

**Project Title:** Wildfire Spreading Prediction Using Graph Neural Networks

**Project Supervisor:** Dr Xiaoyang Wang, Department of Computer Science, University of Exeter

**Project Enquiries:** x.wang7@exeter.ac.uk

**Project keywords:** Machine Learning, Graph Neural Networks, Wildfire, Remote Sensing

### Project description:

Wildfires pose significant threats to both human life and the environment. Timely prediction of their spread is crucial for effective mitigation efforts. Recently, machine learning, especially deep learning, has shown good results in predicting the spread of wildfire at a global scale. This 10-week research project aims to explore the application of Graph Neural Networks (GNNs) in predicting wildfire spread patterns. Traditional methods often fail to capture the intricate spatial dependencies that are inherent. GNNs, however, offer a promising approach by treating the landscape as a graph, where nodes represent geographical locations and edges denote the relationships between them. It has shown great success in traffic prediction[1] and weather forecast[2]. The project will involve leveraging graph-based representations to model the complex interactions among various factors influencing wildfire propagation. Existing dataset such as Next day wildfire spread[3] will be applied in this research. At the end of the project, the intern will acquire knowledge on machine learning, graph neural networks, climate prediction models and large-scale data analysis.

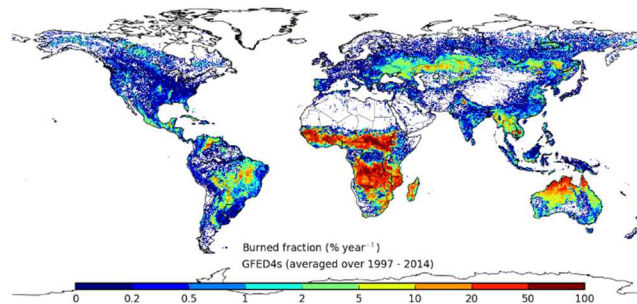


Fig. 1 Annual burned area (as percentage of the area of the grid cell), averaged over 1997-2014.  
(Source: Global Fire Emissions Database)

### References

- [1] Derrow-Pinion, A., She, J., Wong, D., Lange, O., Hester, T., Perez, L., Nunkesser, M., Lee, S., Guo, X., Wiltshire, B. and Battaglia, P.W., 2021, October. Eta prediction with graph neural networks in google maps. In Proceedings of the 30th ACM International Conference on Information & Knowledge Management (pp. 3767-3776).
- [2] Keisler, R., 2022. Forecasting global weather with graph neural networks. arXiv preprint arXiv:2202.07575.
- [3] Huot, F., Hu, R.L., Goyal, N., Sankar, T., Ihme, M. and Chen, Y.F., 2022. Next day wildfire spread: A machine learning dataset to predict wildfire spreading from remote-sensing data. IEEE Transactions on Geoscience and Remote Sensing, 60, pp.1-13.
- [4] Joshi, J. and Sukumar, R., 2021. Improving prediction and assessment of global fires using multilayer neural networks. Scientific reports, 11(1), p.3295.