We consider models of strongly correlated electrons in one dimension, such as the t-J model and the Hubbard model. The t-J model and Hubbard model are solved by using the method of graded algebraic Bethe ansatz. We use it to design graded tensor networks which can be contracted approximately to obtain a Matrix Product State. This overcomes a major shortcoming of current density matrix renormalization group (DMRG) methods which work well on the ground states, but have difficulty working with the excited states of such models. As a proof of principle, we calculate correlation functions of ground states and excited states of such models on finite lattices of lengths in an intermediate regime which are of experimental interest.