



**ESMPE European School for Medical Physics Experts**

## **Statistics in Medical Physics**

**13<sup>th</sup>-15<sup>th</sup> October 2022, Athens, Greece**

EFOMP in collaboration with the Hellenic Association of Medical Physics (HAMP) and the 2nd Department of Radiology, Medical School, National and Kapodistrian University of Athens would like to invite you to the next ESMPE on **13<sup>th</sup>-15<sup>th</sup> October 2022**.

The school will be aimed at advanced tasks connected with the use of statistical methods in data handling and interpretation. The school will cover the methods of inferential statistics most frequently used in the medical field, the statistical methods used in radiomics, the treatment of errors and uncertainties in radiation dosimetry. This course is designed to be accessible to all medical physicists including students and those working in clinical environments and are involved in data management and research.

This two-day event has been accredited by EBAMP (European Board of Accreditation for Medical Physics) as a CPD event for Medical Physicists at EQF Level 8 and awarded 39 CPD credit points (33 CPD credit points for those who do not sit for or do not pass the examination). As in past school editions, there will be an optional examination at the end for those seeking a higher level of certification beyond attendance.

ESMPE have decided this event will be in a hybrid format. Participants will be on-site in Athens where possible, but the school will also be live-streamed so participants can join live online if they cannot travel to the venue. Please note: All times shown are in Greek time (CET+1h).

### **Content**

Sample Size determination. Sample size determination for different study designs  
Evaluation of a diagnostic test– Sensitivity, specificity, diagnostic accuracy, ROC methods  
Applied regression analysis. Analysis of variance, Analysis of Covariance, multiple regression, logistic regression  
Survival analysis – Relative risks Odds ratio. Survival curves with Kaplan Meyer; Log-rank test; Cox models  
Statistical methods in radiomics.  
Errors and uncertainties in radiation dosimetry – Theory of error and uncertainty analysis: Type A and B uncertainty, assessment of the quality of a measurement or calculation.  
Agreement in Radiotherapy – How to assess agreement in Dose distributions and Volume

### **Final exam**

The final exam is voluntary. Participants can gain additional credits when successfully pass the test.

### **Organisers**

Brendan McClean (Chair of the School), Marco Brambilla (Scientific Chair)  
Efi Koutsouveli, Pola Platoni (HAMP)



## Faculty

Marco Brambilla	University Hospital, Novara, Italy
Pierre-Henri Conze	IMT Atlantique, LaTIM, Brest, France
Gianfranco Loi	University Hospital, Novara, Italy
Renata Longo	University of Trieste, Trieste, Italy
Brendan Mc Clean	Saint Lukes Radiation Oncology Network, Dublin, Ireland
Michael Sandborg	Linköping University hospital, Linköping, Sweden
Peter Sharp	University of Aberdeen, Scotland
Federica Zanca	Palindromo Consulting, Leuven, Belgium

Thursday 13<sup>th</sup> October 2022

	Session	Title	Description	Lecturer
8:00-9:00	Registration			
9:00-9:15	Introduction	Setting the scene	Presentation of the ESMPE and introduction to the course	Efi Koutsouveli/GR
9.15-10.00		Statistics with Confidence	How to design the experiment How to analyze the data How to report the data: Hypothesis testing or confidence intervals?	Marco Brambilla/IT
10:00-10:30	Coffee break			
10:30-11:15	Diagnostic tests	Evaluation of a diagnostic test. I: Theory	Sensitivity, specificity, diagnostic accuracy, ROC, FROC, AFROC	Federica Zanca/BE
11.15-12.00		Evaluation of a diagnostic test. I: Worked examples	The practical session will focus on how to lead ROC analyses	Federica Zanca/BE
12:00-12:30			Question and Answer discussion on the morning lectures	All Faculty
12:30-14:00	Lunch break			
14.00-14.45	Applied Regression Analysis	ANOVA, ANCOVA. I Theory	Design of the experiment. One-Way ANOVA; Multiple-way ANOVA (Main effects; Factorial; Repeated Measures). Analysis of Variance Tables	Marco Brambilla/IT
14.45-15.30		ANOVA, ANCOVA. II Worked Examples	The practical session will focus on how to interpret the results of ANOVA/ANCOVA studies lead in the field of medical physics	Marco Brambilla/IT
15:30-15:50	Coffee break			
15:50-16:20	Applied Regression Analysis	Logistic Regression. I Theory	Logistic Function, Logistic Transformation; odds	Michael Sandborg/SE
16:20-17:10		Logistic Regression. II Worked examples	Analyzing data from visual grading experiments with logistic regression models	Michael Sandborg/SE
17.10-17.30			Question and Answer discussion on the afternoon lectures	All Faculty
20:00-23:00	Social dinner - participants + lecturers			

