École de Printemps d'Informatique Théorique 2016
Graphs on Surfaces: Algorithms, Combinatorics, and Topology
Description of lectures and schedule

Speakers
- Éric Colin de Verdière
- Louis Esperet
- Bojan Mohar
- Gilles Schaeffer
- Dimitrios Thilikos
- Uli Wagner

Contents of the lectures
- Topological preliminaries (Éric)
  - Planar graphs: topology, combinatorial maps and data structures, duality, Euler's formula
  - Surfaces: classification of surfaces, Euler's formula
- Algorithmic preliminaries (Dimitrios)
  - Complexity, graphs, P and NP, NP-hardness
  - Fixed-parameter tractability
  - Treewidth and dynamic programming
- Taking advantage of planarity: standard approaches (Bojan)
  - Basics about planar graphs (Jordan curve theorem, Kuratowski, importance of 2- and 3-connectivity, Whitney)
  - Circle packing (planar and general surfaces) and separators
- Graphs -vs- maps: embedding a graph (Bojan)
  - Planarity testing and algorithms for embedding a graph on a surface
  - Structural properties of embeddings and consequences: face-width, edge-width
  - Topological crossing number of graphs (if time)
- Combinatorics on embedded graphs (Gilles)
  - Enumeration and encoding, exact and asymptotic counting via generating series
  - Combinatorial structures on maps: alpha-orientations theory, examples of structures. Application to drawing or sampling
  - Bijections and applications (random sampling, optimal encoding, properties of random maps)
- Parameterized algorithms and embedding (Dimitrios)
  - Branchwidth, dynamic programming, sphere cut decompositions
  - Bidimensionality and subexponential algorithms
  - Bidimensionality and kernels
  - Irrelevant vertex technique
- Algorithms for topological problems (Éric)
  - Basic topological algorithms for surfaces: shortest non-trivial cycles, shortest cut graph, homology
  - Universal cover, and testing homotopy for curves on surfaces (Dehn's algorithm)
  - Tightening curves up to homotopy
  - Application of homology: minimum cut (and minimum multicut if time)
- Embeddability of simplicial complexes in R^3 (Uli)
- Coloring topological and geometric graphs (Louis)

Schedule

	MON	TUE	WED	THU	FRI
9:00-10:30	**Éric**	**Gilles**	**Bojan**	**Uli**	**Dimitrios**
10:30-11:00	*BREAK*	*BREAK*	*BREAK*	*BREAK*	*BREAK*
11:00-11:45	**Éric**	**Bojan**	**Louis**	**Dimitrios**	**Éric**
11:45-12:30	**Dimitrios**				
12:30-16:00	*LUNCH and FREE TIME*	*LUNCH and FREE TIME*	*LUNCH and FREE TIME*	*LUNCH and FREE TIME*	*LUNCH, END of SCHOOL*
16:00-17:00	**Dimitrios**	**Dimitrios**	*FREE TIME*	**Bojan**	
17:00-17:30		*BREAK*		*BREAK*	
17:30-18:00	*BREAK*	**Éric**		**Gilles**	
18:00-19:30	**Bojan**				
19:30-20:30	*DINNER*	*DINNER*	*DINNER*	*DINNER (bouillabaisse)*	
20:30-...		poster session?			