Titles and Abstracts

1. Volker Branding, Technical University of Vienna
   Title: The Full Supersymmetric Nonlinear Sigma Model as a Geometric Variational Problem
   Abstract: We will study the functional of the full supersymmetric nonlinear sigma model from the point of view of differential geometry and global analysis. This study was initiated by Chen et al. leading to the notion of Dirac-harmonic maps. The latter couple the equation for harmonic maps to spinor fields. For a two-dimensional domain Dirac-harmonic maps belong to the class of conformal invariant variational problems yielding a rich structure.
   In the talk we will consider the full supersymmetric nonlinear sigma model and study its critical points. In particular, we will discuss their geometric and analytic properties and their relation to known variational problems in differential geometry

2. Hua Chen, Wuhan University
   Title: Lower bounds of Dirichlet eigenvalues for some degenerate elliptic operators
   Abstract: Let Ω be a bounded open domain in $\mathbb{R}^n$ with smooth boundary and $X = (X_1, X_2, \cdots, X_m)$ be a system of real smooth vector fields defined on Ω with the boundary $\partial\Omega$ which is non-characteristic for X. If X satisfies the Hőrmander condition, then the vector fields is finite degenerate and the sum of square operator $\Delta x = \sum_{j=1}^{m} X_j^2$ is a finitely degenerate elliptic operator, otherwise the operator $-\Delta x$ is called infinitely degenerate. If λ_j is the jth Dirichlet eigenvalue for $-\Delta x$ on Ω, then this paper shall study the lower bound estimates for λ_j. Firstly, by using the sub-elliptic estimate directly, we shall give a simple lower bound estimates of λ_j for general finitely degenerate Δx which is polynomial increasing in j. Secondly, if Δx is so-called Grushin type degenerate elliptic operator, then we can give a precise lower bound estimates for λ_j. Finally, by using logarithmic regularity estimate, for indefinitely degenerate elliptic operator Δx we prove that the lower bound estimates of λ_j will be logarithmic increasing in j.

3. Qi Ding, Fudan University
   Title: Some Results on Minimal Cones via Mean Curvature Flows
   Abstract: In this talk, we shall talk about perturbation and density of minimal cones by mean curvature flow in Euclidean space. We affirm the existence for perturbation of embedded minimal hypercones by smooth embedded hypersurfaces of positive mean curvature proposed by Lawson, and negate the existence of minimal foliations on only one side of minimal (not minimizing) hypercones posed by Hardt. Our method comes from existence and uniqueness of self-expanding solutions of mean curvature flow.
   On the other hand, we show that the density of a topologically nontrivial minimal but not area-minimizing hypercone with an isolated singularity must be greater than $\sqrt{2}$, which yields an affirmative answer of an open problem raised by

Ilmanen-White. Here, $\sqrt{2}$ is the best possible constant independent of dimension for minimal cones.

4. Huijun Fan, Peking University
   Title: Floer Theory of Landau –Ginzburg Model
   Abstract: In this report, I will give the definition of the Floer homology of Laudau-Ginzburg model with a superpotential function W. This is originated from the study of the moduli problem of Witten equation with Lefschetz boundary condition. By mild assumption of W, one can obtain the C^0 estimate of the solutions. By perturbing the Kaehler potential associated to the Kaehler class, we can get the transversality of the Lefschetz thimbles of W, which implies the Fredholm property of the Witten map. As in Lagrangian intersection homology theory of Cauchy-Riemann operator, the Maslov index is used to give a grading of the Floer LG homology. The orientation is simple here and then it is routine to get the definition of this homology theory. This Floer LG homology and the corresponding Category theory may have important application in recent work of open string theory of LG model. This is a joint work with Wenfeng Jiang.

5. Andreas Savas-Halilaj, University of Hannover, Germany
   Title: Translating Solitons of the Mean
   Abstract: We obtain various classi_cation results and topological obstructions for the existence of translating solitons of the mean curvature flow in euclidean space. This is joint work with Francisco Martin (Granada) and Knut Smoczyk (Hannover).

6. Jiaxing Hong, Fudan University
   Title: On degenerate elliptic Monge-Ampere equations and its applications
   Abstract: In this talk two kinds of boundary estimates for degenerate elliptic Monge-Ampere equations arising from study of isometric embeddings in Differential Geometry, will be introduced. As far as the classification of boundary degeneracy be concerned, one is non-characteristic degenerate and another is characteristic degenerate. The corresponding linearized operator is Tricomi type and Keldys type respectively. Their behaviors are quite different. By establishing a priori estimates for such two modeling boundary value problems we can derive the regularity of solutions to the relevant degenerate elliptic Monge-Ampere equations. Finally, some applications to the compactness of Alexandroff-Nirenberg surfaces are presented.

7. Bobo Hua, Fudan University
   Title: Harmonic Functions on Graphs
   Abstract: In this talk, we will talk about the (discrete) harmonic function theory on graphs. In particular, some results on polynomial growth harmonic functions will be discussed.

8. Ernst Kuwert, Freiburg University, Germany

Title: Minimization Problems for the Willmore functional
Abstract: We review some minimization problems for the Willmore functional. This includes an isoperimetric constraint and surfaces in Riemannian manifolds. We also discuss a free boundary condition.

