Cooperative Communications in very large cellular Networks

This submission proposes a subject for a doctoral Thesis, which combines the areas of communication networks and the theory of point processes. Specifically, the topic is on the performance analysis and optimization of cooperative cellular networks in the spirit of CoMP (Multipoint Transmission), where the positions of nodes are modelled by point processes. The thesis will deal with the optimal choice not only of the appropriate signal cooperation scheme but also with the way clusters are formed. Four clustering mechanisms will be investigated, related to (A) geography, (B) signal-strength, (C) utility and (D) traffic-dynamics for user mobility. Furthermore, the coverage/throughput benefits and the energy efficiency resulting from cooperation will be quantified. The approach is novel and will contribute to the globally-growing research on very large wireless networks. The analytic expressions derived for different cooperation mechanisms can be used by the industry to optimally design the future cellular architecture. The thesis will be co-guided by three researchers (Dr. Giovanidis, Prof. Martins and Prof. Tassiulas), and will allow for a collaboration between Télécom ParisTech in France with the Centre for Research and Technology Hellas (CERTH) and the University of Thessaly in Greece.