

Lightning Talk Speaker List  
(in alphabetical order by surname)

Roope	Anttila	University of Oulu
Amlan	Banaji	University of St Andrews
Ryan	Bushling	University of Washington
Zhou	Feng	The Chinese University of Hong Kong
Kornélia	Héra	Alfréd Rényi Institute of Mathematics
István	Kolossváry	University of St Andrews
Caiyun	Ma	The Chinese University of Hong Kong
William	O'Regan	University of Warwick
Rudolf Daniel	Prokaj	Alfréd Rényi Institute of Mathematics
Aleksi	Pyörälä	University of Oulu
Alex	Rutar	University of St Andrews
Lauritz	Streck	University of Cambridge
Andrew	Vince	University of Florida
Jian-Ci	Xiao	The Chinese University of Hong Kong

**Roope Anttila**  
University of Oulu

Title:

Assouad dimensions of planar self-affine sets and applications to Takagi functions.

Abstract: I will discuss recent results for Assouad dimensions of general self-affine sets on the plane. I will talk about a natural connection between the Assouad dimensions of self-affine sets and the dimensions of their slices and projections. The results are applied to a well studied family of nowhere differentiable continuous functions: the Takagi functions.

**Amlan Banaji**  
University of St Andrews

Title:

Generalised intermediate dimensions

Abstract:

Falconer, Fraser and Kempton have introduced a spectrum of dimensions, called the intermediate dimensions, which lie between Hausdorff and box dimension. In order to provide more refined geometric information about compact sets for which the intermediate dimensions do not reach the Hausdorff dimension, we introduce a more general family of dimensions which fully interpolate between Hausdorff and box dimension.

**Ryan Bushling**  
University of Washington

Title:

On the packing dimension of exceptional sets of orthogonal projections of self-similar and homogeneous sets

Abstract:

The famous projection theorems of Mattila and Falconer estimate on the Hausdorff dimension of the exceptional set of orthogonal projections for an analytic set  $A \subseteq \mathbb{R}^n$ , considered as a subset of the Grassmannian  $\mathbf{Gr}(n,k)$ . A 2015 theorem Orponen bounds the packing dimension of the exceptional set in the case that  $n = 2$ ,  $k = 1$ , and  $A$  is self-similar or *homogeneous*. Our purpose is to extend Orponen's result to the case of arbitrary  $0 < k < n$ .

**Zhou Feng**

The Chinese University of Hong Kong

Title:

Typical self-affine sets with non-empty interior

Abstract:

We provide some sufficient conditions on the existence of interior points in self-affine sets with respect to typical translation parameters. This is a joint work with De-Jun Feng.

**Kornélia Héra**

Alfréd Rényi Institute of Mathematics

Title:

Hausdorff dimension of Besicovitch sets of Cantor graphs

Abstract:

It is well known that planar Besicovitch sets – sets containing a unit line segment in every direction – have Hausdorff dimension 2. In a joint work with Iqra Altaf and Marianna Csörnyei we consider Besicovitch sets of Cantor graphs in the plane – sets containing a rotated (and translated) copy of a fixed Cantor graph (its line segments of course removed) in every direction, and prove lower bounds for their Hausdorff dimension.

**István Kolossváry**  
University of St Andrews

Title:

The Assouad spectrum of Lalley-Gatzouras carpets

Abstract: Fraser and Yu determined the Assouad spectrum of Bedford-McMullen carpets when they introduced this new dimension spectra in 2018. In the talk, I will highlight interesting new phenomena that the spectrum exhibits in the more general Lalley-Gatzouras class. Based on joint work with Jonathan M. Fraser and Amlan Banaji.

**Caiyun Ma**

The Chinese University of Hong Kong

Title:

One-sided multifractal analysis of Gibbs measures on the real line.

Abstract:

We determine the Hasdorff and packing dimensions of various level sets of one-sided local dimensions of self-similar measures on the line satisfying the strong separation condition. The results extend to Gibbs measures associated with conformal IFSs satisfying the same separation condition. This is joint work with De-Jun Feng.

