Senigallia, AN

# Carlo Mengucci

Scopus
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## Education

***Ph.D.*** **2018 - 2022**
*Alma Mater Studiorum - Università di Bologna*

**Dottorato di Ricerca in Nanoscienze per la Medicina e per l'Ambiente**
**Specific field of the degree course**: General Chemistry-Applied Physics
**Dissertation/thesis title:** A Take on Complexity: Bio-Molecules and Human Metabolism Interaction Modelling for Health and Nutrition with Machine Learning
**Dissertation/thesis subject:** General and Inorganic Chemistry-CHIM/03
**Thesis supervisor:** Francesco Capozzi

***Master of Physics*** **2015-2018**
*Alma Mater Studiorum - Università di Bologna*

**Specific field of the degree course**: Applied Physics LM-17 - 2nd level degree in Physics
**Dissertation/thesis title:** WISDoM: Wishart Distributed Matrices Multiple Order Classification. Definition and Application to fMRI Resting State Data.
**Final degree mark:** 110/110 cum laude
**Thesis supervisor:** Enrico Giampieri

***Bachelor of Physics*** **2011-2015**
*Alma Mater Studiorum - Università di Bologna*

L-30 - 1st level degree in Physics
**Dissertation/thesis title:** Modello Bayesiano per la regressione di dati troncati con applicazione a dati biologici
**Thesis supervisor:** Daniel Remondini

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## Research Activity & Expertise

- Extensive Background in Statistical and Mathematical Physics applied to Omic Sciences and Chemistry
- 1H NMR Spectroscopy Metabolomics
- Machine Learning and Advanced Data Analysis with Python
- Database Creation and Maintenance
- Complex Network Modelling
- Numerical Methods for 2D NMR Spectroscopy
- Imaging, TD-NMR and Data Integration for Food Structure Characterization

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## Research Experience

***Researcher (Junior)*** **03/2023 - Ongoing**
*DISTAL, UniBo* *Cesena, FC*

**Main activities and responsibilities:**
Machine and Deep learning applied to NMR spectrometry and relaxometry for food structure characterization and biomarkers of intake detection. Omic sciences data integration for free living populations phenotyping (PE-10 ONFOOD).

***Post Doctoral Fellow*** **03/2022 - 03/2023**
*CERM-CIRMMP, UniFi* *Sesto Fiorentino, FI*

**Main activities and responsibilities:**
In-vivo cell NMR kinetic studies. Digital biopsy modelling in the latent space, clustering and machine learning for in-vivo cells spectral data. Numerical methods for spectral data processing and MCR algorithms.

***Research Grant, Collaborazione Coordinata e Continuativa*** **04/2018 - 07/2018**
*Università di Bologna-DISTAL, Bio-NMR Group* *Cesena, FC*

**Main activities and responsibilities:**
Development of multivariate models and learning algorithms for 1H NMR spectroscopy and MultiOmics data analysis in FOODBALL (The Food Biomarkers Alliance, Funding action: JPI HDHL JFA "Biomarkers for Nutrition and Health", BioNH 2014), Contract: Prot.n.1149, 12/03/2018.

***Internship, Tirocinio Curricolare*** **08/2017 - 03/2018**
*Università di Bologna-DIFA, Biophysics Group* *Bologna, BO*

**Main activities and responsibilities:**
Pipeline implementation and advanced server set-up for highly automated fMRI data analysis and machine-learning.

***Internship, Collaborazione a Titolo Gratuito*** **04/2017 - 06/2017**
*Università Politecnica delle Marche-SIMAU* *Ancona, AN*

**Main activities and responsibilities:**
Dimensional analyses of metallic powders for additive manufacturing technology by machine-learning image-driven techniques.

***Internship, Collaborazione a Titolo Gratuito*** **10/2016 - 12/2016**
*Università Politecnica delle Marche-Dipartimento di Medicina* *Ancona, AN*

**Main activities and responsibilities:**
Bayesian Modeling of First Aid intervention data and statistical characterization for logistic planning and resource optimization.

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## International Collaboration

***INFOGEST Network*** **2019-Ongoing**
Work Group 6 membership, in-silico simulation and advanced modelling of gastric digestion.

