

# AN INTRODUCTION TO STEIN'S METHOD (7.5 POINTS)

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## COURSE DESCRIPTION

Stein's method goes back to the sixties when Charles Stein found a clever way to provide errors in the approximation by the normal distribution of the distribution of the sum of dependent random variables of a certain structure. However, his ideas are sufficiently abstract and powerful to be able to work well beyond that intended purpose, applying to approximation of more general random variables by distributions other than the normal (such as the Poisson, exponential, etc). Since then Stein's method has evolved a lot and has been recently used in many hot research areas, such like random matrices, random graphs or point process theory.

Basically Stein's method can be used in every field of probability theory where one wants to proof a limit theorem. The aim of this course is to give a introduction to this powerful method and provide examples how Stein's method can be applied to various problems.

In the first part we cover classical normal and Poisson approximation and proof a Berry-Esseen type central limit theorem. Then we will introduce the so-called "generator approach" which allows basically to approximate any given random variable or even any random object.

A second part is about Poisson point process approximation. We will start with some basic point process theory and then apply the generator approach to this specific problem. Basically we provide error bounds for replacing a given point process with a Poisson process.

If there is time left, we can cover other topics according to the wishes of the students.

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## LITERATURE

The main sources will be:

- *An Introduction to Stein's Method*, Singapore Univ. Press, Singapore. (2005) by Barbour, A. D. and Chen, L. H. Y.,
- *Fundamentals of Stein's method*, lecture notes by Nathon Ross (<http://arxiv.org/pdf/1109.1880v1.pdf>).

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## TIME AND PLACE

We will meet once a week for two hours. The first meeting will be in MVL:14 on Friday 4.9. at 14:15. Further dates will be discussed with the students.