economy and Finance, CONSIP (Central Public Procurement Agency, a public stock company owned by Ministry of the Economy and Finance), as well as the main Italian Regions as Lombardy, Veneto, and Emilia Romagna.

AWARDS

IBM Watson Research Center 2008

- Winner of the IBM Faculty Award on SSME

Best Paper Award 2013

- Best paper award at the Human-Computer Interaction and Knowledge Discovery, 1-3 July 2013, Maribor, Slovenia, with the paper "Inconsistency Knowledge Discovery for Longitudinal Data Management: A Model-Based Approach," published at SouthCHI13 special session on Human-Computer Interaction Knowledge Discovery, Lecture Notes in Computer Science, vol. 7947

Best Paper Award 2014

- Best paper award at the DATA 2014, International Conference on Data Management Technologies and Applications, Vienna 28-30 August 2014, with the paper "Improving Data Cleansing Accuracy: A model-based Approach", In Proceedings of the 3rd International Conference on Data Technologies and Applications (DATA) (pp.189-201). Insticc

EDUCATION

Electronic Engineer Degree 1985
Politecnico di Milano

FOREIGN LANGUAGES

Italian (mother tongue)
English (proficient user - C1)

RECENT PUBLICATIONS

He authored 140+ publications on top-tier conferences and journals on Computer Science, AI and Information Systems (See his profile at <https://tinyurl.com/yyta9yt6>). *Below is a selection of publications.*

Selected Journals (since 2018)

- [1] E Cambria, L Malandri, F Mercurio, M Mezzanzanica, and N Nobani. A survey on xai and natural language explanations. *INFORMATION PROCESSING & MANAGEMENT*, 60(1), 2023.
- [2] A Castelnovo, A Cosentini, L Malandri, F Mercurio, and M Mezzanzanica. Fftree: A flexible tree to handle multiple fairness criteria. *INFORMATION PROCESSING & MANAGEMENT*, 59(6 (November 2022)), 2022.
- [3] A Giabelli, L Malandri, F Mercurio, and M Mezzanzanica. Weta: Automatic taxonomy alignment via word embeddings. *COMPUTERS IN INDUSTRY*, 138(June 2022), 2022.
- [4] A Giabelli, L Malandri, F Mercurio, M Mezzanzanica, and N Nobani. Embeddings evaluation using a novel measure of semantic similarity. *COGNITIVE COMPUTATION*, 14(2):749–763, 2022.
- [5] L Malandri, F Mercurio, M Mezzanzanica, and N Nobani. Convxai: a system for multimodal interaction with any black-box explainer. *COGNITIVE COMPUTATION*, 2022.

- [6] L Malandri, F Mercorio, M Mezzanzanica, N Nobani, and A Seveso. Contrxt: Generating contrastive explanations from any text classifier. *INFORMATION FUSION*, 81(May 2022):103–115, 2022.
- [7] A Giabelli, L Malandri, F Mercorio, M Mezzanzanica, and A Seveso. Skills2job: A recommender system that encodes job offer embeddings on graph databases. *APPLIED SOFT COMPUTING*, 101, 2021.
- [8] L Malandri, F Mercorio, M Mezzanzanica, and N Nobani. Meet-lm: A method for embeddings evaluation for taxonomic data in the labour market. *COMPUTERS IN INDUSTRY*, 124(January 2021), 2021.
- [9] F Mercorio, M Mezzanzanica, V Moscato, A Picariello, and G Sperli. Dico: A graph-db framework for community detection on big scholarly data. *IEEE TRANSACTIONS ON EMERGING TOPICS IN COMPUTING*, 9(4):1987–2003, 2021.
- [10] A Giabelli, L Malandri, F Mercorio, and M Mezzanzanica. Graphlmi: A data driven system for exploring labor market information through graph databases. *MULTIMEDIA TOOLS AND APPLICATIONS*, (3), 2020.
- [11] M Ianni, E Masciari, G Mazzeo, M Mezzanzanica, and C Zaniolo. Fast and effective big data exploration by clustering. *FUTURE GENERATION COMPUTER SYSTEMS*, 102:84–94, 2020.
- [12] P Lovaglio, M Mezzanzanica, and E Colombo. Comparing time series characteristics of official and web job vacancy data. *QUALITY & QUANTITY*, 54(1):85–98, 2020.
- [13] E Colombo, F Mercorio, and M Mezzanzanica. Ai meets labor market: Exploring the link between automation and skills. *INFORMATION ECONOMICS AND POLICY*, 47:27–37, 2019.
- [14] F Amato, A Castiglione, F Mercorio, M Mezzanzanica, V Moscato, A Picariello, and G Sperli. Multimedia story creation on social networks. *FUTURE GENERATION COMPUTER SYSTEMS*, 86:412–420, 2018.
- [15] R Boselli, M Cesarini, S Marrara, F Mercorio, M Mezzanzanica, G Pasi, and M Viviani. Wolmis: a labor market intelligence system for classifying web job vacancies. *JOURNAL OF INTELLIGENT INFORMATION SYSTEMS*, 51(3):477–502, 2018.
- [16] R Boselli, M Cesarini, F Mercorio, and M Mezzanzanica. Classifying online job advertisements through machine learning. *FUTURE GENERATION COMPUTER SYSTEMS*, 86:319–328, 2018.
- [17] P Lovaglio, M Cesarini, F Mercorio, and M Mezzanzanica. Skills in demand for ict and statistical occupations: Evidence from web-based job vacancies. *STATISTICAL ANALYSIS AND DATA MINING*, 11(2):78–91, 2018.
- [18] M Mezzanzanica, F Mercorio, M Cesarini, V Moscato, and A Picariello. Graphdblp: a system for analysing networks of computer scientists through graph databases: Graphdblp. *MULTIMEDIA TOOLS AND APPLICATIONS*, 77(14):18657–18688, 2018.
- [19] G Sperli, F Amato, F Mercorio, M Mezzanzanica, V Moscato, and A Picariello. A social media recommender system. *INTERNATIONAL JOURNAL OF MULTIMEDIA DATA ENGINEERING & MANAGEMENT*, 9(1):36–50, 2018.

