DEPARTEMENT D'INFORMATIQUE DEPARTEMENT FÜR INFORMATIK

## INFORMATICS COLLOQUIUM

### **Speaker:**

### Prof. Alain Hertz, Polytechnique Montréal & GERAD, Canada

# On the average number of colors in the non-equivalent colorings of a graph

### Abstract:

A coloring of a graph G is an assignment of colors to its vertices such that adjacent vertices have different colors. Two colorings of a graph are equivalent if they induce the same partition of the vertex set into stable sets (i.e., sets of pairwise non-adjacent vertices). The n-th Bell number is the number of partitions of a set of n elements into non-empty subsets and is thus the same as the number of non-equivalent colorings of the empty graph or order n (i.e., the graph with n vertices and without any edge). We are interested in the average number A(G) of colors in the non-equivalent colorings of a graph G. We give properties of this new graph invariant and show how it can help derive inequalities for the Bell numbers. We then prove some bounds on A(G). In particular, we give a general upper bound on A(G) that is valid for all graphs G and a more precise one for graphs G of order n and maximum degree in  $\{1, 2, n - 2\}$ . We then conjecture several lower bounds on A(G) and prove that these conjectures are true for specific classes of graphs such as triangulated graphs and graphs with maximum degree at most 2. We finish with many open questions.

#### **Bio:**

Holder of a diploma in Mathematical Engineering, Alain Hertz obtained a Ph.D in operations research at the École Polytechnique Fédérale de Lausanne. Since 2001, he is professor at the department of mathematics and industrial engineering at the Polytechnique Montréal. He is also member of the multi disciplinary GERAD research group that includes nearly sixty researchers and experts in operations research and discrete mathematics. He is the author of more than 200 scientific publications. His main research domains are combinatorial optimization, graph theory, algorithmics, and the development of decision aid systems for scheduling and distribution problems.

Date and time: Location: Contact person: Wednesday November 2nd, 2022, 04.00 pm Pérolles 21, room B207, Bd de Pérolles 90, Fribourg Prof. Bernard Ries

The colloquium is free and open to the public.