WORKSHOP ON SINGULARITIES AND RELATED TOPICS

November 9-13, 2026

Hanoi, Vietnam

PROGRAM
&
ABSTRACTS

Institute of Mathematics - VAST

Objective

In loving memory of Professor Lê Dũng Tráng, on the first anniversary of his passing.

Co-host Institution & Sponsors

- Institute of Mathematics, Vietnam Academy of Science and Technology
- International Centre of Research and Postgraduate Training in Mathematics, Institute of Mathematics, Vietnam Academy of Science and Technology

Organizing Committee

- **Ngo Viet Trung** (Institute of Mathematics, Vietnam Academy of Science and Technology)
- **Nguyen Viet Dung** (CMC University)
- **Nguyen Tat Thang** (Institute of Mathematics, Vietnam Academy of Science and Technology)
- **Le Quy Thuong** (VNU University of Science)

PROGRAM

Monday, November 9, 2026

Morning Session

08:00 – 08:45 **Registration**
Lecture Hall 301, Building A5

08:45–09:00 **Opening Ceremony**

09:00–09:30 **Ngo Viet Trung** (Institute of Mathematics, VAST)
Lê Dũng Tráng and Vietnam

09:30 – 10:30 **Claude Sabbah** (École Polytechnique)
Lê Dũng Tráng and Singularity theory

10:30 – 10:50 ***Photos & Memories***

10:50 – 11:00 **Tea break**

11:00 – 12:00 **David Massey** (Northeastern University)
Lê modules and hypersurfaces with one-dimensional singular sets

12:00 – 13:45 **Lunch time**

Afternoon Session

13:45 – 14:45 **Javier Fernández de Bobadilla**
(Basque Center for Applied Mathematics)
A cohomology embedding result and applications

14:45 – 15:00 **Tea break**

15:00 – 16:00 **Pablo Portilla Cuadrado** (Universidad Politécnica de Madrid)
Lê's conjecture and knot cobordisms

16:00 – 16:15 **Tea break**

16:15 – 17:15 **Cheol-Hyun Cho** (POSTECH)
A symplectic approach to the monodromy conjecture for irreducible plane curve singularitie

Tuesday, November 10, 2026

Morning Session

09:30 – 10:30 **Jean-Paul Brasselet** (CNRS, Aix-Marseille University)
On the bi-Lipschitz classification of surfaces

10:30 – 11:00 **Tea break**

11:00 – 12:00 **Dinh Si Tiep** (Institute of Mathematics, VAST)
Limits of real bivariate rational functions

12:00 – 13:45 **Lunch time**

Afternoon Session

13:45 – 14:45 **Kyoji Saito** (Kyoto University)
Second homotopy classes associated with non-cancellative monoids

14:45 – 15:00 **Tea break**

15:00 – 16:00 **Yongqiang Liu** (University of Science and Technology of China)
Quasi-projectivity of weighted right-angled Artin groups

16:00 – 16:15 **Tea break**

16:15 – 17:15 **Le Cong Trinh** (Quy Nhon University)
A δ-constant criterion for simultaneous normalization over normal bases

Wednesday, November 11, 2026

Morning Session

09:30 – 10:30 **Mutsuo Oka** (Tokyo University of Science)
μ^*-stratification of weighted homogeneous polynomials

10:30 – 11:00 **Tea break**

11:00 – 12:00 **Vo Anh Duc** (Columbia University)
GIT stability of hypersurfaces on smooth quadrics

12:00 – 13:45 **Lunch time**

18:30 – 21:00 **Gala Dinner**

Thursday November 12, 2026

Morning Session

09:30 – 10:30 **José Seade** (Universidad Nacional Autónoma de México)
From quadrics to determinants: Milnor fibres with symmetry

10:30 – 11:00 **Tea break**

11:00 – 12:00 **Laurentiu Maxim** (University of Wisconsin-Madison)
On the topology of fibers of complex polynomial maps

12:00 – 13:45 **Lunch time**

Afternoon Session

13:45 – 14:45 **Edson Sampaio** (Universidade Federal do Ceará)
A proof of the metric Zariski multiplicity conjecture in dimension 4

14:45 – 15:00 **Tea break**

15:00 – 16:00 **Saurabh Trivedi** (Indian Institute of Technology Goa)
On strong bi-Lipschitz triviality of deformations

16:00 – 16:15 **Tea break**

16:15 – 17:15 **Nguyen Xuan Viet Nhan** (FPT University, Da Nang)
Bi-Lipschitz invariance of the transverse polynomial along polar arcs