9. Weixi Li, Wuhan University,
Title: Gevrey Class Smoothing Effect for the Prandtl Equation
Abstract: In this talk we give Gevrey smoothing effects of the Caucy problem for Prandtl boundary layer equation. It is a degenerate parabolic type equation. Under the Oleiniks monotonicity assumption, we prove that any local solution in Sobolev space is belong to some Gevrey class with respect to tangential variables at positive time.

10. Stephan Luckhaus, University of Leipzig, Germany
Title: TBA
Abstract: TBA

11. Chunlai Mu, Chongqing University
Title: Global dynamics in a two-dimensional chemotaxis system with logistic source
Abstract: In this talk, we consider a fully parabolic chemotaxis system with homogeneous Neumann boundary conditions in an arbitrary smooth bounded domain. It is shown that for any initial data there exists a global bounded classical solution. Moreover, under some assumptions on initial data it is proved that the solution of the system approaches the steady state as time tends to infinity.

12. Shuangjie Peng, Central China Normal University
Title: Existence, Local Uniqueness and Periodicity for Polyharmonic Equations with Critical Growth
Abstract: In this talk, we talk about the following poly-harmonic equations with critical exponents

$$(-\Delta)^m u = K(y) u^{\frac{N+2m}{N-2m}}, \quad u > 0, \quad \text{in } R^N,$$

where $N > 2m + 2$, $m \in N+$, K is positive and periodic in first k variables $(x1,x2,...,xk), 1 \leq k < \frac{N-2m}{2}$. Under some conditions on K near its critical point, we prove not only that this problem admits solutions with infinitely many bubbles, but also the bubbling solutions obtained in our existence result are locally unique. This local uniqueness result implies that some bubbling solutions preserve the symmetry of the scalar curvature $K(y)$.
This is based on a joint work with Professors Yuxia Guo and Shusen Yan.

13. Changzheng Qu, University of Ningbo
Title: A Hyperbolic-Type Affine Invariant Curve Flow

Abstract: In this talk, a new hyperbolic version of affine geometric flow is proposed, which is a family of plane curve flows whose acceleration is constant along affine normal direction. The equations satisfied by the graph and support function of the curve under this flow give rise to fully nonlinear hyperbolic equations. By reducing the flow to a single nonlinear hyperbolic equation, we prove the existence for local solutions of the flow. Global existence is established by a method due to LeFloch-Smoczyk for studying the hyperbolic mean curvature flow. Based on the equations for both perimeter and area of closed curves under this flow, we show that for a closed curve, the solution of Cauchy problem of this flow blows up in finite time. Furthermore, some group-invariant solutions to this flow are also discussed.

14. Bert-Wolfgang Schulze, University of Potsdam, Germany
    Title: Operators on Manifolds with Higher Corners
    Abstract: Manifolds with higher corners are specific stratified spaces, intuitively obtained by repeatedly forming cones and wedges, together with globalizations. We consider here the case of geometric" regular singularities. Elliptic operators on such configurations appear in numerous applications, such as material sciences, crack mechanics, elasticity, or many particle systems. Parametrices exist when the components of principal symbolic hierarchies are bijective. Involved operator-valued symbols require understanding large classes of such operators at the same time and in reasonable generality. We outline essential elements of the analysis of such operators on corner manifolds. In particular we illustrate on how the operators acquire their principal symbolic hierarchies from the strata. It is a particularly satisfying aspect that standard pseudo-differential scenarios for solving elliptic boundary value problems belong to the special cases, where a manifold with smooth boundary is regarded as a manifold with edge, and the two-component symbolic hierarchy consists of interior and boundary symbols. Examples of higher singularities appear when the boundaries themselves have conical points, edges, or corners.

15. Knut Smoczyk, Leibniz University at Hannover
    Title: Isotopies of Maps by Mean Curvature Flow
    Abstract: (Joint work with Andreas Savas-Halilaj). We deform the graph of a map between Riemannian manifolds by its mean curvature and show optimal long time existence and convergence results in the case of length and area decreasing maps.

16. Chunpeng Wang, Jilin University
    Title: Smooth Transonic Flows in De Laval Nozzles
    Abstract: This talk concerns smooth transonic flows of Meyer type in de Laval nozzles, which are governed by an equation of mixed type with degeneracy and singularity at the sonic state. First we study the properties of sonic curves. For any C^2 transonic flow of Meyer type, the set of exceptional points is shown to be a closed line segment (may be empty or only one point). Furthermore, it is proved that a flow with nonexceptional points is unstable for a C^1 small perturbation in the

shape of the nozzle. Then we seek smooth transonic flows of Meyer type which satisfy physical boundary conditions and whose sonic points are exceptional. For such a flow, its sonic curve must be located at the throat of the nozzle and it is strongly singular in the sense that the sonic curve is a characteristic degenerate boundary in the subsonic-sonic region, while in the sonic-supersonic region all characteristics from sonic points coincide, which are the sonic curve and never approach the supersonic region. It is proved that there exists uniquely such a smooth transonic flow near the throat of the nozzle, whose acceleration is Lipschitz continuous, if the wall of the nozzle is sufficiently flat. The global extension of this local smooth transonic flow is also studied. The works are jointed with Professor Zhouping Xin.

