复旦大学数学科学学院
数学综合报告会

报告题目：Discrete conformal geometry and applications

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报告摘要：

Discrete conformal geometry translates classical surface geometry into discrete, computable structures with both theoretical and practical applications. Its smooth foundation lies in conformal maps, which are angle-preserving mappings that send infinitesimal circles to circles. They are central to complex analysis and many physical models.

In this talk, I will present circle patterns as discrete analogues of conformal maps. A circle pattern is a configuration of circles in the plane with prescribed intersection angles. When viewed on the sphere, circle patterns correspond to polyhedral surfaces in hyperbolic 3-space, providing a link between combinatorial structures and classical hyperbolic geometry.

I will highlight three areas where this perspective has yielded new insights. First, in statistical mechanics, circle patterns give geometric interpretations of structures arising from dimer models and quasi-tree enumeration. Second, in discrete surface theory, treating circle patterns as discrete holomorphic data enables the construction of discrete minimal surfaces and other polyhedral analogues of smooth surfaces. Third, in computational geometry, discrete harmonic maps provide structure-preserving tools for comparing surfaces.

The talk will illustrate how discrete models preserve essential features of smooth geometry while offering novel approaches for both theoretical understanding and computational applications.

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