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# More thoughts on the use of nonstandard methods to extend Roth's Theorem

*Tuesday, 11 July 2023 15:20 (45 minutes)*

In this talk I will continue to explore some possibilities and some challenges in attempting to use nonstandard methods to extend Roth's theorem to sparser sets. Jin's recent proof of Roth's and Szemerédi's theorem provided new clarity on the combinatorial methods used by Szemerédi, and it is still unclear whether these techniques can be used to obtain stronger results. Meanwhile, some amazing new developments have taken place in regard to generalizations of Roth's Theorem. Recently Bloom and Sisask showed that any subset of the natural numbers with no 3-term arithmetic progression must have asymptotic density less than $\frac{1}{\log(n)^{1+c}}$ for some constant $c > 0$. Then, in the last few months, this bound was significantly improved by Kelley and Meka, who showed that much sparser sets than this must contain 3-term arithmetic progressions, and their result is in close to "best possible." While I will discuss these results, I will not attempt to provide any insight into these groundbreaking proofs.

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