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# TOWARDS FINITE-ELEMENT SIMULATION USING DEEP LEARNING

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**Summary:** Finite-element modeling is commonly used to simulate soft-tissue biomechanics, but is too computationally burdensome for use in real-time applications. Various forms of dimensionality reduction have been investigated to reduce the computational cost of finite-element simulation, such as surrogate models, principal-component analysis, and model-order reduction, however linear dimensionality reduction techniques may be insufficient to capture the high degree of non-linearity in biological soft-tissue materials. Recent advances in deep learning have the potential to represent a highly complex and non-linear model deformation space in a compact form. In this paper, we use a deep-autoencoder to approximate the large deformations of a non-linear, muscle actuated beam. We found that the autoencoder consistently produced lower reconstruction error than the equivalently sized principal-component analysis model. These results are a preliminary step towards modeling more fulsome biomechanical soft-tissue models with deep learning approaches.