We study bootstrap percolation, which is an example of a cellular automaton, sometimes called a 0-player game. We fix a positive integer $k$ and start with a plane graph $T$, in which some faces are “infected”. Once a face is infected, it remains so forever. If a face, $f$, is uninfected, but has at least $k$ infected neighbors, then $f$ becomes infected. The percolation threshold is the largest integer $k$ such that if we infect each face independently with probability $1/2$, then with probability at least $1/2$ eventually the whole graph becomes infected.

We consider bootstrap percolation in tilings of the plane by regular polygons. A vertex type in such a tiling is the (cyclic) order of the faces that meet a common vertex. Let $\mathcal{T}$ denote the set of plane tilings $T$ by regular polygons such that if $T$ contains one instance of a vertex type, then it contains infinitely many instances of that type. We show that no tiling in $\mathcal{T}$ has threshold 4 or more. Further, we show that the only tilings in $\mathcal{T}$ with threshold 3 are four of the Archimedean lattices. Finally, we describe a large subclass of $\mathcal{T}$ with threshold 2.

This is joint work with Neal Bushaw.