ORAM 4: Abstracts of Contributed Talks
University of Kentucky
8-9 March 2014

1. Nadya Askaripour, University of Cincinnati
   Presentation title: **Characterization of closed sets on non-compact Riemann surfaces**

2. Thomas Bieske, University of South Florida
   Presentation title: **Parabolic Equations in Carnot groups**

3. Geng Chen, Georgia Institute of Technology
   Presentation title: **Well-posedness for variational wave equations**
   Presentation abstract: In this talk, we discuss the recent progress on the well-posedness of variational wave equations. These equations model several physical models, such as nematic liquid crystal. This talk includes joint works with Alberto Bressan, Ping Zhang and Yuxi Zheng.

4. Xiaoyue Ciu, Wayne State University
   Presentation title: **New characterizations of Sobolev space on Heisenberg group**

5. Marcelo Disconzi, Vanderbilt University
   Presentation title: **Slightly compressible fluids in a bounded domain**
   Presentation abstract: We study the problem of inviscid slightly compressible fluids in a bounded domain, whose equations of motion are the compressible Euler equations. We find a unique solution to the initial-boundary value problem, and show that it is near the solution to the equations governing the incompressible motion, i.e., the incompressible Euler equations. Furthermore, we find that solutions to the compressible motion problem in Lagrangian coordinates depend differentiably on their initial data, an unexpected result for non-linear hyperbolic equations. This is a joint work with David. G. Ebin.

6. William Green, Rose-Hulman Institute of Technology
   Presentation title: **Dispersive Estimates with Threshold Resonances**
   Presentation abstract: In this talk we will discuss the effect of threshold resonances on L^∞ bounds on solutions to dispersive PDEs. In particular, we will discuss recent results in the analysis of the Schrodinger and wave equation with potential in four dimensions. This is joint work with Burak Erdogan (University of Illinois and Urbana-Champaign) and Michael Goldberg (University of Cincinnati).

7. Jarod Hart, Wayne State University
   Presentation title: **A Biparameter Tb Theorem with an Application to Holomorphic Extension in C^2**
   Presentation abstract: In this joint work with Alessandro Monguzzi, we prove a new Tb type boundedness criterion for biparameter Calderón-Zygmund operators. We use this Tb theorem to prove L^p bounds for a biparameter Cauchy integral transform defined on certain Lipschitz surfaces in C^2 when $1 < p < \infty$. In this setting, the biparameter Cauchy integral transform plays the role that the biparameter Hilbert transform on the product upper half plane in C^2. Consequently, we prove the following holomorphic extension result for appropriate Lipschitz surfaces $\Gamma \subset C^2$: given $1 < p < \infty$ and an $L^p(\Gamma)$ function g defined on $\Gamma \subset C^2$, we define a function G on C^2 that is holomorphic away from Γ and agrees with g on Γ, in an appropriate limiting sense. Furthermore, $G(w) \to g(z)$ almost everywhere on Γ and in $L^p(\Gamma)$ as $w \in C^2$ approaches $z \in \Gamma$.

8. David Herron, University of Cincinnati
   Presentation title: **Finite distortion mappings with subexponentially integrable distortion**
   Presentation abstract: This is joint work with Albert Clop from Universitat Aut'onoma de Barcelona, Catalonia. We examine mappings of finite distortion whose distortion functions are locally subexponentially integrable. We establish a local modulus of continuity estimate for the inverses of such maps, describe the possible expansion and compression of certain Hausdorff measures and Minkowski contents under such mappings, and exhibit examples that describe the extent to which our results are sharp.

9. Tao Huang, Pennsylvania State University
   Presentation title: **Eulerian Description of Variational Wave Equation and Singularity Formation**

10. Baishun Lai, University of Kentucky
    Presentation title **Regularity of solutions to semilinear fourth order elliptic problems**
    Presentation abstract: We examine the regularity of the extremal solution of the nonlinear eigenvalue problem $\Delta^2 u = \lambda(1-u)^p$ on a general bounded domain Ω in R^N, with Navier boundary condition $u = \Delta u$ on $\partial\Omega$. We first prove the extremal solution is smooth for any $p < -1$ and $N \leq 4$, which completes the result of Guo-Wei [Discrete Contin. Dyn. Syst, 34 (2014)], secondly, if $p = -3, N = 3$, we prove any radial weak solution of this nonlinear eigenvalue problem is smooth in the case $\Omega = B$, which complete the result of Dávila-Flores-Guerra [Math. Ann. 348 (2009)].

