# Plan

Takahiro Noda

My research area is Cartan geometry. My plan is as follows.

1. Geometrical study of second order PDE.

This is the main thema. As I mentioned in the Result, there are uncharted territories for geometrical studies of second order PDE. Now, we are studying the type-changing equation by using differential systems. This work is also based on a joint work with Kazuhiro Shibuya. Type-changing equations $\Sigma = \{F = 0\}$ are introduced as follows. First, we consider implicit PDE which satisfy a certain regularity condition. For these equations, we can consider the discriminant $\Delta$. On a smooth hypersurface $\Sigma = \{F = 0\}$ defined by $F$, a point $v$ is called hyperbolic, elliptic, or parabolic when the sign of $\Delta(v)$ is negative, positive, or zero, respectively. If we take a hyperbolic point or an elliptic point as a base point, points around the base point are also hyperbolic or elliptic respectively. However, this property is not satisfied for parabolic points. That is, if a hypersurface $\Sigma = \{F = 0\}$ have a parabolic point, there is a possibility that $\Sigma$ is not locally parabolic. We call these PDEs type-changing equations. Type-changing equations are very simple and important object, but systematic geometric results of these equations are not obtained essentially. Thus, we will study the geometric structure of type-changing equations. On the other hand, we want to study other equations which have some singularities.

2. An application to metric geometry.

We are also interested in relations between Cartan geometry and metric geometry. As typical example, there is a study of subriemannian geometry. Subriemannian geometry is one of the main subject in Cartan geometry. One of the thema which we want to consider is a problem to construct Einstein metric in subriemannian geometry.