UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Differential Geometry

Dr. Gueo Grantcharov

Florida International University

"Hypercomplex manifolds of dimension eight"

Abstract:

We'll present a quaternionic analog of the well-known fact that a compact complex surface is Kaehler if and only if its first Betti number is even. More precisely we prove that 8-dimensional compact SL(n; H) manifold admits HKT (hyperkaehler with torsion) metric if and only if its Hodge number h^{(0,1)} is even. The result is joint work in progress with M.Lejmi and M. Verbitsky.

Friday, April 4th, 2014
Surge 268
2:10 - 3:00 p.m.

UNIVERSITY OF CALIFORNIA, RIVERSIDE
Department of Mathematics

Calendar of Events For the Week of April 7th – 11th, 2014

MONDAY, 7th

1:10-2:00PM, SURGE 284 — **GRADUATE STUDENT SEMINAR** | Joshua Strong, UCR
"A Geometric Perspective of Complex Analysis"

TUESDAY, 8th

8:10-9:30AM, SURGE 284 — **ALGEGBRAIC GEOMETRY** | Dr. Ziv Ran

1:00-2:00PM, SURGE 284 — **LIE THEORY** | Dr. Vyjayanthi Chari

4:10-5:00PM, SURGE 284 — **MATH CLUB** | Kenny Flagg & Scott Manifold, UCR
Grad School Information Session

WEDNESDAY, 9th

10:10-11:00AM, SURGE 268 — **COMBINATORIAL NUMBER THEORY** | Dr. Mei-Chu Chang

1:10-2:00PM, SURGE 268 — **PDE & APPLIED MATHEMATICS** | Dr. Jaewoo Jung, Pohang UST
"On the Fokker-Planck Equation in Multi-Dimensional Bounded Domains"

1:10-2:00PM, SURGE 284 — **OPERATOR ALGEBRAS** | Dr. Feng Xu

3:40-5:00PM, SURGE 284 — **COLLOQUIUM** |
No Colloquium this Week

THURSDAY, 10th

9:40-11:00AM, SURGE 268 — **FRACTAL RESEARCH GROUP** | Dr. Michel Lapidus

1:00-2:00PM, SURGE 284 — **LIE THEORY** | Dr. Vyjayanthi Chari

3:40-5:00PM, SURGE 268 — **MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS** | Dr. Michel Lapidus

FRIDAY, 11th

2:10-3:00PM, SURGE 268 — **DIFFERENTIAL GEOMETRY** | Dr. Bun Wong

3:10-4:00PM, SURGE 284 — **COMMUTATIVE ALGEBRA** | Dr. David Rush

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Graduate Student Seminar

Joshua Strong

UC Riverside

"A Geometric Perspective of Complex Analysis"

Abstract:

Differential geometric techniques, such as Ahlfors's generalization of the Schwarz lemma, can be used to provide new proofs of classical complex function theory. In this talk, we will discuss a differential geometric side of complex analysis and use it to prove the Ahlfors-Schwarz lemma as well as Picard's little theorem.

Monday, April 7th, 2014

Surge 284

1:10 - 2:00 p.m.

Quarter: Spring 2014 Organizer: Dr. Kevin Costello

MATH CLUB

Tuesday, April 8th, 4:10 - 5:00 p.m.

In Surge 284

Grad School Information Session

Kenneth Flagg & Scott Manifold, UC Riverside

Undergrad Student Volunteers:

- Kenneth Flagg

In this week's math club, two grad-school-bound seniors Kenny Flagg and Scott Manifold will discuss the graduate school application process in Math and related areas, including advice to help you stand out, choosing recommenders, choosing schools and programs to apply to, and the resources available to help you prepare and make these important decisions.

Snacks and drinks served!

mathdept.ucr.edu/mathclub.html

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Partial Differential Equations & Applied Mathematics

Dr. Jaewoo Jung

Pohang University of Science and Technology

"On the Fokker-Planck Equation in Multi-Dimensional Bounded Domains"

Abstract:

In this talk, we study the kinetic Fokker-Planck equation in general multi-dimensional bounded domains with absorbing boundary condition. In particular, there has been not many results on the regularity of solutions when the spatial domain has a boundary. We will discuss the global well-posedness, regularity and decay estimate for the Fokker-Planck case and compare it with some other kinetic equations, e.g. Vlasov-Poisson system.

Wednesday, April 9th, 2014

Surge 268

1:10 - 2:00 p.m.

