Student presentations I

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READING **Igor Ganichev: Lower bounds for geometric range searching**

- Chazelle paper
- group model
- given n pts. & n ranges, report (#) pts. in each range (or many variations)
- equivalent to matrix-vector product
- spectral lemma gives lower bound in terms of eigenvalues
  - proof based on (conditional) entropy

$\Rightarrow \Omega(n \lg \lg n)$ group ops. for axis-parallel boxes (2D)
$\Omega(n \lg n)$ group ops. for half-planes (2D)
$O(n \lg n)$ even in semigroup model

THEORY **Jeff Cohen & Daniel Kane: Independence in cuckoo hashing**

- Cuckoo hashing uses two $O(\lg n)$-independent hash f^n's.
- THEOREM: 1 $O(\lg n)$-indep. & 1 2-indep. hash f^n's suffice
- THEOREM: two 2-independent hash f^n's fail in Cuckoo
- THEOREM: two 5-independent hash f^n's fail in Cuckoo (more complicated)
- THEOREM: $\Omega(\lg n)$-joint-independence is necessary for Cuckoo!
- Cuckoo already uses only $O(\lg n)$-joint-indepence

$\Rightarrow$ tight!

- cool constructions of specific hash functions
- OPEN: failure for all hash families of some reasonable size?