Monday, April 29, 2019

09:00–09:15 Welcome

09:15–10:15 David Mount
Innovations in Convex Approximation and Applications

10:15–10:45 Break

10:45–11:45 Eunjin Oh
Geodesic Voronoi Diagram in a Simple Polygon

12:15–14:30 Lunch

14:30–15:30 Open Problem Session

15:30–16:00 Cake

16:00–16:30 Alperen Ergür
Smoothed analysis of Plantinga-Vegter algorithm

16:30–17:00 Kyle Fox
Approximating the Geometric Edit Distance

18:00 Dinner

Tuesday, April 30, 2019

09:00–10:00 Esther Ezra
General Polynomial Partitionings and their Applications in Computational Geometry

10:15–10:45 Break

10:45–11:45 Peyman Afshani
A Review of (some) Data Structure Lower Bound Techniques

12:15–14:30 Lunch

14:30–15:30 Open Problem Session

15:30–16:00 Cake

16:00–16:30 Maria Saumell
Hamiltonicity for convex shape Delaunay and Gabriel graphs

16:30–17:00 Micha Sharir
On the maximum level vertex in an arrangement of lines

18:00 Dinner

Wednesday, May 1, 2019

09:00-9:30 Nicola Wolpert
A Motion Planning Algorithm for the Invalid Initial State Disassembly Problem

09:30-10:00 Suresh Venkatasubramanian
On the geometry of fair representations

10:15–10:45 Break

10:45-11:15 Arnaud de Mesmay
The unbearable hardness of unknotting

11:15-11:45 Guillaume Moroz
Multipoint evaluation for the visualization of high degree algebraic surfaces

12:15–18.00 Lunch & Excursion

18:00 Dinner

Thursday, May 2, 2019

9:00-9:30	Natan Rubin *Hitting Convex Sets with Points*
9:30-10:00	Kevin Verbeek *Stability Analysis of Shape Descriptors*
10:15–10:45	Break
10:45–11:15	Wouter Meulemans *Geometry and Generation of a New Graph Planarity Game*
11:15–11:45	Marc van Kreveld *Competitive searching for a line on a line arrangement*
12:00-12:15	Photo Taking
12:15–14:30	Lunch
14:30–15:30	Free Discussion
15:30–16:00	Cake
16:00–18:00	Free Discussion
18:00	Dinner

Friday, May 3, 2019

9:00-9:30	Hans Raj Tiwary *The Blessing of Dimensionality: When Higher Dimension Helps*
9:30-10:00	Zuzana Patáková *Intersection Patterns of Sets in the Plane*
10:15–10:45	Break
10:45–11:15	Benjamin Raichel *Metric Violation Distance: Hardness and Approximation*
11:15-12:00	Progress Reports
12:15–14:30	Lunch

Innovations in Convex Approximation and Applications

David Mount
University of Maryland, US

Recently, new approaches to convex approximation have produced major improvements to approximation algorithms for a number of geometric optimization and retrieval problems. These include computing the diameter and width of a point set, kernels for directional width, bichromatic closest pairs, Euclidean minimum spanning trees, and nearest neighbor searching under various distance functions including the Mahalanobis distance and Bregman divergence. In this talk, I will describe these techniques, including Macbeath regions, Delone sets in the Hilbert metric, and convexification, and I will explain how these techniques can be applied to obtain these improvements.

Geodesic Voronoi Diagram in a Simple Polygon

Eunjin Oh
Max Planck Institut Informatik, DE

In the presence of polygonal obstacles, the distance of two points is measured by the length of a shortest path between the two points avoiding obstacles. In this talk, I introduce several recent results on problems defined in polygonal domains including an $O(n + m \log m)$-time algorithm for computing the geodesic Voronoi diagram of m points in a simple n-gon.

A Review of (some) Data Structure Lower Bound Techniques

Peyman Afshani
Aarhus University, DK

In this talk, we will have a broad look at the landscape of data structure lower bounds. We will begin by introducing some fundamental lower bound models and then move on to demonstrate the key techniques that enable us prove non-trivial results in each model. These include the pointer machine model, the cell-probe model, the `I/O`-model, and the semi-group (or group) model. We will also very briefly touch the conditional lower bounds.

General Polynomial Partitionings and their Applications in Computational Geometry

Esther Ezra
Bar-Ilan University, IL / Georgia Tech, US

Since the celebrated work of Guth in Katz on the Erdos distinct distances problem, polynomial partitioning became a central tool in solving incidence problems, as well as other main problems in discrete geometry. In spite of this progress, the application of polynomial partitioning in solving computational problems received considerably less attention. Polynomial partitioning for a set of geometric objects forms a space decomposition, such that any component in this decomposition is intersected by a small fraction of the input objects. In this talk, I will survey the polynomial partitioning technique by first presenting the setting of points in d-space, addressed by Guth and Katz, and then discussing polynomial partitioning for general semi-algebraic sets, studied by Guth. I will then describe the algorithmic issues concerning the construction of such polynomials. Whereas there are efficient algorithms to construct polynomial partitionings of the first kind, it is currently unknown how to effectively construct general polynomial partitionings. I will present an efficient algorithm that constructs a general polynomial partitioning for semi-algebraic sets in d-space, which, as a main tool, exploits the concept of "quantifier elimination" combined with "epsilon-approximations". The running time of this algorithm is only linear in the number of input objects. As a preliminary result, I will present an algorithm that constructs a space decomposition for a collection of algebraic curves in 3-space, with complexity bounds similar to those of Guth. These results have several algorithmic implications, including a nearly-optimal algorithm to eliminate depth cycles among disjoint triangles in 3-space, an efficient range-search mechanism in the fast-query/large-storage regime, and an efficient point-location machinery that outperforms traditional point-location machineries exploiting vertical decompositions.

The results reported in this talk are based on a joint work with Pankaj Agarwal, Boris Aronov, and Joshua Zahl.