Friday November 13, 2026

Morning Session

09:30 – 10:30 **Claude Sabbah** (École polytechnique)
Moderate and rapid-decay nearby cycles

10:30 – 11:00 **Tea break**

11:00 – 12:00 **Goulwen Fichou** (Université de Rennes)
Monoreal extensions and injective morphisms between real varieties

12:00 – 13:45 **Lunch time**

Afternoon Session

13:45 – 14:45 **Youngho Yoon** (Chungbuk National University)
Rereading Lê Dũng Tráng's 1973 paper,
and an unfinished one of ours, with Singular, Lean and an AI assistant

14:45 – 15:00 **Tea break**

15:00 – 16:00 **Duong Ngoc Son** (Phenikaa University)
Classification of holomorphic maps between hypersurface models
with large-dimensional symmetry algebras

16:00 – 16:15 **Tea break**

16:15 – 17:15 **Nguyen Hong Duc** (Thang Long University)
Motivic integration on uniformly rigid spaces and
the Kontsevich–Soibelman motivic integral identity conjecture

ABSTRACTS

A cohomology embedding result and applications

Javier Fernández de Bobadilla (Basque Center for Applied Mathematics)

Abstract: Let X be a smooth projective variety over a characteristic 0 local field K. We prove that the primitive intermediate cohomology, together with its Galois representation splits in two direct summands. The first is a direct summand component of projective smooth manifolds over local fields. The second embeds in the intermediate graded part by the nilpotet part of the monodromy of a degeneration defined over $Spec(K[[t]])$ whose central fibre contains X as a component. We derive consequences on the local field version of Frobenius semisimplicity conjecture.

On the bi-Lipschitz classification of surfaces

Jean-Paul Brasselet (CNRS, Aix-Marseille University)

Abstract: I will present a result obtained jointly with Maria Soares Ruas and Thuy Nguyen Thi Bich concerning the local bi-Lipschitz classification of semi-algebraic surfaces. This result involves sets of double points, links, and polar curves. The result is linked to a discussion with Lê Dũng Tráng.

A symplectic approach to the monodromy conjecture for irreducible plane curve singularitie

Cheol-Hyun Cho (POSTECH)

Abstract: Monodromy conjecture for plane curve singularities was proved in 1988 by Loeser. We present a new proof for irreducible cases, based on symplectic geometric ideas. For each pole of the topological zeta function, we construct an explicit

monodromy eigenvector by using appropriate geometric vanishing cycles of the singularity.

Lê's conjecture and knot cobordisms

Pablo Portilla Cuadrado (Universidad Politécnica de Madrid)

Abstract: I will present solution of Lê's conjecture, in its formulation that every holomorphic map germ $(C^2, 0) \to (C^3, 0)$ admitting an injective representative has nonzero differential at the origin. The proof first reduces the possible counterexamples to map germs of order 2, 3 or 4. Separate arguments developed using AI exclude each of these three cases. The talk will focus mainly on the first part: the reduction theorem, which combines plane curve singularities, explicit knot cobordisms, and bounds for their genus coming from knot Floer homology.

This is a joint work with Jiyeon Ryu.

Limits of real bivariate rational functions

Dinh Si Tiep (Institute of Mathematics, VAST)

Abstract: Given two nonzero real bivariate polynomials (f, g) vanishing at the origin, we study the existence of the *limit* $\lim_{x\to 0} \frac{f(x)}{g(x)}$. When this limit does not exist, we compute the numerical range, defined as the set of all possible limits of f/g as x tends to 0.

Classification of holomorphic maps between hypersurface models with large-dimensional symmetry algebras

Duong Ngoc Son (Phenikaa University)

Abstract: In this talk, we present recent results on the classification of holomorphic maps from a hyperquadric into a class of model hypersurfaces with large-dimensional symmetry algebras. The results are based on joint work with Michael Reiter.

Monoreal extensions and injective morphisms between real varieties

Goulwen Fichou (Université de Rennes)

Abstract: Monoreal extensions of real fields play a role similar to purely inseparable extensions in positive characteristic. The goal of the talk is to explain this notion, and its link with the condition of injectivity on morphisms between real algebraic varieties.

This is a joint work with Jean-Philippe Monnier and Ronan Quarez.

A δ-Constant Criterion for Simultaneous Normalization over Normal Bases

Lê Công Trình (Quy Nhon University)

Abstract: Let $f\colon X \to S$ be a flat analytic family of pure one-dimensional, generically reduced complex spaces, allowing the fibers to be nonreduced at finitely many points. We prove that, when the base S is normal, the family admits a simultaneous normalization if and only if the modified delta invariant $\delta(X_s)$ is locally constant. This establishes the curve case of a conjecture of Greuel–Pfister [2] over

arbitrary normal analytic bases and extends the normal-base delta-constant picture for reduced curves [1] to the generically reduced setting.

