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*Visual mathematics: From graph partitioning to cellular automata and fair allocation*

I will survey, and present some striking pictures, of several mathematical models where visualization has played a key role. How can we find the "community" of an individual in a large network, e.g. a social network or the whole web? This is useful when such networks are stored on multiple computers. How can simple rules (such as the celebrated "abelian sandpile), when iterated, create intricate patterns? What is responsible for scaling behavior in these patterns, in the same way a baby resembles an adult? Finally, we will see the beautiful patterns that arise when we attempt to divide a large area fairly between many people in a decentralized manner.