On "Refinement of classical inequalities and application to nonlinear elliptic equations", I will research focusing on the following subjects.

1. "Kato's Inequality" up to the boundary and quasilinear elliptic operators
2. Weighted Hardy's inequalities
3. Refinement of the CNK type inequalities in the space of functions having bounded variation

Subject 1：I studied Kato's inequality in the domain. In the next step, I want to study Kato's inequality up to the boundary. In this study by the assertion of Brezis-Ponce (2008) (when p = 2), $\Delta u + (u + = \max [0, u])$ is not necessarily a bounded measure even if $\Delta u = 0$. They introduced the X class and studied Kato's inequality up to the boundary in X .I would like to extend this result to the nonlinear cases.

Subject 2： In this research, I will study Hardy's inequalities with weight being the distance from boundary and corresponding nonlinear partial differential equations. In the case of p=2 by Brezis-Marcus (1997), established Hardy's inequalities with weights, I will extend their results and further ($\alpha<1-1/p$(noncritical case)、 $\alpha=1-1/p$(critical case)). I study the best constant of the inequality as well.

Subject 3： The CKN type inequalities in this study unify the classical weighted Hardy' inequalities and weighted Sobolev inequalities. Hence all powers of distance from the origin are permitted as weight functions. (c.f.[Mathematics, Vol. 68 No. 1 No. 1 January 2016 Winter issue], Toshiro Horiuchi). When p> 1, the existence of a solution to realize the best constant, the continuity about the parameters of the best constant, the breaking phenomenon of symmetry were systematically studied. In the critical case, it was shown that the right hand side should be modified to a logarithmic term. Based on these, I will study the CKN type inequalities for p = 1 in the critical case and the existence and make clear the symmetry breaking phenomenon for the variational problem in the BV space. In particular, I want to study the range of symmetry breaking. On the other hand, since the linearization method was to be effective in the case of p> 1,I will also empty this method to make clear the symmetry breaking phenomenon in the case of p=2 together with BV space.