

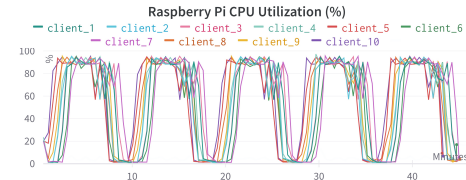
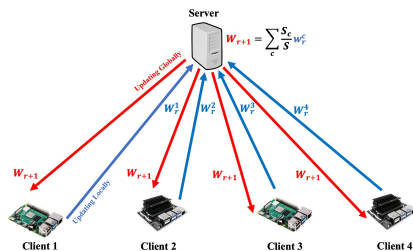
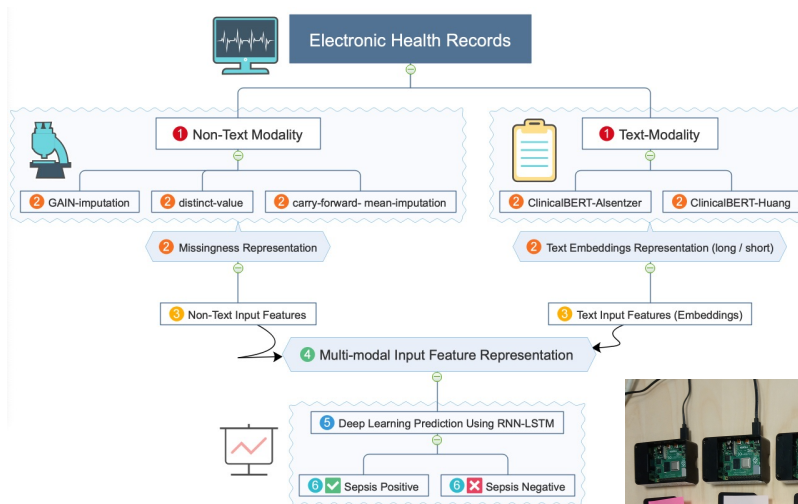
FedSepsis: A Federated Multi-Modal Deep Learning-Based Internet of Medical Things Application for Early Detection of Sepsis from Electronic Health Records Using Raspberry Pi and Jetson Nano Devices

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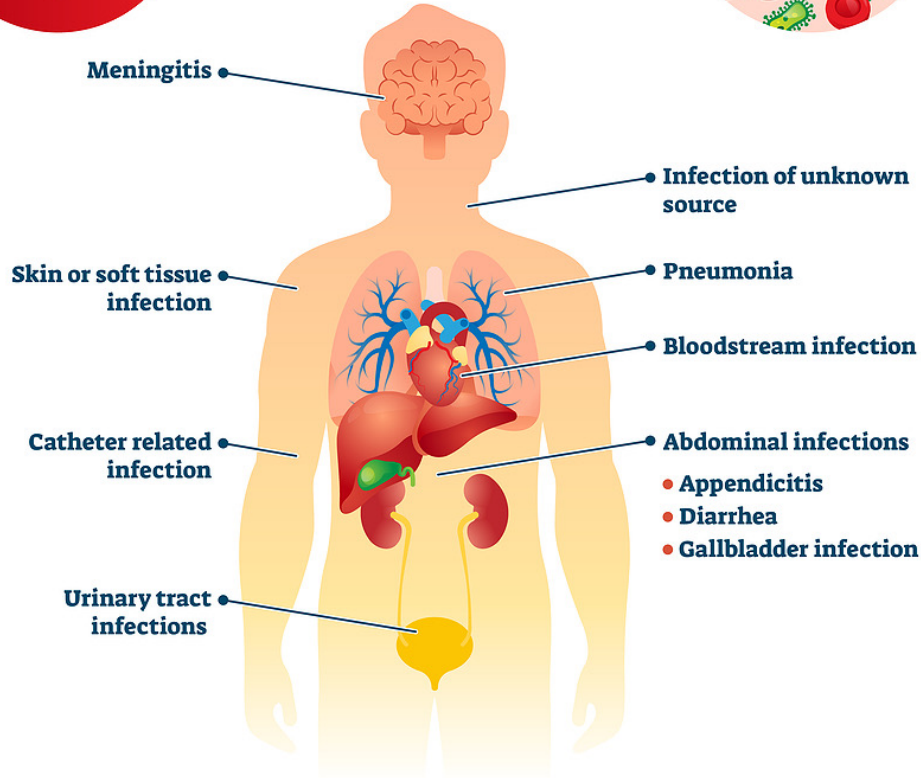
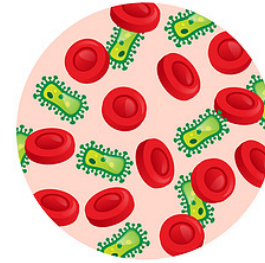
16 January 2023