11. Shenghao Li, University of Cincinnati
    Presentation title: **Initial boundary value problem for sixth order Boussinesq equation**

12. Xining Li, University of Cincinnati
    Presentation title: **Preservation of the bounded geometry under sphericalization**
    Presentation abstract: In the talk, we will introduce the concepts of sphericalization on a complete metric measure space, Ahlfors regular measure, and doubling measure. The idea of preservation of Ahlfors regular and doubling properties under sphericalization will be explained. At the end, we will introduce the Poincaré Inequality and investigate the motivation of the preservation of Poincaré Inequality under sphericalization.

13. Junyu Lin, University of Kentucky
    Presentation title: **Global well-posedness of Landau-Lifshitz-Gilbert equation for initial data in Morrey space**
    Presentation abstract: I will talk about our recent result on global well-posedness of the Landau-Lifshitz-Gilbert equation in R^n with initial data in Morrey space. The method is based on priori estimates of a dissipative Schrodinger equation of Ginzburg-Landau types obtained from the Landau-Lifshitz-Gilbert equation by the moving frame technique. This is a joint work with Prof. Changyou Wang and Baishun Lai.

14. Michael Music, University of Kentucky
    Presentation title: **The nonlinear Fourier transform for two-dimensional subcritical potentials**
    Presentation abstract: We study the inverse scattering method for the Novikov-Veselov equation for a larger class of Schrödinger potentials than could be handled previously. Previous work concerns so-called conductivity type potentials, which have a bounded positive solution at zero energy and are a nowhere dense set of potentials. We relax this assumption to include logarithmically growing positive solutions at zero energy. These potentials are stable under perturbations. For this sufficiently smooth data of this type, we prove that the associated scattering transform can be inverted, and the original potential is recovered from the scattering data.

15. Guanying Peng, Purdue University
    Presentation title: **Analysis of energy minimizers of the Lawrence-Doniach model in perpendicular magnetic fields**
    Presentation abstract: We analyze minimizers of the Lawrence-Doniach energy for layered superconductors occupying a bounded generalized cylinder. For an applied magnetic field in the intermediate regime that is perpendicular to the layers, we prove an asymptotic formula for the minimum Lawrence-Doniach energy as the reciprocal of the Ginzburg-Landau parameter and the interlayer distance tend to zero. Under an appropriate assumption on the relationship between these two parameters, we establish comparison results between the minimum Lawrence-Doniach energy and the minimum 3D anisotropic Ginzburg-Landau energy. This is joint work with Patricia Bauman.

16. Yuanzhen Shao, Vanderbilt University
    Presentation title: **Analyticity of Solutions to the Yamabe Flow on Non-compact Manifolds**
    Presentation abstract: The Yamabe flow can be considered as an alternative approach to the famous Yamabe problem. Nowadays there is increasing interest in studying the Yamabe flow on non-compact manifolds. We show by means of continuous maximal regularity theory and the implicit function theorem that in every conformal class containing at least one real analytic metric, solutions to the Yamabe flow immediately become analytic jointly in time and space. In comparison with the existing results, we do not ask for a uniform bound on the curvatures of the initial metric.

17. David Smith, University of Cincinnati
    Presentation title: **Well-posedness and spectral representation of linear initial-boundary value problems**
    Presentation abstract: We study initial-boundary value problems for linear constant-coefficient evolution equations on a finite 1-space, 1-time domain. Classical separation of variables and Fourier transform methods fail for all problems except those of second order or those with very special boundary conditions whereas the method of Fokas solves any such well-posed problem. We describe the well-posedness criteria and provide a functional-analytic view of the failure of classical methods and the success of Fokas' method.

18. Yayuan Xiao, Ball State University
    Presentation title: **Multi-parameter Hardy spaces**

19. Cheng Yu, University of Texas, Austin
    Presentation title: **Existence of global weak solutions to the compressible Navier-Stokes equations with density dependent viscosity**
    Presentation abstract: In this talk, I will report the recent work on the existence of global weak solutions of the isentropic compressible Navier-Stokes equations with density dependent coefficients vanishing on vacuum. This is a joint work with Alexis F. Vasseur.

20. Jiuyi Zhu, Johns Hopkins University
    Presentation title: **Quantitative uniqueness of elliptic equations**
    Presentation abstract: Based on a variant of frequency function, we improve the vanishing order of solutions for Schrodinger equations which describes quantitative behavior of strong uniqueness continuation property. For the first time, we investigate the quantitative uniqueness of higher order elliptic equations and show the vanishing order of solutions. Furthermore, strong unique continuation is established for higher order elliptic equations using this variant of frequency function.