Name: Toshiyuki KOBAYASHI
Research Field: Lie Groups and Representation Theory/ Diffrerential Geometry
Keywords: representation theory, branching laws, homogeneous spaces,discontinuous groups, non-Riemannian geometry, visible actions on complex manifolds, semisimple Lie groups, Lorentz group, minimal representations, non-commutative harmonic analysis.

Current research: I have been working on several areas related to symmetries and groups as below. For more details, please visit my home page http://www.ms.u-tokyo.ac.jp/˜toshi. In particular, please find the categorized list of publications, the list of my lectures, a research summary, and the list of my former Ph.D. / posdoc students, therein.

1. Representation Theory. Branching laws are mathematical description of broken symmetries. I established the theory of discretely decomposable branching laws, and opened an algebraic theory of branching laws of unitary representations. I continue this work to seek for its finer structure, and also its applications to geometric analysis. See the lecture notes at the European School on Group Theory for the state of art.

2. Discontinuos groups. Beyond the framework of Riemannian geometry, I have been working on the theory of discontinuous groups, including the existence of compact forms, proper actions, rigidity and deformations. See an expository article for recent developments on this subject.

3. Visible actions on complex manifolds. I have introduced the concept of *visible actions*, and use it to a synthetic and systematic study of multiplicity-free representations.

4. Analysis on minimal representations. Minimal representations are typical building blocks of unitary representations. I am developing geometric and analytic approaches to minimal representations of indefinite-orthogonal groups, with emphasis on the interactions with other fields of mathematics such as conformal geometry, special function theory, and partial differential equations.

5. Real analysis, **Geometric alaysis, Integral geometry**.

Prerequisites: Basic knowledge on all the fields of pure mathematics, including topology, manifold, Lie groups and Lie algebras, differential geometry, Lebesgue integrals, functional analysis, differential equations,commutative algebras, and field theory are required.

Some suggested textbooks for Lie groups and Lie algebras might be:

F. Warner Foundation of differentiable manifolds and lie groups., GTM 94., Springer.
S. Helgason, Differential geometry, Lie groups, and symmetric spaces. AMS
J. E. Humphreys, Introduction to Lie algebras and representation theory., GTM 9., Springer.
A. W. Knapp, Lie groups beyond an introduction., Progress in Math. 140., Birkhäuser.
T. Kobayashi and T. Oshima, Lie groups and representations, Iwanami, 2005.

However, it is more important than knowledge, I believe, to have deep understandings with a strong will and a sincere desire for mathematics.

For more activities on our research group, please visit the **seminar information**.