



2024 BICMR-IBSCGP

Conference on Gromov-Witten Theory and Related Topics

August 26-30, 2024

Organizers

- | Xiaobo Liu (Peking University)
- | Yong-Geun Oh (IBS Center for Geometry and Physics & POSTECH)
- | Gang Tian (Peking University)
- | Alexander Aleksandrov (IBS Center for Geometry and Physics)

Invited Speakers

- | Alexander Aleksandrov (IBS Center for Geometry and Physics)
- | Bohan Fang (Peking University)
- | Honghui Fang (Peking University)
- | Shuai Guo (Peking University)
- | Jianxun Hu (Sun Yat-Sen University)
- | Kai Hugtenberg (Lancaster University)
- | Eleny Ionel (Stanford University)
- | Hiroshi Iritani (Kyoto University)
- | Young-Hoon Kiem (Korea Institute for Advanced Study)
- | Sukjoo Lee (The University of Edinburgh)
- | Yuan-Pin Lee (Academia Sinica and University of Utah)
- | Changzheng Li (Sun Yat-Sen University)
- | Jeongseok Oh (Seoul National University)
- | Chongyu Wang (Pecking University)
- | Jian Zhou (Tsinghua University)

Registration

Before July 31st, 2024
<https://cgp.ibs.re.kr/activities/registration/358>

Contact

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For administrative inquiries, please contact :
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Venue Azaria Hall, Uni Hotel Jeju, Jeju Island, South Korea

Webpage <https://cgp.ibs.re.kr/conferences/2024BICMRIBSCGP/>



Abstracts

Monday, August 26

Time	Speaker	Title & Abstract
10:00 – 10:50	Jeongseok Oh (Seoul National University)	Complex Kuranishi structures We develop a theory of complex Kuranishi structures on projective schemes. These are sufficiently rigid to be equivalent to weak perfect obstruction theories, but sufficiently flexible to admit global complex Kuranishi charts. We apply the theory to projective moduli spaces M of stable sheaves on Calabi-Yau 4-folds. Using real derived differential geometry, Borisov- Joyce produced a virtual homology cycle on M . In the prequel work we constructed an algebraic virtual cycle on M . We prove the cycles coincide in homology after inverting 2 in the coefficients. In particular, when Borisov-Joyce's real virtual dimension is odd, their virtual cycle is torsion. This is a joint work with Richard Thomas.
11:10 – 12:00	Jian Zhou (Tsinghua University)	TBA
14:00 – 14:50	Yuan-Pin Lee (Academia Sinica and University of Utah)	Quantum K-theory Quantum K-theory is a K-theoretic version of the (cohomological) Gromov-Witten theory. In this talk, I will present some thoughts on quantum K-theory, including some old results and some new ones.

Abstracts

Tuesday, August 27

Time	Speaker	Title & Abstract
10:00 – 10:50	Changzheng Li (Sun Yat-Sen University)	<p>Mirror symmetry for certain blowup of Grassmannians</p> <p>In this talk, we will discuss the Fano property of the blowup of a complex Grassmannian $Gr(k, n)$ along a sub-Grassmannian $Gr(r, m)$. We will study the quantum cohomology when $(r, m)=(k, n-1)$, and will further discuss the mirror symmetry when $k=2$. This is based on my work in progress joint with Jianxun Hu, Huazhong Ke and Lei Song.</p>
11:10 – 12:00	Alexander Aleksandrov (IBS Center for Geometry and Physics)	<p>KP integrability in topological recursion through the x-y swap relation</p> <p>Topological recursion is a surprisingly universal mathematical physics tool, that has numerical applications in mathematics, for instance in combinatorics, enumerative geometry, and knot invariants. I will discuss a universal relation sometimes called the x-y swap relation, which plays a prominent role in the theory of topological recursion. In particular, the x-y swap relation is natural for the KP integrability and can be described by certain integral transforms, leading to the Kontsevich-like matrix models. This allows us to establish general KP integrability properties of the topological recursion differentials. This talk is based on a joint work with Boris Bychkov, Petr Dunin-Barkowski, Maxim Kazarian, and Sergey Shadrin.</p>
14:00 – 14:50	Eleny Ionel (Stanford University)	<p>Counting embedded curves in 3-folds</p> <p>There are several ways of counting (pseudo)-holomorphic curves in Calabi-Yau 3-folds. Counting them as maps gives rise to the Gromov-Witten invariants. This overcounts multiple covers and gives rise to non-integer invariants due to their symmetries. But one can consider instead images of such maps (possibly with multiplicity), regarded either as subsets or as integral currents. This allowed us to prove a structure theorem for the GW invariants of symplectic 6-manifolds and the Gopakumar-Vafa conjecture. The latter states that the GW invariants of CY 3-folds are obtained, by a specific transform, from another set of invariants called BPS states which have better properties: integrality and finiteness. The integrality statement was proved earlier in joint work with Thomas Parker and the finiteness recently in joint work with Aleksander Doan and Thomas Walpuski.</p> <p>This talk presents some of the background and main ingredients of our proof, as well as recent progress, joint with Penka Georgieva, towards proving that a similar structure theorem holds for the real GW invariants of Calabi-Yau 3-folds with an anti-symplectic involution.</p>

