The elastic, geometrical nonlinear analysis of structures has always been a fundamental topic in structural mechanics. It is a matter of fact that the effects of large displacements and rotations may play a primary role in the correct prediction, for example, of wing structures, space antennas, robotic arms, as well as turbine blades, among others. Then, the availability of accurate models able to deal with post-buckling and large displacement analysis is of crucial relevance. Moreover, the dynamic properties of a structure are evidently a property of the equilibrium state. Since the equilibrium state changes during the nonlinear behavior of a structure (in fact, large displacements and rotations can eventually lead to considerable prestress states within the structure), the modal characteristics change as well. Then, for a reliable design of such structures, an accurate evaluation of the evolution and, eventually, aberration of modes is of fundamental importance. The aforementioned aspects have been investigated by making use of the Carrera Unified Formulation (CUF). Thanks to its flexibility and hierarchical nature, unified 1D and 2D models for the geometrical nonlinear analysis can be built. CUF allows to numerically reproduce the results come from experimental investigation for the static and dynamic properties of a structure in the post-buckling field. Finally, an application of CUF in the context of nonlocal theories has been investigated. In fact, in some cases, classical elasticity may fail in describing the correct behavior of the structures. For this reason, several nonlocal theories have been formulated, and, among these, The micropolar elasticity have been analyzed. 1D and 2D models have been built and validated through available literature results.