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High-Level Program

Monday, November 7th	
8:00 - 10:30	Tutorial I: Cristina Fernandes. <i>Approximation Algorithms</i>
10:30 - 10:50	Break
10:50 - 12:20	Tutorial II: Francisco Rodríguez-Henríquez. <i>About the quest for finding hard computational problems in cryptography</i>
12:20 - 14:00	Lunch
14:00 - 16:00	Tutorial III: Amalia Duch and Conrado Martínez. <i>Randomized Data Structures - Lecture I</i>
16:00 - 16:20	Break
16:20 - 18:20	Tutorial III: Amalia Duch and Conrado Martínez. <i>Randomized Data Structures - Lecture II</i>
18:30 - 21:00	Reception
Tuesday, November 8th	
8:20 - 8:30	Opening
8:30 - 9:30	Keynote I: Jeffrey D. Ullman. <i>Abstractions in Computer Science Theory</i>
9:30 - 9:50	Break
9:50 - 11:55	Session: Complexity Theory
11:55 - 13:30	Lunch
13:30 - 15:10	Session: Approximation Algorithms I
15:10 - 15:30	Break
15:30 - 16:45	Session: Automata Theory and Formal Languages I
16:45 - 16:55	Short break
16:55 - 18:10	Session: Automata Theory and Formal Languages II
Wednesday, November 9th	
8:30 - 9:30	Keynote II: David Eppstein. <i>The Complexity of Iterated Reversible Computation</i>
9:30 - 9:50	Break
9:50 - 10:50	Round Table: Research and Legacy of Héctor García-Molina
10:50 - 12:05	Session: Theoretical Machine Learning

12:05 - 13:30	Lunch
13:30 - 14:20	Session: Cryptography
14:20 - 15:10	Session: Approximation Algorithms II
15:10 - 15:30	Break
15:30 - 17:10	Session: Algorithms and Data Structures I
17:10 - 22:00	Tour (callejoneada) and Banquet
Thursday, November 10th	
8:30 - 10:35	Session: Combinatorics and Graph Theory I
10:35 - 10:55	Break
10:55 - 11:55	Keynote III: Merav Parter
11:55 - 13:30	Lunch
13:30 - 15:10	Session: Algorithms and Data Structures II
15:10 - 15:20	Short break
15:20 - 16:00	Awards Session
16:00 - 18:00	Business Meeting
Friday, November 11th	
8:30 - 9:30	Keynote IV: Mauricio Osorio
9:30 - 9:50	Break
9:50 - 11:55	Session: Combinatorics and Graph Theory II
11:55 - 13:30	Lunch
13:30 - 14:45	Session: Computation Geometry I
14:45 - 14:55	Short break
14:55 - 16:10	Session: Computation Geometry II
16:10 - 16:15	Closing

Detailed Program

Monday, November 7th

8:00 - 10:30. Tutorial I

Cristina Fernandes: *Approximation Algorithms*

Many well-known optimization problems are hard to solve, meaning that the existence of a polynomial-time algorithm for solving them would imply that $P = NP$. Approximation algorithms are a possible way to reasonably deal with hard optimization problems. The goal of such algorithms is to efficiently produce feasible solutions that are close, in some sense, to an optimal solution for the problem. Such algorithms can be thought of as heuristics that have a performance guarantee in terms of the quality of the solution produced. We will present an introduction to the study of approximation algorithms, starting from simple examples, and gradually covering different techniques used in the area. In the process of presenting such

techniques, we will address a variety of optimization problems such as scheduling, clustering, and satisfiability. The first half of the tutorial will be easily followed by anyone with a background on algorithms, and with basic notions of complexity theory. The second half will present techniques that involve linear programming and/or probabilistic strategies.

10:50 - 12:20. Tutorial II

Francisco Rodríguez-Henríquez: *About the quest for finding hard computational problems in cryptography*

Since the publication in 1977 of the Diffie-Hellman key exchange protocol, the cryptographic community initiated a mathematical journey searching for hard computational problems that are suitable for implementing two fundamental cryptographic primitives: key exchange protocols and digital signatures. Generally speaking these problems are instances of what is known as one-way functions with trapdoors. The hardness of these problems is measured using computational complexity theory, traditionally under the setting of classical attackers, but lately, also in the scenario of attackers using large-scale quantum computers (which are still in the making).

We present in this tutorial the long quest for finding hard mathematical problems that can be used in cryptography. We will see how most of the conjectured hard problems proposed in the last 45 years, have been eventually mercilessly broken using algorithmic and/or side-channel cryptanalysis techniques.

