This research explores a new application area for machine learning. Vibration analysis of cantilever beams has been done by some researchers earlier, but those were done for very specialized cases only. In this paper we apply deep learning to a fairly generalized case of cantilever beams and this work can easily be extended to the beams with other boundary conditions. Although these problems can be solved in closed form, but to implement a closed form solution using any programming language requires field specific knowledge, thus using data driven approach helps cross-field researchers also. If we implement the closed form solutions using any of the available programming languages, we need to write a lot of code which is subject to change when newer versions of the programming languages will be released, thus we need to maintain the code regularly. Some of the available software like MATLAB are paid. All these problems are alleviated by the use of data driven approach. We implemented our deep learning model using pytorch, which is open source.

[some other motivation and further research bullet points are mentioned on the next page]

* Some problems are really difficult or impossible to solve theoretically.
* In some cases these can be solved by fitting curve to some data-points generated for special cases.
* Data driven approach:
  1. Removes necessity of field specific knowledge.
  2. There is a large amount of data present.
     + Highly optimized algorithms are there to process this data.
  3. Tremendous computational power available.
* These models can also be trained on data for beams subjected to other boundary conditions.
  1. Due to similar underlying equations, we can expect reasonably high accuracy in predictions.
* Other better models could be developed to improve the extrapolation accuracy of the neural network far away from trained range.
  1. Challenging part in doing this is the complex nature of Bessel functions, which contain integrations of factorial, factorials in denominator, etc.