The main difficulty is that, for a nonreduced fiber, the canonical map from its structure sheaf to the normalization of its reduction has a nilpotent kernel. To retain this information under base change, we introduce a proper separated parameter space of conductor-bounded quotient algebra husks, inspired by Kollár's algebra-husk construction [3]. A finite-determinacy argument on a doubled conductor neighborhood reduces the construction to analytic Quot spaces. Over a dense open subset of the base, the fiber normalizations define a section of this parameter space. We show that the closure of this section has no new boundary points by testing along analytic discs and applying the one-parameter delta-constant criterion. Finally, normality of the base turns the resulting finite birational map into an isomorphism, yielding the desired simultaneous normalization.

References

[1] H.-J. Chiang-Hsieh and J. Lipman, *A numerical criterion for simultaneous normalization*, Duke Math. J. **133** (2006), 347–390.

[2] G.-M. Greuel and G. Pfister, *The delta invariant and fiberwise normalization for families of isolated non-normal singularities*, J. Singul. **25** (2022), 173–196.

[3] J. Kollár, *Simultaneous normalization and algebra husks*, Asian J. Math. **15** (2011), 437–450.

Quasi-projectivity of weighted right-angled Artin groups

Yongqiang Liu (University of Science and Technology of China)

Abstract: Weighted right-angled Artin groups generalize right-angled Artin groups by adding weights to the edges of the defining graphs. We give a complete characterization of quasi-projective weighted right-angled Artin groups in terms of their defining edge weighted graphs. Here quasi-projective groups are the groups that can be realized as the fundamental group of a smooth quasi-projective complex variety.

This is a joint work with Xiaobin Xu.

Lê modules and hypersurfaces with one-dimensional singular sets

David Massey (Northeastern University)

Abstract: By using our previous results on Lê modules and an upper-bound on the betti numbers which we proved with Lê, we investigate the cohomology of Milnor fibers and the internal local systems given by the vanishing cycles of hypersurfaces with one-dimensional singular sets and small Lê numbers.

Joint work with Eki Gartzia.

On the topology of fibers of complex polynomial maps

Laurentiu Maxim (University of Wisconsin-Madison)

Abstract: I will survey classical results and present new developments on the topology of both general and atypical fibers of complex polynomial maps, with particular emphasis on the role of singularities at infinity.

Bi-Lipschitz invariance of the transverse polynomial along polar arcs

Nguyen Xuan Viet Nhan (FPT University, Da Nang)

Abstract: We study transverse polynomials along polar arcs of holomorphic plane function germs. We prove that, under bi-Lipschitz right equivalence, matched tangential polar arcs have the same transverse order and their transverse polynomials agree up to nonzero rescalings of the source and target, at every rational scale $1 < q < d(\gamma)$, where $d(\gamma)$ is the gradient canyon degree. This range is sharp as the result can fail at both endpoints, even under analytic right equivalence

Motivic integration on uniformly rigid spaces and the Kontsevich–Soibelman motivic integral identity conjecture

Nguyen Hong Duc (Thang Long University)

Abstract: We prove the Kontsevich–Soibelman motivic integral identity conjecture for formal functions by developing a new framework for motivic integration on special uniformly rigid spaces. We introduce a motivic volume for special smooth uniformly rigid spaces and prove that it is independent of the choice of formal models. This construction extends to a ring morphism from a Grothendieck ring of special smooth uniformly rigid spaces to the classical Grothendieck ring of varieties. We establish an analytic Fubini theorem for this motivic volume, generalizing the motivic Fubini theorem of Nicaise and Payne for tropicalization maps. As a consequence, we obtain the motivic integral identity conjecture in its original form.

Lê Dũng Tráng and Singularity theory

Claude Sabbah (École polytechnique)

Abstract: I will present a brief overview of the work of Lê Dũng Tráng in Singularity theory, emphasizing the permanence of these themes throughout his career.

Moderate and rapid-decay nearby cycles

Claude Sabbah (École polytechnique)

Abstract: One of the major contributions of Lê Dũng Tráng was the analysis of the Milnor fibration and of its monodromy. We will explain how to extend them to vector bundles with a meromorphic connection (or a holonomic $D-$module). For that purpose, we will introduce the notion of moderate and rapid decay nearby cycles relative to a holomorphic function for such an object.

