PatternClass: A GAP Package for Permutation Pattern Classes

Ruth Hoffmann (University of St Andrews)

Many interesting pattern classes of permutations give rise to regular languages using the rank encoding [AAR03]. This includes the classes generated by finite Token Passing Networks (TPNs) as well as others. A remarkable result of [AAR03] is that in this situation the basis of the class also has a regular language of encodings, and that the basis can be computed from the language representing the whole class, and vice versa.

This talk will present the PatternClass GAP [GAP08] package, which includes: building pattern classes from TPNs with and without a token constraint [ARL04]; computing the basis of a class and vice versa; computing the class from the minimal avoidance set and the token constraint; and inspecting whether a given class can be simulated by a TPN. Furthermore, there are methods for rank encoding and decoding as well as some statistical inspections, including calculating the spectrum of a class [ALR05], and printing the list of permutations of a specific length that are contained within a class.

The talk will also discuss ongoing developments with the package including: computation of plus- and minus-indecomposable sub-languages [AA05]; checking if a given permutation is simple [Bri08] or if it belongs to a given class; calculating the direct and skew sum of classes [AAV10]; and implement one point deletion in simple permutations. Consequently from some of these ideas it should be possible to compute chains of simple permutations [AD12] and separable classes [AAV10] amongst other features.

We will demonstrate the package and its workings, as well as show insight to the ideas behind the algorithms used.