ibs 기초과학연구원
Institute for Basic Science

Conference on Integrable Systems and Related Areas

June 23 - 27, 2025
IBS POSTECH Campus

Organizers

Alexander Aleksandrov (IBS Center for Geometry and Physics)
Anton Alekseev (University of Geneva)
Sonja Hohloch (University of Antwerp)
Yong-Geun Oh (IBS Center for Geometry and Physics & POSTECH)
Tudor Ratiu (Shanghai Jiao Tong University)

Invited Speakers

Yunhyung Cho (Sunkyunkwan University)
Giordano Cotti (Universidade de Lisboa, GEM)
Holger Dullin (University of Sydney)
Konstantinos Efstathiou (Duke Kunshan University)
Eunjeong Lee (Chungbuk National University)
Norton Lee (IBS Center for Geometry and Physics)
Yanpeng Li (Sichuan University)
Yu Li (University of Toronto)
Jiang-Hua Lu (The University of Hong Kong)
Alexander Mikhailov (University of Leeds)
Rak-Kyeong Seong (Ulsan National Institute of Science and Technology)
Daisuke Tarama (Ritsumeikan University)
Dmytro Voloshyn (IBS Center for Geometry and Physics)
Hiroaki Yoshimura (Waseda University)

Registration

https://cgp.ibs.re.kr/activities/registration/368

Webpage

https://cgp.ibs.re.kr/conferences/2025CISRA/

Venue

IBS POSTECH Campus Bldg. #301, Pohang, South Korea

Contact us

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Abstracts

Morning, Monday, June 23

Time	Speaker	Title & Abstract
10:00 – 11:00	Jiang-Hua Lu (The University of Hong Kong)	**The standard cluster structure on Schubert cells from the point of view of Poisson deformation** In this talk we show that the standard Poisson structure on a Schubert cell in the flag variety of a complex semsimple Lie group is, in a sense, a master deformation of its log-canonical term, and we explain a close relation between the Poisson cohomology classes appearing in the deformation and the mutation matrix for the standard cluster structure on the Schubert cell. The talk is partially based on joint work with M. Matviichuk.
11:10 – 12:10	Yu Li (University of Toronto)	**Polynomial integrable systems from cluster structures** We present a general framework for constructing polynomial integrable systems on linearizations of Poisson varieties that admit log-canonical systems. Our construction is in particular applicable to Poisson varieties with compatible cluster or generalized cluster structures. As examples, we consider an arbitrary standard complex semisimple Poisson Lie group G with the Berenstein-Fomin-Zelevinsky cluster structure; nilpotent Lie subgroups of G associated to elements of the Weyl group of G, identified with Schubert cells in the flag variety of G and equipped with the standard cluster structure (first defined by Geiss-Leclerc-Schr\"oer when G is simply-laced); and the restriction of the Gekhtman-Shapiro-Vainshtein generalized cluster structure on the Drinfeld double of the Poisson Lie group ${\rm GL}(n, \mathbb C)$ to its dual Poisson Lie group ${\rm GL}(n, \mathbb C)^*$. In each of the three cases, we show that every extended cluster in the respective cluster structure gives rise to at least one polynomial integrable system on the respective Lie algebra with respect to the linearization of the Poisson structure at the identity element. For some of the polynomial integrable systems thus obtained, we give Lie theoretic interpretations of their Hamiltonians, and we further show that their Hamiltonian flows are complete. This is joint work with Yanpeng Li and Jiang-Hua Lu.

