PROGRAM NOTES AND ABSTRACTS FOR WEEKS 3 AND 4

Abstracts are listed in order of the talks, starting in WEEK 3

Apprentice Program

TBA Continuing.

Joe Jackson

TITLE: TBA

ABSTRACT: TBA

Jacob Fiedler

TITLE: Fractal geometry and Kolmogorov complexity

ABSTRACT: Geometric measure theory is a branch of math that examines how the geometric structure of a set influences its size. For fractal sets, these kinds of problem can often be rather subtle. For instance, how does the size of a "typical" shadow of an infinitely detailed fractal tree compare to the size of the tree itself? To begin, we'll make the idea of "size" rigorous with several notions of fractal dimension, especially Hausdorff and packing dimension. Equipped with these notions, we can more precisely state a number of questions in geometric measure theory. Next, however, we will take a surprising detour into algorithmic information theory, introducing the idea of Kolmogorov complexity. It turns out that it is possible to characterize the Hausdorff dimension of a set in terms of the information content of individual points in the set, and likewise for packing dimension. In addition to connecting two seemingly very distinct areas of math, this "point-to-set principle" turns out to be very useful in GMT. We will close by studying some applications of these algorithmic tools recently used to establish novel results in geometric measure theory.

Although it will be helpful to have experience with basic mathematical analysis (at the level of, say, the 16000s sequence), we will assume no knowledge of the main topics from the audience.

Michael Barz

TITLE: Calculus 5, Continuing

ABSTRACT: TBA

Alexander Razborov

TITLE: TBA

ABSTRACT: TBA

Howard Masur

TITLE: TBA

ABSTRACT: TBA

Ben Lowe

TITLE: [2025] Hyperbolic geometry

ABSTRACT: [2025] Hyperbolic geometry is of fundamental importance in low-dimensional topology. Hyperbolic geometry is also important in many other fields, both in itself and as an indication of what might be true in more general settings (e.g., geometric group theory.) The goal will be to give an overview of the landscape, emphasizing examples and connections to different areas of mathematics such as number theory and dynamical systems. The lectures will neither assume familiarity nor overlap excessively with Tina's earlier lecture on hyperbolic geometry

Peter May

TITLE: An algebraic topology smorgasbord, continuing

ABSTRACT: This week's talk gives a proof of complex Bott perioicity

TBA

TITLE:

ABSTRACT:

Sidhanth Raman

TITLE:

ABSTRACT:

Tina Torkaman

TITLE:

ABSTRACT: