Number theory days

Monday 23 June 2014 - Friday 27 June 2014

Université Lille 1

Conference Scientific Programme

Analytic-Additive Number Theory

There have been several startling developments in the recent past in relations between analytic number theory, additive combinatorics, ergodic theory and harmonic analysis . We have seen applications to arithmetic objects like progressions in primes, to algebraic structures like rational varieties and modular forms as well as to hard-core analytic tools like sieves. The meeting will be an opportunity to discuss newer trends as well as some historical ideas. We will continue with this process in a research school in September.

Galois representations and modular forms

The study of modular forms and Galois representations has been the focal point of research of a large number of forefront mathematicians over the last few decades, in the frame of the ambitious Langlands program. The speakers in this section will present the state of art in that subject and a selection of recent advances and perspectives.

Arithmetic geometry and Galois theory

This is a natural and classical combination in number theory, with the algebraic fundamental group at its center. The fourth day of the conference will be devoted to the recent progress in some of the big topics of this area: fundamental group approach to diophantine geometry, anabelian geometry, patching in algebra and Galois theory, local-global questions and approximation properties, perfectoid spaces, etc.

Quadratic forms

A significant progress has been made in the algebraic theory of quadratic forms during the last few years. This is the consequence of various and sophisticated theories, as the theory of motives of quadrics, Chow groups, algebraic cobordism, unramified cohomology of quadrics, algebraic groups...etc. The aim of this session is to present recent results on quadratic forms and some related structures, with an emphasis on tools mentioned before.

Noncommutative algebra

Noncommutative algebra is a branch of mathematics which has resulted since several decades in important developments and in many applications. Quantum groups, noncommutative algebraic geometry, noncommutative ring theory, coding theory are just a few of the prominent areas of this branch. The imbrications of these areas and their connections with other branches of mathematics are multiple. For example: quantum groups are at the base of the noncommutative algebraic geometry. These are Hopf algebras which, when finitedimensional, are themselves Frobenius algebras. These same Frobenius algebras are of paramount importance in coding theory on finite rings, they also appear for the solutions of the Yang-Baxter equations, in representation theory,...

Number theory days

Monday 23 June 2014

Welcome - Salle de réunions (23 June 09:30-10:00)

Analytic-Additive Number Theory - Salle de réunions (23 June 10:00-18:15)

- **Conveners: Bhowmik, Gautami (Université Lille 1)**

time	title
10:00	**Sign changes of Fourier coefficients of cusp forms** *Presenter: KOHNEN, Winfried (Universität Heidelberg)* We will give a survey on recent results about sign changes of Fourier coefficients of cusp forms in one and several variables.
11:00	Coffee break
11:30	**Generalised Fourier coefficients of multiplicative functions** *Presenter: MATTHIESEN, Lilian (Institut de Mathématiques de Jussieu)* The aim of this talk is to explain a strategy that allows us to bound the Fourier coefficients of a large class of not necessarily bounded multiplicative functions. The interest in this result lies in the fact that the strategy can be adapted to show that these multiplicative functions give rise to functions that are orthogonal to linear nilsequences when applying a `W-trick'. This, in turn, provides one of two necessary steps for an application of the Green--Tao methods, which can be employed to asymptotically evaluate linear correlations of these multiplicative functions. Such correlations appear naturally in many arithmetic problems.
12:30	Lunch break
14:30	**On the history of analytic number theory** *Presenter: GOLDSTEIN, Catherine (Institut de mathématiques de Jussieu)* Contrarily to other parts of number theory, the history of analytic number theory often appears as a collection of particular, even isolated, episodes, focussing on Euler or Riemann or Hadamard and de La Vallée-Poussin. The talk will discuss some of these gems, as well as less well-known ones, and comment on the discontinuous character of their history.
15:30	Break
15:45	**Some Problems in Analytic Number Theory for Polynomials over Finite Fields** *Presenter: ANDRADE, Julio (IHES)* In this talk I will explore some traditional problems of analytic number theory in the context of function fields over a finite field. Several such problems which are currently viewed as intractable can, in the function field scenario, be attacked with vastly different tools than those of traditional analytic number theory. The resulting theorems in the function field setting can be used to check existing conjectures in the classical case, and to generate new ones. The problems I will discuss include: the twin prime conjecture, the additive divisor problem, moments of L-functions and connections with random matrix theory.
16:45	Coffee break
17:15	**Phénomènes de seuil pour les suites de pseudo puissances** *Presenter: PLAGNE, Alain (École polytechnique)* Nous étudions des phénomènes de seuil en théorie additive des nombres. L'objet central est les pseudo puissances s-ièmes introduites par Erdos et Renyi en 1960. In 1975, Goguel a montré que, presque surement, une telle suite n'était pas une base asymptotique d'ordre s. On verra qu'elle est presque surement base d'ordre s+\epsilon. On étudie aussi la taille du plus petit complément additif de sA, c'est a dire du plus petit B tel que sA+B contienne tout entier assez grand. Nous caractérisons précisément la taille seuil d'un tel complément.

