



Mathematics and CS Seminar

Mutual information of two intervals in quantum XX spin chain - a Riemann-Hilbert approach

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Host: Laszlo Erdős

In this talk we consider the quantum XX spin chain in its ground state and in the thermodynamic limit. In 2007, A.R. Its, B.-Q. Jin and V.E. Korepin calculated the asymptotic behaviour of the entanglement entropy of an interval of length n (i.e. a block of n consecutive particles) as n tends to infinity. It is a very natural question what happens if we consider a more complicated subsystem of particles, for instance, a union of two intervals?

In my talk I will present our most recent result on the case when the subsystem is such a union, where the first interval has length m , the second has length n , and the two intervals are separated by a gap of fixed length 1 . Namely, we calculate the mutual information between the two intervals as m, n tend to infinity, and hence compute the limiting entropy of the mentioned subsystem. We will see that this problem leads to a rather complicated mathematical problem, namely, to the estimation of a certain inner product involving a Toeplitz matrix whose symbol possesses Fisher-Hartwig singularities. Using techniques from the theory of integrable operators we connect this problem first to the famous Fokas-Its-Kitaev Riemann-Hilbert problem, and then to the R-Riemann-Hilbert problem appearing in the celebrated 2011 paper of P. Deift, A.R. Its and I. Krasovsky, in which they solved the Fisher-Hartwig conjecture.

A joint work with A.R. Its, V.E. Korepin, F. Mezzadri, J. Virtanen.

Thursday, November 14, 2019 04:00pm - 06:00pm

IST Austria Campus Heinzl Seminar Room / Office Bldg West (I21.EG.101)



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