



Statistics, Data Mining, and Machine Learning in Astronomy: A Practical Python Guide for the Analysis of Survey Data (Princeton Series in Modern Observational Astronomy)

By Željko Ivezić, Andrew J. Connolly, Jacob T VanderPlas, Alexander Gray

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As telescopes, detectors, and computers grow ever more powerful, the volume of data at the disposal of astronomers and astrophysicists will enter the petabyte domain, providing accurate measurements for billions of celestial objects. This book provides a comprehensive and accessible introduction to the cutting-edge statistical methods needed to efficiently analyze complex data sets from astronomical surveys such as the Panoramic Survey Telescope and Rapid Response System, the Dark Energy Survey, and the upcoming Large Synoptic Survey Telescope. It serves as a practical handbook for graduate students and advanced undergraduates in physics and astronomy, and as an indispensable reference for researchers.

Statistics, Data Mining, and Machine Learning in Astronomy presents a wealth of practical analysis problems, evaluates techniques for solving them, and explains how to use various approaches for different types and sizes of data sets. For all applications described in the book, Python code and example data sets are provided. The supporting data sets have been carefully selected from contemporary astronomical surveys (for example, the Sloan Digital Sky Survey) and are easy to download and use. The accompanying Python code is publicly available, well documented, and follows uniform coding standards. Together, the data sets and code enable readers to reproduce all the figures and examples, evaluate the methods, and adapt them to their own fields of interest.

- Describes the most useful statistical and data-mining methods for extracting knowledge from huge and complex astronomical data sets
- Features real-world data sets from contemporary astronomical surveys
- Uses a freely available Python codebase throughout
- Ideal for students and working astronomers

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Editorial Review

Review

Winner of the 2016 IAA Outstanding Publication Award, International Astrostatistics Association

"Ivezic and colleagues at the University of Washington and the Georgia Institute of Technology have written a comprehensive, accessible, well-thought-out introduction to the new and burgeoning field of astrostatistics. . . . The authors provide another valuable service by discussing how to access data from key astronomical research programs."--*Choice*

"A substantial work that can be of value to students and scientists interesting in mining the vast amount of astronomical data collected to date. . . . A well-prepared introduction to this material. . . . If data mining and machine learning fall within your interest area, this text deserves a place on your shelf."--*International Planetarium Society*

From the Back Cover

"This comprehensive book is surely going to be regarded as one of the foremost texts in the new discipline of astrostatistics."--**Joseph M. Hilbe, president of the International Astrostatistics Association**

"In the era of data-driven science, many students and researchers have faced a barrier to entry. Until now, they have lacked an effective tutorial introduction to the array of tools and code for data mining and statistical analysis. The comprehensive overview of techniques provided in this book, accompanied by a Python toolbox, free readers to explore and analyze the data rather than reinvent the wheel."--**Tony Tyson, University of California, Davis**

"The authors are leading experts in the field who have utilized the techniques described here in their own very successful research. *Statistics, Data Mining, and Machine Learning in Astronomy* is a book that will become a key resource for the astronomy community."--**Robert J. Hanisch, Space Telescope Science Institute**

About the Author

Željko Ivezić is professor of astronomy at the University of Washington. **Andrew J. Connolly** is professor of astronomy at the University of Washington. **Jacob T. VanderPlas** is an NSF postdoctoral research fellow in astronomy and computer science at the University of Washington. **Alexander Gray** is professor of computer science at Georgia Institute of Technology."

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