Friday 14<sup>th</sup> October 2022

	Session	Title	Description	Lecturer
09:00-09:45	Applied Regression Analysis	Multiple linear regression. I: Theory	Selecting the best regression equation; Strategy for selecting variables; Reliability with split samples. Coefficient of determination, Standardized regression coefficients	Renata Longo/IT
09:45 – 10:30	Applied Regression Analysis	Multiple linear regression. II Worked examples	The practical session will focus how on how to lead and interpret multiple regression studies in the field of medical physics.	Renata Longo/IT
10:30-10:50	Coffee break			
10:50-11:40	Survival Analysis	Survival Analysis. I. Theory	Relative Risks. Odds ratio. Survival curves with Kaplan Meyer; Log-rank Test; Cox Models	Peter Sharp/UK
11:40-12:10		Survival Analysis. II. Worked examples	The practical session will focus how on to build and interpret survival curves	Peter Sharp/UK
12:10-12:30			Question and Answer discussion on the morning lectures	All Faculty
12:30-14:00	Lunch break			
14:00-15:00	Statistical Methods in Radiomics	Workflow and Feature Categories	Image acquisition. Region segmentation. Features extraction. Histogram-based features (first order statistics). Textural features (second order statistics). Higher order statistical features	Pierre-Henri Conze /FR
15:00-16:00		Properties of an ideal radiomics feature and methodology for evaluation	Test-retest data; Compare metrics through different analysis pipelines; quantify and rank statistical correlation between features; improved models	Pierre-Henri Conze /FR
16:00-16:20	Coffee break			
16:20-17:00	Statistical Methods in Radiomics	Challenges and Limitations	Guidelines to improve the reporting quality and the reproducibility of radiomics studies, as well as the statistical quality of radiomics analyses	Pierre-Henri Conze /FR
17:00-17:30			Question and Answer discussion on the afternoon lectures	All Faculty

Saturday 15<sup>th</sup> October 2022

	Session	Title	Description	Lecturer
09:00-9.45	Error and Uncertainty analysis in Radiation Dosimetry	Treatment of uncertainties in Radiation Dosimetry. I: Theory	The lecture will go through theory of error and uncertainty analysis: Type A and B uncertainty, Standard deviation of the mean, probability density functions	Brendan McClean/IE
09:45-10:30		Treatment of uncertainties in Radiation Dosimetry. II: worked examples	The practical session will focus on the assessment of the quality of a measurement or calculation; the quantitative comparison of results from different investigators; the critical analysis of measurement or calculation method	Brendan McClean/IE
10:30-10:50	Coffee break			
10:50-11:40	Agreement in Radiotherapy	Comparing doses	Comparing measured and calculated dose distributions: distance to agreement, dose difference and gamma evaluation	Gianfranco Loi/IT
11.40-12.20		Comparing Volumes	Determining volume differences by means of DICE, Hausdorff distance	Gianfranco Loi/IT
12.20-12.30			Question and Answer discussion on the afternoon lectures	All Faculty
12:30-13:30	Final examination			



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Course language	English
Level	MPE
Registration fee*	300 € (2 main meals, 5 coffee breaks, 1 social dinner) 350 € (from 10 <sup>th</sup> September 2022)
Reduced registration fee*	150 € - for the first 15 attendees (max. 2 from one country) coming from the following European countries: Albania, Belarus, Bosnia & Herzegovina, Bulgaria, Croatia, Cyprus, Estonia, Greece, Hungary, Kosovo, Latvia, Lithuania, North Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Ukraine.
<ul style="list-style-type: none"><li>• subsidized by EFOMP</li><li>• first-come, first-served policy</li></ul>	
Maximum number of participants	80
Duration	<a href="#">13<sup>th</sup>-15<sup>th</sup> October 2022</a>
Study load	15 hours of lectures and demonstrations
Venue	<a href="#">National and Kapodistrian University of Athens (NKUA)</a> , <a href="#">"Alkis Argyriadis" Amphitheatre</a> Central building, Panepistimiou 30, Athens 106 79
GPS coordinates	<a href="https://goo.gl/maps/t7yPZdYAJZS5tGSw7">https://goo.gl/maps/t7yPZdYAJZS5tGSw7</a>
Accommodation	Individual
Information, programme at:	<a href="http://www.efomp.org">www.efomp.org</a>
Registration	<a href="#">Electronic registration via EFOMP website</a>
Registration period	<a href="#">1<sup>st</sup> April - 30<sup>th</sup> September 2022</a>

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\* payment must be done in 14 days following the pre-registration, otherwise pre-registration will be cancelled and neither free place nor subsidized or ordinary fee can be granted for repeated registration

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