New developments in Kobayashi–Hitchin correspondence and Higgs bundles 2

15-19 June 2026

1 Schedule

	Monday	**Tuesday**	**Wednesday**
9:30-10:30	Garcia-Prada	Wentworth	Heller
10:50-11:50	Ono	Inaba	Hiroe
Lunch			
14:00-15:00	Mochizuki	Lafuente	Fujino
15:20-16:00 (student session)	Gomes	Jinnouchi	Sasaki
16:30-17:30	Murakami	Datar	Logares

	Thursday	**Friday**
9:30-10:10 (student session)	Hada	Yae
10:30-11:30	Yang	Hurtubise
Afternoon	Free discussion	

Banquet: 18:00 on Wednesday 17th, at Restaurant Metasequoia
`https://tabelog.com/en/osaka/A2701/A270404/27101312/`

2 Titles and abstracts

Speaker: Oscar Garcia-Prada (ICMAT, Madrid)

Title: Universal Hitchin moduli spaces

Abstract: We study metric aspects of the universal moduli space of solutions to Hitchin's equations as the complex structure varies over the Teichmüller space of a closed surface. Applying symplectic reduction, we construct two classes of moduli spaces, namely a universal moduli space of solutions to Hitchin's equations over the moduli space of constant scalar curvature Kähler metrics, and a universal moduli space of harmonic flat connections over the Teichmüller space. We show that these spaces carry structures of pseudo-Kähler fibrations with connection. Our approach is gauge theoretical and builds on the theory of Khler fibrations and Donaldson-Fujiki's moment map interpretation of constant scalar curvature

Kähler metrics. Joint work with Luis Álvarez-Cónsul, Mario Garcia-Fernandez, and Samuel Trautwein (arXiv:2512.07553).

Speaker: Takashi Ono (RIMS Kyoto University)

Title: Manton's exotic vortex equation

Abstract: The vortex equation is a second-order PDE on a Riemann surface, defined in terms of a triple consisting of a holomorphic line bundle, a section, and a Hermitian metric. Its solutions are closely related to Hermitian–Einstein metrics and to geometric structures such as metrics with conical singularities.

In https://arxiv.org/abs/1612.06710, Manton introduced several generalizations of the vortex equation, leading to five distinct types of vortex equations, which we refer to as Mantons exotic vortex equations.

In this talk, I will introduce these equations and discuss the existence of their solutions. If time permits, I will also explain how these solutions can be obtained via dimensional reduction of a solution of Hermitian–Einstein equation.

Speaker: Takuro Mochizuki (RIMS Kyoto University)

Title: Boundedness of meromorphic flat bundles with bounded irregularity

Abstract: Boundedness is an important notion in algebraic geometry. Roughly speaking, we call a family of objects bounded if it is a part of a bigger family algebraically parameterized by a variety. It is much weaker than the representability of the moduli space. However, for an algebraic operation, we may divide a bounded family into finite subfamilies, and members in each family behave similarly with respect to the operation. In this sense, bounded families are well controlled.

In this talk, we shall discuss the boundedness of meromorphic flat bundles with bounded irregularity. By non-abelian Hodge theory, we may attach a meromorphic Lagrangian cover to a meromorphic flat bundle, which plays an important role in our discussion.

Speaker: Lucas H. S. Gomes (The University of Osaka)

Title: Kobayashi-Hitchin correspondence on equivariant bundles and basic bundles

Abstract: For foliated manifolds, a transverse version of the Kobayashi-Hitchin correspondence was introduced by Baraglia and Hekmati, who in particular showed that it holds for any compact Sasakian manifold. In this talk, we introduce a G-equivariant version of the Kobayashi-Hitchin correspondence for non-Khler manifolds and a connected non-compact Lie group G. We then discuss its equivalence with the transverse correspondence when the action of G defines a suitable foliation on the manifold. As an application, we show that a $\mathbb{C}$-equivariant Kobayashi-Hitchin correspondence holds for Vaisman manifolds, and explain how the transverse correspondence for compact Sasakian manifolds can be recovered from this equivalence. This is a joint work with Hisashi Kasuya and Takashi Ono.