**William O'Regan**  
University of Warwick

Title:

New bounds for the discretised sum-product problem.

Abstract:

Originally solved by Bourgain in 2010, the discretised version of the sum-product theorem asserts that for any  $\delta$  separated subset  $A$  of  $[1,2]$  (with an appropriate non-concentration condition) the  $\delta$ -covering number of the sum-set  $A + A$  or the product set  $A \cdot A$  must be significantly larger than the size of  $A$ . How much larger depends on the size of  $A$  only. However, Bourgain did not quantify this, and further examination of his paper suggests this value will be small if one tries to get a quantitative version using his exact method. More recently, Guth, Katz, and Zahl in 2018 gave a quantitative version, with Chen later in 2019 making a further improvement for 'large' sets. In this talk we give a further improvement for all sizes of sets  $A$ . This work was done under the supervision of András Máthé.

**Rudolf Daniel Prokaj**  
Alfréd Rényi Institute of Mathematics

Title:

On continuous piecewise linear iterated function systems

Abstract:

We consider iterated function systems on the real line that consist of continuous, piecewise linear functions. Each function in such a system is determined by its slopes and translation parameters, with the latter one including the points where the function changes its slope. We show that for typical translation parameters, the Hausdorff and box dimensions of the attractor are equal to the minimum of 1 and the exponent, which comes from the most natural system of covers of the attractor. The talk is based on a common article with Károly Simon and Peter Raith.

**Alexi Pyörälä**  
University of Oulu

Title:

Resonance between planar self-affine measures

Abstract:

In the 1960s, Frustenberg conjectured that the sum of closed times- $n$  and times- $m$  invariant sets on the one-dimensional torus should always have the maximal Hausdorff dimension, unless  $m$  is a rational power of  $n$ . Since then, the conjecture has been proved and extended for many other dynamical systems as well, in the following general form: The sum or convolution of dynamically defined objects can fail to have the maximal dimension only if the objects or the defining dynamics are algebraically similar, in some sense. I will present an extension of this principle for planar self-affine measures: Assuming strong separation, irreducibility and domination, the convolution of such measures can fail to have the maximal dimension only if the defining contractions are algebraically similar, in a sense.

**Alex Rutar**  
University of St Andrews

Title:

Pointwise Assouad dimension

Abstract:

A (strong) tangent of a compact set  $K$  at a point  $x \in K$  is a limit set given by "zooming in" to the set  $K$  at  $x$ . In general, the Assouad dimension is not characterized by dimensions strong tangents. However, we will see that for a general class of sets (including attractors of overlapping bi-Lipschitz iterated function systems) that the Assouad dimension is attained as the Hausdorff dimension of a strong tangent. We will then discuss multifractal properties of various associated quantities. This is joint work with Antti Käenmäki.

**Lauritz Streck**  
University of Cambridge

Title:

Garsia entropy and its relation to absolute continuity of self-similar measures

Abstract:

The talk presents results for the question of when the Garsia entropy, a quantity naturally associated to a self-similar measure with an algebraic parameter, is maximal. It is shown that this is equivalent to absolute continuity and power Fourier decay of a more general self-affine measure. Moreover, the occurrences of maximal entropy are classified.

**Andrew Vince**  
University of Florida

Title:

Thresholds and Transition Phenomena for the Attractor of an Iterated Function System

Abstract:

For a general one-parameter affine family of iterated functions systems, sharp thresholds exist for certain properties of the attractor. As the parameter increases, the iterated function system becomes less contractive, and the attractor evolves. Thresholds will be discussed for the following properties: the existence of an attractor, the connectivity of the attractor, and the existence of non-empty interior of the attractor.

**Jian-Ci Xiao**

The Chinese University of Hong Kong

Title:

On a homeomorphism problem of generalized Sierpinski carpets

Abstract:

As a direct consequence of a classical result of Whyburn, a generalized Sierpinski carpet is homeomorphic to the standard one if and only if it is connected and has no local cut points. We show that both of these requirements can be determined by examining a finite number of elements in the associated Hata graph sequence, which provides a criterion and an algorithmic solution to this problem.