

Schedule for 2010 Mini-Conference on Additive Combinatorics June 26, Georgia Tech

June 22, 2010

- Meet and greet at 11:00am, room 169 Skiles. We will go to lunch at a nearby restaurant around 11:30, and then will return by 1:00.
- 1:00 - 1:30 Alex Rice

Title: Polynomial differences in the primes

Abstract: Given a natural number N , how many pairs of primes less than or equal to N differ by a perfect square? In this talk we utilize the Hardy-Littlewood circle method, including classical estimates from Waring's Problem and Vinogradov's Theorem, to resolve and generalize this problem. Namely, we give an asymptotic formula that counts the number of pairs of primes whose differences lie in the image of a given non-constant polynomial with integer coefficients. The formula is meaningful as long as the image of the polynomial is not entirely odd, and the main term is remarkably explicit in the case of monomials. (Joint work with Neil Lyall.)

- 1:30 - 1:40 BREAK
- 1:40 - 2:10 Ernie Croot

Title: A Probabilistic Method for Finding Almost Periods in Additive Combinatorics

Abstract: We (E. Croot and Olof Sisask) introduce a new probabilistic technique for finding ‘almost periods’ of convolutions of measures on finite groups. This allows us to give: a new probabilistic proof of Roth’s theorem on arithmetic progressions; a new way to approach the 2D corners problem of Gowers et al; strong bounds on the length of the longest arithmetic progression in a sumset $A + B$, where A and B are subsets of \mathbb{Z}_p , the integers mod p ; and many non-abelian analogues of classical theorems (for which Foruier and Analytic Number Theory methods only produce results that hold in the abelian context). In most cases, our proofs are the shortest known for similar such theorems, and in some cases (like with the long APs in $A + B$), we obtain the strongest bounds to date.

- 2:10 - 2:20 BREAK
- 2:20 - 2:50 Neil Lyall

Title: Simultaneous optimal polynomial recurrence

Abstract: We will discuss some specic (single) recurrence properties of measure preserving probability systems and (quantitative versions of) their combinatorial consequences.

- 2:50 - 3:00 BREAK
- 3:00 - 3:30 Mariah Hamel

Title: Sumsets of primes

Abstract: Let A be a subset of the primes with positive relative density. In this talk, we will show that the sumset $A + A$ must have positive upper density in the natural numbers. Our method combines

techniques of Green and Green Tao with a result on sums of subsets of the multiplicative subgroup of the integers modulo M . This is joint work with Karsten Chipeniuk.

- 3:30 - 3:40 BREAK
- 3:40 - 4:10 Todd Cochrane (with James Cipra and Christopher Pinner)

Abstract: Let p be a prime, k a positive integer and $\gamma(k, p)$ be Waring's number (mod p), the minimal s such that every integer is a sum of s k -th powers (mod p). Let A denote the set of nonzero k -th powers. We discuss various estimates for $\gamma(k, p)$, including the bounds conjectured by Heilbronn, $\gamma(k, p) \ll \sqrt{k}$ for $|A| > 2$, and $\gamma(k, p) \ll k^\epsilon$ for $|A| > c(\epsilon)$. Methods of exponential sums, additive combinatorics and the geometry of numbers are used in the investigation. Generalizations to arbitrary finite fields will also be discussed.

- 4:10 - 4:20 BREAK
- 4:20 - 4:50 Michelle Delcourt

Abstract: In this talk we consider a discrete version of the Bernoulli convolution problem traditionally studied via functional analysis. We develop an algorithm which bounds the Bernoulli sequences and gives a significant improvement on the best known bound. (Joint work with Neil Calkin, Jula Davis, Zebediah Engberg, Jobby Jacob, and Kevin James as part of the 2008 Clemson REU.)

- 4:50 - 5:30 BREAK
- 5:30 - ? Dinner?