UNIVERSITY OF CALIFORNIA, RIVERSIDE
Department of Mathematics

Calendar of Events For the Week of April 14th – 18th, 2014

MONDAY, 14th

1:10-2:00PM, SURGE 284 — **GRADUATE STUDENT SEMINAR** |
No Meeting this Week

TUESDAY, 15th

8:10-9:30AM, SURGE 284 — **ALGEGBRAIC GEOMETRY** | Dr. Ziv Ran

1:00-2:00PM, SURGE 284 — **LIE THEORY** | Dr. Vyjayanthi Chari

4:10-5:00PM, SURGE 284 — **MATH CLUB** | Dr. Kevin Costello, UCR
"The mathematics underlying the card game of Set"

WEDNESDAY, 16th

10:10-11:00AM, SURGE 268 — **COMBINATORIAL NUMBER THEORY** | Dr. Mei-Chu Chang

1:10-2:00PM, SURGE 268 — **PDE & APPLIED MATHEMATICS** | Dr. Jang/Dr. Zhang

1:10-2:00PM, SURGE 284 — **OPERATOR ALGEBRAS** | Dr. Feng Xu

3:40-5:00PM, SURGE 284 — **COLLOQUIUM** | Dr. Changfeng Gui, University of Connecticut / NSF
"Diffusions, Fractional Laplacians and Traveling Waves"

THURSDAY, 17th

9:40-11:00AM, SURGE 268 — **FRACTAL RESEARCH GROUP** | Tim Cobler, UCR
"Quantized modular forms and elliptic curves"

1:00-2:00PM, SURGE 284 — **LIE THEORY** | Dr. Vyjayanthi Chari

3:40-5:00PM, SURGE 268 — **MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS** | Dr. John Neuberger, NAU
"Symmetry and Automated Branch Following for Semilinear Elliptic BVP"

FRIDAY, 18th

2:10-3:00PM, SURGE 268 — **DIFFERENTIAL GEOMETRY** | Paul Cernea, UCR
"The structure of the Fischer-Marsden critical metrics"

3:10-4:00PM, SURGE 284 — **COMMUTATIVE ALGEBRA** | Dr. David Rush

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Colloquium

Dr. Changfeng Gui

University of Connecticut / NSF

"Diffusions, Fractional Laplacians and Traveling Waves"

Abstract:

Fractional Laplacians can be used to model physical phenomena involving abnormal diffusions. In this talk, I will discuss how abnormal diffusions may affect the propagation of certain materials/species.

In particular, the effects of abnormal diffusions on the existence of traveling wave will be examined. For three important classes of diffusion-reaction models with monostable, combustion and bistable nonlinearities, we will show rigorous results for abnormal diffusions and compare them with the results for the classical models. The talk is based on recent results obtained jointly with Tingting Huan and with Mingfeng Zhao.

Wednesday, April 16th, 2014

Surge 284

Tea Time: 3:40 p.m. / Talk: 4:10 – 5:00 p.m.

Quarter: Spring 2014 Organizer: Dr. Kevin Costello

MATH CLUB

Tuesday, April 15th, 4:10 - 5:00 p.m.

In Surge 284

"The mathematics underlying the card game of Set"

Undergrad Student Volunteers:

- Kenneth Flagg

This week's topic will be some of the mathematics underlying the card game of Set, including some problems that are still (notoriously) unsolved.

Snacks and drinks served!

mathdept.ucr.edu/mathclub.html

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Mathematical Physics & Dynamical Systems

Dr. John Neuberger

NAU

"Symmetry and Automated Branch Following for Semilinear Elliptic BVP"

Abstract:

We will discuss our current algorithms for following branches of semilinear elliptic boundary value problems. Our successful applications include regions such as the square, the cube, and even the interior of Koch's snowflake. We have extended our ideas to graphs as well. The algorithms are more efficient and effective by our consideration of symmetry. By choosing an orthonormal basis of eigenfunctions of the Laplacian which has been organized according to the symmetries of the region, we are able to reduce the size of many of the computations required by our Newton's method-based algorithms. This not only speeds up computations, but reduces the dimension of the search spaces when attempting to branch switch at bifurcation points, resulting in our successfully finding more new solutions. One key point of this talk is that for some regions, such as Sierpinski gaskets, the notion of symmetry is not sufficient. We are currently attempting to generalize our ideas to use a concept of local symmetry in order to reduce the excessively large subspace dimensions that occur in such cases. This is joint, ongoing work with James W. Swift and Nandor Sieben, two of my Northern Arizona University colleagues.

Thursday, April 17th, 2014

Surge 268

3:40 - 5:00 p.m.

