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Aperiodic sequences: Complexity and Rauzy fractals

Abstract: Aperiodic sequences and sequence spaces form prototypical mathematical models of quasicrystals. The most quintessential examples include subshifts of Sturmian words and substitutions, which are ubiquitous objects in ergodic theory and aperiodic order. Two of the most striking features these shift spaces have, are that they have zero topological entropy and are uniquely ergodic. Random substitutions are a generalisation of deterministic substitutions, and in stark contrast to their deterministic counterparts, subshifts of random substitutions often have positive topological entropy and exhibit uncountably many ergodic measures. Moreover, they have been shown to provide mathematical models for physical quasicrystals with defects.

We will begin by talking about subshifts generated by Sturmian words and ways to measure their complexity beyond topological entropy, and show how this measure of complexity can be used to build a classification via Jarník sets. We will then build a bridge between these subshifts and subshifts of random substitutions. We will conclude with some recent dynamical results on subshifts of random substitutions and ways to visualise these subshifts. Namely, we will present a method to build a new class of Rauzy fractals.