PySINDy Constraints

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1 Form of Constraints

We need

$$\sum x_i = 0$$

PySyndy works by spitting out equations of the form

$$\frac{\mathrm{d}x_i}{\mathrm{d}t} = f(1, x_1, x_2, x_3..., x_1x_2, x_1x_3, ...x_1^2, x_2^2...)$$

for i = 0,.....14

(Assuming only polynomial terms with a max degree of 2 and ignoring the fact that most of these terms will have a coefficient of zero)

There are 156 possible terms for each of the 15 derivatives. We need to write some set of linear equations with the coefficients of these terms to ensure that the sum of the derivatives is zero.

This is done by defining $Cw = d$ where C is our constraint matrix, w is another matrix where each row represents one constraint and each column corresponds to 1 of the 156*15 terms that PySyndy uses in its equations. d is our resultant to enforce this constraint.