Abstracts

Afternoon, Monday, June 23

Time	Speaker	Title & Abstract
14:00 – 15:00	Alexander Mikhailov (University of Leeds)	**Quantisation Ideals, Neo-Classical Limits and Non-Abelian Hamiltonian Systems** This talk presents an algebraic approach to quantisation based on the notion of {\em quantisation ideals}. Starting from a dynamical system on a free associative algebra A, we look for ideals $I \subset A$ that are invariant under the dynamics and such that the quotient algebra A/I admits a basis of normally ordered monomials. This method has proven effective in the quantisation of numerous integrable systems, including the Volterra and Toda chains, the relativistic Toda chain, the Ablowitz--Ladik system, and many others. Some of the resulting quantisations admit classical limits that recover Hamiltonian and bi-Hamiltonian structures. In other cases, the quantisations correspond to deformations of non-commutative algebras. These deformations motivate the notion of {\em neo-classical} limits, which in turn allow us to identify Poisson structures underlying {\it non-Abelian Hamiltonian systems}.
15:10 – 16:10	Konstantinos Efstathiou (Duke Kunshan University)	**Maslov S^1 bundles** We introduce the Maslov S^1 bundles over symplectic manifolds (M, ω), that is, the determinant bundle Γ of the unitary frame bundle over M, and the bundle $\Gamma^2 = \Gamma / \{ \pm 1 \}$. The usual Maslov index is defined when the bundles are trivial. We discuss the properties of the Maslov bundles focusing on the interplay between their geometry and the dynamics of symplectic group actions on M. Symplectic group actions can be lifted to group actions on the Maslov bundles. When M is a homogeneous G-space, then so are Γ and Γ^2. Moreover, we provide an alternative proof of the fact that when M is a monotone symplectic manifold then the symplectic action is Hamiltonian. In the particular case of symplectic circle actions, we define the notion of Maslov data which generalizes the notion of Maslov index to the case where the Maslov bundle is not trivial. Joint work with Bohuan Lin and Holger Waalkens.

Abstracts

Tuesday, June 24

Time	Speaker	Title & Abstract
10:00 – 11:00	Hiroaki Yoshimura (Waseda University)	**Discretization of Dirac structures and Lagrange-Dirac dynamical systems with associated variational structures** In this talk, we begin with discretizing the canonical one- and two-forms on the cotangent bundle using finite difference maps, which also serve to discretize nonholonomic constraints. This allows us to define a discrete Dirac structure on the cotangent bundle. Then, we discretize the higher-order geometric structure known as Tulczyjew's triple on the cotangent bundle, and show that discretizing the Dirac differential of the Lagrangian yields a discrete Lagrange-Dirac system. Finally, we demonstrate the existence of a discrete Lagrange-d'Alembert--Pontryagin principle, and show that the corresponding discrete equations preserve the discrete Dirac structure together with some examples of nonholonomic systems. This is a joint work with Linyu Peng.
11:10 – 12:10	Giordano Cotti (Universidade de Lisboa, GEM)	**Gromov-Witten theory, isomonodromic deformations, and integral transforms** The quantum differential equations (qDEs) define a class of ordinary differential equations in the complex domain, or more precisely, isomonodromic families of such equations, whose study represents a challenging and active area in both contemporary geometry and mathematical physics. The qDEs encode rich invariants associated with smooth projective varieties. These equations encapsulate information not only about the enumerative geometry of varieties but also, conjecturally, about their topology and complex geometry. The key to unlocking this wealth of data lies in the study of the asymptotics and monodromy of their solutions. In this talk, the speaker will address the problem of explicitly integrating the quantum differential equations of varieties and will report on progress in a long-term project devoted to this topic. Focusing on the case of projectivizations of vector bundles, he will first introduce a family of integral transforms and special functions (the integral kernels), and then demonstrate how to use these tools to obtain explicit integral representations of solutions. Based on arXiv:2005.08262 (Memoirs of the EMS, 2022) and arXiv:2210.05445 (Journal Math. Pures Appl., 2024), and arXiv:2506.xxxxx.

Abstracts

Wednesday, June 25

Time	Speaker	Title & Abstract
10:00 – 11:00	Yanpeng Li (Sichuan University)	**Integrable systems, cluster algebras and symplectic groupoid.** TBA
11:10 – 12:10	Dmytro Voloshyn (IBS Center for Geometry and Physics)	**Topics around Classical Yang-Baxter equation.** The Classical Yang-Baxter equation (CYBE) is well-known in the theory of integrable systems. In the early 1980s, the non-skew-symmetric solutions of the CYBE were classified by Belavin and Drinfeld. Each solution gives rise to a Poisson bracket (BD bracket) on a simple complex algebraic group G. In early 2010s, Gekhtman, Shapiro and Vainshtein proposed a conjecture (GSV conjecture) stating that for each BD bracket, the coordinate ring $\mathbb{C}[G]$ carries a compatible cluster structure. Recent progress on the GSV conjecture has revealed global relations between BD brackets, in the form of Poisson rational maps. Most recently, Yanpeng Li, Yu Li and Jiang-Hua Lu developed a method for constructing integrable systems from cluster structures compatible with Poisson brackets. Observations suggest that this framework applies to linearizations of BD brackets. In this talk, I will discuss connections between these different developments.

