

# PERIOD DOUBLING ROUTE IN THE PERIODIC AND THE CHAOTIC REGION OF THE LOGISTIC MAP

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## ABSTRACT

One of the common route to chaos is the period doubling route [6, 17]. For systems that undergo period doubling cascades, there also exists an “inverse cascade” [2] of chaotic band merging called reverse bifurcation [4, 8, 10]. This paper investigates the period doubling route to chaos and the period doubling nature of chaotic bands using the logistic map. We have considered this map and identified the parameter values  $\mu$  for which the period doubling bifurcations occur and have shown that the bifurcation points converges to an accumulation point where the chaotic situation starts. Our tool for finding such a point is with the help of establishing the ‘Feigenbaum delta’ [3] which is one of the several universalities discovered by famous particle physicist M. J. Feigenbaum. The period doubling scenario explains us how the behaviour of the model changes from regularity to a chaotic one. Further, we have discussed about the reverse bifurcation and reverse bifurcation points called Misiurewicz points [13,14, 15, 18] and established the Feigenbaum delta in that case also. This situation occurs inside the chaotic region and it unfolds some regularity even within the chaotic region.

**KEYWORDS:** Period Doubling Bifurcation, Reverse Bifurcation, Feigenbaum Delta, Chaos