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Andrei Ludu* (ludua@erau.edu), ERAU, COAS-301.11, Daytona Beach, FL 32114. *ODE with Variable Order of Differentiation.*

We introduce a new type of evolution equation where the order of differentiation is considered itself a continuous independent or dependent variable. Such systems having continuously variable order of differentiation can be mapped into a nonlinear fractional partial differential equation and from here into a Volterra integral equation with singular kernel. We elaborate on the existence and qualitative properties of time-dependent solutions through the formalism of FPDE in the Riemann-Liouville-Jumarie sense. Some of the exact solutions represented in integral form, or expanded Mittag-Leffler functions series are compared numerically with piece-wise solutions of traditional evolution equations of different, yet constant order. The idea in this approach is related to the observational connection between the evolution of the degree of complexity, and rate of accelerated change on one hand, and the degree of time non-locality (history dependent) of the model differential equation, on the other hand. (Received January 18, 2017)