14:00 - 18:20. Tutorial III

Lecture I: 14:00 - 16:00

Lecture II: 16:20 - 18:20

Amalia Duch and Conrado Martínez: *Randomized Data Structures*

The use of randomization in the design of data structures has proven along the years to be as fruitful as in the design of algorithms. Like for all kinds of algorithms, in the case of data structures, randomization can be used to devise simple and elegant algorithms for update and query with probabilistic guarantees on their performance, or to obtain substantial gain in time and space at the cost of potential errors. We will study several examples, in particular, as examples of the first type of randomized data structures, we will study randomized binary search trees and skip lists, both data structures allow us to support insertions, deletions and searches in expected logarithmic time without making any assumption about the inputs. As an example of the second type of randomized structures we will review the well-known Bloom filters, which allow us to answer membership queries very fast (constant time) and with very little memory (a few bits per item) at small price: there will be some probability that the returned answer is wrong, with elements reported as present in the data structure when they are actually not there.

Further examples, such as universal classes of hash functions or randomized multidimensional data structures will be covered in the course, if time permits.

We assume basic knowledge of data structures and algorithms (linked lists, hash tables, worst-case analysis and asymptotic notations, ...), as well as some basic knowledge of probability theory (random variables, expected value, conditional probability, ...).

18:30 - 21:00. Reception

Tuesday, November 8th

8:30 - 9:30. Keynote I

Session chair: Francisco Rodríguez-Henríquez

Jeffrey D. Ullman: *Abstractions in Computer Science Theory*

The creative use of abstractions is central to computer science. But not all abstractions address the same kinds of problems. We identify four different reasons abstractions appear in computer-science theory, and focus on the "declarative abstractions," whose purpose is to raise the level at which we program. Important declarative abstractions appear in the theory of compiling and the theory of databases. We shall touch on the most important elements in those two fields.

9:50 - 11:55. Session: Complexity Theory

Session chair: Joachim von zur Gathen

9:50 - 10:15. *MCSP is Hard for Read-Once Nondeterministic Branching Programs*
Ludmila Glinskikh and Artur Riazanov

- 10:15 - 10:40. *Improved Parallel Algorithms for Generalized Baumslag Groups*
Caroline Mattes and Armin Weiß
- 10:40 - 11:05. *On the closures of monotone algebraic classes and variants of the Determinant*
Prasad Chaugule and Nutan Limaye
- 11:05 - 11:30. *Bounds on oblivious multiparty quantum communication complexity*
François Le Gall and Daiki Suruga
- 11:30 - 11:55. *List Homomorphism: Beyond the Known Boundaries*
Sriram Bhyravarapu, Satyabrata Jana, Fahad Panolan, Saket Saurabh and Shaily Verma

13:30 - 15:10. Session: Approximation Algorithms I

Session chair: Cristina Fernandes

- 13:30 - 13:55. *A parameterized approximation algorithm for the Multiple Allocation k -Hub Center*
Marcelo P. L. Benedito, Lucas P. Melo and Lehilton L. C. Pedrosa
- 13:55 - 14:20. *Theoretical analysis of git bisect*
Julien Courtiel, Paul Dorbec and Romain Lecoq
Best Paper Award
- 14:20 - 14:45. *Approximation Schemes for Packing Problems with ℓ_p -norm Diversity Constraints*
Waldo Gálvez and Victor Verdugo
- 14:45 - 15:10. *Obtaining Approximately Optimal and Diverse Solutions via Dispersion*
Jie Gao, Mayank Goswami, Karthik C. S., Meng-Tsung Tsai, Shih-Yu Tsai and Hao-Tsung Yang

15:30 - 16:45. Session: Automata Theory and Formal Languages I

Session chair: TBD

- 15:30 - 15:55. *Binary completely reachable automata*
David Casas and Mikhail V. Volkov
- 15:55 - 16:20. *The Net Automaton of a Rational Expression*
Sylvain Lombardy and Jacques Sakarovitch
- 16:20 - 16:45. *Embedding arbitrary Boolean circuits into fungal automata*
Augusto Modanese and Thomas Worsch

16:55 - 18:10. Session: Automata Theory and Formal Languages II

Session chair: Jacques Sakarovitch

- 16:55 - 17:20. *Conelikes and Ranker Comparisons*
Viktor Henriksson and Manfred Kufleitner
- 17:20 - 17:45. *String Attractors and Infinite Words*
Antonio Restivo, Giuseppe Romana and Marinella Sciortino
- 17:45 - 18:10. *How many times do you need to go back to the future in Unary Temporal Logic?*
Thomas Place and Marc Zeitoun

Wednesday, November 9th

8:30 - 9:30. Keynote II

Session chair: Armando Castañeda

David Eppstein: *The Complexity of Iterated Reversible Computation*

Reversible computation has been studied for over 60 years as a way to evade fundamental physical limits on the power needed for irreversible computational steps, and because quantum computing circuits are necessarily reversible. We study a class of problems based on computing the iterated values of a reversible function. The story leads through Thomason's lollipop algorithm in graph theory, circuit complexity, and reversible cellular automata, to card shuffling, the reflections of light in jewels, and curves on topological surfaces, and involves both PSPACE-hard problems and problems with unexpected polynomial-time algorithms.

