1135-68-2855 **Sarah Cannon*** (sarah.cannon@gatech.edu). *Dyadic Tilings and Phase Transitions.*
We study the weighted edge-flip Markov chain for dyadic tilings, show it exhibits a phase transition, and give results about its behavior at the phase transition. A dyadic tiling of size n is a tiling of the unit square by n non-overlapping dyadic rectangles each of area $1/n$; a dyadic rectangle can be written in the form $[a2^{-s}, (a+1)2^{-s}] \times [b2^{-t}, (b+1)2^{-t}]$ for $a, b, s, t \in Z_{\geq 0}$. The edge-flip Markov chain selects a random edge of the tiling and replaces it with its perpendicular bisector if this yields a valid dyadic tiling. We consider a weighted version of this Markov chain where, given a parameter $\lambda > 0$, we generate each dyadic tiling σ with probability proportional to $\lambda^{|\sigma|}$, for $|\sigma|$ the total edge length. We show there's a phase transition: when $\lambda < 1$, the edge-flip chain mixes in polynomial time, but if $\lambda > 1$, the mixing time is exponential. At the critical point $\lambda = 1$, we give the first polynomial mixing time upper bound. We complement this with lower bounds showing the behavior at the critical point is provably different than on either side of the critical point, supporting a broad statistical physics conjecture. Joint work with Sarah Miracle, David Levin, Dana Randall, and Alexandre Stauffer. (Received September 26, 2017)