## On-line prediction in high dimension

**Resum de la línia de recerca.** Sequential (or online) prediction has been an active area of research in machine learning, see Cesa-Bianchi and Lugosi (2006) for a survey. At each time instant, the forecaster takes an action and, depending of the action and the outcome of the process to be predicted, suffers a loss. In a popular game-theoretical formulation of the problem one doesn't assume any probabilistic structure about the process but rather tries to compete with the best in a class of reference predictors. In many interesting applications the information received by the predictor is limited. For example, very often the predictor is informed about his own loss but cannot calculate how well he would have done if he had chosen a different action. We continue investigating limited-information problems. An aspect we study is when the class of reference predictors has a certain combinatorial structure. As examples, we mention packet routing problems in telecommunications when an action is a path is a certain graph or problems in some mobile communication networks in which a spanning tree of a graph is to be selected at each time instant. Here the decision maker not only faces the statistical problem of finding god prediction strategies but computation of such a strategy leads to important and nontrivial algorithmic problems. Since the prediction rules guaranteeing small loss behavior are randomized, the algorithmic problem is often equivalent of generating a random high-dimensional object from a certain exponentially weighted distribution. In this problem we expect to take advantage of our expertise on Markov Chain Monte Carlo simulation, especially on sequential Monte Carlo methods.