Abstracts

Wednesday, August 28

Time	Speaker	Title & Abstract
10:00 – 10:50	Shuai Guo (Peking University)	Virasoro constraints for cohomological field theory Abstract: Virasoro constraints are a hypothetical framework that arises in many enumerative geometry problems. In this talk, we will investigate the properties and applications of the Virasoro constraints for all genera. First, we will derive the ancestor form of the Virasoro constraints, which leads to a polynomial recursion relation. For semisimple cases, this recursion completely determines the generating series of higher genus invariants, extending Gathmann's result. Then, we will propose a generalized Virasoro conjecture for the CohFTs with non- flat units. For semisimple theories, we will prove this conjecture by using the Givental-Teleman reconstruction theorem. This talk is based on joint work with Qingsheng Zhang.
11:10 – 12:00	Hiroshi Iritani (Kyoto University)	Quantum cohomology of blowups Quantum cohomology is a deformation of the cohomology ring of a smooth projective variety defined by counting rational curves. The relationship between quantum cohomology and birational geometry has attracted much interest. In this talk, I will explain the following decomposition theorem for quantum cohomology of blowups: the quantum cohomology of the blowup of X along a smooth subvariety Z is a direct sum of the quantum cohomology of X and $(\text{codim}(Z)-1)$ copies of the quantum cohomology of Z . The proof idea is based on a D-module version of Teleman's conjecture, which relates the quantum cohomology of a GIT quotient to the equivariant quantum cohomology of the original manifold via Fourier transformation.

Abstracts

Morning, Thursday, August 29

Time	Speaker	Title & Abstract
10:00 – 10:50	Jianxun Hu (Sun Yat-Sen University)	<p>Some recent progress on Gamma conjectures</p> <p>Gamma conjectures, proposed by V. Golyshev, S. Galkin and H. Iritani, consists of conjecture O, Gamma conjecture I and II. Previous answers are affirmative.</p> <p>In this talk, I will talk about some counter-examples to conjecture O and Gamma conjecture I. This talk is based on a joint work with S. Galkin, H. Iritani, H. Ke, C. Li and Z. Su.</p>
11:10 – 12:00	Sukjoo Lee (The University of Edinburgh)	<p>Tropical Descent and Hodge Number Duality</p> <p>In this talk, I will present a tropical framework for computing Hodge-Deligne numbers of quasi-projective varieties, which we refer to as tropical descent theory. I will show that tropical descent holds for quasi-smooth toric hypersurfaces, which partially extends the work of Itenberg, Katzarkov, Mikhalkin, and Zharkov to non-smooth cases. This framework also yields significant applications in mirror symmetry: Hodge number duality holds for orbifold Clarke mirror pairs, providing a proof of a conjecture by Katzarkov, Kontsevich, and Pantev for orbifold toric complete intersections. If time permits, I will discuss several additional applications, including the functoriality in Fano mirror symmetry and Hodge number duality for singular varieties. This is joint work with Andrew Harder.</p>

Abstracts

Afternoon, Thursday, August 29

Time	Speaker	Title & Abstract
14:00 – 14:50	Kai Hugtenberg (Lancaster University)	<p>Open Gromov-Witten invariants: Lagrangian cobordisms and the Fukaya category</p> <p>This talk reports on two projects. The first work (in progress), joint with Amanda Hirschi, constructs (genus 0) open Gromov-Witten invariants for any Lagrangian submanifold using a global Kuranishi chart construction. We also prove a relation between open Gromov-Witten invariants of Lagrangians related by a Lagrangian cobordism. Time permitting, I will discuss the second project, which concerns obtaining open Gromov-Witten invariants from the Fukaya category via an extension of the variation of Hodge structures associated to quantum cohomology.</p>
15:10 – 15:40	Chongyu Wang (Peking University)	<p>On A Tautological Relation Conjectured By Buryak-Shadrin</p> <p>Tautological relations on moduli spaces $\overline{\mathcal{M}}_{g,n}$ of stable curves are important topics. Recently, Buryak and Shadrin conjectured a tautological relation which has the form $\int \text{B}^m_{g, \text{emph}\{d\}} = 0$ where $m \geq 2$, $n \geq 1$ and $\text{emph}\{d\} \geq 2g+m-1$.</p> <p>We proved that the conjecture holds if it is true for the $m=2$ and $\text{emph}\{d\} = 2g+1$ case. This reduces the proof of this conjecture to checking finitely many cases for each genus g. In particular, we proved the conjecture for the $g=1$ case.</p> <p>I will explain our proof and some calculations in this report. This is a joint work with Prof. Xiaobo Liu.</p>
15:40 – 16:10	Honghuai Fang (Peking University)	<p>State integrals over local field and A-polynomials</p> <p>We focus on the generalized Teichmüller TQFT over local field constructed by Garoufalidis and Kashaev. This new TQFT with infinite-dimensional Hilbert spaces is conjecturally related to point counting of the A-polynomial curve, similar to what has been observed in the mirror symmetry of Calabi-Yau manifolds. We will show how these relevant topological invariants relate to A-polynomials of knots.</p>