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Fractal Research Group

Tim Cobler

UC Riverside

"Quantized modular forms and elliptic curves"

Abstract:

Based on the work by Hafedh Herichi and Michel Lapidus in a forthcoming book, I look at defining operator-based versions of modular forms and elliptic curves that I refer to as quantized. Some background for these definitions as well as comparisons to standard modular forms and elliptic curves will be given.

Thursday, April 17th, 2014
Surge 268
9:40 - 11:00 a.m.

UNIVERSITY OF CALIFORNIA, RIVERSIDE
Department of Mathematics

Calendar of Events For the Week of April 21st – 25th, 2014

MONDAY, 21st

1:10-2:00PM, SURGE 284 — **GRADUATE STUDENT SEMINAR** | Mathew Lunde, UCR
"Ext^1 and Prime Factorization of Representations of Quantum Loop Algebras"

TUESDAY, 22nd

8:10-9:30AM, SURGE 284 — **ALGEGBRAIC GEOMETRY** | Dr. Ziv Ran

1:00-2:00PM, SURGE 284 — **LIE THEORY** | Dr. Vyjayanthi Chari

4:10-5:00PM, SURGE 284 — **MATH CLUB** | Dr. Kevin Costello
TBA

WEDNESDAY, 23rd

10:10-11:00AM, SURGE 268 — **COMBINATORIAL NUMBER THEORY** | Dr. Mei-Chu Chang

1:10-2:00PM, SURGE 284 — **OPERATOR ALGEBRAS** | Dr. Feng Xu

THURSDAY, 24th

9:40-11:00AM, SURGE 268 — **FRACTAL RESEARCH GROUP** | Dr. Michel Lapidus

1:00-2:00PM, SURGE 284 — **LIE THEORY** | Dr. Vyjayanthi Chari

2:10-3:00PM, SURGE 268* — **PDE & APPLIED MATHEMATICS** | Dr. Ke Shi, Texas A&M
"Hybridizable DG methods for second order PDEs"

3:40-5:00PM, SURGE 268 — **MATHEMATICAL PHYSICS & DYNAMICAL SYSTEMS** | Dr. Michel Lapidus

3:40-5:00PM, SURGE 284 — **COLLOQUIUM** | Dr. Dietmar Bisch, Vanderbilt University
"Subfactors with infinite representation theory"

FRIDAY, 25th

2:10-3:00PM, SURGE 268 — **DIFFERENTIAL GEOMETRY** | Dr. Bun Wong

3:10-4:00PM, SURGE 284 — **COMMUTATIVE ALGEBRA** | Dr. David Rush

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Graduate Student Seminar

Mathew Lee

UC Riverside

"Graph Theory"

Abstract:

After introducing some graph theory terms, we will work through this relatively short and accessible paper. A simple example will reveal why the result cannot be strengthened.

Monday, June 2nd, 2014
Surge 284
1:10 - 2:00 p.m.

Quarter: Spring 2014 Organizer: Dr. Kevin Costello

MATH CLUB

Tuesday, April 22nd, 4:10 - 5:00 p.m.

In Surge 284

Groups in Music Theory

Kenneth Flagg, UC Riverside

Undergrad Student Volunteers:

- Kenneth Flagg

One of the most satisfying things about studying algebra is using algebraic concepts to understand things that do not initially seem mathematical. As an example, group theory has become a key part of the formal mathematical study of music theory. I will give an introduction to groups and their properties, and then describe some of the groups that appear in mathematical music theory.

Snacks and drinks served!

mathdept.ucr.edu/mathclub.html

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Partial Differential Equations & Applied Math

Dr. Ke Shi

Texas A&M

"Hybridizable DG methods for second order PDEs"

Abstract:

In this talk, we will review a recently introduced finite element method: hybridizable Discontinuous Galerkin (HDG) method. We motivate with simple Possion problem to illustrate the main features of the HDG method. Then we show the systematic way of constructing the method for other second order PDEs. Finally, we will discuss the current work of HDG method on multiscale problems.

Thursday, April 24th, 2014

Surge 268

***2:10 - 3:00 p.m.**

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Colloquium

Dr. Dietmar Bisch

Vanderbilt University

"Subfactors with infinite representation theory"

Abstract:

A subfactor has infinite representation theory, or infinite depth, if its standard representation generates infinitely many non-equivalent irreducibles. Such subfactors are hard to construct, and only very few methods are known to explicitly construct examples. I will highlight one such procedure and discuss analytical properties of these subfactors. The talk will be accessible to non-experts.

Thursday, April 24th, 2014

Surge 284

Tea Time: 3:40 p.m. / Talk: 4:10 – 5:00 p.m.

