

Motives, quadratic forms and arithmetic

Monday, October 24, 2022 - Friday, October 28, 2022

**Louvre Lens Vallée
Program**

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Monday, October 24, 2022

Monday morning: Welcome/Accueil (9:30 AM - 10:00 AM)

time	[id]	title	presenter
9:30 AM		Welcome/Coffee	
9:45 AM		Announcements	

Monday morning (10:00 AM - 12:20 PM)

[13] Questions de surjectivité et d'injectivité pour certaines applications cycles (10:00 AM)

Presenter: COLLIOT-THÉLÈNE, Jean-Louis

On s'intéressera particulièrement au groupe de Chow réduit des zéro-cycles. On commence par noter que l'application de ce groupe vers les points rationnels de l'Albanese n'est pas forcément surjective. On s'intéresse ensuite à la torsion du noyau de diverses applications cycles, dont l'application cycle de Jannsen à valeurs dans la cohomologie étale continue. On passe en revue des résultats récents sur le sujet. On termine en donnant un exemple de non-injectivité pour une surface géométriquement rationnelle, remontant dans son principe à 1982. Ce travail est en partie en commun avec F. Scavia.

[19] Characteristic cycle over symmetric products of curves - Cycle caractéristique sur une puissance symétrique d'une courbe (11:20 AM)

Presenter: RIOU, Joël

Suite à des travaux de Beilinson, T. Saito a développé la notion de cycle caractéristique d'un faisceau étale F sur une variété algébrique lisse Y sur un corps k algébriquement clos : il s'agit d'un cycle sur le fibré cotangent de Y qui permet de mesurer le défaut d'acyclicité de F . Dans un travail en commun avec Fabrice Orgogozo, étant donné un faisceau étale constructible F de F_n -espaces vectoriels modérément ramifié sur une courbe algébrique lisse X , nous calculons le cycle caractéristique des tenseurs symétriques n -uples de F (qui vivent sur le produit symétrique de X). Grâce à ces calculs, nous retrouvons un résultat d'acyclicité initialement établi par P. Deligne dans un séminaire à l'IHÉS en 1980, et nous envisageons de l'appliquer à l'étude du déterminant de la cohomologie des courbes. Characteristic cycle over symmetric products of curves Following Beilinson, T. Saito has developed the notion of characteristic cycle of étale sheaves F over smooth algebraic varieties over algebraically closed fields: this cycle over the cotangent bundle of Y measures the lack of acyclicity of F . In a joint work with Fabrice Orgogozo, given a constructible étale sheaf of F_n -vector spaces that is tamely ramified over a smooth curve, we compute the characteristic cycle of n th-symmetric tensors of F (which lie over a symmetric product of X). Using this computation, we recover an acyclicity result initially obtained by P. Deligne in an IHÉS seminar in 1980, et we are considering applications to the study of the determinant of the cohomology of curves.

time	[id]	title	presenter
11:00 AM		Coffee break	

Monday afternoon (2:00 PM - 4:20 PM)

[8] Some properties of local systems (2:00 PM)

Presenter: ESNAULT, Hélène

We'll review some properties of rigid local systems, what we know and what we expect. Based on joint work with Michael Groechening (and for one point with Johan de Jong).

[4] On some realizations of motives with modulus (3:20 PM)

Presenter: MIYAZAKI, Hiroyasu

The theory of motives with modulus was introduced as a generalization of Voevodsky's theory of motives. This generalization aims to get a motivic picture of non- A^1 -homotopy invariant phenomena, which cannot be captured by Voevodsky's theory. In this talk, I will briefly review the basics of the theory, and explain the construction of Hodge realization of motives with modulus, based on the ongoing joint works with Shane Kelly. If time permits, I will try to explain my recent joint work with Junnosuke Koizumi on the

relationship between motives with modulus and big Witt vectors.

time	[id]	title	presenter
3:00 PM		Coffee break	

Tuesday, October 25, 2022

Tuesday Morning (9:00 AM - 12:30 PM)

[2] Steenrod operations and algebraic classes (9:00 AM)

Presenter: *BENOIST, Olivier*

The first counterexamples to the integral Hodge conjecture, due to Atiyah and Hirzebruch, exploit the action of Steenrod operations. In this talk, we will further study the interaction of Steenrod operations and algebraic classes, over arbitrary fields, and we will derive new examples of non-algebraic cohomology classes.

[5] Geometric representability of 1-cycles on rationally connected threefolds (10:15 AM)

Presenter: *VOISIN, Claire*

We prove that for any rationally connected threefold X over the complex numbers, there exists a smooth projective surface S and a family of 1-cycles on X parameterized by S , inducing an Abel-Jacobi isomorphism $\text{Alb}(S) \cong J^3(X)$. This statement was previously known for some classes of smooth Fano threefolds.

