

IASC-LARS WEBINAR ON COMPUTATIONAL STATISTICS AND DATA SCIENCE



**IASC- LARS SCHOOL ON COMPUTATIONAL
STATISTICS AND DATA SCIENCE**

GEOSTATISTICAL FUNCTIONAL DATA ANALYSIS UNIVARIATE AND MULTIVARIATE SPATIAL FUNCTIONAL PREDICTION AND OPTIMAL SAMPLING WITH ENVIRONMENTAL APPLICATIONS

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**UNIVERSIDAD NACIONAL DE COLOMBIA, COLOMBIA
FEBRUARY 23 – 25, 2021**



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IASC-LARS Webinar on Computational Statistics and Data Science

GEOSTATISTICAL FUNCTIONAL DATA ANALYSIS PROGRAM



IASC- LARS SCHOOL ON COMPUTATIONAL STATISTICS AND DATA SCIENCE

The Latin American Regional Section of the International Association for Statistical Computing (IASC-LARS), the IASC-LARS School on Computational Statistics and Data Science, the International Association for Statistical Computing (IASC), and the International Statistical Institute (ISI) are pleased to invite undergraduate and postgraduate students to attend the IASC-LARS Webinar Course “Geostatistical functional data analysis: Univariate and multivariate spatial functional prediction and optimal sampling with environmental applications”. The course will be team-taught by Professors Martha Bohorquez and Rubén Guevara, and the Statistician Juan Guevara from the Universidad Nacional de Colombia, Colombia, February 23-25, 2021.

The IASC-LARS Courses aim (1) to spread the knowledge base and advances in Statistical Computing in Latin American and the world, (2) to provide an overview of the state-of-the-art of the ongoing research in computational statistics, (3) to provide an overall perspective of the application of computational statistics in data science problems, (4) to present applications where computational statistics have been crucial to solve problems in real-life applications, and (5) to increase the number of researchers and practitioners in computational statistics and data science.

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GEOSTATISTICAL FUNCTIONAL DATA ANALYSIS PROGRAM

Spatial functional data analysis is an alternative approach to spatio-temporal modeling when the curves are time series varying spatially. Specifically, functional geostatistics allows to carry out optimal spatial prediction of the whole curve at unsampled sites. Along with the developments in functional geostatistics, the framework for optimal spatial sampling designs is extended. This course is concerned with functional kriging, functional cokriging and optimal sampling designs for spatial prediction of functional data. Real applications to meteorology, air quality, water quality and brain signals datasets are presented.

INSTRUCTORS: Martha Bohorquez (Universidad Nacional de Colombia).
Rubén Guevara (Universidad Nacional de Colombia).
Juan Guevara (Universidad Nacional de Colombia).

AGENDA

(Local time: Bogota – Colombia, UCT/GMT -5 hours)

Tuesday – February 23

session 1: 09:00 am to 10:15 am

session 2: 10:30 am to 11:45 am

- Background
 - ✓ Spatial and spatio-temporal scalar random fields
 - ✓ Kriging
 - ✓ cokriging
 - ✓ Examples

Wednesday – February 24

session 1: 09:00 am to 10:15 am

session 2: 10:30 am to 11:45 am

- Multivariate spatial functional random field
 - ✓ Introduction to functional data analysis
 - ✓ Recent advances in spatial functional data
 - ✓ Functional principal components
 - ✓ Examples

Thursday – February 25

session 1: 09:00 am to 10:15 am

session 2: 10:30 am to 11:45 am

- Spatial prediction of functional random fields
 - ✓ Functional kriging
 - ✓ Functional cokriging
 - ✓ Basic network design and redesign concepts for functional data
 - ✓ Examples