Speaker: Rei Murakami (Osaka Metropolitan University)

Title: An analytic proof of Griffiths' conjecture on compact Riemann surfaces

Abstract: Griffiths conjecture asserts that the ampleness of a holomorphic vector bundle is equivalent to the existence of a Hermitian metric with Griffiths positive curvature. In the case of line bundles, this follows from Kodairas embedding theorem. The conjecture is also known to hold on compact Riemann surfaces. Recently, J.-P. Demailly proposed a new analytic approach based on a coupled system of Monge-Ampre type and Hermitian-Einstein type equations. In this talk, we present an analytic proof of the one-dimensional case of Griffiths conjecture using this method. A key ingredient is a UhlenbeckYau type blow-up argument in the spirit of the Kobayashi-Hitchin correspondence.

Speaker: Richard Wentworth (University of Maryland)

Title: Kaehler structures on the joint moduli of Higgs bundles

Abstract: I will discuss how a twisted complex structure on the joint moduli space of Higgs bundles gives rise to a Kaehler metric on a dense open set. This leads to mapping class group invariant Kaehler structures on all rank 2 higher Teichmueller spaces, with the Kaehler form given by the Atiyah-Bott-Goldman form.

Speaker: Michi-aki Inaba (Nara Women's University)

Title: Global algebraic functions on the moduli space of logarithmic parabolic connections

Abstract: The moduli space of logarithmic parabolic connections on a smooth projective curve is constructed as an algebraic variety. We will see that the transcendence degree of the ring of global algebraic functions on this moduli space is less than or equal to that on a Hitchin moduli space. As a consequence, the Riemann-Hilbert map from this moduli space to a character variety is not algebraic, while it is biholomorphic. This talk is based on the paper "Moduli spaces of framed logarithmic and parabolic connections on a Riemann surface" by Indranil Biswas, Michi-aki Inaba, Arata Komyo and Masa-Hiko Saito.

Speaker: Ramiro Lafuente (The University of Queensland)

Title: Expanding Ricci solitons and Higgs bundles

Abstract: In this talk, I will describe new families, depending on arbitrarily many parameters, of complete expanding Ricci solitons (including Einstein metrics) in dimensions 4 and above. The construction uses a dimension-reduction argument to the so-called harmonic-Einstein equations inspired by work of Lott, and a link between solutions to the latter and certain G-Higgs bundles with vanishing Hopf differential. This is joint work with Adam Thompson.

Speaker: Satoshi Jinnouchi (The University of Osaka)

Title: The Kobayashi–Hitchin correspondence for nef and big classes

Abstract: In this talk, I present a generalization of the Kobayashi–Hitchin correspondence to nef and big classes.

Classically, the correspondence states that a holomorphic vector bundle E over a compact Kähler manifold X is slope polystable with respect to a Kähler class ω if and only if E admits an ω-Hermitian–Yang–Mills metric.

Our generalization allows one to treat a broader class of singular, not necessarily positive definite, Kähler metrics, including orbifold metrics and singular Kähler–Einstein metrics on klt varieties. As an application, we also establish a result on the equality case of the Bogomolov–Gieseker inequality with respect to nef and big classes.

