

# **T-Curvature Tensor of alpha-Cosymplectic f-Manifolds**

Yavuz Selim BALKAN

Some properties of quasi-T-flat, ksi-T-flat and phi-T-flat alpha-cosymplectic f-manifolds are obtained. We give necessary and sufficient conditions for the alpha-cosymplectic f-manifolds to be quasi-T-flat, ksi-T-flat and phi-T-flat under some algebraic conditions.

*Düzce University*

*email: y.selimbalkan@gmail.com*

# Parametric representation of a surface pencil with a common asymptotic curve

Ergin BAYRAM

In this paper, we study the problem of finding a surface pencil from a given spatial asymptotic curve. We obtain the parametric representation for a surface pencil whose members have the same curve as a given asymptotic curve. Using the Frenet frame of the given asymptotic curve, we present the surface as a linear combination of this frame and analyse the necessary and sufficient condition for that curve to be asymptotic. We illustrate this method by presenting some examples.

*Ondokuz Mays University*

*email: [erginbayram@yahoo.com](mailto:erginbayram@yahoo.com)*

# Construction of the Bonan Form via Strong Self-Dual 2-forms

Ayşe Hümeýra Bilge

Joint work with Tekin Dereli and Şahin Koçak. The notion of self-duality of 2-forms in 4-dimensions plays an eminent role in many areas of mathematics and physics, but although the 2-forms have a genuine meaning related to curvature and gauge-field-strength in higher dimensions also, their self-duality is something which is almost avoided above 4-dimensions. We show that self-duality of 2-forms is a very natural notion in higher (even) dimensions also and we prove the equivalence of some scattered and rarely used definitions in the literature. We demonstrate the usefulness of this higher self-duality by studying it in 8-dimensions and we derive a natural expression for the Bonan form in terms of self-dual 2-forms and we give an explicit expression of the local action of  $SO(8)$  on the Bonan form.

## References

- [1] A. H. Bilge, T. Dereli, Ş. Koçak. Linear Algebra and Its Applications - LINEAR ALGEBRA APPL 01/2011; 434(5):1200-1214. DOI:10.1016/j.laa.2010.11.002.

*Kadir Has University*

# Surfaces in 4-dimensional Euclidean Space $\mathbb{E}^4$ with Pointwise 1-type Gauss Map

Betül BULCA

In this talk we consider some surfaces with pointwise 1-type Gauss map in  $\mathbb{E}^4$ . We show that Vranceanu surfaces, tensor product surfaces and rotational surfaces in  $\mathbb{E}^4$  satisfying the Gauss map conditions. We give necessary and sufficient conditions become 1-type Gauss map.

*Uludağ University*

*email:* `bbulca@uludag.edu.tr`

# Nonproperly Embedded Minimal Surfaces in $\mathbb{H}^3$

Barış Coşkunüzer

In this talk, we will show that an open, orientable surface  $S$  with arbitrary topology can be nonproperly embedded in hyperbolic 3-space as a complete minimal surface. This construction also shows that the Calabi-Yau Conjecture is not true in hyperbolic space.

A. H. Bilge, T. Dereli, Ş. Koçak.

*Koç University, İstanbul*

# On Slant Riemannian Submersions For Cosymplectic Manifolds

İrem Küpeli Erken

In this paper we introduce slant Riemannian submersions from cosymplectic manifolds onto Riemannian manifolds. We obtain some results on slant Riemannian submersions of a cosymplectic manifolds. We also give examples and inequalities between the scalar curvature and squared mean curvature of fibres of such slant submersions according to characteristic vector field is vertical or horizontal

*Uludağ University*

*email:* iremkupeli@uludag.edu.tr

# Embedded triply periodic zero mean curvature surfaces of mixed causal type in the Lorentz-Minkowski 3-space

S.Fujimori

We construct embedded triply periodic zero mean curvature surfaces of mixed causal type in the Lorentz-Minkowski 3-space with the same topology as the Schwarz D surface in the Euclidean 3-space.