Abstracts

Morning, Thursday, June 26

Time	Speaker	Title & Abstract
10:00 – 11:00	Yunhyung Cho (Sunkyunkwan University)	**Cluster-type structure on Fano simplices and T-singularities** A combinatorial mutation of a lattice polytope is a procedure producing a new lattice polytope and it is a combinatorial counterpart of a mutation of Landau-Ginzburg mirrors on a Fano manifold. In this talk, we will describe a certain cluster-type structure of a Fano simplex, which is the polar dual of a moment polytope of a fake weighted projective space. More precisely, we define a mutable facet of a Fano simplex and prove that the number of mutable facets (called the rank) are invariant under combinatorial mutation. Consequently, each Fano simplex gives rise to a certain rank-valent graph whose vertices and edges correspond to Fano simplices and mutations, respectively. In dimension two, we will show that a Fano triangle is of full rank (i.e., three) if and only if the corresponding fake weighted projective plane admits only T-singularities.
11:10 – 12:10	Norton Lee (IBS Center for Geometry and Physics)	**Dimers for Type D Relativistic Toda lattice** We construct the dimer graph for the Type D Relativistic Toda lattice by introducing impurity to the $Y^{2N,0}$ square dimer. By properly placing the impurities and change of canonical variables assigned to the 1-loops on the dimer graph, we introduce the "folding" of the graphs and get the type D relativistic Toda lattice Hamiltonian and monodromy matrix.

Abstracts

Afternoon, Thursday, June 26

Time	Speaker	Title & Abstract
14:00 – 15:00	Daisuke Tarama (Ritsumeikan University)	**Geodesic flows on step-two nilpotent Lie groups** This talk deals with the geodesic flows of a step-two nilpotent Lie groups with respect to a left-invariant (pseudo-)Riemannian metric. The complete integrability is discussed in relation to the isometries and the Williamson types of relative equilibria are considered. The latter analysis requires the classification of Cartan subalgebras in real simple Lie algebras of types B and D. Some related topics may also be mentioned. The talk is based on collaborations with Wolfram Bauer and Genki Ishikawa.
15:10 – 16:10	Eunjeong Lee (Chungbuk National University)	**On toric degenerations of flag varieties** For a semisimple algebraic group G and a Borel subgroup B, the homogeneous space G/B, called the \textit{flag variety}, is a smooth projective variety with rich connections to representation theory and combinatorics. Although the flag variety G/B is not necessarily a toric variety, one may associate a toric variety to G/B via the theory of Newton--Okounkov bodies. For instance, the string polytopes, including Gelfand--Cetlin polytopes, are known to be Newton--Okounkov polytopes of G/B. Recently, Fujita and Oya have provided a larger family of Newton--Okounkov polytopes arising from cluster structures of G/B. In this talk, we will discuss the combinatorics of Newton--Okounkov polytopes arising from cluster structures of G/B. This talk is based on several joint works with Yunhyung Cho, Naoki Fujita, Akihiro Higashitani, Yoosik Kim, and Kyeong-Dong Park.