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## Participation in Projects

- **PATHWAY-27**, Pivotal assessment of the effects of bioactives on health and wellbeing. From human genoma to food industry. *Grant agreement No: 311876*
- **AIM**, Artificial Intelligence in Medicine. *Funding by INFN-CSN5*
- **FOODBALL**, The Food Biomarker Alliance. *Joint Funding Action, JPI HDHL JFA "Biomarkers for Nutrition and Health" (BioNH 2014)*
- **FUTUREEUAQUA**, Future growth in sustainable, resilient and climate friendly organic and conventional European aquaculture. *Funding by European Union's Horizon 2020 research and innovation program under Grant Agreement No: 817737*
- **MARKAGE**, European Study to Establish Biomarkers of Human Ageing. *Grant agreement No: 200880, Funded under FP7-HEALTH*

- **NUAGE**, New dietary strategies addressing the specific needs of elderly population for an healthy ageing in Europe. *Grant agreement No: 266486, FP7-KBBE*
- **COST ACTION IG15209**, Nuclear Magnetic Resonance Relaxometry for Dairy Products. *Funded under E-COST, European Cooperation in Science and Technology*
- **PE10 ONFOOD, Spoke 5, COMBINR** Characterization Of Multiomics Biomarkers In lifelong Nutrition Research. *Funded under PNRR, PE10 ONFOODS-J33C22002860001*

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## Conferences and Seminars

**As Invited Speaker/Trainer:**

- COST Action IG15209 - Nuclear Magnetic Resonance Relaxometry for Dairy Products, International Training School, *Practicing protocols of dairy product analysis from "A to Z" for industry members*, Cesena, Italy, 24-27/10/2022.

- Sustainable Production and Consumption of Meat, Poultry and Seafoods,PhD School *Insights on Optimization of Seafood and Poultry Products with Data Analysis and Machine Learning*, Bertinoro, Italy, 26/10/2023.

- PON Seminars, Department of Mathematics, *Food Quality Analysis with Time Domain NMR and AI-Driven Mathematical Models*, Bologna, Italy, 20-21/04/2023.

- ONFOODS SPOKE 5 Seminars, *Omics Sciences and Machine Learning: a Powerful Paradigm for Life Sciences*, Italy 13/06/2024

- GIDRM Day Giovani, Università degli Studi della Campania, *NMR Problem Solving*, Caserta, Italy 1-2/02/2024

- iNext-Discovery, *NMR and Food Matrix Studies: Structure, Bioaccessibility and Digestion*, Rome, Italy 05/2024

- MRFOOD 2024, *FFC NMR as a Powerful Tool for Food Systems Investigation*, Foz do Iguacu, Brazil 06/2024

**As Contributed/Selected Speaker:**

- *COMBINR: Characterization of MultiomicsBiomarkers in Lifelong Nutrition*, ONFOODS ECS Meeting, Planeterranea Academy and II Yale Symposium on Gastronomy and Culture, Napoli, 2025
- *Insights on nutritional quality and shelf life estimation of fish products (sparus aurata) through 1h NMR metabolomics and data integration*, GIDRM, 50th National Congress on Magnetic Resonance, Rome, 2023
- *Multi-scale Bone Remodeling Prediction in Patients Undergoing Total Hip Arthroplasty*, Padua Days on Muscle & Mobility Medicine (PDM3), Padova, 2022
- *Modelling Nutrients Kinetics and Bioaccessibility: the FOODBALL Study*, International Conference on Foodomics, Cesena, 2020, **Award Winning Oral Presentation**
- *Classification of Prostate Tumors from NMR Images Texture Analysis: a Machine Learning Approach*, INFN-Artificial Intelligence in Medicine, Pisa, 2020
- *WISDoM: Toward Correlation-Based Modeling of Neurological Data*, INFN-Biophys and Plexnet, Napoli, 2019
- *CHIMeRA - Complex Human Interactions in Medical Records and Atlases*, International Conference on Complex Systems, Trento, 2019
- *WISDoM: Wishart Distributed Matrices Multiple Order Classification. Database and Results*, INFN-Biophys and Plexnet, Arcidosso, 2018

