In course, I plan to discuss two manuscripts in preparation:

1. Distribution of cycles on Hilbert modular varieties
2. Rational points on hyper or super elliptic curves.

The first manuscript is a long term joint work with Di-Hua Jiang (University of Minnesota) and Jian-Shu Li (Hong Kong University of Science and Technology) beginning in the summer of 2001. We are trying to show that Shimura curves are equidistributed in Hilbert modular surfaces, motivated by a conjecture of Andre-Oort in which the Zariski closure of any set of CM points are Shimura varieties. The equidistribution should follows from an explicit formula between periods of automorphic forms and special values of automorphic $L$-functions. To prove this explicit formula, we will combine various methods in automorphic forms including Asai $L$-series, theta liftings, and Godement-Jacquet integrals.

In the second manuscript, I will try to show that there are infinitely many quadratic twists of a certain hyperelliptic curve have only trivial (i.e. Weierstrass) points as rational points but have non-trivial points locally everywhere. This is motivated by some conjectures of Szpiro and Caporaso-Harris-Mazur in which the number or sizes of rational points are uniformly or effectively bounded. To do so, we combine the recent works on Gross-Zagier formula, Euler system (Ye Tian), and the early work on nonvanishing of $L$-series (Waldspurger). If we assume conjectures of Goldfeld and Katz-Sarnak, then at least 50% (and sometime even 100%) of member have only trivial rational points.

Ye Tian and Diaconu at Columbia are working on a similar problem on family of high twists of the Fermat curves where Waldspurges result is replaced by Diaconus non-vanishing results proved by using multiple zeta functions. I will put their work in frame work of super elliptic curves.