Speaker: Ved Datar (Indian Institute of Science)

Title: On Yau's uniformization conjecture

Abstract: A classical result, going back to the work of Cohn-Vossen and Huber, states that a non-compact Riemann surface which admits a complete conformal metric with positive Gauss curvature, is biholomorphic to the complex plane. Yau's uniformization conjecture is a vast generalization of this result to higher dimensions and is one of the outstanding open problems in complex geometry. The conjecture asserts that any complete, non-compact Kähler manifold with positive holomorphic bisectional curvature is biholomorphic to the standard complex Euclidean space. A weaker form of the conjecture has the same conclusion under positive (Riemannian) sectional curvature. In this talk, I will speak about our recent resolution of weaker form of Yau's conjecture for Kähler surfaces. This seems the first general result which does not require any additional hypothesis on the asymptotic geometry. Our main new idea is the use of complex Monge–Ampère equations in constructing weight functions that are in turn used to construct holomorphic functions and in proving fininteness results. This is joint work with Vamsi Pingali and Harish Seshadri.

Speaker: Lynn Heller (BIMSA)

Title: TBA

Abstract: TBA

Speaker: Kazuki Hiroe (Chiba University)

Title: Unfolding of irregular singularities and deformation of moduli spaces

Abstract: The Kummer confluent hypergeometric equation is known to be obtained from the Gauss hypergeometric equation through the confluence of singularities. This motivates the following question:

Can every differential equation with irregular singularities be realized as a confluence of a Fuchsian differential equation?

We investigate this by considering a deformation of the moduli space of meromorphic connections with unramified irregular singularities on a compact Riemann surface. We prove that for genus=0, there exists a deformation where the generic fiber is the moduli space of Fuchsian connections. Furthermore, we discuss a Betti analogue: any wild character variety is birationally and symplectically equivalent to a (non-wild) character variety.

This talk is based on joint work with Daisuke Yamakawa and ongoing work with Michi-aki Inaba.

Speaker: Osamu Fujino (Kyoto University)

Title: Notes on acceptable bundles

Abstract: The notion of acceptable bundles plays a fundamental role in the Simpson–Mochizuki theory. We revisit their basic properties from a slightly different point of view. In this talk, I will explain this approach. This is joint work with T. Fujisawa and T. Ono.

Speaker: Jun Sasaki (Institute of Science Tokyo)

Title: The moduli space of Higgs pairs

Abstract: Let E be a smooth complex vector bundle over a compact Riemann surface. A Higgs pair (D'', s) consists of a structure of Higgs bundle D'' in E and a smooth section s of E satisfying $D''s = 0$. Higgs pairs can be considered as a generalization of holomorphic pairs and one can define the notion of τ-stability for Higgs pairs, depending on a real number τ.

The notion of a Higgs pair was introduced by Mehta in 2003. He proved that a certain open subset of the moduli space $\mathscr{M}$ of τ-stable Higgs pairs is non-singular. In this talk, we prove that for a suitable choice τ, the entire moduli space $\mathscr{M}$ is non-singular. Moreover, under assumptions that $\mathrm{rank} E = 2$ and $\deg E$ is odd, we determine the Betti numbers of $\mathscr{M}$.

Speaker: Marina Logares (Universidad Complutense de Madrid)

Title: Irregular Parabolic Hitchin systems

Abstract: In this talk I will discuss Hitchin systems associated with moduli spaces of irregular parabolic Higgs bundles on a smooth complex projective curve. These moduli spaces carry natural holomorphic Poisson structures, whose symplectic leaves are determined by fixing suitable orbit data at the marked points. I will describe the corresponding Hitchin map, the

associated spectral curves, and the relation between the fibres of the Hitchin fibration and the Picard varieties of the spectral curves in the regular semisimple locus.

I will also explain the role of framed irregular parabolic Higgs bundles, where the geometry becomes more explicit, and compare the framed and unframed pictures. The aim is to show how the classical Hitchin-system framework extends to this irregular parabolic setting, and to identify the conditions under which the restriction of the Hitchin map to a symplectic leaf gives an algebraically completely integrable system.

