

Joint ICTP-IAEA Workshop on Artificial Intelligence in Ionizing Radiation for Medical Physicists
Trieste, Italy, 20-24 November 2023

	Monday 20 November 2023	Tuesday 21 November 2023	Wednesday 22 November 2023		Thursday 23 November 2023		Friday 24 November 2023
			Practical session		Practical session		
			Group 1	Group 2	Group 1	Group 2	
9:00-9:45	Welcome and introduction of participants. Administrative matters	Data management: data collection and quality assessment (JW)	<i>ML Regression + Classification using Google Colab + Python</i>	<i>Decision Trees, testing, splitting, evaluation vs. Conf. Matrices, etc.</i>	<i>DL CNN vs. GAN. Colab + Python</i>	<i>Demo: Real example of auto TP AI-based tool</i>	Clinical implementation of AI tools: process from medical physicist's perspective (JW)
9:45-10:30	Pre course test	Data management: Data curation (JW)	<i>ML Regression + Classification using Google Colab + Python</i>	<i>Decision Trees, testing, splitting, evaluation vs. Conf. Matrices, etc.</i>	<i>DL CNN vs. GAN. Colab + Python</i>	<i>Demo: Real example of auto TP AI-based tool</i>	Challenges and pitfalls of AI in radiation medicine (JW)
10:30-11:00	Coffee break	Coffee break	Coffee break		Coffee break		Coffee break
11:00-11:45	Introduction to AI, historical background, vocabulary and definition of terms related to AI (JD)	Machine learning models and data analytics tools (AD)	<i>Decision Trees, testing, splitting, evaluation vs. Conf. Matrices, etc.</i>	<i>ML Regression + Classification using Google Colab + Python</i>	<i>Demo: Real example of auto TP AI-based tool</i>	<i>DL CNN vs. GAN. Colab + Python</i>	AI in radiation medicine: Ethical considerations (JD)
11:45-12:30	Roles and Responsibilities of Medical Physicists in AI-based Clinical Applications (AD)	Machine learning models and data analytics tools (cont.) (AD)	<i>Decision Trees, testing, splitting, evaluation vs. Conf. Matrices, etc.</i>	<i>ML Regression + Classification using Google Colab + Python</i>	<i>Demo: Real example of auto TP AI-based tool</i>	<i>DL CNN vs. GAN. Colab + Python</i>	AI and MC simulations in medical physics. Virtual clinical trials (JW)
12:30-13:30	Lunch break	Lunch break	Lunch break		Lunch break		Lunch break
13:30-14:15	Overview of radiation therapy procedures utilizing AI (or may potentially benefit from) (JW)	Machine learning models and data analytics tools (cont.) (AD)	Introduction to deep learning. (SDG)		Practical's Q and A (All)		Discussion and Q&A

14:15-15:00	Overview of diagnostic radiology and nuclear medicine procedures utilizing AI (or may potentially benefit from) (JD)	Machine learning models and data analytics tools (cont.) (AD)	Introduction to deep learning (SDG)	IAEA support to medical physics and AI related activities (until 16:00) (Olivera+Egor)	Workshop evaluation and post course test.
15:00-15:30	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
15:30 -16:15	Advanced statistical Methods: regression for predictive modelling and classification, co-variance, correlation, ROC analysis (SDG)	Training of machine learning models (AD)	Deep learning: transformer networks, GANs, transfer learning, augmentation, metrics of evaluation. (SDG)	Regulatory considerations on AI for radiation medicine (JD)	Workshop closure
16:15-17:00	Advanced statistical Methods: cont'd (+ Q and A) (SDG)	Validation of machine learning models (cont.) (AD)	Deep learning: transformer networks, GANs, transfer learning, augmentation, metrics of evaluation.(cont.) (SDG)	Basic requirements and IT infrastructure for AI application in radiation medicine + Q and A (JW)	

Lecturers (in alphabetical order):

John Damilakis (JD), University of Crete and University Hospital of Heraklion, Greece

Andre Dekker (AD), Maastricht University Medical Center and Maastricht Clinic, The Netherlands (Mon-Wed)

Serafina Di Gioia (SDG), SISSA/ICTP, Italy

Jackie Wu (JW), Duke University Medical Center, USA