

CLAIMS

WHAT IS CLAIMED IS:

1. A method comprising:
 - splitting a neural network into a first client-side network, a second client-side network
 - 5 and a server-side network;
 - sending the first client-side network to a first client, wherein the first client-side network is configured to process first data from the first client, the first data having a first type and wherein the first client-side network comprises at least one first client-side layer;
 - sending the second client-side network to a second client, wherein the second client-
 - 10 side network is configured to process second data from the second client, the second data having a second type and wherein the second client-side network comprises at least one second client-side layer, wherein the first type and the second type have a common association;
 - training the first client-side network on first data from the first client and generating
 - 15 first activations;
 - transmitting the first activations from the first client-side network to the server-side network;
 - training the second client-side network on second data from the second client and generating second activations;
 - 20 transmitting the second activations from the second client-side network to the server-side network;
 - training at least one server-side layer of the server-side network based on the first activations and the second activations to generate gradients; and
 - transmitting the gradients from the server-side network to the first client-side network
 - 25 and the second client-side network.

2. The method of claim 1, wherein the common association comprises at least one of a device, a person, a consumer, a patient, a business, a concept, a medical condition, a group of people, a process, a product and/or a service.
3. The method of claim 1, wherein the server-side network comprises a global machine
5 learning model.
4. The method of claim 1, wherein the neural network comprises weights, bias and hyperparameters.
5. The method of claim 1, wherein the at least one first client-side layer and the at least one second client-side layer comprise a same number of layers or a different number of
10 layers.
6. The method of claim 1, wherein a cut layer exists between the server-side network and the first client-side network and the second client-side network.
7. The method of claim 1, wherein the first type comprises text data and the second type comprises image data.
- 15 8. The method of claim 7, wherein the first client-side network and the second client-side network are independent and operate independently.
9. The method of claim 1, wherein the first type comprises tabular data and the second type comprises image data.
10. A system comprising:
20 a processor; and
a computer-readable storage device storing instructions which, when executed by the processor, cause the processor to perform operations comprising:
splitting a neural network into a first client-side network, a second client-side network and a server-side network;

sending the first client-side network to a first client, wherein the first client-side network is configured to process first data from the first client, the first data having a first type and wherein the first client-side network comprises at least one first client-side layer;

5 sending the second client-side network to a second client, wherein the second client-side network is configured to process second data from the second client, the second data having a second type and wherein the second client-side network comprises at least one second client-side layer, wherein the first type and the second type have a common association;

10 receiving, at the server-side network, first activations from a training of the first client-side network on first data from the first client;

 receiving, at the server-side network, second activations from a training of the second client-side network on second data from the second client;

 training at least one server-side layer of the server-side network based on the first activations and the second activations to generate gradients; and

15 transmitting the gradients from the server-side network to the first client-side network and the second client-side network.

11. The system of claim 10, wherein the common association comprises at least one of a device, a person, a consumer, a patient, a business, a concept, a medical condition, a group of people, a process, a product and/or a service.

12. The system of claim 10, wherein the server-side network comprises a global machine learning model.

13. The system of claim 10, wherein the neural network comprises weights, bias and hyperparameters.

14. The system of claim 10, wherein the at least one first client-side layer and the at least one second client-side layer comprise a same number of layers or a different number of layers.
15. The system of claim 10, wherein a cut layer exists between the server-side network
5 and the first client-side network and the second client-side network.
16. The system of claim 10, wherein the first type and the second type are different types of data.
17. The system of claim 10, wherein the first type comprises tabular data or time-series data and the second type comprises image data.
- 10 18. A method comprising:
- splitting a neural network into a first client-side network, a second client-side network and a server-side network;
- sending the first client-side network to a first client, wherein the first client-side network is configured to process first data from the first client, the first data having a first
15 type and wherein the first client-side network comprises at least one first client-side layer;
- sending the second client-side network to a second client, wherein the second client-side network is configured to process second data from the second client, the second data having a second type and wherein the second client-side network comprises at least one second client-side layer, wherein the first type and the second type have a common
20 association;
- receiving, at the server-side network, first activations from a training of the first client-side network on first data from the first client;
- receiving, at the server-side network, second activations from a training of the second client-side network on second data from the second client;

training at least one server-side layer of the server-side network based on the first activations and the second activations to generate gradients; and

transmitting the gradients from the server-side network to the first client-side network and the second client-side network.

- 5 19. The method of claim 18, wherein the first type and the second type are different types of data.
20. The system of claim 18, wherein the first type comprises tabular data or time-series data and the second type comprises image data.