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Speech Time: 09:35-10:15, July 22, 2023

Speech Title: Information Theory as a Unified Tool for Understanding and Designing Human-Computer Interaction

Bio: Olivier Rioul (<https://perso.telecom-paristech.fr/rioul/>) is full Professor at the Department of Communication and Electronics at Télécom Paris, Institut Polytechnique de Paris, France. He graduated from École Polytechnique and from École Nationale Supérieure des Télécommunications, Paris, France, where he obtained his PhD degree. His research interests are in applied mathematics and include various, sometimes unconventional, applications of information theory such as inequalities in statistics, hardware security, and experimental psychology. He has been teaching information theory and statistics at various universities for twenty years and has published a textbook which has become a classical French reference in the field.

Abstract: Information theory, particularly in a Bayesian context, has recently regained interest as a unified tool to understand and design human-computer communication and interaction. Like in everyday life, by continuously making predictions using previous experiences, the human-computer interaction should somehow aim at reducing the level of uncertainty (entropy), reinforcing true predictions and correcting wrong ones, via some feedback interaction loop. Taking the stance that human-computer interaction can be considered as a communication process, where uncertainty and information are described using information-theoretic terms, we can design interaction in such a way to optimize decisions under uncertainty.

In my presentation I will illustrate these concepts in the context of a Bayesian experimental design using an expected utility function, where the computer can "run experiments" on the user by sending feedback that maximizes the expected gain of information by the computer, and exploits the users' subsequent input to update its knowledge as interaction progresses. Applications to Fitts' law, fast file retrieval and multiscale navigation are given to illustrate the concepts.