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Graduate Student Seminar

John Dusel

UC Riverside

"Balanced quotients or Normal forms in the D-Weyl group"

Abstract:

After reviewing the word problem for finitely generated groups we exposit a solution to this problem for a special subset of the D-Weyl group. The normal forms afforded by this solution are enumerated by the vertices in an infinite sequence of forest graphs. The only background required for this talk is a working knowledge of group presentations.

Monday, May 12th, 2014
Surge 284
1:10 - 2:00 p.m.

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Partial Differential Equations & Applied Math

Dr. Alejandro Velez-Santiago

UC Riverside

"The p(x)-Laplacian with Wentzell boundary conditions"

Abstract:

We investigate the solvability and regularity theory for a general class of quasi-linear elliptic equations involving the p(x)-Laplace operator, with inhomogeneous Wentzell boundary conditions, on bounded Lipschitz domains. We show existence and uniqueness of weak solutions for the elliptic problem, and moreover, we prove that such solutions area globally Hölder continuous, up to the boundary.

Wednesday, May 14th, 2014

Surge 268

1:10 - 2:00 p.m.

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Graduate Student Seminar

Donna Blanton

UC Riverside

"Root Systems"

Abstract:

A root system is a subset of Euclidean space satisfying certain axioms. Their applications range from classifying simple Lie algebras to the classification of certain types of graphs. In this talk, we will look at examples of root systems, and study the relationship between a simple Lie algebra, and its corresponding root system.

Monday, May 5th, 2014
Surge 284
1:10 - 2:00 p.m.

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Colloquium

Dr. Zhen Lei

Fudan University & IAS

"Global well-posedness of incompressible elastodynamics in 2D"

Abstract:

I will report our recent result on the global wellposedness of classical solutions to system of incompressible elastodynamics in 2D. The system is revealed to be inherently strong linearly degenerate and automatically satisfies a strong null condition, due to the incompressible constraint.

Wednesday, May 7th, 2014

Surge 284

Tea Time: 3:40 p.m. / Talk: 4:10 – 5:00 p.m.

Quarter: Spring 2014 Organizer: Dr. Kevin Costello

MATH CLUB

Tuesday, May 13th, 4:10 - 5:00 p.m.

In Surge 284

Misused Proof Technique Awareness

Nick Lanni, UC Riverside

Undergrad Student Volunteers:

- Kenneth Flagg

Come to Math Club to see the dangers of using the wrong proof technique, as Nick will explore different proof styles on a typical induction exercise.

Snacks and drinks served!

mathdept.ucr.edu/mathclub.html

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Colloquium

Dr. Jason McCullough

Rider University

"Graded Free Resolutions of Ideals: A UCR Story"

Abstract:

Let S be a polynomial ring over a field K. Among the many invariants one can attach to a homogeneous ideal, or its associated projective variety/scheme, is its graded free resolution, from which much geometric information can be derived.

Hilbert's famous Syzygy Theorem gives simple, yet often unhelpful, upper bound on the length of this resolution. An open question by Stillman asks for a more effective upper bound in terms of just the degrees of the minimal homogeneous generators.

I will discuss the current status of this problem along with the contributions of three UCR postdocs, past and present: myself, Bahman Engheta and Paolo Mantero.

I also hope to touch on the ways in which I think mathematics research is changing with the rise of computational tools.

Wednesday, May 14th, 2014

Surge 284

Tea Time: 3:40 p.m. / Talk: 4:10 – 5:00 p.m.

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Graduate Student Seminar

Edward Burkard

Notre Dame

"A Primer on Pseudoholomorpic Curves"

Abstract:

I will begin with an overview of almost complex manifolds and complex manifolds. Next, I will define pseudoholomorphic curves (no one actually calls them that anymore... we usually just call them holomorpic curves these days, or at least J-holomorpic) and I will try to convince you that these are just the usual notion of a holomorpic function in a special case. After that, I will give some basic definitions in symplectic geometry and relations with almost complex structures. Finally, I will state some results in symplectic geometry which are applications of holomorphic curves, one of which can be thought of as a generalization of the Riemann Mapping Theorem.

Monday, May 19th, 2014
Surge 284
1:10 - 2:00 p.m.

Quarter: Spring 2014 Organizer: Dr. Kevin Costello

MATH CLUB

Tuesday, May 20th, 4:10 - 5:00 p.m.

