SAMSI AFFILIATES MEETING REPORT

Richard L. Smith

Director of SAMSI

JSM

July 31 2010

Changes at SAMSI

- Richard Smith now Director, replacing Jim Berger

- Rick Durrett now Associate Director, replacing Michael Minion

- Pierre Gremaud (NCSU) is Deputy Director

- Nell Sedransk continues as Associate Director (NISS)

- New members of National Advisory Committee:
  - Max Gunzberger (Mathematics, Florida State),
  - Kathryn Roeder (Statistics, CMU),
  - Diane Lambert (Statistics, Google),
  - Irene Gamba (Mathematics, Austin Texas),
  - Mac Hyman (Mathematics, Tulane/LANL).

- A new "Directorate Liaison" committee contains representatives from each of the local departments that are not already represented on the Directorate.

Upcoming Programs (2010 - 2011)

- Semiparametric Bayesian Inference in PKPD Analysis (summar program, completed)

- Complex Networks

- Analysis of Object Data

Complex Networks

- Research themes:
  - network modeling and inference
  - flows on networks
  - network models for disease transmission
  - dynamics of networks

- Organizing Committee:
  - Eric Kolaczyk, Alex Vespignani (Program Leaders)
  - Pierre Degond, Stephen Fienberg, Martina Morris (Scientific Advisory Committee)
  - Alun Lloyd, Peter Mucha (Local Scientific Coordinators)
  - Pierre Gremaud (Directorate Liaison)
  - Bin Yu (National Advisory Committee Liaison)

Complex Networks Opening Workshop

- Tutorials:
  - Eric Kolaczyk (Boston University)
  - Alessandro Vespignani (Indiana University)
  - Rick Durrett (Duke)
  - Michael Mahoney (Stanford)

- Invited Sessions:
  - Sampling and Inference
  - Spectral Analysis and Geometric Algorithms
  - Percolation and Diffusion on Networks
  - Dynamics of Networks
  - Biological Applications

Complex Networks: Possible Working Groups

- Network sampling
  (David Banks, Eric Kolaczyk, Tyler McCormick)

- Geometric algorithms on graphs
  (Mauro Maggioni, Michael Mahoney)

- Percolation/diffusion on networks
  (Rick Durrett, Jim Moody)

- Epidemiology on nets
  (Alun Lloyd)

- Dynamic of networks
  (Peter Mucha, Skyler Cranmer)

Analysis of Object Data

- Research themes:
  - Classification of objects (Euclidean, mildly non-Euclidean, strongly non-Euclidean)
  - Statistical challenges
  - Potential applications (Image analysis; Bioinformatics; Evolutionary biology; E-commerce and econometrics; Psychiatry, psychology and social sciences)

- Organizing Committee:
  - Hans-Georg Müller, Jane-Ling Wang, Ian Dryden, Jim Ramsay (Program Leaders)
  - Steve Marron (Local Scientific Coordinator)
  - Nell Sedransk (Directorate Liaison)
  - Jianqing Fan (National Advisory Committee Liaison)

Analysis of Object Data Opening Workshop

- Tutorials:
  - Fang Yao (Toronto)
  - Jim Ramsay (McGill)
  - Sarang Joshi (Utah) and Martin Lindquist (Columbia)
  - John Kent (Leeds)
  - Steve Marron (UNC)

- Invited Sessions:
  - Functional Data Analysis
  - Dynamics
  - Images
  - Shapes and Manifolds
  - Trees

Analysis of Object Data — Other Activities

- Graduate Student Courses
  - Fall Course
    - ∗ Introduction to Object Oriented Data (Marron)
    - ∗ Shape Analysis, Landmark and Manifold Data (Dryden)
    - ∗ Functional Data (Müller)
    - ∗ Functional and Longitudinal Data (Wang)
    - ∗ Functional and Dynamic Data (Ramsay)

  - Spring Course
    - ∗ Dynamic systems (Ramsay)
    - ∗ Manifold data (Ramsay and Marron)
    - ∗ Tree-structured data (Marron)

- Additional Workshops:
  - Interface of Longitudinal and Functional Data Analysis (Müller)
  - Function Valued Traits in Evolutionary Biology (Marron)

Upcoming Programs (2011 - 2012)

- Summer 2011 program — under development; topics being considered are
  - Causal inference
  - Large observational datasets

- Uncertainty Quantification

Future Programs: 2012 - 2013 and Beyond

- NSF renewal proposal due February 2011

- Likely site visit around October, decision by end of 2011

- Detailed programs being developed for 2012–2013

- Tentative programs for subsequent years

- Look for fit with "Mathematics of the Planet Earth" theme for 2013

Program Idea:
Applications of Mathematics in Medicine

- Deterministic and stochastic differential equations applied to problems in medicine and biology

- Cancer modeling

- Statistical questions associated with cancer genome project

- Physiology, neurobiology, brain diseases are all potential areas for mathematical modeling

- Directorate Liaison: Rick Durrett

Program Idea:
Massive or Complex Data

- Motivation: ever-increasing size of datasets (now "exascale") demands new methods of data mining

- Related to "Data Enabled Science" — workshop recently organized by NSF

- Astrophysics data sets, e.g. Large Synoptic Survey Telescope (LSST) or Sloan Digital Sky Survey (SDSS)

- Large datasets in genomics

- Possible collaborations with, e.g., RENCI, Oak Ridge

- Proposed by Bin Yu and Jun Liu from National Advisory Committee

Other Topics Under Consideration

- Ecology, Global Carbon Modeling and Biodiversity
  - Good fit with "Mathematics of the Planet Earth"
  - Physical, biological and economic modeling (e.g. pricing of emission certificates)

- Sustainability

- Agent-Based Modeling in the Social Sciences
  - Possible link with Santa Fe Institute
  - Potential for wider involvment by Affiliates
  - Proposal on "Microsimulation" (Cliff Spiegelman) may well fit within this

- Optimization and Simulation

- Stochastic Networks

Other Initiatives

- Outreach
  - Undergraduate workshops
  - Graduate workshops (IMSM)
  - K/12 education (Kenan Foundation)
  - Public Outreach??

- Look for additional sources of funding and new types of research activities

How to Get Involved

- Visit

- Lead a working group

- Propose your graduate students for postdoc positions

- Tell us your ideas for new programs