Tuesday 24 June 2014

Galois representations and modular forms - Salle de réunions (24 June 09:00-18:00)

- Conveners: Dimitrov, Mladen (Université Lille 1)

time	title
09:00	**Rings and images occurring from universal deformations of profinite groups** *Presenter: BOECKLE, Gebhard (Heidelberg University)* Recently Dorobisz, Eardley-Manoharmayum and Manoharmayum have proved abstract results (a) on the shape of possible deformation rings and (b) on the image of universal deformations of profinite groups, for representations into GL_n. The result regarding (a) were motivated by questions of Bleher, Chinburg and de Smit. We place these results in an axiomatic framework that in principle applies to all reductive groups that are simple modulo their center. In this framework, we give alternative proofs of the above results. For the case GL_n we recover the results by Dorobisz, Eardley and Manoharmayum. For other cases, it remains to verify the stated axioms for these groups, for instance results on the first and second cohomology for the adjoint action of these groups. This is work in progress jointly with Sara Arias de Reyna.
10:00	Coffee break
10:30	**Equivariant L-values of modular abelian varieties** *Presenter: BRUNAULT, François (École normale supérieure de Lyon)* An abelian variety defined over a number field is called strongly modular when its L-function is the product of L-functions of modular forms of weight 2. In this talk, we will show a weak version of Beilinson's conjectures for non-critical L-values of strongly modular abelian varieties. We will explain the interest of formulating an equivariant version of these conjectures (after Burns and Flach), as well as the main ingredients of the proof: a Hecke-equivariant version of Beilinson's theorem on modular curves, and a modularity result for endomorphism algebras. As an application, we deduce a weak version of Zagier's conjecture on L(E,2) when E is a Q-curve without complex multiplication which is completely defined over a quadratic field.
11:30	Break
11:45	**On the modularity of reducible mod l Galois representations** *Presenter: BILLEREY, Nicolas (Université Clermont-Ferrand 2)* In this talk, I'll give a modularity result for reducible mod l Galois representations. By analogy with the irreducible case, I'll state some questions regarding characterization and optimization of the different types of modular forms attached to such a given representation. Finally, I'll give an application of these results to the determination of an explicit lower bound for the highest degree of the coefficient fields of newforms of prime level and trivial Nebentypus. This is a joint work with Ricardo Menares.
12:45	Lunch break
15:30	**The future of modularity** *Presenter: DIEULEFAIT, Luis (Universitat de Barcelona)* This is joint work with Ariel Pacetti. We present generalizations to totally real number fields of the construction done by the speaker some years ago over Q that allows to connect to each other any given pair of newforms through chains of modular compatible systems of Galois representations. We also discuss applications of this, and we consider the case of abstract Galois representations and we explain what we can do there, and what we conjecture, and finally (time permitting) how this conjecture should be attacked. This provides a new path to attack Langlands functoriality and modularity conjectures.
16:30	Coffee break
17:00	**Automorphic Galois representations in the inverse Galois problem** *Presenter: WIESE, Gabor (Université du Luxembourg)* In the talk I will report on recent results on the inverse Galois problem based on compatible systems of Galois representations coming from modular and automorphic forms. The focus will be on ideas and strategies as well as the obstacles that are preventing us from proving much stronger theorems. In this context, the role of coefficient fields will be particularly highlighted. Most parts are joint work with Sara Arias-de-Reyna, Luis Dieulefait and Sug-Woo Shin.

