# Results

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My research theme is 「Geometry of differential systems」. In particular, I am interested in the geometric study of differential systems associated with differential equations. Results which we obtained until now are as follows.

1. Equivalence problem of second order PDE for Scale transformations [2].

First, we introduce a notion of the equivalence problem of differential equations in general. We need to fix classes of differential equations and a group of coordinate transformations (contact transformations) to consider this problem. Then, the equivalence problem of differential equations is a problem how differential equations change under coordinate transformations. For this problem, we studied an equivalence problem of second order PDE with respect to scale transformations. Consequently, we calculated local invariant functions of this problem by using Cartan's method.

2. Implicit second order PDEs without a regularity condition [3].

This thema is based on a joint work with Kazuhiro Shibuya. We studied a certain degenerations of implicit second order PDEs for one unknown function of two variables. More precisely, we considered the structures of implicit PDEs without a regularity condition which is assumed ordinary. To consider the problem by using differential systems, we assumed the appropriate condition. Under the condition, we obtained some characterization of these equations.

3. Type-changing equations [4].

This is also based on a joint work with Kazuhiro Shibuya. Among second order single PDEs with 2 independent 1 dependent variables, equations which have not constant signatures of the discriminant are type-changing equations. For these equations, we studied some properties by using the theory of differential systems. In particular, we formulated the notion of geometric solutions and gave the existence condition of solutions of a special class.

4. An explicit construction of special Lagrangian fibration [1].

We also considered an explicit method of constructing special Lagrangian submanifolds as an application of Cartan geometry to another research area. In particular, we constructed special Lagrangian fibration in a certain Hyper-Kähler 2-fold which is called Taub-NUT space by using techniques of group symmetry (or associated moment map) and moving frame.