Dear Editor:

I wish to submit a research article for publication in *IEEE Signal Processing Letters* titled “Data-driven Neural Network Discovery of Caputo Fractional Order Systems” The paper was coauthored by Xuemeng Fan, Ran Huang, Guoqing Jiang and Cong Wu.

Discovering Caputo fractional order models from data is being a central challenge in many diverse areas of science and engineering, with the increasing development in theory and applications of Caputo fractional order systems. In our very recent work, we have extended the sparse regression method, one of two main types of data-driven (integer order model) discovery methods (the other one is the neural network method), to the Caputo fractional order case. However, the library of element functions must be prescribed in advance when applying this method, which seriously limits its application. In this paper, we develop the neural network method to discover Caputo fractional order systems hidden in data after overcoming the problems of gradient, time step and high computational complexity. No prescribed knowledge is needed any more in our method and so a milestone advance is made in the data-driven methods. We finally demonstrate the advanced method on a wide range of discovering models, from simple autonomous systems, including Lorenz system and Chua's circuit, to the nonautonomous Duffing’s oscillator.

This manuscript has not been published or presented elsewhere in part or in entirety and is not under consideration by another journal. We have read and understood your journal’s policies, and we believe that neither the manuscript nor the study violates any of these. There are no conflicts of interest to declare.

Thank you for your consideration. I look forward to hearing from you.

Sincerely,

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