2023 OCAMI-RIRCM International Workshop on Geometry and Symmetric Spaces

— The 20th OCAMI-RIRCM Joint Differential Geometry Workshop —

Osaka Metropolitan University, Osaka, Japan

Feb. 22 (Wed) – 24 (Fri), 2023

Feb 22, 2023

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Antipodal sets of compact symmetric spaces

An antipodal set is a subset A of a symmetric space which satisfies $s_x(y) = y$ for any $x, y \in A$, where s_x denotes the symmetry at x. In the joint research with H. Tasaki, we have been studying antipodal sets of compact symmetric spaces. In the first half of this talk, we summarize our results related to antipodal sets of compact symmetric spaces. In the second half, we explain the classification of maximal antipodal sets of a compact symmetric space M, when M is one of $U(n)/O(n)$, $U(2n)/Sp(n)$, and their quotient spaces. We explicitly describe a representative of each congruence class of maximal antipodal sets.

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1st-2 Eungbeom Yeon *E-mail*: ebeom.yeon@pusan.ac.kr
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Minimal hypersurfaces in Schwarzschild Riemannian $n-$manifolds

Affected by the spherical mass body, there are very few complete minimal hypersurfacces in Schwarzschild Riemannian manifolds. We introduce Frankel's property for free boundary minimal hypersurfaces in the Riemannian Schwarzschild n-manifolds. Furthermore, we extend this property to some class of asymptotically flat manifolds where its scalar curvature is no longer positive. This talk includes the contents from a joint work with Dr. Jaehoon Lee

1st-3 Yuan Shyong Ooi *E-mail*: yuanshyong@pusan.ac.kr
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Higher codimension minimal submanifold with isolated singularity

In 1984, Caffarelli-Hardt-Simon studied minimal hypersurface in Euclidean space with isolated singularity. By suitably perturbing any given regular minimal cone, they manage to construct non-conical minimal hypersurface with isolated singularity. In this talk, I will introduce my work on the generalization of Cafferelli-Hardt-Simon construction to the higher codimension setting.

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1st-4 Yuichiro Taketomi *E-mail*: v21255l@omu.ac.jp
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A maximal element of a moduli space of Riemannian metrics

For a given smooth manifold X, we consider the moduli space of Riemannian metrics on X up to isometry and scaling. Define a (pre)order on the moduli space by the size of isometry groups. A Riemannian metric g is said to be maximal if the equivalent class $[g]$ attains a maximal element with respect to the order. Isotropy irredicible spaces give simple examples of maximal metrics. Maximal metrics give nice examples of self-similar solutions for various metric evolution equations (*e.g.* Ricci flow). In this talk, we construct many examples of maximal metrics on Euclidean spaces. Our method to construct the examples is to study a mouli space of left-invariant metrics up to automorphism and scaling on some simply connected solvable Lie groups.

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Cyclic parallel normal Jacobi operator for Hopf real hypersurfaces in complex Grassmannians of rank 2

As the generalized notion of parallelism for any symmetric (1,1) type tensor field T of a real hypersurface in Kähler manifolds $(\tilde{M}, g)$, we introduce the notion of cyclic parallelism. In this talk, by using this notion with respect to the normal Jacobi operator, we want to give some classification results of Hopf real hypesurfaces in the complex Grassmannians of rank 2.

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Real hypersurfaces in complex quadric with Reeb invaraint structure Jacobi operator

We introduce a new notion of Reeb invariant structure Jacobi operator and two kinds of singular normal vector field for a real hypersurface in the complex quadric. We give a classification of Hopf real hypersurfaces with Reeb invariant structure Jacobi operator in the complex quadric.

