▸ ZHIXUAN YANG, *Functional data structures in monoidal categories.*
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An achievement of functional programming is the invention of many efficient purely functional data structures and algorithms. Motivated by the observation that many of these data structures and algorithms can be typed in linear type systems, in this talk I will show my ongoing work of studying functional data structures at the generality of monoidal categories. This generalisation unlocks the door to a strange new world of data structures: lists and free monoids no longer need to be isomorphic in non-closed monoidal categories; cons-lists and snoc-lists no longer need to coincide in non-symmetric monoidal categories; the time complexities of accessing the two components of a monoidal product may be different; and pattern matching may only be possible for the first variable of a context, but not the others, in categories where the monoidal product only distributes from the right but not the left.

As an application of this generalisation, I will show how Chris Okasaki's *catenable lists* [1] can be typed in a certain non-commutative linear type system and interpreted in the category of endofunctors. This gives us a data structure of abstract syntax trees that supports amortised constant-time-per-variable substitution, eliminating the cost of traversing the inner nodes of the syntax tree, which might be of interest for efficient implementations of type theories and programming languages.

[1] Chris Okasaki, ***Purely Functional Data Structures***, Cambridge University Press, 1998.