# Abstract of My Study

I have been studying the mathematical science related to Industry, and also investigated the algebraic curves, real curves in differential geometry and a relation between physics and number theory.

Mathematics as a language expressing the natural phenomena has power;
I have showed the power of mathematics by investigating the following themes.

1. Mathematics associated with Industry
   - 1.1 Conductivity in Parcolation system (complex materials)
   - 1.2 Modeling of Multiphase fluid
   - 1.3 Micro-quantum devises
   - 1.4 Surface conduction electron emitter
   - 1.5 Characterization of shape of complex materials
   - 1.6 Conductivity in Carbon fiber
2. Statistical Mechanics of Elastic Curve (Quantized Elastica)
   - 2.1 Partition Function of Equienergy surface in terms of MKdV hierarchy
   - 2.2 Algebro-Gometric solution of Loop Soliton in terms of hyperelliptic functions
   - 2.3 Classification of Immersed Curves in a plane
3. Abelian Function of Algebraic Curves
   - 3.1 Generalization of Weierstrass sigma function
   - 3.2 Generalization of Jacobi inversion problem
   - 3.3 Explicit Representation of Riemann-Kempf problem
   - 3.4 Generalization of Jacobi-sn functions
   - 3.5 n-division points and Toda equation
4. Dirac Operators in Submanifold Immersed in Higher space
   - 4.1 Generalization of Weierstrass-Kenmotsu representation of submanifold
   - 4.2 Generalization of Index theorem of submanifold
   - 4.3 Formulation of Submanifold Quantum Mechanics
   - 4.4 A relation to integrable system
5. Application of Number Theory to Physics
   - 5.1 Study on the relation between fractional Talbort effect and Gauss sum (and Weil representation)
   - 5.2 P-adic analysis to Physics.