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Image generated on my home PC in Edmonton, Alberta

Images of Research Competition

University of Alberta

Tobler's Mandala

Second Prize (2020)

Tobler's First Law of Geography observes that "everything is related to everything else, but near things are more related than distant things." This phenomenon is important in many areas of science because, if ignored, it can make measurements appear more precise than they actually are.

In the language of statistics, Tobler's Law is described by autocorrelation: near things are correlated, while those spaced far apart are not. My research looks for ways to correct for this effect, so that scientists can better gauge the uncertainty in their samples.

Autocorrelation can be oriented along a particular direction. My image depicts a sampling design that detects this direction. The warmer (more red) the colour, the more often we sample at that location.

Strange and beautiful patterns emerge when these colours are plotted together. Symmetries amidst the chaos reflect the mathematics of lattices, a topic of fascination among number theorists and crystallographers. My design exploits this theory to make statistical calculations faster – often by many orders of magnitude.