Graphs on Surfaces: Dualities, Polynomials, and Knots (SpringerBriefs in Mathematics)

Joanna A. Ellis-Monaghan, Iain Moffatt

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Graphs on Surfaces: Dualities, Polynomials, and Knots offers an accessible and comprehensive treatment of recent developments on generalized duals of graphs on surfaces, and their applications. The authors illustrate the interdependency between duality, medial graphs and knots; how this interdependency is reflected in algebraic invariants of graphs and knots; and how it can be exploited to solve problems in graph and knot theory. Taking a constructive approach, the authors emphasize how generalized duals and related ideas arise by localizing classical constructions, such as geometric duals and Tait graphs, and then removing artificial restrictions in these constructions to obtain full extensions of them to embedded graphs. The authors demonstrate the benefits of these generalizations to embedded graphs in chapters describing their applications to graph polynomials and knots.

Graphs on Surfaces: Dualities, Polynomials, and Knots also provides a self-contained introduction to graphs on surfaces, generalized duals, topological graph polynomials, and knot polynomials that is accessible both to graph theorists and to knot theorists. Directed at those with some familiarity with basic graph theory and knot theory, this book is appropriate for graduate students and researchers in either area. Because the area is advancing so rapidly, the authors give a comprehensive overview of the topic and include a robust bibliography, aiming to provide the reader with the necessary foundations to stay abreast of the field. The reader will come away from the text convinced of advantages of considering these higher genus analogues of constructions of plane and abstract graphs, and with a good understanding of how they arise.

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