Master class with Christos Papadimitriou

January 10th, 15:00, room 25-26/105

Short presentations by PhD students or post-docs. Each presentation is followed by an open discussion with Christos Papadimitriou.

- Niklas Hahn (postdoc, LIP6)
  - **Title:** Online TSP with Known Locations.
  - **Abstract:** We revisit the classic traveling salesperson problem (TSP) in an online model. A server has to visit n requests in a metric space, traveling at (at most) unit speed. The request locations are known initially, but the requests are released over time. The server strives to minimize the time to visit all requests, i.e., the makespan. For this, we develop an online algorithm which achieves an optimal competitive ratio of 3/2 for both the open variant (the server finishes at the last request) and the closed variant (the server needs to return to the starting position after serving all requests) of the problem. Further, we consider different interesting metric spaces, and discuss competitive poly-time algorithms as well as lower bounds for the problem in these spaces.
- Martin Durand (PhD student, LIP6)
  - **Title:** Collective schedules: axioms and algorithms.
  - **Abstract:** The collective schedules problem consists in computing a schedule of tasks shared between individuals. Tasks may have different duration, and individuals have preferences over the order of the shared tasks. Our aim is, given the preferred schedules of individuals (voters), to return a consensus schedule. We propose an axiomatic study of the collective schedule problem, by using classic axioms in computational social choice and new axioms that take into account the duration of the tasks. We show that some axioms are incompatible, and we study the axioms fulfilled by three aggregation rules. From an algorithmic point of view, we show that these rules solve NP-hard problems and we give an efficient heuristic for large instances.
- Esteban Bautista Ruiz (postdoc, LIP6)
  - **Title:** A frequency-structure decomposition for link streams.
  - **Abstract:** A link stream is a set of triplets (t, u, v) representing that u interacted with v at time time. Link streams are an excellent model for data having temporal and relational components. In this work, we develop a frequency-structure decomposition for link streams. In the same way that the Fourier decomposition allows to express a time series as a combination of elementary sine/cosine signals that are easy to study, our decomposition allows to express any link stream as the combination of elementary link streams that contain one structure oscillating at one frequency. We show that this decomposition opens numerous possibilities, like the filtering of noisy interactions or the recovery of patterns having specific frequency and structural signatures.
- Augustin Chartouny (PhD student, ISIR)
  - **Title:** Curiosity in model-based reinforcement learning.

– **Abstract:** Reinforcement learning allows both living organisms and robots to adapt to their environments using extrinsic rewards and trial and error. However, simple reinforcement learning agents may struggle with tasks where external rewards are scarce. On the contrary, developmental science suggests that young children naturally explore their environment, even in the absence of external rewards. In particular, humans may be curious about options that may not provide immediate rewards, but which instead lead to an increase in knowledge (epistemic value) and which can improve their internal models. Recent neuroscience research shows possible neural correlates of such an epistemic value. Taking inspiration from the cognitive science perspective and comparing our views with the current intrinsically motivated reinforcement learning literature, we endow model-based reinforcement learning agents with curiosity directed towards gaining information on their internal models.