Data Science in Astrophysics

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I give a lecture on the data science methods in astrophysics. We begin with the basics on statistics and parameter estimation. We then move on to modern computer-aided data science methods. We introduce the Markov Chain Monte Carlo (MCMC) and machine learning. After learning the theoretical basis, we have some time (~ an hour) for a workshop to solve actual astronomical problems.

Note: please prepare the Python 3 environment with Jupyter Notebook on your computer.

Contents

Part I: Lecture

What is an error? Probability distribution Propagation of errors Least square method The χ^2 -test of probability distribution Maximum likelihood method for parameter estimation From Fisher analysis to information geometry Bayesian methods and Markov Chain Monte Carlo (MCMC) Elementary machine learning

Part II: Workshop

Parameter estimation MCMC Machine learning, etc.