9:50 - 10:50. Round Table: Research and Legacy of Héctor García-Molina

Round table moderator: Mariano Rivera

Panelists: Carlos Coello Coello, Andreas Paepcke and Jeffrey D. Ullman

10:50 - 12:05. Session: Theoretical Machine Learning

Session chair: Edgar Chávez

- 10:50 - 11:15. *Exact Learning of Multitrees and Almost-Trees Using Path Queries*
Ramtin Afshar and Michael T. Goodrich
- 11:15 - 11:40. *Almost Optimal Proper Learning and Testing Polynomials*
Nader H. Bshouty
- 11:40 - 12:05. *Estimating the Clustering Coefficient using Sample Complexity Analysis*
Alane M. de Lima, Murilo V. G. da Silva and Andre L. Vignatti

13:30 - 14:20. Session: Cryptography

Session chair: Francisco Rodríguez-Henríquez

- 13:30 - 13:55. *On APN functions whose graphs are maximal Sidon sets*
Claude Carlet
- 13:55 - 14:20. *On the subfield codes of a subclass of optimal cyclic codes and their covering structures*
Félix Hernández and Gerardo Vega

14:20 - 15:10. Session: Approximation Algorithms II

Session chair: Francisco Rodríguez-Henríquez

- 14:20 - 14:45. *Pathlength of Outerplanar graphs*
Thomas Dissaux and Nicolas Nisse
- 14:45 - 15:10. *Approximations for the Steiner Multicycle Problem*
Cristina G. Fernandes, Carla N. Lintzmayer and Phablo F. S. Moura

15:30 - 17:10. Session: Algorithms and Data Structures I

Session chair: Conrado Martínez

- 15:30 - 15:55. *Cutting a tree with Subgraph Complementation is hard, except for some small trees*
Dhanyamol Antony, Sagartanu Pal, R. B. Sandeep and R. Subashini
- 15:55 - 16:20. *Computing and Listing Avoidable Vertices and Paths*
Charis Papadopoulos and Athanasios E. Zisis
- 16:20 - 16:45. *Weighted Connected Matchings*
Guilherme C. M. Gomes, Bruno P. Masquio, Paulo E. D. Pinto, Vinicius F. dos Santos and Jayme L. Szwarcfiter
- 16:45 - 17:10. *Klee's Measure Problem Made Oblivious*
Thore Thießen and Jan Vahrenhold

Thursday, November 10th

8:30 - 10:35. Session: Combinatorics and Graph Theory I

Session chair: TBD

- 8:30 - 8:55. *On the Zero-sum Ramsey Problem over Z_2^d*
José D. Alvarado, Lucas Colucci, Roberto Parente and Victor Souza
- 8:55 - 9:20. *Percolation and Epidemic Processes in One-Dimensional Small-World Networks*
Luca Becchetti, Andrea Clementi, Riccardo Denni, Francesco Pasquale, Luca Trevisan and Isabella Ziccardi
- 9:20 - 9:45. *Min orderings and list homomorphism dichotomies for signed and unsigned graphs*
Jan Bok, Richard C Brewster, Pavol Hell, Nikola Jedličková and Arash Rafiey
- 9:45 - 10:10. *Multidimensional Manhattan Preferences*
Jiehua Chen, Martin Nöllenburg, Sofia Simola, Anaïs Villedieu and Markus Wallinger

10:10 - 10:35. *Patterns in ordered (random) matchings*
Andrzej Dudek, Jarosław Grytczuk and Andrzej Ruciński

10:55 - 11:55. Keynote III

Session chair: Armando Castañeda

Merav Parter: *A Graph Theoretic Approach for Resilient Distributed Algorithms*

Following the immense recent advances in distributed networks, the explosive growth of the Internet, and our increased dependency on these infrastructures, guaranteeing the uninterrupted operation of communication networks has become a major objective in network algorithms. The modern instantiations of distributed networks, such as the Bitcoin network and cloud computing, introduce new security challenges that deserve urgent attention in both theory and practice.