**Posters:**
- ECEESPE, Copenaghen, Denmark 2025
- MRFOOD, Foz do Iguacu, Brazil, 2024
- GIDRM 2023-50th National Congress
- ONFOODS National Meeting, RESEARCH EFFORTS AND IMPACT SO FAR, Bari, 2025
- ONFOODS ECS Meeting, Planeterranea Academy and II Yale Symposium on Gastronomy and Culture, 2025
- MRFOOD, Aarhus, Denmark, 2022
- ECMP-European Congress of Medical Physics, Torino, 2021
- International Conference on FoodOmics, Cesena, 2024

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## Awards

**Foodomics International Conference Award 2020**
Nutrients Award for Best Oral Presentation, *Modelling Nutrients Kinetics and Bioaccessibility: the FOODBALL Study.*

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## Teaching Activities & Thesis Supervision

***OFA Suppletive Course, Chemistry, STVP*** **2025-2026**
*Università di Bologna-DISTAL* *Imola, Bo*

**Role**: Teaching Tutor, (20 hrs)
**Main Professor**: Daniele Torreggiani

***Excersises in General Chemistry and Stoichiometry, CHIM/03, TAL*** **2024-2025**
*Università di Bologna-DISTAL* *Cesena, FC*

**Role**: Teaching Tutor, (40 hrs)
**Main Professor**: Francesco Capozzi

***Excersises in General Chemistry, CHIM/03, STVP*** **2023-2024**
*Università di Bologna-DISTAL* *Imola, Bo*

**Role**: Teaching Tutor, (20 hrs)
**Main Professor**: Elida Nora Ferri

***Excersises in General Chemistry, CHIM/03, Scienze e Culture della Gastronomia*** **2022-2023**
*Università di Bologna-DISTAL* *Cesena, FC*

**Role**: Teaching Tutor, contr. 188027 (20 hrs)
**Main Professor**: Francesco Capozzi

***Excersises in General Chemistry, CHIM/03, Tecnologie Alimentari*** **2022-2023**
*Università di Bologna-DISTAL* *Cesena, FC*

**Role**: Teaching Tutor, contr. 176473 (40 hrs)
**Main Professor**: Luca Laghi

***Excersises in General Chemistry, CHIM/03, Tecnologie Alimentari*** **2021-2022**
*Università di Bologna-DISTAL* *Cesena, FC*

**Role**: Teaching Tutor, contr. 157324 (40 hrs)
**Main Professor**: Luca Laghi

***OFA Suppletive Course, Physics and Chemistry, Tecnologie Agrarie*** **2020-2021**
*Università di Bologna-DISTAL* *Bologna, BO*

**Role**: Teaching Tutor, contr. 145061 (20 hrs)

***Excersises in General Chemistry, CHIM/03, Tecnologie Alimentari*** **2020-2021**
*Università di Bologna-DISTAL* *Cesena, FC*

**Role**: Teaching Tutor, contr. 124181 (40 hrs)
**Main Professor**: Francesco Capozzi

***Course in Pattern Recognition, FIS/07, Laurea Magistrale in Fisica Applicata*** **2019-2020**
*Università di Bologna-DIFA* *Bologna, BO*

**Role**: Guest Lecturer (8 hrs)
**Main Professors**: Gastone Castellani, Daniel Remondini

**Thesis Supervision:**
- Co-supervisor, Corso di Studio in Scienze e tecnologie alimentari [LM-DM270], Cesena, University of Bologna. Master Thesis : *Struttura sovra molecolare e autenticità degli alimenti: Applicazione delle curve di rilassamento nucleare 1H al caso delle mozzarelle di bufala campana D.O.P.*, Davide Rabiti, 2020
- Co-supervisor, Corso di Studio in Scienze e tecnologie alimentari [LM-DM270], Cesena, University of Bologna. Master Thesis : *Utilizzo di biomarcatori molecolari di consumo alimentare per la validazione dei risultati di strumenti nutrizionali convenzionali.*, Carlotta Bernabini, 2020
- Co-supervisor, Corso di Studio in Tecnologie alimentari [L-DM270], Cesena, University of Bologna. Bachelor Thesis : *Nuovo sistema di verifica della qualità basato su curve di rilassamento nucleare applicato al pecorino Fiore Sardo.*, Davide Lodovichetti, 2023

