FRIDAY

4:10pm Alex Kontorovich

Geometry and Arithmetic of Crystallographic Packings

In joint work with Kei Nakamura, we formulate a precise conjecture (the SuperPAC) on the nature of sphere packings having all radii reciprocals of integers and arising as limit sets of hyperbolic reflection groups. A consequence of the conjecture is that there are only finitely many "maximal" such packings, in all dimensions. We prove the conjecture in several families.

SATURDAY

9:00am Jacopo De Simoi

Spectral rigidity and planar convex billiards

Convex billiards were introduced by Birkhoff in the 1920's as a natural example of Hamiltonian dynamical system. In this talk we describe a remarkable relation between their dynamics and inverse spectral theory. We prove spectral rigidity among generic (finitely) smooth axially symmetric domains which are sufficiently close to a circle and present some work in progress in the direction of extending this result to generic axially symmetric domains.

10:00am Rohini Ramadas

Algebraic dynamics from topological and holomorphic dynamics

Let f:S^2 —> S^2 be an orientation-preserving branched covering from the 2-sphere to itself whose postcritical set P := { f^n(x) | x is a critical point of f and n > 0 } is finite. Thurston studied the dynamics of f using an induced holomorphic self-map T(f) of the Teichmüller space of complex structures on (S^2, P). Koch found that this holomorphic dynamical system on Teichmüller space descends to an algebraic dynamical system. In particular, when P contains a point x at which f is fully ramified, under certain combinatorial conditions on f, the inverse of T(f) descends to a meromorphic self-map M(f) of projective space CP^n. When, in addition, x is a fixed point of f, i.e. f is a \`topological polynomial', the induced self-map M(f) is holomorphic. The dynamics of M(f) may be studied via numerical invariants called dynamical degrees: the k-th dynamical degree of an algebraic dynamical system measures the asymptotic growth rate, under iteration, of the degrees of k-dimensional subvarieties. I will introduce the dynamical systems T(f) and M(f), and dynamical degrees. I will then discuss why the dynamical degrees of M(f) are algebraic integers, and how their properties are constrained by the dynamics of f on the finite set P. In particular, when M(f) exists, then the more f resembles a topological polynomial, the more M(f) behaves like a holomorphic map.

11:30am Scott Schmieding
Automorphisms of the shift: Lyapunov exponents and the dimension representation

For a (one-dimensional) shift of finite type (X,s), the automorphism group Aut(s) consists of all homeomorphisms from X to X which commute with s. The group Aut(s) is known to contain a rich structure, and has been heavily studied over the years. To analyze a particular automorphism, one may consider certain Lyapunov exponents which describe the asymptotic behavior of the sequence of coding ranges of iterates of the automorphism. These Lyapunov exponents have been previously studied, especially from the point of view of cellular automata. For an automorphism, we will address connections between the Lyapunov exponents, the topological entropy, and the action of the automorphism on the dimension group, a certain ordered abelian group associated to (X,s). In particular, we will discuss certain lower bounds on both the Lyapunov exponents and the topological entropy of an automorphism in terms of spectral properties of its action on the dimension group.

2:30pm Joel Moreira
Multiple recurrence along sparse sequences over thick sets

Multiple recurrence results in probability preserving systems (i.e., higher order versions of Poincare's recurrence theorem) were first studied by Furstenberg in 1977. He obtained a multiple recurrence theorem and moreover showed that the set of return times is syndetic, i.e., has bounded gaps, thus partially extending Khintchine's recurrence theorem. Multiple recurrence has since been established along polynomial sequences and more general classes of sequences; however, for most non polynomial sequences the set of return times is no longer syndetic. In this talk I will describe joint work with Bergelson and Richter showing that for a wide class of sequences, the set of return times has nice combinatorial properties and, in particular is thick, i.e., contains arbitrarily long intervals of integers.

4:00pm Daniel Groves
Uniform versus non-uniform convergence action on the two-sphere

The Cannon conjecture states that if a group G acts as a uniform convergence group on the two-sphere then (up to finite groups) G is a cocompact Kleinian group and that the G-action is topologically conjugate to an action on the two-sphere by Mobius transformations. Thus, it predicts that a dynamical condition with no smoothness conditions can be upgraded to a conformal action.

I will begin by explaining what a uniform convergence group action is, and the natural generalization to the non-uniform setting, where there is a version of the Cannon Conjecture. I will explain joint work with Jason Manning and Alessandro Sisto that the uniform version implies the non-uniform version. Time permitting, I will describe work in preparation with Manning, Sisto and also Damian Osajda and Genevieve Walsh that (under mild hypotheses) proves the converse implication.

SUNDAY

9:00am Patrick Ingram
The critical height and its depleted variants

Rational functions of degree d > 1 in one variable are parametrized by a quasi-projective variety. From the point of view of arithmetic geometry, it is natural to study points on this variety through the machinery of Weil heights, while the dynamical interpretation suggests other measures of complexity, such as the "critical height" introduced by Silverman. This talk will present some recent work relating the critical height to Weil heights on moduli space, and then go on to suggest some further directions involving variants of the critical height.

10:00am Liz Vivas
Scattering methods for skew-product parabolic maps

A classical tool in the study of the dynamics of a given map f is to conjugate it to a simpler one g. One way to obtain a conjugacy is to take limits of composition and precompositions of this two maps $f^{n}\circ g^{-n}$. This standard procedure does not always converge. We will survey a list of results in which this method is used and introduce a new setting in which we obtain convergence: the case of parabolic skew product maps in $\mathbb{C}^2$. We study the dynamics of our map in a neighborhood of the invariant fiber. We give explicit formulas for the parametrizations of the "unstable" manifolds in this context, as well as for the "Fatou coordinates" of the incoming and outgoing basins of F.

11:30am Boris Kalinin
Normal forms on contracting foliations.

We consider a diffeomorphism f of a compact manifold M which contracts an invariant foliation W with smooth leaves. If the differential of f on TW has narrow band spectrum, there exist coordinates $H _x : W_x \to T_x W$ in which $f_W(x)$ is a polynomial in a finite-dimensional Lie group G. We construct H_x that depend smoothly on x along the leaves of W and give an atlas with transition maps in G. Our results apply, in particular, to any C^1-small perturbation of an algebraic systems. More generally, we construct similar normal forms on a stable foliation of an arbitrary measure preserving diffeomorphism f. This yields an f-invariant structure of a G homogeneous space on almost every leaf.