Jones Polynomial Obstructions for Positivity of Knots

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Abstract

A fundamental problem in knot theory is how to distinguish one knot from another. We try to accomplish this by looking at knot invariants. One such invariant is positivity. A knot is positive if it has a diagram in which all crossings are positive. A knot is almost-positive if it does not have a diagram where all crossings are positive, but it does have a diagram in which all but one crossings are positive. Given a knot with an almost-positive diagram, it is in general very hard to determine whether it might also have a positive diagram. The work in this thesis provides positivity obstructions for three classes of knots that are distinguished by the second coefficient of their Jones polynomial, and we present three infinite families of examples of almost-positive knots whose non-positivity can be proved using those obstructions.