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## Referee Experience

Referee for MDPI Journals, Frontiers Journals and Springer Nature Journals. Check:

- Loop
- OrcID

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## Skills

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| **Programming** | Python, C++, Git, R, LaTeX, Matlab, MarkDown |
| **Communication** | Italian (native), English (Europass level C1) |
| **Other** | Unix Based OS, Microsoft Office, ChenoMx, TopSpin |

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## Published Work

**Metrics**
- **Citations (all)**: 147 (Scopus), 182 (Scholar)
- **H-Index**: ResearchGate, Scholar: 6; Scopus, Web of Science: 6
- **i-10 Index**: Scholar: 6
- **On Peer Reviewed International Journals**: 14
- **As First Author**: 10

**On Peer Reviewed International Journals**
**: Authors contributed equally*

1. Vega-Abellaneda, S.; **Mengucci, C.**; Soriano, G. et al. *A Metagenomics Approach to Frailty in Patients With Cirrhosis Undergoing a Multifactorial Intervention*, Liver International, 2025, 45

2. Minato, I. ; **Mengucci, C.**; Danesi, F. et al. *Evidence for a Modulatory Effect of a 12-Week Pomegranate Juice Intervention on the Transcriptional Response in Inflammatory Bowel Disease Patients Reducing Fecal Calprotectin Levels: Findings From a Proof-of-Principle Study*, Molecular Nutrition and Food Research, 2025, 69

3. Laghi, L.; Àngels Ortiz, M.; Rossi, G.; Román, E.; **Mengucci, C.** ; Cantó, E.; Biagini, L.; Sánchez, E.; Mulet, M.; García-Osuna, Á.; Urgell, E. ; Kaur, N. ; Poca, M.; Padrós, J. ; Josep Nadal, M. ; Cuyàs, B. ; Alvarado, E. ; Vidal, S.; Juanes, E. ; Ferrero-Gregori, A. ; Escorsell, À.; Soriano, G. *Biomarkers of Frailty in Patients with Advanced Chronic Liver Disease Undergoing a Multifactorial Intervention Consisting of Home Exercise, Branched-Chain Amino Acids, and Probiotics.* Biomolecules, 2024, 14

4. **Mengucci, C.** *; Rampelli, S. *; Picone, G.; Lucchi, A.; Litta, G.; Biagi, E.; Candela, M; Manfreda, G.; Brigidi, P.; Capozzi, F.; De Cesare, A. *Application of multi-omic features clustering and pathway enrichment to clarify the impact of vitamin B2 supplementation on broiler caeca microbiome.* Frontiers in Microbiology, 2023, 14

5. **Mengucci, C.***; **Nissen, L.***; Picone, G.; Malpuech Brugère, C.; Orfila, C.; Ricciardiello, L.; Bordoni, A.; Capozzi, F.; Gianotti, A. *K-Clique Multiomics Framework: A Novel Protocol to Decipher the Role of Gut Microbiota Communities in Nutritional Intervention Trials.* Metabolites, 2022, 12

6. **Mengucci, C.**; Ferranti, P.; Romano A.; Masi, P; Picone, G.; Capozzi, F. *Food structure, function and artificial intelligence.* Trends in Food Science & Technology, 2022, 123

7. Picone, G.; **Mengucci, C.**; Capozzi, F. *The NMR added value to the Green Foodomics perspective: advances by machine learning to the holistic view on food and nutrition.* Magnetic Resonance in Chemistry, 2022, 60

8. **Simonetti, G.***; **Mengucci, C.***; Padella, A. et al. *Integrated genomic-metabolic classification of acute myeloid leukemia defines a subgroup with NPM1 and cohesin/DNA damage mutations.* Nature Leukemia, 2021, 35

9. **Mengucci C.**; Remondini D.; Castellani G.; Marrale M., Giampieri E. *WISDoM: a framework for the analysis of wishart-distributed matrices for neuroinformatics.* Physica Medica, 2021, 92

