

# Bocconi Summer School in Advanced Statistics and Probability

Lake Como School of Advanced Studies - July 8-19, 2019

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## Home

### ▪ Bocconi Summer School in Advanced Statistics and Probability

The Bocconi Summer School in Advanced Statistics and Probability is offered by [Università Bocconi](#), Milan, and is hosted by the Lake Como School of Advanced Studies at Villa del Grumello, on the shores of the Lake of Como, usually in July. The School continues the tradition of the Summer Schools in Statistics and Probability that Università Bocconi had been organizing since the early '90s, and held in Torgnon, Val d'Aosta, until 2008.

The aim of the Bocconi Summer School in Advanced Statistics and Probability is to establish a track of high level courses on advanced and cutting-edge topics in Statistics and Probability. The Summer School offers lectures delivered by internationally leading scholars on the specific designated topic, and supervised tutorials.

The 2019 edition, on [Random Graphs and Complex Networks: Structure and Function](#), will take place on **July 8-19, 2019**. The main instructors will be **Remco van der Hofstad** (Eindhoven University of Technology, NL) and **Shankar Bhamidi** (University of North Carolina, USA).

Up to two Awards, covering the registration fee, will be conferred by the Bocconi Institute of Data Science ([BIDSA](#)) to outstanding applicants.

#### Directors

Prof. Sonia Petrone (Università Bocconi)  
Prof. Pietro Muliere (Università Bocconi)

#### [PhD Università Bocconi](#)

#### Past Editions

[2017: Statistical Causal Learning.](#)  
[2018: Graphical models.](#)

#### [Photos](#) and videos





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## Program

### Random Graphs and Complex Networks: Structure and Function

- Keywords: Random Graphs, Complex Networks, Network Statistics, Stochastic Processes in Random Media, Algorithms

The topic of random graphs is at the forefront of applied probability, and it is one of the central topics in multidisciplinary science where mathematical ideas are used to model and understand the real world. At the same time, random graphs pose challenging mathematical problems that have attracted the attention from probabilists and combinatorialists since the 1960, with the pioneering work of Erdős and Rényi. Around the change of the millennium, when data sets started to become available, several applied disciplines started to realize that many real-world networks, even though they are from various different origins, share many fascinating features.

The aim of this course is four-fold. First, we aim to describe the novel models invented since 2000 to describe real-world networks, as well as their topological properties. These models share that they are rather inhomogeneous. Various models were invented to model specific aspects of networks, such as their community structure, clustering, and degree structure. Their topological properties are by now relatively well understood, and we aim to discuss them. Key examples of such properties include their giant component, critical connectivity behavior, graph distances and degree structure. Secondly, we aim to study their local behavior, as described by their local weak limit, and how they can be constructed using random walks and related stochastic processes, particularly in their scaling limits. Thirdly, we aim to discuss network functionality, as described by stochastic processes on them. These processes include the metric of weighted random graphs, and distances in those, as well as the vulnerability of networks, as modeled by percolation on them. Finally, we discuss several statistical problems of networks and their functionality, including community detection problems, the estimation of preferential attachment functions, and estimation of the source of an epidemic.

The school will present basic material in the first week, while the second week will contain more advanced material, at the forefront of science. The aim is that students who have followed the course can read recent articles in the mathematics of networks and place their content in the broad field.

Part of this material comes from the basic random graphs book by van der Hofstad, as well as two follow-up works on more advanced random graphs topics and the Saint-Flour lecture notes in preparation on stochastic processes on random graphs. Aside from this, the course aims to cover some seminal papers on the subject.

### Instructors

Lectures:

**Remco van der Hofstad**

(Department of Mathematics and Computer Science, Eindhoven University of Technology, NL)

**Shankar Bhamidi**

(Department of Statistics and Operations Research, University of North Carolina, USA)

Tutorials:

Viktoria Vadon

(Eindhoven University of Technology, NL)

**Clara Stegehuis**

(Eindhoven University of Technology, NL)

### Format

Morning: 3 hours/day lectures

Afternoon: 2 hours/day supervised tutorials as well as individual and team work.

Moreover, there will be a poster session, where participants, upon previous request, may present their research. A welcome cocktail will be offered during the poster session. More detailed info to follow.

### Room and board

Accommodation is included in the registration fee.

The students will be hosted at the Guest House of Villa del Grumello and at the Ostello Bello .

The organizing committee will take care of the reservation.

Working days' lunches are included in the registration fees.

### Attendance and final certificate

Full attendance of the activities of the summer school is mandatory for the participants.

An attendance certificate will be awarded by Università Bocconi, subject to a positive participation to the program.





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## Schedule

**Tentative schedule** (a detailed version, including references and teaching material, [is available here](#) (RvdH is professor Remco van der Hofstad, SB is professor Shankar Bhamidi))

### Week 1: Basic Material

- Day 1:** Empirics of Complex Networks
- Day 2:** Basic Models: locally tree-like
- Day 3:** Structural Properties of Random Graphs
- Day 4:** Branching process comparisons and intro to dense graphs
- Day 5:** Dense models vs sparse models

### Week 2: Advanced Material

- Day 6:** Local weak convergence
- Day 7:** Community detection
- Day 8:** Information diffusion on networks
- Day 9:** Network vulnerability
- Day 10:** Statistics for dynamical networks



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## Deadlines

- \* Closing date for application: **April 2, 2019**
- \* Notification of admission: **by April 11, 2019**
- \* Registration of admitted candidates: **by April 23, 2019**

All applicants will be notified via e-mail about their admission result (i.e.: admitted in the main list, in the waiting list, or not admitted due to excess demand). Should any place become available, candidates in the waiting list will be soon notified by email.