*Okayama Univ.*

# Hamiltonian minimality of normal bundles over the isoparametric submanifolds

T. Kajigaya

A Hamiltonian minimal (shortly, H-minimal) Lagrangian submanifold in a Kaehler manifold is a critical point of the volume functional under all compactly supported Hamiltonian deformations. In this talk, we give new families of non-compact H-minimal Lagrangian submanifolds in the complex Euclidean space. Our examples are obtained by normal bundles over principal orbits of the adjoint actions of compact (semi-) simple Lie groups. Moreover, we characterize these orbits by this property in the class of full, irreducible isoparametric submanifolds in the Euclidean space.

*Tohoku Univ.*



# Deformations of associative submanifolds in nearly parallel $G_2$ -manifolds

K. Kawai

A Riemannian 7-manifold  $Y$  is called nearly parallel  $G_2$  if the holonomy group of its cone is contained in  $\text{Spin}(7)$ . An associative submanifold  $M$  in  $Y$  is defined to be a 3-dimensional minimal submanifold which is related to the nearly parallel  $G_2$ -structure of  $Y$ . There are many classes of associative submanifolds arising from other geometries. We study the infinitesimal deformations of associative submanifolds, and compare deformation spaces in these classes. Then we study the homogeneous associative submanifolds in the 7-sphere  $S^7$  explicitly.

*Tohoku Univ.*

# Global existence of rotational hypersurfaces with prescribed mean curvature

K. Kenmotsu

We prove that for a given continuous function  $H(s)$  defined on the whole line  $\mathbb{R}$ , there exists a globally defined rotational hypersurface in a Euclidean space such that the mean curvature is  $H(s)$  on  $\mathbb{R}$ . The key lemma for the result proves the existence of solutions for a singular initial value problem of ordinary differential equation satisfied using generating curves of those hypersurfaces. We also show some applications of this existence theorem.

*Tohoku Univ.*

## **PDE-based image processing and viscosity solutions**

A. Kızılay

The goal of this talk is to understand PDE methods in image processing. Connection between partial differential equations and diffusion (morphological filtering) in Image processing will be discussed. Moreover, efficient solution of nonlinear PDE for image processing is very important, in this talk, viscosity solutions to PDE-based morphological filtering will be presented.

*Tohoku Univ.*

# Bifurcation theory for minimal and constant mean curvature surfaces

Miyuki Koiso

We construct general criteria for existence and nonexistence of (continuous and discrete) bifurcation for minimal and constant mean curvature surfaces. For continuous bifurcation, we also give a criterion for stability for each surface in the bifurcation branch. We apply our general results to several concrete boundary value problems. Especially, we mention the existence of unknown examples of triply periodic minimal surfaces in the Euclidean three-space which are close to known examples. This talk is based on joint work with Bennett Palmer (Idaho State U., USA) and Paolo Piccione (University of Sao Paulo, Brazil), and joint work with Paolo Piccione and Toshihiro Shoda (Saga U., Japan).

*Institute of Mathematics for Industry, Kyushu University, Japan*

# Gauss map of self-shrinkers of mean curvature flow and integrable systems

K. Kunikawa

Mean Curvature Flow (MCF) is one of the geometric flows. Start with a generic initial surface having singularities. After rescaling near a singularity, we can see a self-shrinker of the flow. They are special solutions of MCF and they do not change their shape under the flow (up to scaling). Classifying self-shrinkers is an important topic of research. In general, however, it is impossible to do so without some additional conditions. I will explain a method using the Gauss map to approach this problem. It is known that Gauss map of self-shrinkers are weighted harmonic map. So we could study self-shrinkers by analogy to CMC surfaces.

# Singular Riemannian foliations and Transnormal systems

R. Miyaoka

We consider singular Riemannian foliations such as generated by orbits of group actions, and relate it to a function of which level sets are the orbits. This is applied to investigate isothermic surfaces, geometric optics, etc.

*Tohoku Univ.*

# **Anti-invariant Riemannian submersions from cosymplectic and Kenmotsu Manifolds**

Cengizhan Murathan

We introduce anti-invariant Riemannian submersions from cosymplectic and Kenmotsu manifolds onto Riemannian manifolds. We survey main results of anti-invariant Riemannian submersions defined on cosymplectic and Kenmotsu manifolds. We investigate necessary and sufficient condition for an anti-invariant Riemannian submersion to be totally geodesic. We give examples of anti-invariant submersions such that characteristic vector field is horizontal.

