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An efficient method to recover mathematical operators supported on genetic programming using average mutual information –AMI–

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This paper introduces a heuristic which is able to build, being guided by data sets, from simple mathematical operators such as linear functions to more complex operators, such as ordinary differential equations and discrete maps. This heuristic is supported in genetic programming, but uses average mutual information –AMI- to design the operator's structures, showing how in this kind of method it is more important first to understand the way in which information flows through mathematical operators, particularly in non-linear equations, than to make great stresses trying to improve model performance. Once a good mathematical operator has been identified, the calibration process can be carried out in many ways: gradient, evaluative methods, etc. Here it is also shown how effective and efficient this heuristic can be when compared to traditional genetic programming, due to reductions in the population size of individuals proposed and selected. Finally, it presents how nonlinear equations (Manning), ordinary differential equations (Lorenz, Rossler) and discrete maps (Hénon, Tinkerbell) are recovered.