Univariate multiplicity codes are a family of algebraic error correcting codes that are obtained by evaluating low degree univariate polynomials and all their derivatives up to a certain order at a set of distinct input points in an underlying field. These codes are a well studied generalisation of the more well known Reed-Solomon codes and are now known to have amazing list decodable properties; specifically, they are known to be efficiently list decodable up to the so-called list decoding capacity with constant list size.

In this talk, I will discuss a recent joint work with Rohan Goyal, Prahladh Harsha and Ashutosh Shankar, where we show that these codes can be list decoded up to capacity in nearly linear time. On the way, we will talk about lattices over the univariate polynomial ring, and will see a nearly linear time algorithm for solving linear differential equations of high order.

The talk isn't really going to assume familiarity with coding theory and should be accessible to a general CS theory audience.