Abstracts

Friday, June 27

Time	Speaker	Title & Abstract
10:00 – 11:00	Holger Dullin (University of Sydney)	**Geodesic flows on S3 and SO(3) and their quantisation** It is well known that the sphere S3 is the double cover of SO(3). We study corresponding (quantum) integrable systems on S3 and SO(3) and their relation. Choosing a separating coordinate system for the geodesic flow on S3 induces a Liouville integrable system, which after symplectic quotient by the S1 action given by the geodesic flow induces an integrable system on S2xS2. We choose the separating coordinate system on S3 such that the induced system on S2xS2 is toric. The image of the classical momentum map on S3 is a cone over a square, containing the joint spectrum of the corresponding quantum integrable system. Repeating the construction for SO(3) also gives a cone, but with half the volume where the square is rotated by 45 degrees. The arrangement of the joint spectra is different, but of course such that Weyl's law holds in the semi-classical limit with half the number of states for SO(3). The relation of this story to spherical harmonics is discussed. Joint work with Damien McLeod.
11:10 – 12:10	Rak-Kyeong Seong (UNIST)	**Birational Transformations on Dimer Integrable Systems** Dimers, also known as brane tilings, are bipartite periodic graphs on a 2-torus, that represent a Type IIB brane configuration in string theory, which realizes a family of 4-dimensional supersymmetric quiver gauge theories corresponding to toric Calabi-Yau 3-folds. By Goncharov and Kenyon, these dimer models have been shown to define also integrable systems. In this talk, we illustrate a recent discovery that when two toric Calabi-Yau 3-folds and their corresponding toric varieties are related by a birational transformation, the corresponding dimer models define two integrable systems, which are also birational equivalent. I illustrate this discovery with an explicit example and give also a brief overview on how this discovery can lead us to new results in the future. The talk is based on: https://arxiv.org/pdf/2504.21081

CONFERECNE GENERAL INFORMATION

▪ Meals Provided During the Conference

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

Light morning refreshments

Some sandwiches and fruits will be provided to conference registrants from June 23rd to 27th.
Time: 9:30 - 10:00 am

Lunch

Lunch will be provided to conference registrants from June 23rd to 27th.
Menu: Lunch Box, Main menu will be slightly changed each day.
Time: 12:10 pm - 13:30 pm

Excursion on June 25

PLEASE SIGN UP for the excursion at the reception desk.

Venue: Oeosa Temple Trail
Time: 1:30 PM – (Departure after Lunch)
Participation Fee: TBA

Dinner on June 26

PLEASE SIGN UP for the dinner at the reception desk.

Menu: TBA
Restaurant: TBA
Time: 5:30 ~ 7:30 PM

Shuttle Bus for the Conference

The shuttle bus will depart daily at 9:20 AM from POSCO International Center (Hotel), from June 23 (Mon) to June 27 (Fri).
Route: 9:20 AM POSCO International Center (Hotel) → 9:25 AM POSTECH HQ Bldg. (next to the flagpole) → 9:35 AM IBS POSTECH Campus Bldg.
Please note: There will be no return shuttle service in the afternoon.

CONFERECNE GENERAL INFORMATION

▪ Available Offices for Speakers

For speakers who need some space, please check 'OFFICE FOR THE SPEAKERS' sign on the doors around CGP area. Please understand that the office may need to be shared by two as there're limited number of rooms.