Wednesday 25 June 2014

Noncommutative algebra - Salle de réunions (25 June 09:00-15:00)

- Conveners: Leroy, Andre

time	title
09:00	**Almost involutive Hopf algebras: are there additional symmetries in Hopf algebras besides the antipode?** *Presenter: FERRER-SANTOS, Walter (Universidad de la Republica, Montevideo)* An involutory Hopf algebra is a Hopf algebra whose antipode squared equals the identity, $S^2=\operatorname{id}$. The identity map is an automorphism of Hopf algebras, hence it is tempting to substitute $\operatorname{id} \mapsto \sigma$ where σ is an arbitray Hopf morphism and consider Hopf algebras whose antipode (that is an antimorphism of Hopf algebras) squared is the square of a Hopf automorphism, $\ant^2=\sigma^2$. A map such as σ if it exists, is called a companion morphism. If $\ant$ has finite order, so does σ. A morphism of a given mathematical structure that is of finite order may be interpreted as a symmetry of the structure. Hence, the companion morphism can be interpreted as an additional symmetry of the structure of H. If the Hopf algebra H admits a companion morphism, we say that it is almost involutory (AI). The purpose of this talk, is to define and consider the initial properties of almost involutory Hopf algebras. We prove that up to dimension 15 all Hopf algebras except a few types in dimensions eight and twelve are AI.
10:00	Coffee break
10:30	**Skew Generalized Quasi-Cyclic Codes** *Presenter: SOLé, Patrick (Telecom ParisTech)* In this article we introduce skew generalized quasi-cyclic codes over finite field F with Galois automorphism θ. This is a generalization of quasi-cyclic codes and skew polynomial codes. These codes have an added advantage over quasi-cyclic codes, since the length of the code C need not be a multiple of the index of C. After a brief description of the skew polynomial ring $F[x;\theta]$, it is shown that a skew generalized quasi-cyclic code C is a left submodule of $R_1\times R_2\times \cdots R_l$, where $R_i = F[x;\theta]/(x^{m_i}-1),\,\left\vert \left\langle \theta\right\rangle \right\vert = m$ and $m\|m_{i}$ for all $i=1,\ldots ,l$. This method provides a direct construction of many codes with best known parameters over $GF(4)$. Joint work with T. Abualrub, P. Seneviratne
11:30	Break
11:45	**Some particular direct-sum decompositions and direct-product decompositions** *Presenter: FACCHINI, Alberto (University of Padova)* We will describe direct-sum decompositions and direct-product decompositions for some classes of modules. We will be mainly interested in direct sums and direct products of modules whose endomorphism rings have at most two maximal ideals.
12:45	Lunch break

Thursday 26 June 2014

Arithmetic geometry and Galois theory - Salle de réunions (26 June 09:00-18:00)

- Conveners: Borne, Niels; Debes, Pierre

time	title
09:00	**Points rationnels et zéro-cycles dans les fibrations** *Presenter: WITTENBERG, Olivier (École normale supérieure)* Si X est une variété projective et lisse définie sur un corps de nombres, la ``méthode des fibrations'' pour étudier l'ensemble des points rationnels de X ou le groupe de Chow des zéro-cycles de X vise à ramener les questions que l'on pose pour X (par exemple: existence d'un point ou d'un zéro-cycle de degré 1) aux mêmes questions pour les fibres d'un morphisme dominant f:X->P^1. Le but de l'exposé est un théorème général dans cette direction lorsque la fibre générique de f est rationnellement connexe, sans hypothèse sur les fibres singulières (travail en commun avec Y. Harpaz).
10:00	Pause café
10:30	**Oort groups and lifting problems** *Presenter: HARBATER, David (University of Pennsylvania)* The Oort conjecture states that every cyclic branched cover of curves in characteristic p can be lifted to such a cover in characteristic zero. This raises the more general question of which finite groups G have the property that every G-Galois branched cover of curves in characteristic p can be lifted to characteristic zero. While this can be viewed as analogous to the inverse Galois problem, the situation here turns out to be very different, and the finite groups that have the lifting property are quite constrained. This talk will discuss the Oort conjecture and its generalizations, presenting in particular recent developments.
11:30	Pause
11:45	**The arithmetic of tori over various fields** *Presenter: HARARI, David (Université Paris-Sud)* Let T be an algebraic torus defined over a number field K. In the case of a number field, obstructions to local-global principles for T are well understood thanks to work by Voskresenskii and Sansuc. We consider the case K=k(t) for different fields k (quasi-finite, p-adic) and extend the classical results in this context.
12:45	Pause déjeuner
15:30	**Generalised perfectoid rings and perfectoid spaces** *Presenter: RAMERO, Lorenzo (Université Lille 1)* Scholze's theory of perfectoid rings and perfectoid spaces is rather recent, but it has already had some spectacular applications to étale cohomology, p-adic Hosge theory and p-adic representations. I will present a generalization of this theory that I am developing in collaboration with Ofer Gabber. I will also explain the questions that have led us to this generalization.
16:30	Pause café
17:00	**Recent Progress in Bogomolov's Program: A Survey** *Presenter: SILBERSTEIN, Aaron (University of Pennsylvania)*