17. Guofang Wang, University of Friburg, Germany
Title: Gauss-Bonnet-Chern mass
Abstract: In this talk I will talk about the Gauss-Bonnet-Chern mass and its related problems. This is joint work with Yuxin Ge and Jie Wu, and also with Chao Xia.

18. Yaguang Wang, Shanghai Jiao Tong University
Title: on Stability of boundary Layers
Abstract: In this talk, we shall study the stability of the Prandtl boundary layer equations in three space variables. First, we obtain a well-posedness result of the three-dimensional Prandtl equations under some constraint on its flow structure. It reveals that the classical Burgers equation plays an important role in determining this type of flow with special structure, that avoids the appearance of the complicated secondary flow in the three-dimensional Prandtl boundary layers. Second, we give an instability criterion for the Prandtl equations in three space variables. Both of linear and nonlinear stability are considered. This criterion shows that the monotonic shear flow is linearly stable for the three dimensional Prandtl equations if and only if the tangential velocity field direction is invariant with respect to the normal variable, which is an exact complement to the above well-posedness result for a special flow. This is a joint work with Chengjie Liu and Tong Yang.

19. Ling Yang, Fudan University
Title: Bernstein type theorems for spacelike stationary graphs in Minkowski spaces
Abstract: We establish several Berntein type theorems for entire spacelike stationary 2-dimensional graphs in Minkowski spaces, under the conditions on the W-function or the total curvature. These conclusions imply the classical Bernstein theorem for minimal surfaces in 3-dimensional Euclidean space and Calabi's theorem for spacelike maximal surfaces in 3-dimensional Minkowski space.

20. Xiaozhou Yang, Wuhan Institute of Physics and Mathematics, China Academy of Sciences
Title: Global Solutions and Evolution of Structure in Multi-dimensional

Conservation Laws

Abstract: In this talk, we will present results on global solutions of multi-dimensional conservation laws and relating applications in study of evolution of multi-dimensional structures.

21. Yihu Yang, Shanghai Jiaotong University

Title: Harmonic maps and singularities of period mappings

Abstract: We use simple methods from harmonic maps to investigate singularities of period mappings at infinity. More precisely, we derive a harmonic map version of Schmid's nilpotent orbit theorem. This is a joint work with J. Jost and K. Zuo.

22. Rugang Ye, University of California, Santa Barbara, USA

Title: TBA

Abstract: TBA

23. Ting Zhang, Zhejiang University

Title: Global Existence and Uniqueness Theorem to 2-D Incompressible Non-Resistive MHD System with Linearly Growing Velocity

Abstract: In this talk, we consider the following 2D incompressible viscous and non-resistive magnetohydrodynamics (MHD) system

$$\begin{cases} \partial_t b + v \cdot \nabla b = b \cdot \nabla v, & (t, x) \in \mathbb{R}^+ \times \mathbb{R}^2, \\ \partial_t v + v \cdot \nabla v - \nu \Delta v + \nabla p = -\frac{1}{2} \nabla(|b|^2) + b \cdot \nabla b, \\ \mathrm{div} v = \mathrm{div} b = 0, \\ (b, v)|_{t=0} = (b_0, v_0). \end{cases}$$

Here, we consider the global existence and uniqueness of the solution which close to the particular solution

$$\bar{b} = (1 + m(t))(1, 0)^\top, \ \bar{v} = \frac{m'}{1+m} Mx, \ M = diag\{1, -1\}.$$

24. Huijiang Zhao, Wuhan University

Title: The Vlasov-Maxwell-Boltzmann System near Maxwellians for Cutoff Potentials

Abstract: This talk is concerned with the construction of global smooth small-amplitude solutions to the Vlasov-Maxwell-Boltzmann system near Maxwellians for the whole range of cutoff intermolecular interactions. It is based on a recent work joint with Dr. Renjun Duan of the Chinese University of Hong Kong, Dr. Yuanjie Lei of Wuhan University, and Prof. Tong Yang of City University of Hong Kong.

25. Chunqin Zhou, Shanghai Jiaotong University

Title: A local estimate for super-Liouville equations on closed Riemann surfaces

Abstract: In this talk, we will consider the super-Liouville equations, a variational problem motivated by the supersymmetric extension of the Liouville functional in quantum field theory. We study the profile of blow-up solutions near the blow up point and establish a local estimate for the bubbling sequences. This is a joint work

with Juregen Jost and Miaomiao Zhu.

26. Miaomiao Zhu, Max Planck Institute for Mathematics in the Sciences, Germany
Title: Interior and boundary regularity for certain critical elliptic systems and applications
Abstract: In the past few years there have been some new techniquesdeveloped for the interior and boundary regularity theory of certain critical elliptic systems. In this talk, we shall discuss some progress in this direction and show some applications to harmonic maps into certain pseudo-Riemannian manifolds as well as (Dirac-) harmonic maps into compact Riemannian manifolds.