Auto-encoders for compression in reduced order modelling

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ABSTRACT

Auto-encoders have primarily been used to reduce the amount of data required to represent an image [1] but recently have been applied in fluid dynamics to reduce the number of variables required to represent a solution [2].

Usually, in reduced order modelling, Singular Value Decomposition (SVD) is used to compress a set of simulation results into a small number of basis functions which capture the fundamental behaviour of the system. Auto-encoders are showing great promise in their ability to compress variables and have major advantages over linear compression methods such as the SVD. These advantages include the ability to represent Lagrangian motions with ease due to their ability to produce non-linear representations that are position invariant.

We will compare the effectiveness of the SVD and auto-encoder in the construction of a reduced order model.

REFERENCES

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[2] Gonzalez, F.J. and Balajewicz, M. Deep convolutional recurrent autoencoders for learning low-dimensional feature dynamics of fluid systems. *arXiv:1808.01346 [math.DS]*, (2018).