پژوهشگاه دانش‌های بنیادی
پژوهشکده علوم کامپیوتر

سخنرانی علمی

Reconstruction of an unknown function from its samples

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Abstract

The problem of reconstructing an unknown function from its samples is a classical problem in signal processing. To reconstruct the function with minimum distortion (error), we are interested in finding the best locations to sample the unknown function, and the best strategy to compress the samples. The problem of finding the best sampling strategy has been widely studied in the signal processing literature. In particular, the Nyquist–Shannon sampling theorem gives a sufficient condition for perfect reconstruction of a continuous-time function with a finite bandwidth. Most of the signal processing literature deals with deterministic functions, with relatively less attention paid to probabilistic models. On the other hand, if we are only interested in compressing the sample values, Shannon's rate distortion theory addresses this problem for probabilistic models.

In this talk, I will present optimal sampling strategies (uniform or nonuniform) and distortion tradeoffs for three different settings: (1) the case of having just one function; (2) the case of having multiple correlated functions, and (3) when reconstructing different parts of the functions have different degrees of importance to us.

Biography

Elaheh Mohammadi received her B.Sc. degree from University of Tehran, her M.Sc. degree from AmirKabir University of Technology and her Ph.D. degree from Sharif University of Technology. Her research interests include Signal Processing, Information Theory and Machine learning.

زمان : چهارشنبه ۱۴۰۰/۰۳/۲۶– ساعت ۱۵:۰۰

ارائه به صورت مجازی انجام خواهد شد.

https://conf.ipm.ir/b/lot-0ed-uys-36o