Abstracts

Friday, August 30

Time	Speaker	Title & Abstract
10:00 – 10:50	Bohan Fang (Peking University)	Mirror symmetric Gamma conjecture for toric Calabi-Yau 3-orbifolds I will explain the correspondence between K-theoretic framing of a toric Calabi-Yau 3-orbifold and Lagrangian cycles on the mirror curve. Under such correspondence the oscillatory integral on the mirror curve produces the expected genus zero Gromov-Witten invariants. By Givental-Teleman's graph sum expression for Gromov-Witten invariants, this further gives an all-genus descendant formula using the topological recursion.
11:10 – 12:00	Young-Hoon Kiem (Korea Institute for Advanced Study)	Gromov-Witten invariants for branched covers A fundamental idea for computing Gromov-Witten invariants is to push the computation to simpler spaces like projective spaces. When the target manifold X is a complete intersection in a projective space P , the virtual fundamental class of the moduli space $M(X)$ of stable maps to X coincides with the cosection localized virtual fundamental class of the moduli space of stable maps to P with an additional field. Hence we can enumerate curves in X by studying certain decorated moduli spaces of curves in P . In this talk, I will extend this idea to the case where the target manifolds are branched covers of simpler spaces. Based on a joint work with Hyeonjun Park.

CONFERENCE GENERAL INFORMATION

▪ Meals Provided During the Conference

※ If you have a companion who is not attending the conference, please arrange for separate payment.

Breakfast

Breakfast will be provided to conference registrants from August 26th to 30th, and you can receive breakfast vouchers upon check-in.

Restaurant: Kosilong at Uni Hotel Jeju

Menu: Buffet style meal

Time: 7:30-9:30 am

Lunch

Lunch will be provided to conference registrants from August 26th to 30th.

Restaurant: Kosilong at Uni Hotel Jeju

Menu: Korean Cuisine, Set meal, Main menu will be slightly changed each day.

Time: 12:00-13:30 pm

Dinner on August 29 for all participants

PLEASE SIGN UP for the dinner at the reception.

Menu: Jeju Black Pork BBQ & Soybean Paste Stew (된장찌개)

Restaurant: Jeju Aewol Samyukgong (제주 애월 삼육공)

Time: 6:00 ~ 8:00 pm

▪ Wireless Internet Access

Free Wi-Fi is available at the conference venue.

▪ How to call the taxi at the Uni Hotel Jeju

You can request the front desk to call a taxi for you.

▪ Message for Taxi Driver When You Arrive in Jeju

Destination	Korean Sentence for the driver	What the sentence means
Uni Hotel Jeju (Conference Venue)	유니호텔제주로 가주세요. 감사합니다. 주소: 제주 제주시 애월읍 애월해안로 656	Please take me to the Uni Hotel Jeju. Thank you.
Jeju International Airport	제주 국제 공항으로 가주세요.	Please take me to Jeju International Airport.
(Waiting)	여기서 잠시만 기다려주세요	Please wait here for a minute.
(Safety)	천천히 안전하게 가주세요	Please drive slowly and safely.

▪ Contact

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Please visit our workshop website:
<https://cgp.ibs.re.kr/conferences/2024BICMRIBSCGP/>

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Conference Schedule

Time	Aug. 26 (Mon)	Aug. 27 (Tue)	Aug. 28 (Wed)	Aug. 29 (Thu)	Aug. 30 (Fri)
9:30 – 10:00	Welcome and Registration				
10:00 – 10:50	Jeongseok Oh	Changzheng Li	Shuai Guo	Jianxun Hu	Bohan Fang
10:50 – 11:10	Break / Teatime				
11:10 – 12:00	Jian Zhou	Alexander Aleksandrov	Hiroshi Iritani	Sukjoo Lee	Young-Hoon Kiem
12:00 -14:00	Lunch				
14:00 – 14:50	Yuan-Pin Lee	Eleny Ionel	Free Afternoon	Kai Hugtenberg	Free Discussion & Closing
14:50 – 15:10	Break / Teatime			Break / Teatime	
15:10 – 15:40	Free Discussion	Free Discussion		Chongyu Wang	
15:40 – 16:10				Honghuai Fang	
16:10 – 18:00				Photo Session & Free Discussion	
18:00 – 20:00				Banquet	

Please visit our workshop website:

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