Selected Conferences (since 2018)

- [20] N Alimonda, L Guidotto, L Malandri, F Mercorio, M Mezzanzanica, and G Tosi. A survey on xai for cyber physical systems in medicine. In *2022 IEEE International Workshop on Metrology for Extended Reality, Artificial Intelligence and Neural Engineering, MetroXRaine 2022 - Proceedings*, pages 265–270. Institute of Electrical and Electronics Engineers Inc., 2022.

- [21] A Giabelli, L Malandri, F Mercorio, and M Mezzanzanica. Jota: Aligning multilingual job taxonomies through word embeddings (student abstract). In *36th AAAI Conference on Artificial Intelligence, AAAI 2022*, volume 36, pages 12955–12956. Association for the Advancement of Artificial Intelligence, 2022.
- [22] L Malandri, F Mercorio, M Mezzanzanica, N Nobani, and A Seveso. Contrastive explanations of text classifiers as a service. In *NAACL 2022 - 2022 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, Proceedings of the Demonstrations Session*, pages 46–53, 2022.
- [23] L Malandri, F Mercorio, M Mezzanzanica, N Nobani, and A Seveso. The good, the bad, and the explainer: A tool for contrastive explanations of text classifiers. In *Proceedings of the Thirty-First International Joint Conference on Artificial Intelligence Demo Track.*, pages 5936–5939. A A A I Press, 2022.
- [24] A Castelnovo, L Malandri, F Mercorio, M Mezzanzanica, and A Cosentini. Towards fairness through time. In *Machine Learning and Principles and Practice of Knowledge Discovery in Databases*, volume 1524, pages 647–663, GEWERBESTRASSE 11, CHAM, CH-6330, SWITZERLAND, 2021. Springer Science and Business Media Deutschland GmbH.
- [25] A Giabelli, L Malandri, F Mercorio, M Mezzanzanica, and A Seveso. Neo: A system for identifying new emerging occupation from job ads. In *35th AAAI Conference on Artificial Intelligence, AAAI 2021*, volume 35, pages 16035–16037, Palo Alto, California, 2021. AAAI Press.
- [26] A Giabelli, L Malandri, F Mercorio, M Mezzanzanica, and A Seveso. Skills2graph: Processing million job ads to face the job skill mismatch problem. In *30th International Joint Conference on Artificial Intelligence, IJCAI 2021*, pages 4984–4987. International Joint Conferences on Artificial Intelligence, 2021.
- [27] L Malandri, F Mercorio, M Mezzanzanica, and N Nobani. Taxoref: Embeddings evaluation for ai-driven taxonomy refinement. In *Machine Learning and Knowledge Discovery in Databases. Research Track*, volume 12977, pages 612–627. Springer Science and Business Media Deutschland GmbH, 2021.
- [28] N Nobani, L Malandri, F Mercorio, and M Mezzanzanica. A method for taxonomy-aware embeddings evaluation (student abstract). In *35th AAAI Conference on Artificial Intelligence, AAAI 2021*, volume 18, pages 15859–15860, 2275 E BAYSHORE RD, STE 160, PALO ALTO, CA 94303 USA, 2021. Association for the Advancement of Artificial Intelligence.
- [29] N Nobani, F Mercorio, and M Mezzanzanica. Towards an explainer-agnostic conversational xai. In *IJCAI International Joint Conference on Artificial Intelligence*, pages 4909–4910. International Joint Conferences on Artificial Intelligence (IJCAI), International Joint Conferences on Artificial Intelligence, 2021.
- [30] A Seveso, A Giabelli, L Malandri, F Mercorio, and M Mezzanzanica. Skills2job: A recommender system that encodes job offer embeddings on graph databases (student abstract). In *35th AAAI Conference on Artificial Intelligence, AAAI 2021*, volume 18, pages 15885–15886, 2275 E BAYSHORE RD, STE 160, PALO ALTO, CA 94303 USA, 2021. Association for the Advancement of Artificial Intelligence.
- [31] A Seveso, F Mercorio, and M Mezzanzanica. A human-ai teaming approach for incremental taxonomy learning from text. In *Proceedings of the Thirtieth International Joint Conference on Artificial Intelligence*, pages 4917–4918. International Joint Conferences on Artificial Intelligence (IJCAI), International Joint Conferences on Artificial Intelligence, 2021.
- [32] A Giabelli, L Malandri, F Mercorio, M Mezzanzanica, and A Seveso. Neo: A tool for taxonomy enrichment with new emerging occupations. volume 12507, pages 568–584, 2020.