*Uludağ University, Bursa*

# Classification of totally umbilical CR-submanifolds of cosymplectic manifolds

Cenap Özel

Cabras, Ianus and Piti proved that in a cosymplectic manifold there does not exist any extrinsic sphere tangent to the structure vector field. We consider, the structure vector field normal to the submanifold in the sense of N. Papaghiuc and investigate that the totally umbilical CR-submanifold of a cosymplectic manifold is either (i) totally geodesic or (ii) anti-invariant or (iii) extrinsic sphere. Joint work with Siraj Uddin, Viqar Azam Khan.

*Abant İzzet Baysal University, Bolu*



# Calibrations and Manifolds with Special Holonomy

Sema Salur

In 1982, Harvey and Lawson introduced four types of calibrated geometries. Special Lagrangian submanifolds of Calabi-Yau manifolds, associative and coassociative submanifolds of  $G_2$  manifolds and Cayley submanifolds of  $\text{Spin}(7)$  manifolds. Calibrated geometries have been of growing interest over the past few years and represent one of the most mysterious classes of minimal submanifolds. In particular, they are believed to play a crucial role in explaining the "mirror symmetry" between pairs of Calabi-Yau and  $G_2$  manifolds. In this talk we give a report of recent research on the calibrations inside the manifolds with special holonomy.

*University of Rochester*

*email:* `salur@math.rochester.edu`

*web:* [http://www.math.rochester.edu/people/faculty/salur/Sema\\_Salur\\_Home\\_Page/General\\_Information.html](http://www.math.rochester.edu/people/faculty/salur/Sema_Salur_Home_Page/General_Information.html)

# The biharmonic maps and the warped product

Seddik Ouakkas

In this work we study the harmonic and biharmonic maps and the warped product, in particular we give some properties of the conformal maps between riemannian manifolds.

*Université de Saida*

*email:* `seddik.ouakkas@gmail.com`

# Periodic minimal surfaces in terms of Morse indices

T. Shoda

Morse index of a minimal surface is defined as the sum of the dimensions of the eigenspaces corresponding to negative eigenvalues of the second variational operator of area. In this talk, we shall announce our results related to Morse index of a periodic minimal surface in the Euclidean space.

*Saga Univ.*

## Harmonic maps of Nondivergence type

Muazzez Şimşir

Chen, Jost and Qui has recently been established existence and uniqueness theorems for  $V$ -harmonic maps from complete non-compact manifolds. This includes Hermitian harmonic maps, affine harmonic maps, Weyl harmonic maps and Finsler harmonic maps. In this talk, we shall try to explain the relationship between  $V$ -harmonic maps and affine harmonic maps between compact manifolds.

*Hitit University, Çorum*

## Connections as Fixed Points

Cem Tezer

The talk will consist of a compilation of the recent research of the speaker in the field of smooth dynamical systems, towards the proof of the principal conjecture to the effect that an Anosov diffeomorphism is topologically equivalent to an infranilmanifold automorphism.

*ODTÜ, Ankara*

# On the construction of quasiminimal surfaces with 1-type Gauss Map

Nurettin Cenk TURGAY

In this talk, we construct quasiminimal surfaces with finite type Gauss map and given boundary. We also give some examples of compact surfaces with pointwise 1-type Gauss map.

*Istanbul Technical University*

*email: turgayn@itu.edu.tr*

# Stability of complete non-compact Lagrangian submanifolds

S. Ueki

In the variational problem for Lagrangian submanifolds, Y.G. Oh derived the second variation formula for Lagrangian submanifolds in Kaehler manifolds. As a corollary, he showed that a compact minimal Lagrangian stable Lagrangian submanifold in a Kaehler manifold with positive Ricci curvature must have trivial first de Rham cohomology group. In this talk, we consider the relation between stability of complete non-compact Lagrangian submanifolds and the topology. More precisely, we see that a complete non-compact stable minimal Lagrangian submanifold in a Kaehler manifold with positive Ricci curvature does not have nontrivial square integrable harmonic one form. We also see examples which have nontrivial square integrable harmonic one form.