10. **Mengucci, C.**; Rabiti, D.; Urbinati, E.; Picone, G.; Romano, R.; Aiello, A.; Ferranti, P.; Capozzi, F. *Spotting Frozen Curd in PDO Buffalo Mozzarella Cheese Through Insights on Its Supramolecular Structure Acquired by 1H TD-NMR Relaxation Experiments.* Applied Sciences 2021, 11

11. **Danesi, F.***; **Mengucci, C.***; Vita, S.; Bub, A.; Seifert, S.; Malpuech-Brugère, C.; Richard, R.; Orfila, C.; Sutulic, S.; Ricciardiello, L.; Marcato, E.; Capozzi, F.; Bordoni, A. *Unveiling the Correlation between Inadequate Energy/Macronutrient Intake and Clinical Alterations in Volunteers at Risk of Metabolic Syndrome by a Predictive Model.* Nutrients 2021, 13

12. **Mengucci C.**; Remondini D.; Castellani G.; Giampieri E. *WISDoM: Characterizing Neurological Time Series With the Wishart Distribution.* Frontiers in Neuroinformatics, 2021, 14

13. **Biagi, E.***; **Mengucci, C.***; Barone, M.; Picone, G.; Lucchi, A.; Celi, P.; Litta, G.; Candela, M.; Manfreda, G.; Brigidi, P.; Capozzi, F.; De Cesare, A. *Effects of Vitamin B2 Supplementation in Broilers Microbiota and Metabolome.* Microorganisms 2020, 8

14. **Mengucci, C.**; Bordoni, A.; Capozzi, F. *Understanding the Kinetics of Nutrients bioaccessibility by Modelling Foodomics Data.* Current Opinion in Food Science 2020, 31

**Proceedings**

1. Galante, G.; **Mengucci, C.**; Fanelli, F,; *Circadian dysregulation of metabolic pathways in different states of cortisol excess and insufficiency.* Endocrine Abstracts 2025, 110

2. Simonetti, G; Padella, A; **Mengucci, C**; Fonzi, E; Picone, G; Pazzaglia, M; Perricone, M; Fontana, M; Bruno, S; Bochicchio, MT. *PF197 A NEW CLASSIFICATION OF ACUTE MYELOID LEUKEMIA BASED ON INTEGRATED GENOMICS AND METABOLOMICS.* HemaSphere, 3, S1, 51, 2019

3. Simonetti, G; Padella, A; **Mengucci, C**; Fonzi, E; Picone, G; Pazzaglia, M; Perricone, M; Fontana, MC; Bruno, S; Bochic-Chio, MT. *INTRACELLULAR AND SYSTEMIC METABOLIC PROFILING OF ACUTE MYELOID LEUKEMIA IMPROVES GENOMIC CLASSIFICATION AND SUGGESTS NOVEL THERAPEUTIC TARGETS.* Haematologica, 104, 51-51, 2019

4. Simonetti, G; **Mengucci, C**; Padella, A; Fonzi, E; Picone, G; Delpino, C; Nanni, J; De Tommaso, R; Franchini, E; Papayannidis, C. *THE METABOLOMIC PROFILE DISTINGUISHES TWO SUBGROUPS OF NPM1-MUTATED ACUTE MYELOID LEUKEMIA WITH DIVERSE GENOMIC, TRANSCRIPTOMIC SIGNATURES AND TARGETED DRUG RESPONSE.* Haematologica, 105, S23-S23, 2020

5. Simonetti, G; **Mengucci, C**; Padella, A; Fonzi, E; Picone, G; Delpino, C; Nanni, J; De Tommaso, R; Franchini, E; Papayannidis, C. *METABOLIC STRATEGIES OF MYELOID BLAST SURVIVAL.* Haematologica, 107, 6-6, 2022

**PhD. Dissertation Thesis:**
A take on complexity: bio-molecules and human metabolism interaction modelling for health and nutrition with machine learning.

- **Supervisor**: Francesco Capozzi
- **Co-Supervisor**: Daniel Remondini
- **PhD Course**: Nanoscienze per la medicina e per l'ambiente, Ciclo 34
- **SSD**: CHIM/03
- **Keywords**: 1H NMR, Machine Learning, Metabolomics, Health, Nutrition, Omic Sciences
- **DOI**: 10.48676/unibo/amsdottorato/10198

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