



Endorsed by
ESTRO



ESMPE European School for Medical Physics Experts

Statistics in Medical Physics

19th-21st November 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 and uncertainties in radiation dosimetry.

This two-and-half day event has been accredited by EBAMP (European Board of Accreditation for Medical Physics) as 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) and is intended for practicing clinical Medical Physicists who are involved in data management and research. 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 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 Volumes

Final exam

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

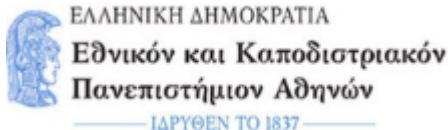
Organizers

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

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



EFOMP



Ένωση Φυσικών Ιατρικής Ελλάδος

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, 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 |

23th April 2020

| | Session | Title | Description | Lecturer |
|-------------|--|---|---|--------------|
| 8:00-9:00 | Registration | | | |
| 9:00-9:15 | Setting the scene | | Presentation of the ESMPE and introduction to the course | |
| 9:10-10:00 | | 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 | | | |

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 |

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 | | | |

Further Information

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| Course language | English |
| Level | Medical Physics Expert (MPE) |
| Registration fee* (2 main meals, 5 coffee breaks, 1 social dinner) | 300 € 350 € (from 15.10.2020) |
| 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 | 19 th November 2020 – 21 st November 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 | 1 st September 2019 – 5 th November 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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