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## Application

### ▪ Target Participants

The Summer School is designed for PhD students, and possibly brilliant MSc graduates / final-year students interested in pursuing doctoral studies in Statistics, Probability, Computer Science, Applied Mathematics, Operation Research and related areas.

Lectures are in English.

In order to foster active interaction among students and instructors, **the School is targeted for a class of at most 30 qualified and selected participants.**

The class group will include some students of the [PhD in Statistics of Università Bocconi](#).

The Bocconi Institute of Data Science ([BIDSA](#)) will confer up to two Awards, covering the registration fee, to outstanding applicants.

### ▪ Selection criteria

Selection of participants will be mainly based on the quality of the curriculum. The Organizing Committee will also consider other relevant aspects of candidates' application such as: the coherence of the motivation with the aim and scope of the school, the potential benefit for the student's research and the timeliness for the development of the student's career.

Required documents for applying:

1) Personal CV

– Education; work experience; language skills and other relevant info;

2) Academic records

– for PhD students: PhD exams transcript (if applicable)

– for MSc students and graduates: transcript of MSc exams

3) Referees

up to 2 referees that the Admission Committee could contact (names, institution and e-mail address)

4) Statement of purpose

Max 1200 words; short description of:

– academic background in statistics, probability and/or other related areas

– research interests

– motivation for participating in the Summer School

Name

Surname

Gender

Institution

Street

Postal code

Town

City

Country

Phone

Email

Referees

Curriculum vitae (2 pages) [pdf, max 2MB]

Nessun file scelto

Academic records Transcript (2 pages) [pdf, max 2MB]

Nessun file scelto

Statement of purpose (2 pages) [pdf, max 2MB]

Nessun file scelto

☐ By submitting this registration form you authorise Fondazione Alessandro Volta to include your personal data on its mailing list for the distribution of information material. We will never share your personal data with any third party. According to the General Data Protection Regulation 2016/679, you may have access to these details at any time and request their modification and cancellation sending an email to: [info@lakecomoschool.org](mailto:info@lakecomoschool.org)



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## Registration

### • Registration procedure

Registration fee: € 530 (VAT free)

The fee covers the school activities and course material; wi-fi connections; working days lunches; welcome cocktail; accommodation for the 2 weeks, July 7 evening – July 20 morning, 2019.

### IMPORTANT:

The school will end on July 19, around 2pm. Participants will be asked about their travel plans, for a possible earlier check out on July 19.

After registration, participants will be notified about their accommodation.

Admitted applicants on the main list should register via [Paytool](#) by **April 23**, following these steps:

- Fill in the registration form
- Login
- Select the initiative “Summer School in Advanced Statistics and Probability (PhD School)”
- Select the product “Bocconi Summer School in Advanced Statistics and Probability”
- Follow the payment instructions

If the payment is successfully completed, Paytool issues a receipt of payment, which is sent to the candidate's email address. The receipt of payment is also available on the Paytool personal page and users can download it any time by clicking on the “Receipt” button. **The receipt of payment confirms that the registration for the Summer School has been carried out successfully.**

Should any candidates in the main list decline the offer, candidates in the waiting list will be notified by email so that they can register.



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## Venue and Accommodation

Lake Como School of Advanced Studies, Villa del Grumello, Como, Italy.

Placed in a central position within Europe, close to four international airports, it is hosted in an outstanding old noble palace located on the shoreline of beautiful Lake Como. The School is an international research facility running short term programs on a wide range of interdisciplinary subjects, sharing a common focus on complex systems. The School attracts leading scholars in different fields including: physics, biology, economics, sociology, geopolitics, education, environmental and development studies, to engage in collaborative research. In small teams, visitors explore questions at the cutting edge of science and knowledge. In a context of globalization and in front of the increasing interaction between various kinds of networks, the analysis of complex systems offers insights into economic development, social cohesion and the environment on many geographical scales.

### Venue

The school will be held at Villa del Grumello, Via per Cernobbio 11, Como (Italy).

### Accommodation

Students will be hosted at the [Guest House of Villa del Grumello](#) and at the [Ostello Bello](#).

The organizing committee will take care of the reservation.

Working days' lunches are included in the registration fees.

**HOW TO GET THERE:** <http://lakecomoschool.org/contact/travel-info/>

Villa del Grumello is 20 min on foot from Como city center – you can also take a bus, lines 6 and 11 (bus stop: "Como Via Regina Piscine Villa Olmo", just after "Villa Olmo").

From the main Train Station (Como S. Giovanni), the nearest bus stop to catch line 6 and 11 is "Piazzale Rocchetto".

**Important! For all school speakers and attendees!**

We have learned that third part companies are contacting school speakers and attendees offering to make travel arrangements (hotel and flight bookings) on our behalf and asking for credit card details in order to proceed. PLEASE NOTE these agencies are not authorized by us, this is most likely a fraud.

For any doubt do not hesitate to contact us. Thank you!





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## Contact us

For info, please contact

[bss.statistics@unibocconi.it](mailto:bss.statistics@unibocconi.it)







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## Protetto: Course Material

Il contenuto è protetto da password. Per visualizzarlo inserisci di seguito la password:

Password:

Invio



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## Photo & Video



Group photo, Bocconi Summer School in Advanced Statistics and Probability  
July 8-19, 2019

