LIST OF PUBLICATIONS: WAI LING YEE

(1) **Signatures of Invariant Hermitian Forms on Irreducible Highest Weight Modules**
Submitted (Duke Mathematical Journal), 19 pages.

Perhaps the most important problem in representation theory in the 1970s and early 1980s was the determination of the multiplicity of composition factors in a Verma module. This problem was settled by the proof of the Kazhdan-Lusztig Conjecture which states that the multiplicities may be computed via Kazhdan-Lusztig polynomials. In this paper, we introduce signed Kazhdan-Lusztig polynomials, a generalization of Kazhdan-Lusztig polynomials which encode signature information in addition to composition factor multiplicities and Jantzen filtration level. Careful consideration of Gabber and Joseph's proof of Kazhdan and Lusztig's inductive formula for computing Kazhdan-Lusztig polynomials at the level of coherent continuation functors, translation functors, Jantzen's Conjecture, and symbols associated with contravariant forms leads to an inductive formula for the signed Kazhdan-Lusztig polynomials. We use these generalized polynomials to compute the signature of an invariant Hermitian form on an irreducible highest weight module. Such a formula has applications to unitarity testing.

(2) **The Signature of the Shapovalov Form on Irreducible Verma Modules**
Representation Theory **9** (2005), 638–677.

This work is motivated by the unitary dual problem, which is a component of I.M. Gelfand's broad programme in abstract harmonic analysis which provides an algebraic framework for solving problems in a wide area of mathematics (eg. solving differential equations, computing the homology of a space). Classifying the irreducible unitary representations for a real reductive group is equivalent to the algebraic problem of classifying all irreducible Harish-Chandra modules which admit an invariant Hermitian form. All irreducible Harish-Chandra modules may be constructed via cohomological induction. Cohomological induction is a two-step process where one applies a Zuckerman functor to a generalized Verma module which was produced via induction from a representation on a Levi subgroup. A formula for the signature of the invariant Hermitian form on the intermediate module, the generalized Verma module, may permit the computation of the signature of the invariant Hermitian form on the corresponding Harish-Chandra module. In this paper, we compute the signature of invariant Hermitians forms on all irreducible Verma modules.

(3) **Pointwise Estimates of the Size of Characters of Compact Lie Groups**
Journal of the Australian Mathematics Society Series A **69** (2000), no. 1, 61–84.
Joint work with Kathryn E. Hare and David C. Wilson.

(4) **The Singularity of Orbital Measures on Compact Lie Groups**
Revista Math. Iberoamericana **20** (2004), no. 2, 517–530.
Joint work with Kathryn E. Hare.

Broadly, this research could be described as the usage of representation theory as a tool in understanding the smoothing behaviour of convolutions on orbital measures. We give sharp pointwise estimates for the size of characters of representations of compact, connected, classical, simple Lie groups expressed as a function of the type and rank of the Lie group. Using these bounds, we find the minimal number k such that any continuous orbital measure convolved with itself k times belongs to L^2. Our results are sharp and a significant improvement upon classical results. In recognition of this work on the size of characters and the singularity of orbital measures, I was awarded the Honourable Mention for the 2000 AMS-MAA-SIAM Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student.