*Tohoku Univ.*

# Special warped-like product manifolds with exceptional $G_2$ and $Spin(7)$ holonomy

Selman Uğuz

We study a special ansatz of warped-like product metric as a definition of warped-like product. By using fiber-base decomposition of the manifolds, the definition of special warped-like product is considered as a generalization of multiply-warped product manifolds, by allowing the fiber metric to be non block diagonal. We consider  $(3 + 3 + 1)$  (and  $(3 + 3 + 2)$ ) decomposition of 7-(and 8-)dimensional warped-like product manifolds which is called a special warped-like product of the form  $M = F \times B$ , where the base  $B$  is a one (and two) dimensional Riemannian manifold, and the fibre  $F$  is of the form  $F = F_1 \times F_2$  where  $F_i$ 's ( $i = 1, 2$ ) are Riemannian 3-manifolds. When the each fibers are complete, connected and simply connected, it follows that the fibers are isometric to  $S^3$  with constant curvature  $k > 0$  in the class of special warped-like product metrics admitting the  $G_2$  (and  $Spin(7)$ ) holonomy determined by the fundamental 3-(and 4-)form.

*Harran University, Şanlıurfa*



# $\varphi$ -critical Submanifolds of Calibrated Manifolds

İbrahim Ünal

A *calibration* on a Riemannian manifold  $(M^n, g)$  is a closed differential  $p$ -form  $\varphi$  with the property that, when restricted to any tangent  $p$ -dimensional subspace  $\xi$ ,  $\varphi|_\xi = \lambda \text{Vol}_\xi$  with  $\lambda \leq 1$ . A  $p$ -dimensional submanifold  $N \subset M$  is calibrated if  $\varphi|_N = \text{Vol}_N$ . Calibrated submanifolds are globally volume minimizing in their homology classes. Hence, they are a very good source of minimal submanifolds. These submanifolds correspond to the global maximum value of a calibration when considered as a function on Grassmannian of  $p$ -planes.

In this talk, starting with examples of calibrated geometries, I will show that submanifolds corresponding to any non-zero critical value of a calibration, namely  *$\varphi$ -critical submanifolds*, are also minimal under some conditions. Moreover, I will give examples of these special submanifolds for certain calibrations.

*Middle East Technical University Northern Cyprus Campus*

# Geometry of (bi-)harmonic maps and k-harmonic maps

H. Urakawa

I would like to talk about my recent results which are due to joint works with Nobumitsu Nakauchi and/or Shun Maeta. After introducing notion of harmonic map and biharmonic map, I will explain B-Y. Chen's conjecture on biharmonic isometric immersion: "Any biharmonic submanifold in the Euclidean space must be minimal." And also the generalized B-Y. Chen's conjecture: "Any biharmonic submanifold of a non-positively curved manifold must be minimal." Then, I will show recent results of Ou and Tang, Akutagawa and Maeta, and our results. If time permits, I would also show more recent our results on k-harmonic B-Y. Chen's conjecture: "Any k-harmonic submanifold of the Euclidean space must be minimal."

*Tohoku Univ.*

# Generalized Kenmotsu Manifolds

Aysel Turgut Vanlı

In 1972, K. Kenmotsu studied a class of almost contact Riemannian manifolds. Later, such a manifold was called a Kenmotsu manifold. In this paper, we studied Kenmotsu manifolds with  $(2n + s)$ -dimensional metric  $f$ -manifold and this manifold is called generalized Kenmotsu manifold. A metric  $f$ -manifold to be generalized Kenmotsu manifold is given necessary and sufficient condition. Generalized Kenmotsu manifold is a locally warped product space  $L^s \times_f V^{2n}$  with warped product function

$$f(t_1, \dots, t_s) = c e^{\sum_{i=1}^s t_i}.$$

In addition, we studied some curvature properties of generalized Kenmotsu manifolds. Moreover, we show that the  $\varphi$ -sectional curvature of any semi-symmetric and projective semi-symmetric  $(2n + s)$ -dimensional generalized Kenmotsu manifold is  $-s$ . Joint work with Ramazan Sari.

*Gazi University, Ankara*