ESMPE
European School for Medical Physics Experts

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European Society for Magnetic Resonance in Medicine and Biology

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ESMPE European School for Medical Physics Experts

Statistics in Medical Physics

23th-25th April 2020, Athens, Greece

The 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 in **Statistics 2020**

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 an uncertainties in radiation dosimetry.

This two-and-half day event will be accredited by EBAMP (European Board of Accreditation for Medical Physics) and is intended for practicing clinical Medical Physicists who are involved in data management and research. As in last year's school, there will be an optional examination at the end for those seeking a higher level of certification beyond attendance.

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 an 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 Volumes

Final exam

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

Organizers

Marco Brambilla (Scientific Chair)**, Alberto Torresin** (Chair of the School)

Pola Platoni, **Gerasimos Messaris** (HAMP), **Efi Koutsouveli** (ESMPE Board)

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Faculty

Marco Brambilla	University Hospital, Novara, Italy
Mathieu Hatt	LaTIM INSERM, Brest, France
Renata Longo	University of Trieste, Trieste, Italy
Brendan McClean	St Luke's Radiation Oncology Network, Dublin, Ireland
Michael Sandborg	Linköping University hospital, Linköping, Sweden
Peter Sharp	University of Aberdeen, Aberdeen, Scotland
Jeroen van de Kamer	Netherlands Cancer Institute, Antoni van Leeuwenhoek, Amsterdam, The Netherlands
Dimitris Visvikis	LaTIM INSERM, Brest, France
Federica Zanca	Palindromo Consulting, Leuven, Belgium

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23th April 2020				
	Session	**Title**	**Description**	**Lecturer**
8:00-9:00	Registration			
9:00-9:15	Setting the scene	Introduction	Presentation of the ESMPE	E Koutsouveli
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?	M Brambilla
10:00-10:30	Coffee break			
10:30-11:30	Diagnostic test	Evaluation of a diagnostic test. I: Theory	Sensitivity, specificity, diagnostic accuracy, ROC, FROC, AFROC	F Zanca
11:30-12:30		Evaluation of a diagnostic test. I: Worked examples	The practical session will focus on how to lead ROC analyses	F Zanca
12:30-14:00	Lunch break			
14.00-15.00	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	M Brambilla
15.00-16.00		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.	M Brambilla
16:00-16:30	Coffee break			
16.30-17.00	Applied Regression Analysis	Logistic Regression. I Theory	Logistic Function, Logistic Transformation;odds	M. Brambilla
17.00-18.00		Logistic Regression. II Worked examples	Analysing data from visual grading experiments with logistic regression models	M. Sandborg
20:00-23:00	Social dinner - participants + lecturers			

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24th April 2020				
	Session	**Title**	**Description**	**Lecturer**
9:00-10:00	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	R Longo
10:00-10:30	Coffee break			
10.30-11.30	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.	R Longo
11.30-12.30	Survival Analysis	Survival Analysis. I. Theory	Relative Risks. Odds ratio. Survival curves with Kaplan Meyer; Log-rank Test; Cox Models	P Sharp
12:30-14:00	Lunch time			
14.00-15.00	Survival Analysis	Survival Analysis. II. Worked examples	The practical session will focus how on to build and interpret survival curves	P Sharp
15.00-16.00	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	D Visvikis
16:00-16:30	Coffee break			
16.30-17.30	Statistical Methods in Radiomics	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	M Hatt
17.30-18.00		Challenges and Limitations	Guidelines to improve the reporting quality and the reproducibility of radiomics studies, as well as the statistical quality of radiomics analyses.	M Hatt

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25th April 2020				
	Session	**Title**	**Description**	**Lecturer**
9.00-10.00	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	B McClean
10.00-11.00		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	
11:00-11:30	Coffee break			
11:30-13:00	Agreement in Radiotherapy	Comparing dose	Comparing measured and calculated dose distributions: distance to agreement, dose difference and gamma evaluation	J van de Kamer
		Comparing Volumes	Determining volume differences by means of DICE, Hausdorff distance	
13:00-15:00	Final examination			

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Further Information

Course language	English
Level	Medical Physics Expert (MPE)
Registration fee* (2 main meals, 5 coffee breaks, 1 social dinner)	300 € 350 € (from 15.03.2020)
Reduced registration fee* • subsidized by EFOMP • first-come, first-served policy • deadline for application (23.09.2019)	150 € - for the first **15** attendees (max. 2 from one country) coming from the following European countries: Albania, Belarus, Bosnia & Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Kosovo, Latvia, Lithuania, North Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Turkey, Ukraine.
Maximum number of participants	80
Duration	23th April 2020 – 25th April 2020
Study load	17 hours of lectures and practical demonstrations
Venue	National and Kapodistrian University of Athens (NKUA), Central building, Panepistimiou 30, Athens 106 79
Website:	www.efomp.org
Accommodation	Individual
Information, programme at:	www.efomp.org
Registration	Electronic registration via EFOMP website
Registration period	1st September 2019 – 10th April 2020

* 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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