



PALESTRA

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**Cost-Distortion-Optimal Communication via Measure-Matching:
Key Ideas and Speculations Concerning Mother Nature**

Prof. Bixio Rimoldi
(EPFL, Lausanne, Switzerland)

Abstract:

We first review the classical source-channel communication problem comparing and contrasting separation-based solutions with the measure-matching approach. The idea of measure-matching consists in realizing that, ultimately, achieving a target rate-distortion operating point is a matter of achieving a desired channel input distribution and a desired joint distribution between the source and the destination. The distributions that lead to a cost-distortion operating point that cannot be improved have to satisfy simple-to-describe conditions that involve the source and channel statistic as well as the cost and distortion measures. Hence the name measure-matching conditions. The separation principle is one way to approach measure matching. Sometimes the source and the channel are "almost" matched to begin with. Then, roughly speaking, the channel code destroys the favorable channel statistic and the source code has to do more work to ensure the proper measure matching. Latency is one of the prices of working "against" rather than "with" the inherent source and channel randomness. Of particular interest is when the desired match is obtained by means of low-complexity small-latency transmitter/receiver pairs such as those consisting of memoryless maps or linear filters. One can make sure that this is the case if one has some freedom in designing the source and/or the channel. Thinking that Mother Nature may have this prerogative, we will conclude with some thoughts on the optimality (or lack of it) of neural communications.

Bio

Prof. Bixio Rimoldi is the director of the Communication Systems Program at EPFL (École Polytechnique Fédérale de Lausanne). His general research and teaching interests are in communication theory and its applications, information theory, and software designed radio. One of his recent interests is in exploring neural coding from an information theoretic perspective. He is an IEEE fellow and second vice president of the Information Theory Society.