Abstract:
Waterfilling is a very familiar term in information theory, communication systems, and signal processing. The idea goes back to Shannon: it gives the capacity-achieving power allocation over a set of Gaussian parallel channels, and the name follows naturally from an appealing graphical interpretation. We will start by giving a new geometric interpretation of the waterfilling solution which is better suited for some purposes. As a curiosity, we will also show that waterfilling solutions are far more pervasive than one would think as they appear in a variety of single-user communication systems. Then, we will move to multiuser systems, where waterfillings pop up everywhere as well. Examples include the Gaussian multiple-access channel and the Gaussian broadcast channel, where the notion of iterative waterfilling plays a key role. We will finally get to the main part of the talk and consider the Gaussian interference channel from a pragmatic and suboptimal perspective, showing that again waterfilling is a key concept. In this setup the alternative geometric interpretation of the waterfilling turns out to be instrumental.