Caterina Alfano

EDUCATION AND TRAINING

November 2021-present

Phd Student in Network Oncology and Precision Medicine

Sapienza University of Rome

Auditor of the Advanced Professional Course in Immuno-Oncology.
Sapienza training courses on “soft skills” A (RI & Project writing), D (Communications and Ethics) and E (Third Mission, Public Engagement and Entrepreneurship).

August 2021

Cornell, Maryland, Max Planck Pre-doctoral School

Selected to attend the 2021 edition of CMMRS that focused on state-of-the-art research in computer science.

February – July 2021

Research Internship

Sapienza University of Rome

During my master’s degree, I worked on a network medicine research project aimed at integrating and analysing complex biological data to gather insight into the occurrence of drugs’ side effects. This information can be used both for precision medicine purposes and to better develop new drugs. This work was later used to prepare a manuscript that has now been published.

July – September 2020

Google and Poste Italiane Training Camps

As part of Data Science MS, I completed two challenges: object detection on satellite imagery (with Poste Italiane) and developing of a search engine for images (with Google).

2019 – 2021

Data Science Master’s Degree

Sapienza University of Rome

Grade: 110/110 cum laude
Thesis title: A network-based approach to investigate drug therapy-related side effects: a case study about hormonal contraceptives

February - June 2019

Research Internship

Sapienza University of Rome

During this internship with my university aimed at writing my thesis, I studied reinforcement learning and the challenges of the smart-home devices to then develop a wireless communication protocol that I implemented and tested.

2016 – 2019

Bachelor of Computer Science

Sapienza University of Rome

Grade: 110/110 cum laude
Thesis title: Use of reinforcement learning in the communication between wireless devices

RESEARCH ACTIVITY

Research topics: network medicine, computational methods for biomarker integration, drug repurposing, multi-omics data analysis, patient stratification, mutational signatures
My Phd research project focuses on gender-specific medicine: I developed a multi-omics network-based algorithm (MIRROR) to explore sexual dimorphism in cancer. MIRROR integrates miRNA and mRNA expression data to identify key sex-biased regulatory mechanisms and molecules, suggesting sex-specific biomarkers for improved and personalized patient care in oncology

LANGUAGES

Mother tongue(s) Italian

Other language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	C1	C1	C1
	Cambridge Esol CAE				
Spanish	B2	B2	B2	B2	B2
	Dele Nivel B2 – Instituto Cervantes				
Brazilian Portuguese	B1	B1	A1	A1	A1

GRANTS

As PI:

- "Progetti di Avvio alla Ricerca – Tipo 1" (2022): Network-based characterization of therapy-related side effects aimed at precision medicine and drug repurposing

As a member:

- "Progetto per bando di Ateneo 2021": Towards a network-based integration of molecular and large-scale brain data for precision medicine advances in neurological diseases (PI:Manuela Petti)
- "PRIN2022": Integrating cutting-edge tools for targeted approach to patients with adrenocortical tumors (COOL-REACT) (co-PI e responsabile unità di ricerca: Manuela Petti)

COLLABORATIONS

- Since 2021 I collaborate with the Oncogenomic Research Unit (Prof. Elisabetta Ferretti) at the Department of Experimental Medicine (La Sapienza) and the Department of Medicine, surgery and neuroscience (Prof. Francesco Dotta, Università degli Studi di Siena) to study the role of miRNA and isomiRNAs in the development of cardiovascular complications in DMT2 patients
- Since 2023 I collaborate with Marco Filetti from Fondazione Policlinico Universitario A. Gemelli IRCCS (Phase 1 Unit) on the topics of molecular mechanisms of sexual dimorphism in colorectal cancer and mutational profiles of NSCLC patients
- Since 2022 I collaborated with the Laboratory of Immunology of Tumors and Cell Therapies (Prof. Marianna Nuti) at the Department of Experimental Medicine (La Sapienza) to to investigate the contribution of lectin receptors to the immune suppressive networks of the tumor immune microenvironment in glioblastoma (GBM).