[3] The Picard-Lefschetz formula for normal crossings (11:30 AM)

Presenter: *KERZ, Moritz*

In the study of semi-stable degeneration of Lefschetz pencils one is led to a generalization of the classical Picard-Lefschetz formula for certain perverse sheaves on normal crossing spaces. In the talk I will recall the formalism of nearby cycle and vanishing cycle functors and I will explain how Hodge theory allows one to obtain the normal crossing Picard-Lefschetz formula. Joint work with A. Beilinson and H. Esnault.

time	[id] title	presenter
10:00 AM	Coffee break	
11:15 AM	Coffee break	

Tuesday afternoon (2:30 PM - 5:00 PM)

[10] Nearby motivic sheaves of weighted equivariant functions (2:30 PM)

Presenter: *IVORRA, Florian*

Let X be a smooth algebraic variety (over a field of characteristic zero) endowed with a multiplicative action of the affine line. In a recent work with Julien Sebag we show that the nearby motivic sheaf functor of a weighted equivariant function on X commutes with direct images for twists (by some Thom equivalence) of constant motives. In this talk, I will sketch the proof of this result and provide some motivation. In particular I will explain how our result provides a generalized functorial version within the stable homotopy category of schemes of conjectures by Behrend-Bryan-Szendrői and Davison-Meinhardt motivated by Donaldson-Thomas theory and originally formulated as an equality between virtual motives.

[18] Iwasawa modules along p-adic Lie extensions (4:00 PM)

Presenter: *RAMDORAI, Sujatha*

This talk will define various modules that occur in Iwasawa theory over different p-adic Lie extensions and provide a survey of recent results and open conjectures.

time	[id] title	presenter
3:30 PM	Coffee break	

Wednesday, October 26, 2022

Wednesday morning (9:00 AM - 12:35 PM)

[17] Representing Hodge realization (9:00 AM)

Presenter: LECOMTE, Florence

Looking for a category to represent Hodge filtration, with or without log, with or without modulus.

[11] HKR theorem and residue sequences for logarithmic Hochschild homology (10:15 AM)

Presenter: BINDA, Federico

Using a geometric definition of logarithmic Hochschild homology of derived pre-log rings, we construct an André-Quillen type spectral sequence and show a logarithmic version of the Hochschild-Kostant-Rosenberg theorem. We use this to show that (log) Hochschild homology is representable in the category of log motives. Among the applications, we deduce a residue sequence for Hochschild homology involving blow-ups of log schemes, generalising results of Rognes-Sagave-Schlichtkrull. This is a joint work with Tommy Lundemo, Doosung Park and Paul Arne Østvær.

[7] Unramified cohomology and P^1 -invariance (11:35 AM)

Presenter: YAMAZAKI, Takao

Binda-Rulling-Saito proved that a smooth proper variety with universally trivial Chow group of zero-cycles has trivial unramified cohomology for any reciprocity sheaves. We generalize this result to P^1 -invariant sheaves with transfers. A key ingredient is a new moving lemma. This is joint work with Wataru Kai and Shusuke Otabe.

time	[id] title	presenter
10:00 AM	Coffee break	
11:15 AM	Coffee break	

Field trip: Field trip (2:00 PM - 6:00 PM)

Conference dinner: Conference dinner (8:00 PM - 10:00 PM)

time	[id] title	presenter
8:00 PM	Conference dinner	

Thursday, October 27, 2022

Thursday morning (9:30 AM - 12:00 PM)

[1] Quadratic counts of twisted cubic curves on hypersurfaces and complete intersections in a projective space (9:30 AM)

Presenter: *LEVINE, Marc*

Early on in the development of Gromov-Witten theory, Ellingsrud and Strømme computed the number of twisted cubic curves on hypersurfaces and complete intersections of appropriate (multi-)degree. With Sabrina Pauli, we adapt their method to give a refinement to a 'count' landing in the Grothendieck-Witt ring of quadratic forms; the rank recovers the classical count, while the signature gives a lower bound for the number of real twisted cubics in a real hypersurface/complete intersection of suitable (multi-)degree. The signature for the case of the quintic threefold agrees with the Ooguri-Vafa invariant computed as a weighted count of holomorphic maps of disks, due to Pandharipande-Solomon-Walcher, but we do not have any explanation for this identity. We will give some background on the theory of quadratic enumerative geometry, and explain the main ingredients going into our computation.