Feb 23, 2023

2nd-1 Young Jin Suh *E-mail*: yjsuh@knu.ac.kr
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Yamabe, Ricci-Bourguignon solitons in the complex hyperbolic quadric and related topics

The study of geometric flows has recently aroused interest of the mathematical community. In this talk we want to introduce recent research activities on Yamabe, Ricci-Bourguignon solitons on real hypersurfaces in the Complex Hyperboilc Space and the complex Hyperbolic Quadric, which are Hermitian symmetric spaces of non-compact type with rank 1 and rank 2 respectively. Besides of them, related to our expertise, we will give some motivations and research back grounds for other Hermitian symmetric spaces like Complex Two-Plane Grassmannians, Complex Hhyperbolic Two-Plane Grassmannians and Complex Quadrics.

2nd-2 Osamu Ikawa *E-mail*: ikawa@kit.ac.jp
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σ-actions associated with triality automorphism on $Spin(8)$

This talk is based on a joint work with Professor Katsuya Mashimo (Hosei university).

Let G be a compact connected Lie group, σ an automorphism of G. Then we can define an action of G on itself, which is called a σ-action. The σ-action has a nice property, called hyperpolarity, from the geometric view point. When $G = Spin(8)$ and σ is a triality automorphism, we determine the orbit space of the σ-action and featured orbits such as minimal, or austere orbits.

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2nd-3 Satoshi Ogawa *E-mail*: sn22894n@st.omu.ac.jp
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Linearization of transition functions along a certain class of Levi-flat hypersurfaces

We pose a normal form of transition functions along some Levi-flat hypersurfaces obtained by suspension. By focusing on methods in circle dynamics and linearization theorems, we give a sufficient condition to obtain a normal form as a geometrical analogue of Arnol'd's linearization theorem. This talk is mainly based on my preprint [O].

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The Delsarte theory for probability measures on homogeneous spaces

In combinatorial optimization, which aims to find the optimal objects under certain conditions, coding theory and design theory are both important and active researching themes. The goal of coding theory is efficient and trustworthy communications, and the goal of design theory is efficient and trustworthy samplings. The Delsarte theory links these two theories as dual concepts through Fourier analysis, and give a fundamental tool to study codes and designs. For example, the Delsarte theory for finite subsets on spheres contributes to the kissing number problem and the sphere packing problem. In this talk, we give a formulation of the Delsarte theory for probability measures.

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2nd-5 Juncheol Pyo *E-mail*: jcpyo@pusan.ac.kr
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Solitons for the mean curvature flow

Self-similar solutions and translating solitons are not only special solutions of mean curvature flow (MCF) but a key role in the study of singularities of MCF. They have received a lot of attention. We introduce some examples of self-similar solutions and translating solitons for the mean curvature flow (MCF) and give some properties and rigidity results of some of them.

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2nd-6 Luis Pedro Castellanos Moscoso *E-mail*: caste3.1416@gmail.com
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Symplectic Structures on Almost Abelian Lie algebras

We are interested in the classification or finding conditions for the existence of left-invariant symplectic structures on Lie groups. Only some classifications are know, specially in low dimensions. We approach this problem by studying the "moduli space of left-invariant nondegenerate 2-forms", which is a certain orbit space in the set of all nondegenerate 2-forms on a Lie algebra. In this talk we consider this problem in the case of almost abelian Lie algebras, that is Lie algebras that contain a codimension 1 abelian subalgebra. We show that, in this setting, the problem of existence and classification can be reduced to a known matrix equation and a corresponding equivalence relation, respectively. Finally, we solve these equations for several particular examples.

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2nd-7 Fumika Mizoguchi *E-mail*: m21sa032@st.osaka-cu.ac.jp
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Nilpotent Lie algebras obtained by quivers and Ricci solitons

Nilpotent Lie groups with left-invariant metrics provide non-trivial examples of Ricci solitons. A quiver is a directed graph where loops and multiple arrows between two vertices are allowed. In this talk, we introduce a new method for obtaining nilpotent Lie algebras from finite quivers without cycles. For all of these Lie algebras, we prove that the corresponding simply connected nilpotent Lie groups admit left-invariant Ricci solitons. This constructs a large family of examples of Ricci soliton nilmanifolds with arbitrarily high nilpotency steps.

