Abstract:
Roth famously used Fourier analysis to upper bound the size of a set of integers without 3-term arithmetic progressions. One might hope that similar techniques can be used for 4 or more term progressions, and some simple examples demonstrate otherwise. However, Gowers (2001) introduced a “higher order” Fourier analysis which generalizes Roth’s proof to longer arithmetic progressions. In this talk, we will give a combinatorial sketch of the methods of higher order Fourier analysis culminating in the key problem of the field, the inverse conjecture for the Gowers norms.