Social dinner - Brasserie La Paix (26 June 19:30-22:30)

Friday 27 June 2014

Quadratic forms - Salle de réunions (27 June 09:00-15:00)

- Conveners: Laghribi, Ahmed; Calmès, Baptiste (Université d'Artois)

time	title
09:00	**Classification of Torsors and Subtle Stiefel-Whitney classes** *Presenter: VISHIK, Alexander (University of Nottingham)* This is a joint work with Alexander Smirnov. I will describe a new homotopic approach to the classification of torsors of algebraic Groups. It extends the approach of Morel-Voevodsky, where torsors are interpreted as Hom's to the classifying space of the group in the A^1-homotopy category of Morel-Voevodsky. In the case of the orthogonal group O(n), we introduce new invariants: "Subtle Stiefel-Whitney classes" which are much more informative than the classical ones (defined by J.Milnor). These invariants distinguish the triviality of the torsor (quadratic form), see powers I^n of the fundamental ideal, contain Arason and higher invariants, and are related to the J-invariant of quadrics (thus, connecting previously isolated areas). These classes are also essential for the motivic description of some natural varieties related to a quadratic form.
10:00	Coffee break
10:30	**Faisceaux à réciprocité** *Presenter: KAHN, Bruno (Institut de Mathématiques de Jussieu)* On définit une notion de réciprocité sur les préfaisceaux avec transferts (PST) de Voevodsky. Pour cela, on enrichit les groupes de 0-cycles avec module de Kerz-Saito en leur conférant une structure de PST. Les PST invariants par homotopie sont à réciprocité, ainsi que ceux représentables par un groupe algébrique commutatif : ce dernier point généralise un théorème classique de Rosenlicht qui est à l'origine de ce travail. On généralise aux PST à réciprocité un certain nombre des propriétés démontrées par Voevodsky pour les PST invariants par homotopie : préservation de cette propriété par faisceautisation Zariski ou Nisnevich, injectivité semi-locale. Il s'agit d'un travail en collaboration avec Shuji Saito et Takao Yamazaki.
11:30	Break
11:45	**Invariant d'Arason et complexe de Peyre** *Presenter: TIGNOL, Jean-Pierre (Université catholique de Louvain)* La dimension, le discriminant, et l'invariant de Clifford sont des invariants classiques des formes quadratiques, qui s'étendent au contexte plus général des algèbres centrales simples à involution orthogonale. Sous certaines conditions, on peut aussi définir un invariant d'Arason; mais contrairement à ce qui se passe pour les formes quadratiques, celui-ci n'est pas toujours représenté par une classe de cohomologie tuée par 2. Dans un article commun avec Anne Quéguiner-Mathieu, on étudie cet invariant pour les algèbres de degré 12 et d'indice 2. Dans ce contexte, il apparait étroitement lié à l'homologie d'un complexe de cohomologie galoisienne introduit et étudié par Emmanuel Peyre. Ce point de vue permet, notamment, de donner de nouveaux exemples dans lesquels l'homologie de ce complexe est non triviale, et qui sont d'une nature un peu différente des exemples décrits dans l'article de Peyre.
12:45	Pause déjeuner

Number theory days

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Université Lille 1 - Plan du campus

LILLE 1 S'ENGAGE DANS LE DEVELOPPEMENT DURABLE

BUS, METRO, VELO ... PENSEZ DURABLE !