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2nd-8 Yimin Chen *E-mail*: sherlockpoe@pusan.ac.kr
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Heintze Karcher type inequalities on capillary hypersurfaces in hyperbolic space

In this talk, I will introduce our recent results on Heintze Karcher type inequalities for capillary hypersurfaces supported on different types of umbilical hypersurfaces in hyperbolic space. I will introduce some conformal Killing vector fields in hyperbolic space and use them to prove our result. As applications, I will introduce the Minkowski type formula we established and use them together with the Heintze-Karcher type inequality to prove the Alexandrov type theorem. In addition, I will introduce some other rigidity result for capillary hypersurfaces. This talk is based on the joint work with Prof. Juncheol Pyo

2nd-9 Sanghun Lee *E-mail*: kazauye@pusan.ac.kr
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Rigidity for the weighted area-minimizing hypersurfaces

In this talk, we will talk about rigidity result for weighted area-minimizing hypersurfaces. First, we review previous rigidity results related to scalar curvature. In particular, we focus on the splitting theorem for area-minimizing hypersurfaces in ambient manifold with scalar curvature bounded below. Second, we introduce the notion of weighted manifold and prove our new rigidity results for weighted area-minimizing hypersurfaces.

2nd-10 Sangwoo Park *E-mail*: s.w.park@pusan.ac.kr
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Rigidity Theorems for Free Boundary Minimal Hypersurfaces in a Geodesic Ball

In this talk, we will talk about rigidity results for free boundary minimal hypersurfaces in a geodesic ball. First, we prove that any free boundary minimal hypersurface in a closed geodesic ball inside an open round hemisphere $\mathbb{S}^{n+1}_+$ which is Killing-graphical has to be a totally geodesic hypersurface. Second, we provide an analogous result for free boundary maximal hypersurfaces in a region bounded by a de Sitter space in the Lorentz-Minkowski space. More precisely, any smooth, compact free boundary maximal hypersurface in a de Sitter ball is the spacelike coordinate planar disk passing through the center of the de Sitter space. Notably, no extra condition such as Killing-graphical assumption is needed in this setting. Therefore free boundary maximal hypersurfaces in the de Sitter space are substantially rigid. On the other hand, we also prove that any graphical self-shrinker with free boundary in a ball centered at the origin in $\mathbb{R}^{n+1}$ is a flat disk passing through the origin. It is an analogous result to our first result of free boundary minimal hypersurface for self-shrinkers case.

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Feb 24, 2023

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Biharmonic Cartan embeddings

In this talk, we determine all the proper biharmonic submanifolds in compact Lie groups which are the image of Cartan embeddings defined by automorphism of order 4. Moreover we show that if the Cartan embedding defined by automorphism of order 3 is biharmonic, then it is harmonic.

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Real hypersurfaces in the complex quadric with semi-symmetric structure Jacobi operator

In this paper, we introduce a new notion of *semi-symmetric structure Jacobi operator* for Hopf real hypersufaces in the complex quadric $Q^m = SO_{m+2}/SO_mSO_2$. Next we prove that there does not exist a Hopf real hypersurface in the complex quadric $Q^m = SO_{m+2}/SO_mSO_2$ with semi-symmetric structure Jacobi operator. As a corollary, we also get a non-existence property of Hopf real hypersurfaces in the complex quadric Q^m with symmetric (parallel), or recurrent structure Jacobi operators.

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A duality between para-Hermitian symmetric spaces and pseudo-Hermitian symmetric spaces

A symmetric space equipped with an invariant para-complex structure and an invariant para-Hermitian metric is called a para-Hermitian symmetric space. It is known that para-Hermitian symmetric spaces and pseudo-Hermitian symmetric spaces have similar structure. In this talk, we will discuss a duality between absolutely simple para-Hermitian symmetric space of hyperbolic orbit type and pseudo-Hermitian symmetric spaces. By this duality, we show that any para-real form of an effective absolutely simple para-Hermitian symmetric space of hyperbolic orbit type can be realized as a real form of an effective simple irreducible pseudo-Hermitian symmetric space, and vice versa.