RESEARCH HIGHLIGHT : DECOMPOSITION NUMBERS FOR SYMMETRIC GROUPS

WORK OF TAN KAI MENG

The complete determination of decomposition numbers for symmetric groups is a longstanding open problem in the modular representation theory of finite groups. These numbers, denoted $d_{\lambda\mu}$, count the multiplicity of the simple module D^μ as a composition factor of the Specht module S^λ. While a complete solution to this famous problem does not seem forthcoming in the near future, A/P Tan and his co-authors has made significant progress towards such a solution.

In the 1990s, Kleshchev [K] obtained results in the relevant algebraic groups and used them to provide a closed formula, in terms of sign sequences, for $d_{\lambda\mu}$ where the partition μ is obtained from λ by moving one node.

A/P Tan and his undergraduate student Teo Wei Hao extended this [TT] to decomposition numbers $d_{\lambda\mu}$ where μ is obtained from λ by moving *any number* of nodes, all of which having the same p-residue.

Subsequently, with the help of his co-author Joseph Chuang, A/P Tan extended this [CT] even further, to decomposition numbers $d_{\lambda\mu}$ where μ is obtained from λ by moving any number of nodes, all of which having *non-adjacent* p-residues.

References

[CT] J. Chuang, K. M. Tan, 'Canonical bases for Fock spaces and tensor products', *Advances in Mathematics* **302** (159–190), 2016.

[K] A. Kleshchev, 'On decomposition numbers and branching coefficients for symmetric and special linear groups', *Proceedings of the London Mathematical Society (3)* **75** (497–558), 1997.

[TT] K. M. Tan, W. H. Teo, 'Sign sequences and decomposition numbers', *Transactions of the American Mathematical Society* **365** (6385–6401), 2013.