# Asteroid Diameter Prediction Using Deep Learning Methodology
# DMML 2 Project Proposal

Raj Shrikant Sonawane
*MSc. Data Analytics*
*National College of Ireland*
Dublin, Ireland
x21155054@student.ncirl.ie

Viplav Vijay Gadewar
*MSc. Data Analytics*
*National College of Ireland*
Dublin, Ireland
x21164274@student.ncirl.ie

Kapil Lalwani
*MSc. Data Analytics*
*National College of Ireland*
Dublin, Ireland
x21123292@student.ncirl.ie

Rohan Sanjay Kore
*MSc. Data Analytics*
*National College of Ireland*
Dublin, Ireland
x19214413@student.ncirl.ie

## I. MOTIVATION

We have all been astrological, galactic, and space enthusiasts since we were young. One of an asteroid's most crucial physical characteristics is its diameter, which is used to many other physical and fundamental characteristics of The asteroids enjoy determining the period of rotation of asteroid and to determine whether an asteroid is Depending on whether it is determined to be a Near Earthly body. Various further applications of the diameter investigates the asteroid.Both the accessible data and our physical space are huge. AI has applications in space exploration and has the ability to address all current issues in all fields. Asteroids are a component of our galaxy and, like our planets and stars, orbit around the sun. There might be a great deal of devastation if a large asteroid strikes our planet. Therefore, if we could foresee the asteroid's diameter, we could take precautions against any potential harm.

The largest asteroid, Vesta, has a diameter of around 329 miles (530 kilometers), whereas the smallest asteroids are only 33 feet (10 meters) broad. The mass of the moon of Earth is more than the total mass of all asteroids.

The bulk of asteroids are uneven and usually pitted or cratered, despite the fact that others are practically spherical. In addition to rotating, occasionally rather erratically, asteroids tumble through their erratic orbits around the Sun. More than 150 asteroids are known to have a small companion moon. In binary asteroids, two rocky rocks of about the same size orbit one another. There are also triple asteroid systems.

We can use Machine Learning and Deep Learning to predict the diameter of asteroids using a variety of characteristics, preventing the harm caused by asteroids.

## II. RESEARCH QUESTION

How accurately can we make a model that determine asteroid's diameter using deep learning techniques?

## III. LITERATURE REVIEW

In this paper, types of asteroids group are given Near Earth Objects (NEO), Potentially Hazardous Objects (PHA).Data is taken from official website of JPL (Jet Propulsion Laboratory).The R2-Score which we have achieved through Multilayer Perceptron is 0.9665626238, along with it we have achieved Explained Variance Score of 0.9665631410, the Mean Absolute Error for this model is 0.4306106593, Mean Squared Error is 3.3754211434 and Median Absolute Error is0.2242921644.(Basu 2019)

In this paper, the problem of training neural networks with discontinuous nonlinearities is Described and the proposed algorithm formulates a vowel discrimination problem. The new learning algorithm proposes algorithm for neural networks with hard limiting nonlinearities.(Buhrke & LoCicero 2003)

In this paper (Vaughn & Franks 2003) , Vaughan describes how helicopter air frame load spectra are predicted using data on continuously valued flying parameters using a multi-layer perceptron. According to the investigation, the top-ranked positive traits also serve as negative features.

The effectiveness of multilayer perceptrons (MLP) and generalized regression neural networks (GRNN) in the active cancellation of sound noise is assessed in this research (Salmasi et al. 2011) . According to the findings of simulations, the MLP neural network is superior to the GRNN at cancelling sound noise.

In their investigation, specific daily flow and sediment concentration data are used to multilayer perceptrons and generalized regression neural networks. In both the estimate of sediment concentration using observed river flow values and the prediction of sediment values using previously recorded sediment values, generalized regression neural networks were shown to be superior than feed forward multilayer perceptrons.(Yidirim & Cigizoglu 2002)

The total recognition rate, which is extremely high, is 82.06 percent. Along with MLP architecture, we may use Hidden Markov model (HMM) or Support Vector Machine (SVM) classifiers to increase the overall recognition rate.(Singh & Sachan 2016)

Multilayer perceptrons are feedforward neural networks containing one or more layers of nodes between the input and output nodes. These nodes are referred to as hidden

nodes. These perceptrons have been effectively employed as pattern classifiers in several applications after being trained using the fundamental back-propagation technique. However, it still seems like there is some debate over the ideal number of hidden nodes needed to create arbitrary decision areas. The techniques used in practice range from a decision made intuitively to one made through simulation.(Mirchandani & Cao 1989)

In this study, the possibility of using flight state and control system (FSCS) characteristics to infer helicopter airframe loads at fixed locations from multi-layer artificial neural networks (ANNs) was investigated. The advantage of employing solely FSCS parameters is that most helicopters already have the hardware needed to capture these information, and it is operational. The ultimate goal of this research is to increase component retirement times' (CRTs') accuracy so that they more accurately represent the aircraft's real usage.(Liu et al. 2011)

## IV. Data Sources

The official website of the Jet Propulsion Laboratory provides access to the whole dataset (https://ssd.jpl.nasa.gov/tools/sbdb query.html).

## References

Basu, V. (2019), 'Prediction of asteroid diameter with the help of multi-layer perceptron regressor 36 prediction of asteroid diameter with the help of multi-layer perceptron regressor'. **URL:** *http://iraj.in*

Buhrke, E. & LoCicero, J. (2003), A learning algorithm for multi-layer perceptron networks with nondifferentiable non-linearities, Institute of Electrical and Electronics Engineers (IEEE), pp. 944–949.

Liu, A., Cheung, C. & Martinez, M. (2011), 'Use of artificial neural networks for helicopter load monitoring'.

Mirchandani, G. & Cao, W. (1989), 'On hidden nodes for neural nets', *IEEE Transactions on Circuits and Systems* **36**, 661–664.

Salmasi, M., Mahdavi-Nasab, H. & Pourghassem, H. (2011), Comparison of multilayer perceptron and generalized regression neural networks in active noise control.

Singh, G. & Sachan, M. (2016), Offline gurmukhi script recognition using knowledge based approach multi-layered perceptron neural network, Institute of Electrical and Electronics Engineers Inc., pp. 266–271.

Vaughn, M. L. & Franks, J. G. (2003), Explaining how a multi-layer perceptron predicts helicopter airframe load spectra from continuously valued flight parameter data, Vol. 2, pp. 1059–1064.

Yidirim, T. & Cigizoglu, H. K. (2002), Comparison of generalized regression neural network and mlp performances on hydrologic data forecasting, Vol. 5, Institute of Electrical and Electronics Engineers Inc., pp. 2488–2491.