Introduction to Astrostatistics

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Duration: 18 weeks

Course Description

This course introduces basics of astronomy and aims to teach the application of statistics in various aspects of astronomy, starting from making observations to extracting informations on physical models. The course is divided into four parts. In the first part of the course, techniques involved in measuring the 'observable quantities' of astronomical objects are discussed. In the second part of the course the zoo of astronomical objects are introduced. The third part introduces the statistical tools commonly used in astronomy and how these tools have helped to answer the basic astrophysical questions. The fourth part of the course covers theoretical and observational cosmology and discusses the statistical techniques used to estimate the cosmological parameters.

About half of the course will be of classroom lectures and the remaining half will be of 'laboratory work' where numerical/statistical techniques will be applied to real datasets to gain experience on the application of statistical methods in astronomy. The laboratory work will be carried out using Python. Therefore a computer with Linux (preferably) is necessary. Guidance can be provided for easy migration to Linux/Unix.

EVALUATION

Completion of 'laboratory'/home works: 50%
Exam/Project work: 50%

BIBLIOGRAPHY

1. Fundamental Astronomy, (Eds.) Karttunen, H., Kröger, P., Oja, H., Poutanen, M., Donner, K.J. , 2017, Springer-Verlag Berlin Heidelberg
2. An Introduction to Modern Astrophysics, 2nd Ed., B. W. Carroll, D. A. Ostlie, 2007, Cambridge University Press, ISBN-10: 1108422160
3. Extragalactic Astronomy and Cosmology: An Introduction, 2nd ed., P. Schneider, 2015, Springer, ISBN-10: 3642540821
4. Statistics, Data Mining, and Machine Learning in Astronomy: A Practical Python Guide for the Analysis of Survey Data, Z. Ivezic, A. J. Connolly, J. T VanderPlas, A. Gray 2014, Princeton University Press, ISBN: 0691151687
5. Review Articles (A list will be provided)
6. Manual for Python based statstical tools (TO BE DONE).
7. Internet Resources (TO BE COMPILED)

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