In the doctoral course, I essentially extended Kato 's inequalities for p-Laplacian $(1 < p < \infty)$ to the Radon measure, as a direct application, we studied on the strong maximum principle for the nonlinear elliptical operator. In this research, roughly speaking, we set an Admissible Class, where $u \geqq 0$, $-\Delta_p u + a(x)u^{p-1} \geqq 0$ in the meaning of measure and when u has a zero point set, $u = 0$ is established almost everywhere. When $p = 2$, the concept of Admissible Class is unnecessary because it is clearly satisfied. But in the general, it is a generic set containing the usual Sobolev space $W^{1, p}$. In addition to the usual p-capacity, we introduced a capacity using p-Laplacian equivalent to that in order to properly measure the size of the set. The result of this maximum principle is that the uniqueness of the solutions is established if Admissible Class is appropriately set for all solutions of the nonlinear degenerate elliptical equation that is not uniquely in general. I think it is an ingenious result. In the linear case ($p = 2$), this assertion is said to be a weak unique connection theorem, has already been studied using potential theory by Ancona (1979), etc., and after that Benilan-Brezis-Ponce (2004) use the argument of partial differential equation proved it also. However, in the case of nonlinear, we only know a partial result, and this research is on the direct extension of these previous studies. Then we began researching further refinement of Kato 's inequality for p - Laplacian and the solvability of quasilinear elliptical equation of Radon measure. We have succeeded in further refining Kato 's inequality by using the fact that radon measures are uniquely decomposed into "diffuse part" and "concentrate part" with p - capacity as a modulus. Based on results, we expanded the inverse maximum principle to the nonlinear case for the "concentrate part" by Brezis-Ponce in the linear case.

After that, for the general quasilinear elliptic operator including p-Laplacian (denoted as A), the concept of Admissibility on p-Laplacian in the previous study was extended to the concept of Admissible Class for operator A, On the other hand, we succeeded in extending the strong maximum principle, inverse maximum principle and Kato's inequality. Furthermore, we are studying the existence and uniqueness of Admissible solutions for boundary problems on A. Up to now I have proved the existence and partial uniqueness. The most original point of these studies is the introduction of A - Admissible Class and development of 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 theory of potential and I think that it is very interesting.

From last year, we begin studying an integral inequality by G. Hardy in the 1920s. On the basis of precedent results, we extended to Hardy' s inequalities in the case of one-dimensional weights. Surprisingly our result on this matter is essentially dependent on the range of parameter α. Therefore, we classify the range of the parameter α into two cases and define the best constant.