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Current Fluctuations for a System of One-dimensional Random Walks in a Common Random Environment

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For a system of independent one-dimensional random walks, Seppalainen and Kumar have shown that the current fluctuations scaled by $n^{-1/4}$ converge to a mean-zero Gaussian process. Moreover, if the system is started from the stationary distribution, the current fluctuations converge to fractional Brownian motion with Hurst parameter $1/4$. In this talk, I will consider the current fluctuations of a system of independent random walks in a common random environment. It turns out that the randomness of the environment substantially changes the current fluctuations. Under certain conditions on the law of the environment, the quenched mean (given the environment) of the current scaled by $n^{-1/2}$ converges to Brownian motion, while the deviations from the quenched mean when scaled by $n^{-1/4}$ converge (in the sense of finite dimensional distributions) to a mean-zero Gaussian process which is different from the limiting process for classical random walks.

This is a joint work with Timo Seppalainen.