Astrostatistics Opening Workshop and Tutorials

January 18-25, 2006

Poster Titles

Ethan Anderes
University of California, Berkeley
Department of Statistics
anderes@stat.berkeley.edu

"Estimating Deformations of Isotropic Gaussian Random Fields on the Plane"

We present a new approach to the estimation of the deformation of an isotropic Gaussian random field on $\Bbb $R^2$$ based on dense observations of a single realization of the deformed random field. Under this framework we investigate the identification and estimation of deformations. We also present a complete methodological package---from model assumptions to algorithmic recovery of the deformation---for the class of non-stationary processes obtained by deforming isotropic Gaussian random fields.

Kinman Au
Carnegie Mellon University
Department of Statistics
kinman@stat.cmu.edu

"Inferring Galaxy Morphology Through Texture Analysis"

We give an approach to estimate galaxy morphology from digital images. In particular, our algorithm extracts orientation information of the texture at difference scales, and merges the multiscale information into an unified representation. By fitting a morphological model based on the textural information, we derive an quantitative and physically meaningful description of galaxy morphology. Such description will help scientists to study how galaxy morphology evolve over time, and the effect of environment toward the evolution. The answers will provide important clues about the origin of the Universe.

Antonio Cava
Milano University & INAF-OAPD
Department of Physics
cava@pd.astro.it

"The Wide-field Imaging Nearby Galaxy Survey"

Peter Driscoll
San Francisco State University
Department of Physics and Astronomy
driscoll@stars.sfsu.edu

"A Comparison of Least-Squares and Bayesian Techniques in Fitting the Orbits of Extrasolar Planets"

Eric Ford
University of California, Berkeley
Department of Astronomy
eford@berkeley.edu

"Developing a Bayesian Toolbox for Detection and Orbit Determination of Extrasolar Planets"

Radial velocity surveys have now detected over 150 extrasolar planets around nearby main sequence stars. Many of these planets are clearly detected and have well characterized orbits, thanks to a large ratio of the velocity amplitude to measurement precision and observations spanning many orbital periods. However, a growing number of planets have orbital periods comparable to the duration of observations and/or induce radial velocity variations not much larger than the measurement precision (Fig. 1). For such planets, there are often large uncertainties in the orbital parameters. In the most extreme cases, even establishing the reality of a periodic signal is difficult. These difficulties become even more severe for multiple planet systems which require simultaneously fitting numerous model parameters. So far, most analyzes of extrasolar planets have relied on frequentist methods such as maximum likelihood. I review recent progress in developing the necessary computational tools for implementing such analyzes. I demonstrate these techniques with a Bayesian analysis of a recent triple planet system orbiting HD 37124.

Peter Freeman
Carnegie Mellon University
Department of Statistics
pfreeman@cmu.edu

"Non-Parametric Analysis of Supernova Data and the Dark Energy Equation of State"

Philip Gregory
University of British Columbia
Department of Physics and Astronomy
gregory@phas.ubc.ca

"A Bayesian Multi-Planet Kepler Periodogram for Exoplanet Detection"

Woncheol Jang
Duke University
Institute of Statistics and Decision Sciences
wjang@stat.duke.edu

"Density Estimation and Clustering in Astronomical Sky Surveys"

William Jefferys
Universities of Texas and Vermont
Department of Astronomy (UT) & Statistics (UVM)
bill@astro.as.utexas.edu

"A Bayesian Approach to Analyzing Star Cluster Parameters"

Hyunsook Lee
Pennsylvania State University
Department of Statistics
hlee@stat.psu.edu

Title: TBA

Jayanta Pal
University of Michigan
Department of Statistics
jpal@umich.edu

"Estimating a Decreasing Density for the Dark Matter in Nnearby Dwarf Galaxies"

Taeyoung Park
Harvard University
Department of Statistics
tpark@stat.harvard.edu

"Fitting Narrow Emission Lines in X-ray Spectra"

Alex Rojas
Carnegie Mellon University
Department of Statistics
arojas@stat.cmu.edu

"Characterization of Galaxy Evolution as function of Local Environment"

Adam Roy
University of California, Irvine
Department of Statistics
ajroy@uci.edu

"Highly Structured Models and Statistical Computation in High-Energy Astrophysics"

David Valls-Gabaud
Canada-France-Hawaii Telescope
dvg@cfht.hawaii.edu

"Genetic Algorithms for Gravitational Lenses"

Diana Yanchukova and **Don Ellison**
North Carolina State University
Department of Physics
dyanchu@ncsu.edu

"High Energy Photon Emission in Young Supernova Remnants"

Young SNRs are believed to produce cosmic ray ions and electrons, but direct evidence for ion acceleration in SNRs remains illusive. An important key to the solution of this problem concerns the relative efficiency for producing inverse Compton radiation vs. gamma-ray production via pion decay. We outline elements of this problem and compare results to recent H.E.S.S. TeV observations of young SNRs.