References

1. Bohorquez M.; Giraldo R.; Mateu J. Spatial prediction and optimal sampling of functional data in Geostatistical Functional Data Analysis: Theory and Methods (2020). John Wiley & Sons, Chichester, UK. ISBN: 978-1-119-38784-8
2. Bohorquez, M., Giraldo, R., and Mateu, J. (2015), Optimal sampling for spatial prediction of functional data., Statistical Methods and Applications. DOI: 10.1007/s10260-015-0340-9.
3. Bohorquez, M., Giraldo, R., and Mateu, J. (2017) Multivariate functional random fields: prediction and optimal sampling. Stochastic Environmental Research and Risk Assessment, 31 (1), 53-70.
4. Bongiorno, E.G., Salinelli, E., Goia, A., and Vieu, P. (2014) Contributions in infinite-dimensional statistics and related topics, Societa Editrice Esculapio.
5. Horvath, L. and Kokoszka, P. (2012) Inference for functional data with applications, Springer.
6. Bosq, D. (2000) Linear Processes in Function Spaces: Theory and Applications, vol. 149, Springer.
7. Ferraty, F. and Vieu, P. (2006) Nonparametric Functional Data Analysis: Theory and Practice, Springer Verlag.
8. Müller, W. (2007) Collecting Spatial Data: Optimum Design of Experiments for Random Fields, Springer Verlag.
9. Nerini, D., Monestiez, P., and Manté, C. (2010) Cokriging for spatial functional data. Journal of Multivariate Analysis, 101 (2), 409-418.
10. Reed, M. and Simon, B. (1980) Methods of Modern Mathematical Physics I: Functional Analysis, Academic Press, Inc. San Diego.
11. Myers, D. (1982) Matrix formulation of co-kriging. Mathematical Geology, 14 (3), 249-257.
12. Schabenberger, O. and Gotway, C. (2004) Statistical Methods for Spatial Data Analysis, CRC Press.
13. Secretaría del Medio Ambiente México, S. (2015), <http://www.aire.df.gob.mx/default.php>.
13. Zhu, Z. and Stein, M. (2006) Spatial sampling design for prediction with estimated parameters. Journal of Agricultural, Biological, and Environmental Statistics, 11 (1), 24-44.

IASC-LARS Webinar on Computational Statistics and Data Science

GEOSTATISTICAL FUNCTIONAL DATA ANALYSIS REGISTRATION PROCEDURE

The IASC-LARS Webinar “Geostatistical Functional Data Analysis” will be held virtually using the platform [GoToWebinar](#) from February 23-25, 2021. The official language is English. The deadline for early registration is **February 10, 2021**. The course is free of charge.

Please complete the IASC-LARS Webinar Registration Form at <https://forms.gle/eR6RmT9HMD7zEdHc6>. If you have any questions or you need any help, please do not hesitate to contact us at lasc.lars.iasc@gmail.com.

To become an IASC-LARS member, please complete the Membership Application Form at <https://www.isi-web.org/index.php/membership/individual-membership/iasc>.

All participants are expected to adhere to the ISI Community Principles and Conduct Policy (<https://www.isi-web.org/index.php/about-isi/policies/community-conduct>).

More information about GoToWebinar please visit <https://www.gotomeeting.com/webinar>. GoToWebinar application is also available for iOS, Android and Windows Phone: <https://support.goto.com/webinar/help/gotowebinar-for-mobile-devices-g2w050033>.

IASC-LARS Webinar on Computational Statistics and Data Science

GEOSTATISTICAL FUNCTIONAL DATA ANALYSIS GoToWebinar Platform

To attend this virtual course:

1. Please complete the IASC-LARS Webinar Registration Form at <https://forms.gle/eR6RmT9HMD7zEdHc6> as soon as you decide to attend the course.
2. You will receive an email with an URL link to register in the GTW platform to attend the webinar. Please, provide all the requested information.
3. One hour before starting the course, you will receive an invitation link and a webinar's ID to join the course by GoToWebinar. Later you will receive an email confirming your registration.
4. You can also go to <https://www.gotomeeting.com/webinar/join-webinar> and join the webinar entering the 9-digit Webinar ID and your email in the Join a Webinar window.

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5. Please, try to connect about 30 minutes before the start of the course.
6. We recommend joining via a high speed and wired connection and to use a USB headset for best sound quality.
7. Before to attend the course, please visit the webpage <https://www.gotomeeting.com/webinar/join-webinar> and see the video “GoToWebinar Attendee Quick Start”. For more information, you can also visit the YouTube channel <https://www.youtube.com/user/gotowebinar>.
8. If you have any questions or you need any help, please do not hesitate to contact us at iasc.lars.iasc@gmail.com.