

# SUMMARY of RESEARCH

My primary research interests in the last five years have been in the following themes:

- (1) Unramified Shintani functions for  $(GSp_4, GSpin_4)$  and their applications.
- (2) Real Shintani functions for  $(GSp_4, GSpin_4)$  and their applications.
- (3) Critical values of Rankin–Selberg  $L$ -functions and triple product  $L$ -functions.
- (4) Inner product formula fo Shimura and Shintani lifts.

(1) I established an explicit formula of Shintani functions for  $GSp_4$  over the non-archimedean local field of general characteristic by following in the footsteps for Shintani functions on  $SO_n$  of Murase–Sugano. The important point in this research is that the proof of meromorphic continuation of Shintani functionals, which is key lemma, was simplified by using Bernstein’s rationality theorem, which is easily proved. This method is also applicable to Shintani functions on general reductive groups. I formulated the local integral of Murase–Sugano type for  $GSp_4$ , and as an application of the explicit formula proved that the local integral represents the spin  $L$ -factor of  $GSp_4$ .

(2) I proved that the real Shintani function associated with the holomorphic discrete series representation of  $GSp_4(\mathbb{R})$  is expressed by using generalized hypergeometric functions  ${}_3F_2$ . Moreover I computed the local zeta integral of Murase–Sugano type by using the explicit formula. As a result, I found that the local zeta integral represents the spin  $L$ -factor associated with the holomorphic discrete series representation of  $GSp_4(\mathbb{R})$ .

(3) I proved an explicit formula for the critical values of the Rankin–Selberg  $L$ -function associated with two modular forms for  $SL_2(\mathbb{Z})$ . More precisely, I proved that the critical value of the Rankin–Selberg  $L$ -function is expressed as a finite sum using Bernoulli numbers and Fourier coefficients of cusp forms in the orthogonal basis. In addition, as corollaries, I proved an integrality of the critical values and that a cusp form  $g$  is uniquely determined by certain critical values of the family of Rankin–Selberg  $L$ -functions  $D(s, f \otimes g)$ , where  $f$  runs over a fixed orthogonal basis of cusp forms. Also, applying the above method to the triple product  $L$ -function, I and Kengo Fukunaga proved explicit formulas for the rightmost critical value of the triple product  $L$ -function.

(4) This is joint work with Atsushi Murase. Shintani lifts are mappings from elliptic modular forms to Jacobi forms. The holomorphic kernel functions of Shintani lifts were constructed by Gross–Kohnen–Zagier. We reformulated Shintani lifts as theta lifts and proved the inner product formulas for Shintani lifts.