SAMSI Spring 2006 Program on Astrostatistics
Workshop on Source and Feature Detection Kick-Off
Thursday, January 26, 2006, 9:00AM – 5:00PM
NISS Bldg, Room 104

8:45 Bus Departs from Radisson Hotel Research Triangle Park

9:00 Breakfast (provided)

9:30 Welcome and Introductions

Name	Field	In Residence
Keith Arnaud	Astronomy	Opening Session
Jim Chiang	Astronomy	1/26
Alanna Connors	Astronomy	Opening Session
Peter Freeman	Astronomy	Opening Session
Jiashun Jin	Statistics	4 wks inc Opening Session
Vinay Kashyap	Astronomy	Opening Session
Thomas Lee	Statistics	1/26
Li Meng Lo	Statistics	periodically
Xiao Li Meng	Statistics	1/26 and 2/13 - 2/17
Taeyoung Park	Statistics	Opening Session
Adam Roy	Statistics	Opening Session
Jeff Scargle	Astronomy	1/17 - 1/27
Aneta Siemiginowska	Astronomy	Opening Session
David van Dyk	Statistics	Jan 18 - March 24
Martin Weinberg	Astronomy	Opening Session
Becca Willet	Elec. & Comp. Engineering	Througout
Alex Young	Astronomy	Opening Session
Yaming Yu	Statistics	Opening Session

Introduction

9:45 Peter Freeman

FEATURE DETECTION "IN-THE-TRENCHES". In this talk I introduce an important subset of astronomical data to statisticians: binned two-dimensional Poisson images, and binned one-dimension energy/wavelength spectra. Both may contain "features" that are to be detected via hypothesis testing, e.g., astronomical sources in images or atomic lines in spectra. I map out the landmines that one may step on in analyses, e.g., spatially varying PSFs, varying exposure, instrumental artifacts, and feature blending. I also point out two problems of particular interest to astronomers: the classification of point/extended sources, and the estimation of upper limits.

Statistical Computing

10:15 Kieth Arnaud

MCMC METHODS. MCMC is turning up more and more in papers on a range of astronomical topics from cosmology to planet detection. I will discuss one or two examples and compare with current best practice in the statistical community.

10:45 Martin Weinberg
Use of the Bayesian Inference Engine (BIE) to infer the structure of the Milky Way galaxy from 2MASS and other datasets. `URL: http://www.astro.umass.edu/ weinberg/BIE/`

11:15 Break.

Gamma-Rays

11:30 James Chiang
The Large Area Telescope (LAT) aboard GLAST has a point spread function and effective area that vary strongly over the 5 decades in energy (20 MeV - 200 GeV) that the instrument covers and across its 2 steradian field-of-view. Coupled with the default observing mode of continually scanning the sky, these features result in each detected gamma-ray essentially having its own set of instrument response functions. An additional difficulty is that the LAT PSF is sufficiently broad that source confusion will often be a concern, especially in regions along the Galactic plane where interstellar emission is the dominant component. I'll present some specific problems regarding point source detection, image deconvolution for extended objects, and time variability that are expected to be encountered in analyses of LAT data.

12:00 Alanna Connors
Mapping the Diffuse γ-ray Sky or the Sky at Different Energy Bands.

12:30 Jeff Scargle
Segmentation of Astronomical Data.
`URL: trotsky.arc.nasa.gov/ jeffrey/scargle_abstract.pdf`

1:00 Lunch (provided)

Methods

1:30 Vinay Kashyap
Upper Limits. Upper limits mean different things to different people. For statisticians, it is the bound of the parameter value at some confidence level. For astronomers, it means something completely different, the maximum value that the intensity of an undetected source can have without being detected. I will have some slides that discuss these differences and some attempts to cast the question in meaningful statistical terms.

2:00 Aneta Siemiginowska
Detection Limits and Faint Features.

Solarphysics

2:30 Alex Young
Statistical Challenges in Solar Astrophysics. Solar physics shares many statistical challenges with astronomy/astrophysics but it has some unique problems. The types of data the solar physicist encounters include some similar to that of astrophysics but some data is more a kind to medical imaging and earth remote sensing. I will present a small overview of some of the common types of data gathered in solar physics and discuss some of the associated analysis challenges.

3:00 Break

Synthesis

3:15 Develop Goals and agenda for program. Begin to form research groups.

4:30 Adjourn

4:45 Bus returns to Radisson

6:00 Meet in Lobby of Radisson for dinner (optional!)