Second homotopy classes associated with non-cancellative monoids

Kyoji Saito (Kyoto University)

Abstract: It is well-known that the regular orbit space of a finite Weyl group is a $K(\pi, 1) - space$. A key point of Deligne's proof is the embedability of the associated Artin monoid into the Artin gropup (Brieskorn-Saito). However, the elliptic Artin monoid cannot be embeddable into the elliptic Artin group. This causes a doubt that the regular orbit space of an elliptic Weyl group may have higher homotopy classes. In attempt to answer this question, we develop a general frame work to construct second homotopy classes in a topological space, whose fundamental group is semipositively presented and its associated monoid is non-canncellative. Precisely, we introduce a concept of non-cancellative twins of the monoid, and construct second homotopy classes associated with the twins. As an experiment, we apply the method to Hattori's line arrangement, where there are non-trival second homotopy classes. Then the Yoshinaga's relations for the fundamental groups define monoids which have many non-cancellative twins. Then, appying our method to the twins, we obtain the Hattori senond homotopy classes.

μ^*-stratification of weighted homogeneous polynomials

Mutsuo Oka (Tokyo University of Science)

Abstract: We consider the space of weighted homogeneous polynomials of three variables $W(P, e)$ of degree e with respect to a fixed weight vector P having an isolated singularity at the origin. It splits into several $\mu*$ -strata. We give a complete description of these strata. This work is a complementary work which is not considered in our previous papers.

A proof of the metric Zariski multiplicity conjecture in dimension 4

Edson Sampaio (Universidade Federal do Ceará)

Abstract: OpenAI recently announced a counterexample to the Zariski multiplicity conjecture in dimension 4. In this talk, we will show that the metric version of the Zariski multiplicity conjecture holds in dimension 4.

From quadrics to determinants: Milnor fibres with symmetry

Jose Seade (Universidad Nacional Autónoma de México)

Abstract: A classical theorem of Arnold, Kuiper and Massey identifies the quotient of the complex projective plane CP^2 by complex conjugation with the 4-sphere. In 2003, in a joint article with Lê Dũng Tráng and Alberto Verjovsky we gave a proof of that theorem and an equivariant version of it. The viewpoint is that of cohomogeneity-one group actions, placing it in a broader geometric setting involving quadrics, Milnor fibres and tangent bundles of homogeneous spaces.

In this talk we shall revisit that theorem and extend it to determinantal singularities. We show that the Milnor fibre of the determinant of a complex symmetric matrix is equivariantly diffeomorphic to the tangent bundle of $SU(m)/SO(m)$, and describe the corresponding projective complements and compact group actions. We also discuss the geometry of complete conics.

On strong bi-Lipschitz triviality of deformations

Saurabh Trivedi (Indian Institute of Technology Goa)

Abstract: We will discuss the Lipschitz analogue of the ThomLevine theorem on the triviality of deformations of function germs. We will show that its converse fails in general. We will also present a partial converse under suitable hypotheses.

GIT stability of hypersurfaces on smooth quadrics

Vo Anh Duc (Columbia University)

Abstract: Inspired by a recent work of Sung Gi Park on GIT moduli space of hypersurfaces and minimal exponent, we study analogous phenomena for hypersurfaces on quadrics. Our results generalize work by Fedorchuk for cubic curves on smooth quadric surfaces, by Byun-Lee for hypersurfaces of smooth quadric threefolds, and by Laza-O'Grady for quartic curves on smooth quadric surfaces.

Rereading Lê Dũng Tráng's 1973 paper, and an unfinished one of ours, with Singular, Lean and an AI assistant

Youngho Yoon (Chungbuk National University)

Abstract: Lê Dũng Tráng's 1973 paper on the number of vanishing cycles counts them through a hyperplane section and the polar curve, and asks, in (3.6), what interesting properties the relative monodromy of the pair $(f, f|_H)$, for H a generic hyperplane, has. Spectral pairs record the Jordan blocks of the monodromy together with the Hodge numbers of the vanishing cohomology, and for convenient Newton non-degenerate f in three or four variables they can be computed from the Newton boundary. I have recently begun to reread, with Singular, Lean and an AI assistant, an unfinished paper on such formulas written with S.-J. Jung, I.-K. Kim and M. Saito, and am filling in what we had missed. The pair of Milnor fibres (F, F_0) carries a mixed Hodge structure whose (Steenbrink) spectrum is $Sp_f + tSp_{f|_H}$; we ask whether the Jordan type of the relative monodromy is also determined by the spectral pairs of f and of its section. What in formulas like these can a machine check, and how can errors best be prevented?

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