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On Caratheodory's Approximation Theorem.

In 1926, Carathéodory, in his study of holomorphic functions from the open unit disc $\mathbb{D}$ of the complex plane to the closed unit disc $\mathbb{D}$, proved that any holomorphic self-map on $\mathbb{D}$ can be approximated by finite Blaschke products (uniformly on compact subsets). Afterward, Rudin generalized this result to the polydisc as well as the open unit ball.

In this talk, we will explore extended versions of this theorem, specifically Carathéodory's approximation theorem for matrix-valued functions on the disc, the bidisc, and multi-connected domains. Our discussion will primarily focus on two perspectives: one rooted in operator theory and the other viewed through the lens of operator algebra. We will delve into the limitations and benefits inherent in both approaches. Finally, we will see a few applications of this result.