In Surge 284

"From Classical Mechanics to Symplectic Geometry"

Edward Burkard, Notre Dame

Undergrad Student Volunteers:

- Kenneth Flagg

We will start with Newton's equation, and from there, generalize to symplectic geometry. This will eventually require some manifold terminology, but I will keep it as basic as the subject will permit me to. From there, I will talk about a few different fundamental results in the area, as time permits.

Snacks and drinks served!

mathdept.ucr.edu/mathclub.html

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Partial Differential Equations & Applied Math

Dr. Hongyu Liu

University of North Carolina at Charlotte

"Regularized approximate cloaking of acoustic and electromagnetic waves"

Abstract:

In this talk, I will describe the recent progress of our work on regularized transformation-optics cloaking. Ideal cloak makes use of singular metamaterials, posing great difficulties for both theoretical analysis and practical fabrication. Regularizations are incorporated into the construction to avoid the singular structures.

Wednesday, May 21st, 2014
Surge 268
1:10 - 2:00 p.m.

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Differential Geometry

Kaylee Hamann

UC Riverside

"Bergman Geometry on Domains in C^n"

Abstract:

I will present a survey of Bergman geometry, beginning with the construction of the Bergman Kernel and the Bergman metric, followed by an overview of some important known results regarding curvature and properties of the boundary. I will conclude with a few open questions and opportunities for further work.

Friday, May 23rd, 2014
Surge 268
2:10 - 3:00 p.m.

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Partial Differential Equations & Applied Math

Dr. Christian Clason

University of Duisburg-Essen

"A convex analysis approach to hybrid binary–-continuous optimal control problems"

Abstract:

This talk is concerned with infinite-dimensional optimization problems where a distributed function should only take on values from a set of allowed states. This property can be promoted with the aid of a L0-type penalty that is zero on the admissible set and one otherwise. Possible applications include sparse, integer ("multi-bang") and switching control. Although functionals involving such binary terms are non-convex and lack weak lower-semicontinuity, application of Fenchel duality yields a formal primal-dual optimality system that admits a unique solution. This solution is in general only suboptimal, but the optimality gap can be characterized and shown to be zero under appropriate conditions. A regularized semismooth Newton method allows the numerical computation of (sub)optimal solutions. For the case of multi-bang controls, in certain situations it is possible to derive a generalized multi-bang principle, i. e., to prove that the control almost everywhere takes on allowed values except possibly on a singular set. Numerical examples illustrate the effectiveness of the proposed approach.

Friday, May 23rd, 2014

Surge 268

1:10 - 2:00 p.m.

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Differential Geometry

Joshua Strong

UC Riverside

"Curvature and Generalizations of Schwarz's Lemma"

Abstract:

Since Ahlfors's extension of Schwarz's lemma, there have been many new generalizations. Evidently, curvature plays an important role. We will discuss various techniques used in proving a few of these generalizations and some possible future developments.

Friday, May 30th, 2014
Surge 268
2:10 - 3:00 p.m.

Quarter: Spring 2014 Organizer: Dr. Kevin Costello

MATH CLUB

Tuesday, June 3rd, 4:10 - 5:00 p.m.

In Surge 284

Undergrad Student Volunteers:

- Kenneth Flagg

"An Introduction to Projective Geometry with Applications"

Reeve Garrett, former UCR undergrad, now at Ohio State for grad school

Projective geometry is a beautiful and rich subject, but unfortunately, many math majors don't learn about it, or their coverage of it (even in courses for graduate students) is driven by formal definition and without much context. In this talk, we'll explore some of the history and motivation for developing the subject, what it is, and why it's useful. If time permits, we'll also take a look at some applications, particularly to the notion of "blowing up" varieties in algebraic geometry (we'll discuss what varieties are and what blowing up is in this talk). There are no formal prerequisites beyond a good understanding of high school math necessary to understand this talk.

Snacks and drinks served!

mathdept.ucr.edu/mathclub.html

UNIVERSITY OF CALIFORNIA RIVERSIDE

DEPARTMENT OF MATHEMATICS

Partial Differential Equations & Applied Math

Joshua Buli

UC Riverside

"A remark on the multi-domain hybrid method for calculating the power-law decay of the gravitational radiation waveforms with the analytic radiation boundary condition"

Abstract:

In this talk, we will discuss the multi-domain hybrid spectral and finite difference method and its application to numerically evaluate the power law decay of gravitational radiation waveforms. Specifically, we consider the gravitational radiation wave equation with Zerilli potential term and the Schwarzschild black hole system. In addition, the method utilizes the analytic radiation boundary condition, developed by Stephen Lau, to significantly reduce computational complexity, which will also be discussed.

Wednesday, June 4th, 2014

Surge 268

1:10 - 2:00 p.m.