The Gaudin model in the Deligne category Rep GL_t

Deligne's category D_t is a formal way to define the category of finite-dimensional representations of the group GL_n with $n = t$ being a formal parameter (which can be specialized to any complex number). I will show how to interpolate the construction of the higher Hamiltonians of the Gaudin magnet chain associated with the Lie algebra $\mathfrak{gl}_n$ to any complex n, using D_t. Next, according to Feigin and Frenkel, Bethe ansatz equations in the Gaudin model are equivalent to no-monodromy conditions on a certain space of differential operators of order n on the projective line. We also obtain interpolations of these no-monodromy conditions to any complex n and prove that the relations in the algebra of higher Gaudin Hamiltonians for complex n are generated by our interpolations of the no-monodromy conditions. I will explain the relation of this to the Bethe ansatz for the Gaudin model associated with the Lie superalgebra $\mathfrak{gl}_{m|n}$. This is joint work with Boris Feigin and Filipp Uvarov, https://arxiv.org/abs/2304.04501.