CONFERENCE ATTENDANCE

46th Annual International Conference of the IEEE Engineering in Medicine and Biology Society Orlando, Florida USA, July 15-19, 2024

- ORAL PRESENTATION of the paper "MIRROR: miRNA regulation-level differential network to study sex and ethnic disparities in cancer"
- POSTER PRESENTATION of the paper "Patient stratification through mutational signatures-based similarity network reveals clusters of patients with different survival outcomes"
- POSTER PRESENTATION of the paper "A New Method for Patient Stratification Based on Multi-Layer Network Modeling and Molecular Data Integration"

IEEE International Conference on Bioinformatics and Biomedicine (BIBM), Istanbul, Turkey, 2023

- ORAL PRESENTATION of the paper "Stratification of metastatic melanoma patients based on mutational signatures"

VIII Congresso del Gruppo Nazionale di Bioingegneria (GNB), Padova, 21-23 June 2023

- POSTER PRESENTATION of the paper "Network-based integration of clinical, imaging and molecular biomarkers of dementia"

PROFESSIONAL ASSOCIATIONS

- IEEE Engineering in Medicine and Biology Society (EMBS) - student member
- Gruppo Nazionale di Bioingegneria - student member
- IEEE - student member

PUBLICATIONS

Conference and Journal papers

M. Petti, **C. Alfano**, L. Farina, Molecular network analysis of hormonal contraceptives side effects via database integration, Informatics in Medicine Unlocked, Volume 36, 2023, 101163, ISSN 2352-9148

C. Alfano, L. Farina and M. Petti, "Differential Co-expression Network Analysis to Investigate Sexual Dimorphism in Colon Cancer," 2022 IEEE International Conference on Bioinformatics and Biomedicine (BIBM), Las Vegas, NV, USA, 2022, pp. 1873-1878

C. Alfano, L. Farina, M. Petti, Biomarkers' networks: uses and purposes. Genes 2023, 14, 429.

C. Alfano, L. Farina, M. Petti Network-based integration of clinical, imaging and molecular biomarkers of dementia. Conference paper accepted for the "GNB Congress (VIII National Congress of Bioengineering).

C. Alfano, L. Farina, M. Petti, "Stratification of metastatic melanoma patients based on mutational signatures," 2023 IEEE International Conference on Bioinformatics and Biomedicine (BIBM), Istanbul, Turkiye, 2023, pp. 2798-2802

C. Alfano, M. Filetti, L. Farina, M. Petti, "MIRROR: miRNA regulation- level differential network to study sex and ethnic disparities in cancer" 2024 International Conference of the IEEE Engineering in Medicine and Biology Society

Abstracts for international congresses

G. Grieco, Z. Besharat, A. Mori, S. Trocchianesi, L. Farina, M. Petti, **C. Alfano**, S. Auddino, M. Bruttini, A. Po, L. Nesti, A. Natali, G. Sebastiani, E. Ferretti, F. Dotta - "Network analysis of circulating microRNAs reveals novel therapeutic targets in subjects with type 2 diabetes and cardiovascular disease", for the European Association for the Study of Diabetes (EASD), 59th annual meeting 2023

A. Pace, F. Scirocchi, **C. Alfano**, S. Minasi, A. Asquino, C. Napoletano, I. Zizzari, L. D'Angelo, A. Santoro, L. Farina, F. Buttarelli, M. Petti, M. Nuti, A. Rughetti – "Dissecting Immunosuppression in glioblastoma: the MGL C-type lectin and its ligands in the tumor microenvironment", for the 35th AICC International Meeting 2023

A. Pace and C. Alfano, F. Scirocchi, C. Napoletano., I. Zizzari, L. Farin, M. Nuti, M. Petti, A. Rughetti – "Network analysis to unveil lectins-mediated immunosuppression in glioblastoma", for the Congresso della Società italiana di Immunologia 2024 **(co-first author)**

C. Alfano, L. Farina, M. Petti "Patient stratification through mutational signatures-based similarity network reveals clusters of patients with different survival outcomes"- 46th Annual International Conference of the IEEE Engineering in Medicine and Biology Society

M. Petti, D. Mascolo, **C. Alfano**, L. Farina "A New Method for Patient Stratification Based on Multi-Layer Network Modeling and Molecular Data Integration"- 46th Annual International Conference of the IEEE Engineering in Medicine and Biology Society

Chapters in international books

M. Petti, C. Punzi, **C. Alfano**, L. Farina, L. Astolfi, P. Paci, P.H. Guzzi, F. Castiglione, P. Tieri, "Network Inference and Reconstruction in Bioinformatics", Encyclopedia of Bioinformatics and Computational Biology, 2nd Edition Chapter 3070

ADDITIONAL INFORMATION

Technical Skills Programming: R, Python, SQL, Java, MongoDB, Assembly, Bash, Unix systems, PyTorch, Keras
Data Analysis: data mining, machine learning, statistical modelling, data visualization, image filtering/classification/object detection, neural networks, text classification (NLP)

Other activities

- "Create - Protect - Innovate: Bringing ideas to market" - The European Patent Academy
- Student tutoring, seminars and workshops for the Digital Epidemiology course of the Data Science Master's Degree (years 2022/2023, 2023/2024, 2024/2025)