Theoretical Computer Science at Stony Brook

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Who's Who in Theory at SB

- *Estie Arkin* – graph theory and approximation algorithms.
- *Leo Bachmair* – automatic theorem proving.
- *Michael Bender* – randomized algorithms, data structures.
- *Jie Gao* – computational geometry and mobile computing.
- *Ker-I Ko* – numerical computational complexity
- *Joe Mitchell* – computational geometry and approximation algorithms.
- *Steven Skiena* – computational biology, string algorithms

Significant Results

- PTAS for the Geometric Traveling Salesman problem (Mitchell)
- Approximation algorithms for graph problems, versions of TSP and scheduling. (Arkin)
- Cache Oblivious Data Structures (Bender)
- Clustering and sensor networks (Gao)
- Computational Complexity of Real Functions (Ko)
- Computational Biology and Text/News Analysis (Skiena)

Courses in Algorithms and Theory

- Graduate Algorithms (CSE 548 – Fall 2007)
- Computational Geometry (CSE 555 – Fall 2007)
- Linear Programming (AMS 540 – Fall 2007)
- Computational Biology (CSE 549 – Fall 2007)
- Discrete Mathematics (CSE 547 – Spring 2008)
- Theory of Computation (CSE 540 – Fall 2007)

Get to know us by taking our courses this semester.

Theory is Practical

Theory uses different techniques than other areas of computer science, but an important goal is attacking important practical problems.
Applications areas include:

- DNA sequence design for viruses (Skiena)
- Parallel processor scheduling (Bender, R&D 100 Award)
- Aircraft routing (Mitchell)
- Mobile computing (Gao)

Several faculty have funding, with opportunities for both MS and PhD students.

Theory is Beautiful

The real rewards from working in theoretical computer science come from its sense of beauty and fun.

Theory is typically the product of small groups of people building on the ideas of others – using techniques for algorithm design, counting, and proving hardness.

Theory is guided by a sense of beauty – we work on problems because they are interesting and pretty. Pretty problems are often inspired by or applicable to real-world problems.

Theory is guided by a sense of challenge – problems become interesting when they cannot be solve by routine application of standard techniques.

Country TSP

As an example of the problems we think about, consider the following generalization of the traveling salesman problem.

TSP asks for the shortest tour visiting all n cities in a weighted graph.

But suppose each city is in a specific country, and if the weights are defined by a $c \times c$ country distance matrix.

Can we solve TSP efficiently if c is small and n is big?

What about $c = 1$?

What about $c = n$?

What about $c = 2$?

The Algorithm Reading Group

If problems like this interest you, you should come to the Algorithm Reading Group.

We discuss open problems, present current research papers, meet visitors, and plan trips to local conferences.

We meet Fridays at 11:00AM in the CS Lounge. A good time is had by all.

We will be happy to put you on the e-mailing list – let jgao@cs or skiena@cs know of your interest.

You may register for CSE 642 (Algorithm Seminar) or just show up.

We will soon start on an open problem. See you there!