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Functional RG for zero- and one-dimensional Fermi systems

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I present an overview of our recent applications of funtional RG for zero- and one-dimensional many-fermion systems. The vertex expansion scheme with the two-particle interaction U being the small parameter is used. Equilibrium as well as nonequilibrium situations are considered. Several questions are tackled. Can one describe phase transitions which occur at finite U? If so, what is the role of the self-energy feedback and that of the two-particle vertex? Does the breaking of current conservation in nonequilibrium situations with a frequency dependent self-energy render the corresponding results useless right away? Can one use functional RG to study interacting (topological) insulators? Is it possible to extend functional RG to the realm of pseudo-Hermitian quantum many-body problems?

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