In this talk, I will present a unified framework for obtaining fast, resilient and secure distributed algorithms for fundamental graph problems. Our approach is based on a graph-theoretic perspective in which common notions of resilient requirements are translated into suitably tailored combinatorial graph structures. We will discuss recent developments along the following two lines of research:

- Designing distributed algorithms that can handle various adversarial settings, such as, node crashes and Byzantine attacks. We will mainly provide general compilation schemes that are based on exploiting the high-connectivity of the graph. Our key focus will be on the efficiency of the resilient algorithms in terms of the number of communication rounds.

- Initiating and establishing the theoretical exploration of security in distributed graph algorithms. Such a notion has been addressed before mainly in the context of secure multi-party computation (MPC). The heart of our approach is to develop new graph theoretical infrastructures to provide graphical secure channels between nodes in a communication network of an arbitrary topology.

Finally, I will highlight future directions that call for strengthening the connections between the areas of fault tolerant network design, distributed graph algorithms and information theoretic security.

13:30 - 15:10. Session: Algorithms and Data Structures II

Session chair: TBD

13:30 - 13:55. *Median and Hybrid Median K-Dimensional Trees*
Amalia Duch, Conrado Martínez, Mercè Pons and Salvador Roura

13:55 - 14:20. *Near-Optimal Search Time in δ -Optimal Space*
Tomasz Kociumaka, Gonzalo Navarro and Francisco Olivares

14:20 - 14:45. *Space-efficient data structure for next/previous larger/smaller value queries*
Seungbum Jo and Geunho Kim

14:45 - 15:10. *Elastic-Degenerate String Matching with 1 Error*
Giulia Bernardini, Estéban Gabory, Solon Pissis, Leen Stougie, Michelle Sweering and Wiktor Zuba

15:20 - 16:00. Awards Session

16:00 - 18:00. Business Meeting

Friday, November 11th

8:30 - 9:30. Keynote IV

Session chair: Armando Castañeda

Mauricio Osorio: *Logic(s) for Knowledge Representation (KR): a Personal Perspective*

My current believe is that Logic(s) is/are clearly useful for KR. I try to support this claim in the talk. In fact, a lot can be done with (Modal, Classical, Constructive and Paraconsistent) propositional logics. An important observation is that Logic(s) can be used in different ways: (\models , models, completions, etc). A non-monotonic behaviour is desirable in many situations. We also need different ways to deal with inconsistency. Current "software" tools are complex, efficient and useful. Finally, I present my conclusions and future work.

9:50 - 11:55. Session: Combinatorics and Graph Theory II

Session chair: Andrzej Dudek

- 9:50 - 10:15. *Tree 3-spanners on generalized prisms of graphs*
Renzo Gómez, Flávio K. Miyazawa and Yoshiko Wakabayashi
- 10:15 - 10:40. *A combinatorial link between labelled graphs and increasingly labelled Schröder trees*
Olivier Bodini, Antoine Genitrini and Mehdi Naima
- 10:40 - 11:05. *A General Approach to Ammann Bars for Aperiodic Tilings*
Carole Porrier and Thomas Fernique
- 11:05 - 11:30. *On the Zombie number of various graph classes*
Prosenjit Bose, Jean-Lou De Carufel and Thomas Shermer
- 11:30 - 11:55. *On χ -diperfect digraphs with stability number two*
Caroline Aparecida de Paula Silva, Cândida Nunes da Silva and Orlando Lee

13:30 - 14:45. Session: Computational Geometry I

Session chair: TBD

- 13:30 - 13:55. *Local routing algorithms on Euclidean spanners with small diameter*
Nicolas Bonichon, Prosenjit Bose and Yan Garito
- 13:55 - 14:20. *Piercing Pairwise Intersecting Convex Shapes in the Plane*
Saman Bazargani, Ahmad Biniiaz and Prosenjit Bose
- 14:20 - 14:45. *Complexity Results on Untangling Red-Blue Matchings*
Arun Kumar Das, Sandip Das, Guilherme D. da Fonseca, Yan Gerard and Bastien Rivier

14:55 - 16:10. Session: Computational Geometry II

Session chair: Guilherme D. da Fonseca

- 14:55 - 15:20. *On r -Guarding SCOTs — a New Family of Orthogonal Polygons*
Vasco Cruz and Ana Paula Tomás
- 15:20 - 15:45. *On Vertex Guarding Staircase Polygons*
Matt Gibson-Lopez, Erik Krohn, Bengt J. Nilsson, Matthew Rayford, Sean Soderman and Paweł Żyliński
- 15:45 - 16:10. *On the Complexity of Half-Guarding Monotone Polygons*
Hannah Miller Hillberg, Erik Krohn and Alex Pahlow