In the master course, I learned classical Kato' s inequality and its extension to the case of p-Laplacian. In my thesis, I studied removability of singularities of solutions to nonlinear degenerate elliptic equation with absorption term.

In the doctoral course, I established Kato 's inequality for p-Laplacian ($1 < p < \infty$) in the Radon measure space. As a direct application, I studied the strong maximum principle for nonlinear elliptic operators. In this research, I introduced and effectively used the Admissible Class. I verified if $u \geqq 0$, $-\Delta_p u + a(x)u^{p-1} \geqq 0$ in the sense of measure and u vanishes on a set of positive capacity, then $u = 0$ almost everywhere. When $p = 2$, the concept of Admissible Class is unnecessary because it is automatically satisfied. But it is a generic set containing the Sobolev space $W^{1, p}$. In addition to a usual p-capacity, I introduced an equivalent capacity using p-Laplacian in order to measure the size of set properly.

By this maximum principle, the uniqueness of the solutions of the nonlinear degenerate elliptic equation is established if using properly defined. I think it is a good result. In the linear case ($p = 2$), this assertion is called the weak unique continuity and it has already been studied using potential theory by Ancona (1979), and after that Benilan-Brezis-Ponce (2004) used the argument of partial differential equation to prove a similar result for this subject. However in the nonlinear case, I know only partial results, and this research concerns the extension of these previous results. Then I studied further refinement of Kato 's inequality for p-Laplacian and the solvability of quasilinear elliptical equation including Radon measures. In this work I essentially used the fact that a Radon measure is uniquely decomposed into "diffuse part" and "concentrate part" with p-capacity as a modulus of continuity. I also extended the inverse maximum principle to the nonlinear case as the counter-part to the one by Brezis-Ponce in the linear case.

After that, for the general quasilinear elliptic operator (denoted as A) including p-Laplacian, the concept of Admissibility for a p-Laplacian in the previous study was naturally extended to that for operator A. Then I extended successfully the strong maximum principle, the inverse maximum principle and Kato's inequality for the operator A. Furthermore, I am studying the existence and uniqueness of Admissible solutions for elliptic boundary problems for A. Up to now I have proved the existence and partial uniqueness. The most original point of these studies is to introduce the A-Admissible Class and develop a theory systematically. In addition, in the case of $p = 2$, this research (Non-admissible solution corresponds to pathological solution) is also deeply related to the potential theory and I think that it is very interesting.