Existence of persistence exponent for Gaussian stationary functions

Abstract:

Let \( Z(t) \) be a Gaussian stationary function on the real line, and fix a level \( L > 0 \).

We are interested in the asymptotic behavior of the persistence probability: \( P(T) = P( Z(t) > L, \text{ for all } t \in [0,T] ) \).

One would guess that for "nice processes", the behavior of \( P(T) \) should be exponential. For non-negative correlations this may be established via sub-additivity arguments. However, so far, not a single example with sign-changing correlations was known to exhibit existence of the limit of \( \{ \log P(T) \}/T \), as \( T \) approaches infinity (that is, to have a true "persistence exponent").

In the talk I will present a proof of existence of the persistence exponent, for processes whose spectral measure is monotone on \([0,\infty)\) and is continuous and non-vanishing at 0. This includes, for example, the sinc-kernel process (whose covariance function is \( \sin(t)/t \)).

Joint work with Ohad Feldheim and Sumit Mukherjee.