

# POWER SYSTEM MODEL TOOLBOX WITH TRADITIONAL DAMPING CONTROLLERS, MACHINE LEARNING AND HYBRID ARTIFICIAL COMPUTATIONAL INTELLIGENCE SYSTEM

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## **ABSTRACT**

Power system dynamics and control is one of the most important courses in BSc/BTech, MSc/MTech and PhD programs of Electrical Engineering at most universities worldwide. Due to the practical nature of this course, students cannot appreciate the course properly. This Manuscript presents a toolbox based on simulations and programs in MATLAB software that are useful for the practical application of power system dynamics and control. The toolbox incorporates Matpower and Simulink implementation of two different types of power system models incorporated with Proportional Integral Derivative, Fractional Order Proportional Integral Derivative, Tilt Integral derivatives, Power System Stabilizer control and Neurofuzzy Controller. The controllers are designed using an Artificial ecosystem optimization algorithm, Ant bee colony algorithm and Particle Swarm Optimization. The first model is run alongside Matpower for power flow studies which calculates steady state operating conditions, while the second includes the power flow programs. The Simulink interface is utilized to solve the differential-algebraic equations (DAE). The power system models are presented in single-machine infinite bus, 3-machine power system and 10-machine power system. The results of the damping controller design are explained for all the controllers installed in each power systems model. All the program codes and models are available at the GitHub links attached in the necessary sections: for verification purposes. However, for proper understanding, it is advisable to follow the step-by-step guide to build your model and then verify it against the model in the GitHub link.