# Applications of federated learning in a healthcare setting

**Ó Fithcheallaigh, S.1, Last Name, Initial.2 (please underline presenting author)**

1 Ulster University, Belfast

2 Institution of second author

*email: o\_fithcheallaigh-s@ulster.ac.uk*

# Introduction

Recent years have seen a marked increase in the use of systems we call the Internet of Things (IoT) – the network of physical objects that collect and exchange data. As more of these devices are in use, the amount of data being collected and stored has increase. This has, in part, lead to greater interest in the world of artificial intelligence (AI).

Alongside the increase in activity related to the IoT, there has also been an increase in public concern over data privacy. According to a Pew Research Centre survey carried out in America, 79% of adults were concerned about the way their personal data was being used by companies [1]. This has been reflected in legislation, such as the General Data Protection Regulation (GDPR), introduced in 2018 in the EU, China introduced the Personal Protection Information Law in 2021, and South Korea enacted the Personal Information Protect Act of 2011.

This period has also seen researchers working in AI looking for ways to ensure data privacy in their models, while still being able to benefit from the increasing amount of data that companies and organisations have. One approach that shows promise is Federated Learning [2] (FL).

A diagram of a flowchart

Description automatically generated

***Figure 1*** *Federated Learning Systems Diagram*

This work aims to provide an overview of FL and how it can be applied to the healthcare sector as a way of benefitting from advances in artificial intelligence, while ensuring data privacy for the users of the services provided.

# Discussion

Taking the example of disease detection, with ML, a typical workflow would be to gather the dataset, build a model, fine tune it, and then deploy it when a level of accuracy is reached. But this dataset may not have been updated with more recent data

FL offers a way to continually update the ML model while keeping data private by training a local model, known as the client model, on local data (i.e. the data the hospital holds), and when the local model has been trained, the updated model parameters, and not the data itselfare sent back to a central server, which receives the updates from a large number of sites, and aggregates them to train a new global model. which is them sent back to the clients. This process is shown in Figure 1.

# CONCLUSION

In a healthcare environment, federated learning offers a way to train machine learning models which can be widely used on data that remains local to the hospital or health centre, thereby allowing more users to benefit from a system trained on the most recent data.

# References

[1] Engström (*et al.),* Computers in Human Behavior Reports, Vol 9, 2023

[2] McMahan (*et al.),* Artificial Intelligence and Statistics, pp. 1273-1282, 2017