

Work Programme

The Biostatistics and Bioinformatics Laboratory aims to offer both a methodological-statistics and bioinformatic support in collecting, managing, and elaborating biomedical data, over the different phases of the oncological research. This Laboratory supports scientific research and actively cooperate with both oncologists and clinicians afferent to the Institute for the development of several research lines in different clinical and oncological settings (breast, lung, melanoma, head and neck, and so on). The research activity is mainly oriented to the statistical analysis of biomedical data of different nature, including clinical and omics data, imaging, molecular biology, as well as translational studies intended to define personalized medicine models which analyze Big Data by means of Artificial Intelligence techniques. The research program mainly covers the following research lines:

- ✓ development of sentinel lymph-node status predictive models;
- ✓ development of automated prognostic support models for both planning and monitoring adjuvant and neoadjuvant chemotherapy;
- ✓ development of algorithms able to analyze both radiological and digital pathology images for designing decision support systems.

Team composition

Team Leader: Annarita Fanizzi - *Radiomica ed elaborazione dati imaging*

Team members:

Dott. Raffaella Massafra, medical physicist
Dott. Vittorio Didonna, medical physicist
Dott. Pasquale Tamborra, medical physicist
Dott. Maria Colomba Comes, researcher
Dott.ssa Samantha Bove, researcher
Dott.ssa Nicole Petruzzellis, data manager
Dott. Alessio De Bartolo, administrative
Dott.ssa Domenica Bavaro, researcher
Dott.ssa Erika Di Benedetto, data manager
Dott.ssa Rahel Signorile, researcher
Dott.ssa Martina Milella, researcher
Dott. Federico Fadda, researcher

Team networks:

Alleanza Contro Cancro (ACC)
Associazione Italiana di Fisica Medica (AIFM)
Istituto Nazionale di Fisica Nucleare (INFN)
Dipartimento Interateneo di Fisica, Università degli Studi di Bari
Dipartimento di Diagnostica per Immagini, Ospedale Universitario di Siena,
Azienda Ospedaliera Universitaria Senese, Siena,
Università degli Studi della Campania Luigi Vanvitelli, Dipartimento
Medicina di Precisione, Napoli,
Radiodiagnostica ad indirizzo senologico, Policlinico Bari

Radiologia e Senologia presso P.O. San Paolo, Bari,
Radiology and Biomedical Imaging Department, University of California,
San Francisco.

Key funding:

- *Health Big Data*, funded by the Ministry of Health, involving the IRCCS Networks and the Politecnico di Milano, aimed at creating a technological platform that allows the collection, sharing and analysis of clinical and scientific data of patients.
- *Progetto di Rete 2018*, funded by the Ministry of Health in the context of Finalized Research 2018, co-financed by the Puglia Region, it involves in addition to the Istituto Superiore di Sanità and 7 other national health institutes, aimed at experimenting with the integrated use of the HTA methodology with machine learning techniques for the development of automated systems to support doctors' decisions in defining personalized treatment paths.
- *Alleanza Contro Cancro (ACC)*, WG Radiomics
- *Ricerca Corrente 2016-2018, 2018-2021, 2022-2024*

Key publication:

- Bove, S., Comes, M. C., Lorusso, V., Cristofaro, C., Didonna, V., Gatta, G., ... & Massafra, R. (2022). An ultrasound-based radiomic approach to predict the nodal status in clinically negative breast cancer patients. *Scientific Reports*, 12(1), 1-10.
- Massafra, R., Comes, M. C., Bove, S., Didonna, V., Gatta, G., Giotta, F., ... & Paradiso, A. V. (2022). Robustness Evaluation of a Deep Learning Model on Sagittal and Axial Breast DCE-MRIs to Predict Pathological Complete Response to Neoadjuvant Chemotherapy. *Journal of personalized medicine*, 12(6), 953
- Massafra, R., Catino, A., Perrotti, P. M. S., Pizzutilo, P., Fanizzi, A., Montrone, M., & Galetta, D. (2022). Informative Power Evaluation of Clinical Parameters to Predict Initial Therapeutic Response in Patients with Advanced Pleural Mesothelioma: A Machine Learning Approach. *Journal of Clinical Medicine*, 11(6), 1659
- Comes, M. C., Fanizzi, A., Bove, S., Didonna, V., Diotaiuti, S., La Forgia, D., ... & Massafra, R. (2021). Early prediction of neoadjuvant chemotherapy response by exploiting a transfer learning approach on breast DCE-MRIs. *Scientific Reports*, 11(1), 1-12.
- Comes, M. C., La Forgia, D., Didonna, V., Fanizzi, A., Giotta, F., Latorre, A., ... & Massafra, R. (2021). Early prediction of breast cancer recurrence for patients treated with neoadjuvant chemotherapy: a transfer learning approach on DCE-MRIs. *Cancers*, 13(10), 2298.
- Massafra, R., Bove, S., Fanizzi, A., Lorusso, V., Biafora, A., Comes, M. C., Didonna, V., ... & La Forgia, D. (2021). Radiomic feature reduction approach to predict breast cancer by contrast-enhanced spectral mammography images. *Diagnostics*, 11(4), 684.

- Massafra, R., Latorre, A., Fanizzi, A., Bellotti, R., Didonna, V., Giotta, F., ... & Lorusso, V. (2021). A clinical decision support system for predicting invasive breast cancer recurrence: preliminary results. *Frontiers in Oncology*, 11, 576007.
- Massafra, R., Bove, S., La Forgia, D., Comes, M. C., Didonna, V., Gatta, G., ... & Lorusso, V. (2022). An Invasive Disease Event-Free Survival Analysis to Investigate Ki67 Role with Respect to Breast Cancer Patients' Age: A Retrospective Cohort Study. *Cancers*, 14(9), 2215.
- Fanizzi, A., Pomarico, D., Paradiso, A., Bove, S., Diotaiuti, S., Didonna, V., ... & Massafra, R. (2021). Predicting of sentinel lymph node status in breast cancer patients with clinically negative nodes: A validation study. *Cancers*, 13(2), 352.
- Fanizzi, A., Basile, T., Losurdo, L., Bellotti, R., Bottigli, U., Dentamaro, R., ... & La Forgia, D. (2020). A machine learning approach on multiscale texture analysis for breast microcalcification diagnosis. *BMC bioinformatics*, 21(2), 1-11.