Speaker: Yohei Hada (Kyoto University)

Title: Optimal algebraic tangent cones of torsion-free sheaves via valuations

Abstract: Motivated by the Chen–Sun description of analytic tangent cones of Hermitian–Yang–Mills connections, we develop a valuation-theoretic framework for algebraic tangent cones of torsion-free sheaves. Replacing the blow-up valuation, which corresponds to the local behaviour of smooth Kähler metrics, by finitely generated valuations, we construct degenerations via Rees algebras and introduce a slope stability theory for the associated graded modules. We define an instability functional and prove the existence of an optimal degeneration for quasi-regular valuations. Moreover, we show that its Harder–Narasimhan graded object is uniquely determined up to grading twists.

Speaker: Mengxue Yang (Kavli IPMU, The University of Tokyo)

Title: A stacky Cayley correspondence and its application

Abstract: This talk shows a stacky generalization of the classical Cayley correspondence for Higgs bundles via Gaiottos Lagrangian stacks. We show that the resulting stacky Cayley morphism is an open and universally closed embedding. We explore some implications for the Dolbeault geometric Langlands program by computing the S-dual of the associated complex Lagrangian branes. Specifically, we demonstrate that the Cayley BAA-brane dualizes to a BBB-brane supported on the Hitchin stack of the spherical dual group, verifying this explicitly for quasi-split cases through the invariant geometry of cameral curves.

Speaker: Arya Yae (University of Oregon)

Title: Metric Convergence from Parabolic Higgs Bundle Moduli Spaces to Hyperpolygon Spaces

Abstract: The moduli spaces of parabolic Higgs bundles on a Riemann sphere with n marked points are hyperkähler manifolds with rich geometric structure, having close ties to character varieties, integrable systems, and Teichmüller spaces. Points in the moduli space correspond to solutions to Hitchin's equations, which arise via dimensional reduction of the Yang-Mills equations.

We show that under a fine-tuned degeneration of the moduli parameters, the hyperkähler metric on the moduli space converges pointwise to that of an embedded Nakajima quiver variety called hyperpolygon space. Of particular interest is the $n = 4$ case, where the Hitchin moduli space is a ALG-D_4 gravitational instanton and the hyperpolygon space is an ALE-D_4 gravitational instanton. The proof uses a construction of model solutions to Hitchin's equations near the marked points, a delicate gluing procedure, and an application of the analytic implicit function theorem in the degenerate limit to perturb the approximate solution to an actual solution. This talk is based on joint work with Laura Fredrickson.

Speaker: Jacques Hurtubise (McGill University)

Title: Quasi-monopoles

Abstract: It has been understood for a while that the end of the moduli space of charge k SU(2) monopoles in $\mathbb{R}^3$ decomposes into regions where one has a glueing of monopoles of charges $k_1, .., k_s$; i.e a picture of well separated particles. This approximation is rather rough, in that comparing the metrics only gives an approximation to order $1/R$, where R is the separation parameter. Any further improvement requires some form of interaction between the particles. We define spaces of quasi-monopoles, with a separate spectral curve for each charge, and an interaction through their intersection divisors. The spaces of these quasi-monopoles are hyperkahler, and approximates the monopole metric to order e^{-cR}. They also have torus actions, which allow a way of finalising Segal-Selbys proof of the Sen conjecture in the coprime case. (w. R. Bielawski and S. Cherkis)

3 Support

- Osaka Central Advanced Mathematical Institute (MEXT Promotion of Distinctive Joint Research Center Program JPMXP0723833165 and Osaka Metropolitan University Strategic Research Promotion Project: Development of International Research Hubs).
- JSPS KAKENHI (Grant-in-Aid for Scientific Research (B)), 2024-2029, Grant Number JP24K00524.
- JSPS KAKENHI (Grant-in-Aid for Scientific Research (C)), 2023-2027, Grant Number JP23K03120.
- NSF FRG Award DMS- 2152107.
- NSF CAREER Award DMS 1749013.

4 Organisers

- Yoshinori Hashimoto (Osaka Metropolitan University)
- Hisashi Kasuya (Nagoya University)
- Laura Schaposnik (University of Illinois at Chicago)