- [33] L Malandri, F Mercurio, M Mezzanzanica, and N Nobani. Meet: A method for embeddings evaluation for taxonomic data. In *2020 International Conference on Data Mining Workshops (ICDMW)*, pages 31–38, 2020.
- [34] F Mercurio, M Mezzanzanica, V Moscato, A Picariello, and G Sperli. A tool for researchers: Querying big scholarly data through graph databases. In *The European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML PKDD)*, volume 11908, pages 760–763. Springer, 2020.
- [35] F Mercurio, M Mezzanzanica, and A Seveso. exdil: A tool for classifying and explaining hospital discharge letters. In *Machine Learning and Knowledge Extraction. 4th IFIP TC 5, TC 12, WG 8.4, WG 8.9, WG 12.9 International Cross-Domain Conference, CD-MAKE 2020, Dublin, Ireland, August 25–28, 2020, Proceedings*, volume 12279, pages 159–172. Springer, 2020.
- [36] M Cesarini, F Mercurio, M Mezzanzanica, V Moscato, and A Picariello. A tool for exploring networks of computer scientists as a graph. In *Proceedings of the 34th ACM Symposium on Applied Computing SAC 2019; Limassol; Cyprus; 8-12 April 2019*, volume 147772, pages 2240–2242. ACM Special Interested Group on Applied Computing, Association for Computing Machinery, 2019.
- [37] F Colace, M De Santo, M Lombardi, F Mercurio, M Mezzanzanica, and F Pascale. Towards labour market intelligence through topic modelling. In *Proceedings of the 52nd Hawaii International Conference on System Sciences*, pages 5256–5265, 2019.
- [38] F Mercurio, M Mezzanzanica, and A Picariello. Komis: Application of ai and big data analytics (editorial). In *34th Annual ACM Symposium on Applied Computing, SAC 2019; Limassol; Cyprus; 8-12 April 2019*, volume Part F147772, pages 1064–1064, New York, 2019. Association for Computing Machinery.

Selected Books

- [39] M Mezzanzanica and F Mercurio. *Big Data as Fuel of Skill Intelligence*, pages 1–14. Springer, 2022.
- [40] M Mezzanzanica and F Mercurio. *Big Data Enables Labor Market Intelligence*, pages 1–11. Springer, 2018.
- [41] S Dusi, M Fontana, F Mercurio, and M Mezzanzanica. *Analysing the Relevance of ICT Skills on occupations in Web Job Vacancies*, pages 31–44. Rainer Hampp Verlag, Munchen, 2016.
- [42] S Dusi, M Fontana, F Mercurio, and M Mezzanzanica. *Analysing the Relevance of ICT Skills on Occupations n Web Job Vacancies*, pages 67–85. Hampp, R (Verlag), 2016.
- [43] M Mezzanzanica, S Dusi, A Fioni, and C Graziani. *The Lombardy Industries Towards Industry 4.0: Evidences of the Evolution of Occupations and Skills*, pages 53–67. Hampp, R (Verlag), 2016.
- [44] R Boselli, M Cesarini, F Mercurio, and M Mezzanzanica. *Accurate data cleansing through model checking and machine learning techniques*, volume 178, pages 62–80. Springer, 2015.
- [45] S Dusi, F Mercurio, and M Mezzanzanica. *Big Data meets Job Vacancy: Trends, Challenges and Development Directions*, pages 31–44. Rainer Hampp Verlag, 2015.
- [46] R Boselli, M Cesarini, F Mercurio, and M Mezzanzanica. *A Policy-Based Cleansing and Integration Framework for Labour and Healthcare Data*, volume 8401, pages 141–168. Springer Verlag, Berlin Heidelberg, 2014.
- [47] P Lovaglio and M Mezzanzanica. *La dinamica strutturale delle imprese in Italia*, pages 21–78. Arance, 2014.

- [48] R Boselli, E Colombo, C Graziani, M Mezzanzanica, and G Ronzoni. *L'offerta di lavoro sul web*, pages 77–134. Aracne, Roma, 2013.
- [49] F Cipollini, C Ferretti, P Ganugi, and M Mezzanzanica. *A continuous time mover-stayer model for labor market in a northern italian area*, pages 181–188. Springer, 2013.
- [50] P Lovaglio and M Mezzanzanica. *I flussi del mercato del lavoro. Evidenze empiriche da dati ufficiali e dati amministrativi longitudinali*, pages 19–77. Arance Editrice, Roma, 2013.
- [51] M Mezzanzanica and R Boselli. *Data... as a Service. Una opportunità per il cambiamento delle politiche e dei servizi*, pages 15–27. Aracne, 2013.

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