- Accès limités
- Barrières et portails principaux
- Administration et services
- Bâtiments d'enseignement
- Écoles et instituts
- Équipements sportifs
- Restaurants / Résidences Universitaires
- UFR de Chimie
- UFR de Biologie
- UFR de Géographie et Aménagement
- UFR des Sciences de la Terre
- UFR d'IEEA (Informatique Electronique Electrotechnique Automatique)
- Faculté des Sciences Economiques et Sociales
- UFR de Physique
- UFR de Mathématiques

A1 Chaufferie
A2 Ateliers
A3 Administration centrale
A4 & A5 Bibliothèque Universitaire provisoire
A6 Ateliers espaces verts-DUSVA *(Domaine Universitaire Scientifique de Villeneuve d'Ascq)*
BU Bibliothèque Universitaire
CERLA Centre Études et Recherches Lasers et Applications
CNED Centre National d'Enseignement à Distance
COSEC Complexe sportif-Service des sports
CRI Centre de Ressources Informatiques
CUEEP Centre Université Économie d'Éducation Permanente
ECL École Centrale de Lille
ENSCL École Nationale Supérieure de Chimie de Lille
IFSTTAR Institut français des sciences et technologies des transports, de l'aménagement et des réseaux
IEMN Institut d'Électronique et de Microélectronique du Nord
IUT A Institut Universitaire de Technologie
LIFL Laboratoire d'Informatique Fondamentale de Lille
LML Laboratoire de Mécanique de Lille
MACC'S Métropole Auditorium pour la Culture, les Congrès et les Séminaires
MASS Local syndical
MDE Maison Des Étudiants
MUS Maison Universitaire de la Santé
P7 SCAS *(Service Commun d'Action Sociale)*, CAS *(Comité d'Action Sociale)*, ASA *(Association de Solidarité des Anciens)*, ASP-Lille 1 *(Association Sportive des Personnels de Lille 1)*
RU Restaurant Universitaire
SCD Service Commun de Documentation
SPCET Service Patrimoine Construction Etudes et Travaux et Service des Marchés Publics
SEMM Service Enseignement et Multimédia
SIUMPPS Service Inter-Universitaire de Médecine Préventive et de Promotion de la Santé
SN6 Animalerie
SUAIO Service Universitaire Accueil, Information, Orientation
SUDES Service Universitaire de Développement Économique et Social
SUP Service Universitaire de Pédagogie
TP Travaux Pratiques de Chimie *(bâtiment C16)*

LILLE 1

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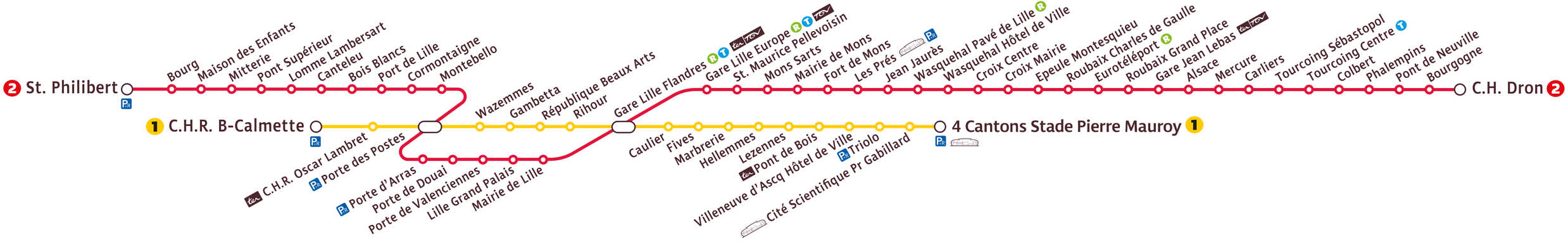
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Bois Blancs
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Montebello
1 C.H.R. B-Calmette
C.H.R. Oscar Lambret
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Croix Centre
Croix Mairie
Epeule Montesquieu
Roubaix Charles de Gaulle
Eurotéléport
Roubaix Grand Place
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4 Cantons Stade Pierre Mauroy 1

bing Cartes

Number theory days
23-27 juin 2014, Université Lille 1 La carte de la conférence.

1. **Gare de Lille-Flandres**
2. **Gare Lille Europe**
3. **Hotel de la Paix**
4. **Rihour**
5. **Cité Scientifique**
6. **Mathématiques - Informatique**
7. **Brasserie La Paix**

bing Cartes

Number theory days
23-27 juin 2014, Université Lille 1 La carte de la conférence.

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