Artificial Intelligence in Medicine

INFN - CSN5
2019-2021

UO BOLOGNA

AIM: Bologna group description

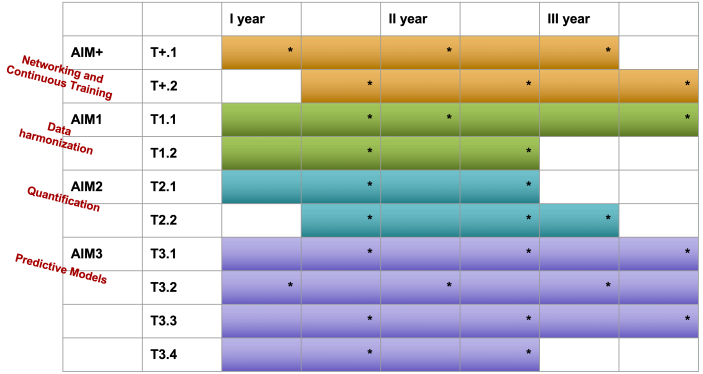
EXPERTISES

Systems biology (network theory applied to biological systems)
Big Data Analysis (high-throughput omics data)
Medical physics (NMR imaging)
Experimental biophysics (electrophysiology, microscope imaging)

AIM: Bologna group description

Prof.ssa Testa Claudia Dott. Brizi Leonardo Dott. Barbieri Marco	NMR expertise (pathologies, technology, analysis)	AIM WP 2
Dott. Curti Nico Prof. Giampieri Enrico Dott. Matteuzzi Tommaso Dott.ssa Merlotti Alessandra Dott.ssa Vitali Silvia	Machine Learning, Bioinformatics, SW implementation & optimization	AIM WP 2 3
Prof. Gastone Castellani Dott.ssa Claudia Sala	Bioinformatics, Modelling, PET imaging	AIM WP 2 3

Project Implementation: Bologna



AIM 1: Data harmonization

AIM1.T1 - Multi-site data harmonization in MRI (PI, BA, **BO**)

AIM 2: Quantification

AIM2.T1 - Quantification models in PET (GE, **BO**)

AIM2.T2 - Integrated quantification of PET and omics data (BO)

> public data TCGA + TCIA PRAD prostate cancer (Sala)

NEW > AIM2.T3 - Quantification and processing of NMR imaging data through Deep Learning techniques – Sir Peter Mansfield Institute (Barbieri)

AIM 3: Predictive models

AIM3.T3 – Predictive models for transcranial-MR-guided Focused Ultrasound Surgery (tcMRgFUS) (CT, **BO**)

AIM3.T4 - Predictive models for Systems Medicine (BO)

> In progress: IRST NGS haematological data (Matteuzzi Merlotti Vitali)

Milestones

	I year	II year	III year
AIM+	M+.1 (30-06-2019) Organization of the first MACRO workshop	M+.1 (30-06-2020) Organization of the second MACRO workshop	M+.1 (30-06-2021) Organization of the third MACRO workshop
	M+.2 (31-12-2019) Organization of the first APP workshop	M+.2 (31-12-2020) Organization of the second APP workshop	M+.2 (31-12-2021) Organization of the third APP workshop
AIM1	M1.1 (31-12-2019) Identification and coding of Generative Adversarial Network for MRI data harmonization	M1.1 (30-06-2020) Acquisition of suitable MRI data sample for testing (e.g. ABIDE, ADNI, ...), identification of test metrics and validation.	M1.1 (31-12-2021) Comparison with standard techniques and publication
	M1.2 (31-12-2019) Implementation of first prototype of the harmonization algorithm for mammograms	M1.2 (31-12-2020) Database consolidation and validation of the harmonization algorithm and publication of the results	--
AIM2	M2.1 (31-12-2019) Paper submitted, describing an innovative method of amyloid- PET quantification	M2.1 (31-12-2020) Method validation on EU multicentric dataset and all fluorinated tracers	--
	M2.2 (31-12-2019) Characterisation of PET dataset and its association to clinical variables	M2.2 (31-12-2020) Implementation and validation of methods to combine quantitative PET measures and omics data	M2.2 (30-06-2021) Publication of the results

Milestones

	I year	II year	III year
AIM3	M3.1 (31-12-2019) Creation of database for predictive models for Radiation Therapy treatments	M3.1 (31-12-2020) Software development for the selection of the most important features and first test on data	M3.1 (31-12-2021) Data analysis and study of results obtained in predicting: overall survival, radiation treatment response, distant metastases, recurrences, and radiation-related toxicity
	M3.2a (30-06-2019) Development of a CNN for automatic classification of breast density according to the 4 BIRADS classes	M3.2a (30-06-20) Validation of the CNN on the available database	M3.2a (30-06-2021) Development and validation of a CNN for automatic classification of breast density according to the 4 BIRADS classes on the harmonized database
	M3.2b (31-12-2019) Database creation and development of analysis software for predictive models for Contrast Enhanced Spectral Mammography	M3.2 (31-12-2020) Further patient data acquisition and application of the analysis software on the data acquired on the first year and validation of an automatic classification method	M3.2 (31-12-2021) Application of the analysis software on all data acquired and publication of the results
	M3.3 (31-12-2019) Database creation and development of analysis software for predictive models for transcranial-MR-guided Focused Ultrasound Surgery	M3.3 (31-12-2020) Further patient data acquisition and application of the analysis software on the data acquired on the first year	M3.3 (31-12-2021) Application of the analysis software on all data acquired and publication of the results
	M3.4 (31-12-2019) Development of a pipeline for the integration of multiple omics data in relation to drug target identification	M3.4 (31-12-2020) Application of the pipeline to real patient case studies for personalized targeting	--