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U G Abdulla, Rashad U Abdulla, Muhammad U Abdulla, Alyssa Turnquist and Naveed H Iqbal* (nchaudhr@my.fit.edu). *On the Fine Classification of Periodic Orbits of the Continuous Endomorphisms on the Real Line and Universality in Chaos.*

We pursue the classification of periodic orbits of continuous endomorphisms on \mathbb{R} and clarify the structure and distribution of periodic orbits within the chaotic regime for the discrete nonlinear dynamical systems. By developing a new constructive method suggested by Abdulla et al. JDEA, 19(2013), no.9, we complete the classification of minimal orbits. We advance an open problem on the structure of the second minimal odd orbits, which are defined as those that immediately follow the minimal orbits under the Sharkovski ordering. We prove there are 9 types of second minimal 7-orbits with accuracy up to inverses. We apply this result to the problem on the distribution of superstable periodic windows within the chaotic regime of the bifurcation diagram of the one-parameter family of unimodal maps. It is revealed that by fixing the maximum number of appearances of the periodic windows there is a universal pattern of distribution. Another development of this research is the revelation of the pattern of the pattern dynamics with respect to increased number of appearances. Understanding the nature and characteristics of this fascinating universal route and classification of all the second minimal odd orbits is an outstanding open problem (Received September 15, 2015)