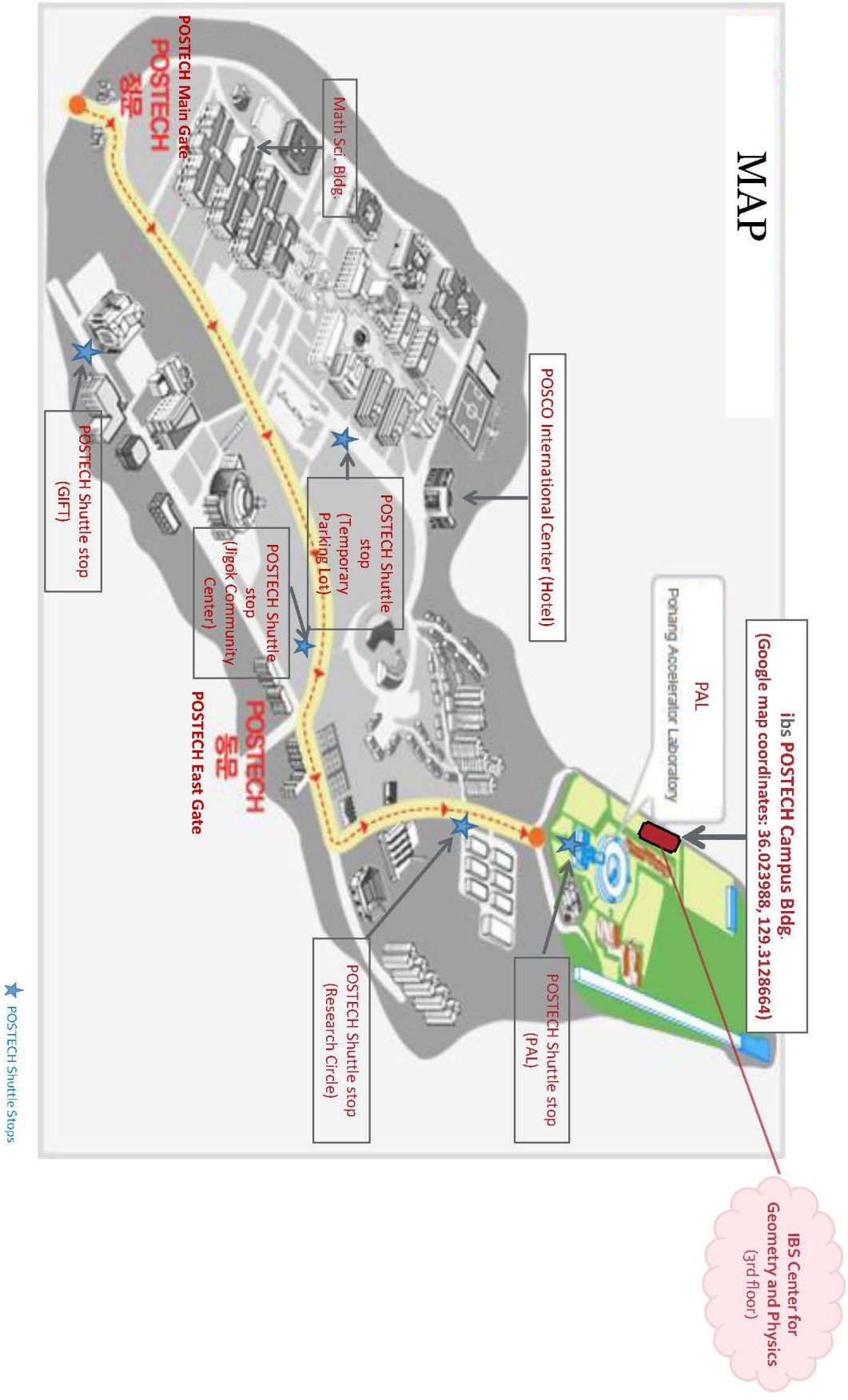
▪ Wireless Internet Access

- Network Name: Guest_ibsWiFi
- ID: Guest_ibsWiFi
- PW: 0123456789@

▪ Banking

Banking (Global ATM) near IBS POSTECH Campus Bldg.