[12] Representability of Hermitian K-theory in the homotopy category of schemes (11:00 AM)

Presenter: *CALMES, Baptiste*

This is a report on joint work with Yonatan Harpaz and Denis Nardin. Hermitian K-theory and motivic homotopy theory enjoy a fruitful relationship, in particular through the quadratic nature of morphisms in the latter, epistomized by the theorem of Morel relating the endomorphisms of the unit sphere with Milnor-Witt K-theory. A recent definition of Hermitian K-theory in terms of stable infinity-categories and quadratic functors enables one to consider various flavours of Hermitian K-theory -- symmetric forms, quadratic forms, etc. -- related in a common framework. As required to distinguish these, the theory unfolds nicely without any invertibility of 2 assumption. I'll discuss representability results of Hermitian K-theory in the stable homotopy category of schemes over a base, in a characteristic free manner.

time	[id] title	presenter
10:30 AM	Coffee break	

Thursday afternoon (2:00 PM - 4:30 PM)

[6] Niveaux de corps de fonctions de variétés réelles (2:00 PM)

Presenter: *WITTENBERG, Olivier*

Soit X une variété algébrique réelle lisse de dimension d . On sait depuis Artin que -1 est somme de carrés dans le corps de fonctions de X si et seulement si X n'a pas de point réel. Dans ce cas, combien de carrés sont-ils nécessaires pour écrire -1 comme somme de carrés ? Nous exhibons un lien entre cette question et la géométrie et la cohomologie de X , en montrant que la borne supérieure de Pfister 2^d peut être améliorée sous diverses hypothèses sur X . Il s'agit d'un travail en commun avec Olivier Benoist.

[14] Algèbres d'exposant 2 et extensions multiquadratiques (3:30 PM)

Presenter: *LAGHRIBI, Ahmed*

Pour les algèbres simples centrales d'exposant 2, nous discuterons la notion de décomposition adaptée à certaines extensions multiquadratiques du centre. Le cas d'un corps de caractéristique 2 et de 2-dimension cohomologique 2 sera particulièrement étudié en mettant le lien avec des questions sur les formes quadratiques et la cohomologie de Kato. (C'est un travail en commun avec Demba Barry).

time	[id] title	presenter
3:00 PM	Coffee break	

Friday, October 28, 2022

Friday morning (9:00 AM - 12:35 PM)

[15] Perverse homotopy heart of stable motivic homotopy and Milnor-Witt-modules (9:00 AM)

Presenter: *DEGLISE, Frederic*

One of Voevodsky's pillar for motivic complexes is the Gersten resolution of homotopy invariant sheaves with transfers over a perfect field k . In my Ph. D., prepared in the Algebraic Geometry team that Bruno was leading in Chevaleret, I extended this result in an equivalence of categories between the homotopy heart of (stable) Voevodsky's motivic complexes and Rost's cycle modules, over k . After the fundamental work of Morel on stable homotopy over the field k , Niels Feld has been able to extend this result for motivic spectra over k , after introducing a suitable variant of Rost's theory, based on the Milnor-Witt variant of Milnor K-theory. In this new theory, invariants of quadratic nature such as Witt and Chow-Witt groups are captured. Shortly after his Ph. D., Joseph Ayoub proposed a way to extend the first motivic equivalence to bases over a field. This was based on his perverse version of the homotopy t-structure, a theory that was continued by Bondarko and myself a few years ago using the notion of dimension functions. In this talk, I will present a work in collaboration with Niels Feld and Fangzhou Jin where we realize Ayoub's conjectural program showing that the heart of stable homotopy category over appropriate base schemes can be related to a suitable version of relative Milnor-Witt modules. We will also show the link between objects of the perverse homotopy heart and both Cousin and Cohen-Macaulay complexes of Grothendieck-Hartshorne.

[16] Spectral measures associated with tensor categories (10:15 AM)

Presenter: *FRESÁN, Javier*

I will report on an ongoing project with Arthur Forey and Emmanuel Kowalski that grew out of some afterthoughts on our work on equidistribution of exponential sums. We define spectral measures associated with complex-valued additive invariants on tensor categories, and find simple criteria for their existence and uniqueness. We then compute them for some exotic tensor categories, such as Deligne's category of representations of the "symmetric group" S_t for a complex number t , and show how they give rise to abstract proofs of very classical results, for example the fact that the random variables giving the number of fixed points of a uniformly chosen random permutation on n letters converge to the Poisson distribution with parameter 1 as n goes to infinity.

[9] Universal Weil cohomology (11:35 AM)

Presenter: *BARBIERI VIALE, Luca*

In a joint work with Bruno Kahn we construct a universal Weil cohomology for smooth projective varieties over a field. In this talk we explain universal cohomology theories as solutions of representability problems providing the main ingredients for this construction.

time	[id] title	presenter
10:00 AM	Coffee break	
11:15 AM	Coffee break	