- **Campus Map (Location of IBS CGP):**



▪ Dining on campus

POSTECH Dining Services - Facilities Operation Time

Store			Operation hours		Breaktime	Closing Day
Jigok Community Center	Haedong-Aurum Hall	Full-course meals (Students only)	Breakfast	07:30~09:30 (Saturday/Sunday/Holiday 08:00~09:30)	-	Open throughout the year
			Lunch	11:30~13:30		
			Dinner	17:30~19:00		
		Bob berger	Lunch	11:30~13:30	-	Weekend/Holiday
		Chinese Cuisine	Not in operation			
		Geu Yeo Deun	Breakfast	07:30~10:30	-	Weekend/Holiday
			Lunch	11:30~13:30		
			Dinner	17:30~19:00		
		Wisdom	11:50~13:00		-	Weekend/Holiday
		GS25* (Jigok Community Center)	Staff Service	08:00~02:00	-	Open throughout the year (Closed on Lunar New Year's Day & during Thanksgiving)
			Self-Check-out	02:00~08:00		
		BURGER KING	11:00~20:00		-	Open throughout the year
		Monet Cafe	08:00~19:00		-	Weekend/Holiday
		e-Sports COLOSSEUM	Lunch	11:30~14:00	14:00 ~17:30	Saturday(lunch)/Sunday/Holiday ※Closed on Saturdays during vacation
			Dinner	17:30~02:00		
POSCO International Center		The Blue Hill	11:30~13:30		-	Weekend/ Holiday
Student Union Bldg	GS25* (Student Union Bldg.)		Staff Service	08:00~22:00	-	Open throughout the year
			Self-Check-out	22:00~08:00		
	coffee nearme		08:00~19:00		-	Weekend/ Holiday
	Oasis	MAKKI/ Geu Yeo Deun	11:30~13:30		-	Weekend/ Holiday
Research Bldg.		GS25* (ME Engineering Lab. Bldg.)	Staff Service	09:00~18:00	-	Open throughout the year
			Self-Check-out	18:00~09:00		
Tae-Jun Park Digital Library		GS25* Library	Staff Service	08:00~22:00 (Saturday/Sunday/Holiday 10:00~19:00)	-	Open throughout the year
			Self-Check-out	22:00~08:00 (Saturday/Sunday/Holiday 19:00~10:00)		
		coffee nearme Library	08:00~21:00 (Saturday/Sunday/Holiday 10:00~17:00)		-	Open throughout the year
PAL,Science Hall		coffee nearme PAL&NINT	11:30~15:30		-	Weekend/ Holiday
Log Cabin			18:00~02:00		-	Sunday/Holiday

* GS25: Convenience Store

▪ Message for Taxi Driver When You Arrive in Pohang

Destination	Korean Sentence for the driver	What the sentence means
IBS POSTECH Campus Bldg. * Conference Venue #301	기초과학연구원 포스텍 캠퍼스로 가주세요. (가속기 연구소 안쪽, 선형가속기 지나서) 감사합니다. 기초과학연구원 포스텍 캠퍼스 주소: 경북 포항시 남구 지곡로 127번길 79 (가속기 연구소 출입구 지나서 안쪽, 선형가속기 지나서)	Please take me to the IBS POSTECH Campus Bldg. Thank you.
POSCO International Center (Hotel) at POSTECH	포항공대 포스코 국제관 호텔로 가주세요. 감사합니다.	Please take me to the POSCO International Center (Hotel). Thank you.
IBS POSTECH Campus Bldg. via POSCO International Center (Hotel) at POSTECH	포스코국제관 호텔에 잠시 들렀다 기초과학연구원 포스텍 캠퍼스(가속기 연구소 안쪽, 선형가속기 지나서)로 가주세요.	Please stop by at POSCO International Center (Hotel) briefly, then take me to the IBS POSTECH Building. Thank you.
Pohang KTX Station	포항 KTX역으로 가주세요	Please take me to Pohang KTX Station.
Pohang Intercity Bus Terminal	포항 시외버스터미널로 가주세요	Please take me to Pohang Intercity Bus Terminal.
(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/2025CISRA/

Workshop Schedule

Time	June 23 (Mon)	June 24 (Tue)	June 25 (Wed)	June 26 (Thu)	June 27 (Fri)
9:30 – 10:00	Welcome and Registration / Breakfast				
10:00 – 11:00	**Jiang-Hua Lu**	**Hiroaki Yoshimura**	**Yanpeng Li**	**Yunhyung Cho**	**Holger Dullin**
11:00 – 11:10	Break / Teatime				
11:10 – 12:10	**Yu Li**	**Giordano Cotti**	**Dmytro Voloshyn**	**Norton Lee**	**Rak-Kyeong Seong**
12:10 -14:00	Lunch				
14:00 – 15:00	**Alexander Mikhailov**	Discussions		**Daisuke Tarama**	Closing & Free Discussion
15:00 – 15:10	Break / Teatime			Break / Teatime	
15:10 – 16:10	**Konstantinos Efstathiou**			**Eunjeong Lee**	
16:10 – 16:40				Photo Session & Discussions	
16:40 – 17:30					
17:30 – 19:30				Banquet	

Please visit our workshop website:
https://cgp.ibs.re.kr/conferences/2025CISRA/

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