SEPSIS

Sepsis is a potentially life-threatening condition caused by the **body's response** to an infection



<https://www.griswoldhomecare.com/images/blog/bigstock-Sepsis-Vector-Illustration-La-366032344.jpg>





Feeling very unwell, extreme pain or the "worst ever"



Fast breathing



Skin rash or clammy, sweaty skin



Feeling very hot or cold, chills or shivering

SYMPTOMS OF ADULT SEPSIS



Fast heart beat



Feeling confused disorientated, or slurring speech



Not passing much (or any) urine



Weakness or aching muscles

https://www.health.qld.gov.au/__data/assets/image/0033/881574/varieties/800-lg.jpg





WORLD SEPSIS DAY INFOGRAPHICS

A GLOBAL HEALTH CRISIS



47 000 000 - 50 000 000
cases per year



At least 11 000 000 die
- 1 death every 2.8 seconds



Survivors may face
lifelong consequences



1 in every 5 deaths worldwide
is associated with sepsis

Infographic 2/21



Global
Sepsis
Alliance

www.worldsepsisday.org
www.global-sepsis-alliance.org

September 13 2020 | World Sepsis Day

Survival is dependent on initiating appropriate antimicrobial treatment **as early as possible**

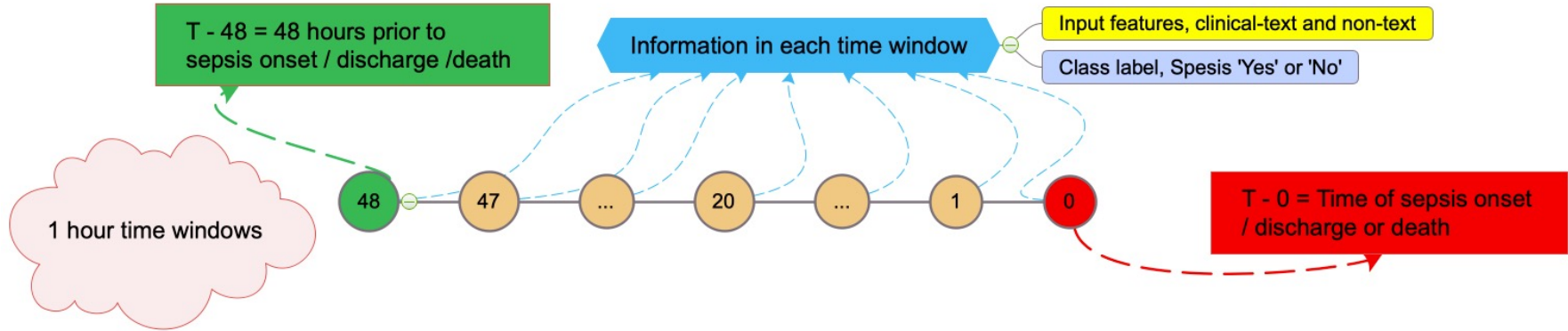
Mortality from septic shock increases by 7.6% for every hour that antimicrobial treatment is delayed after the onset

https://www.momed.com/wp-content/uploads/2020/09/2_Global-Health-Crisis-1536x1536.jpg

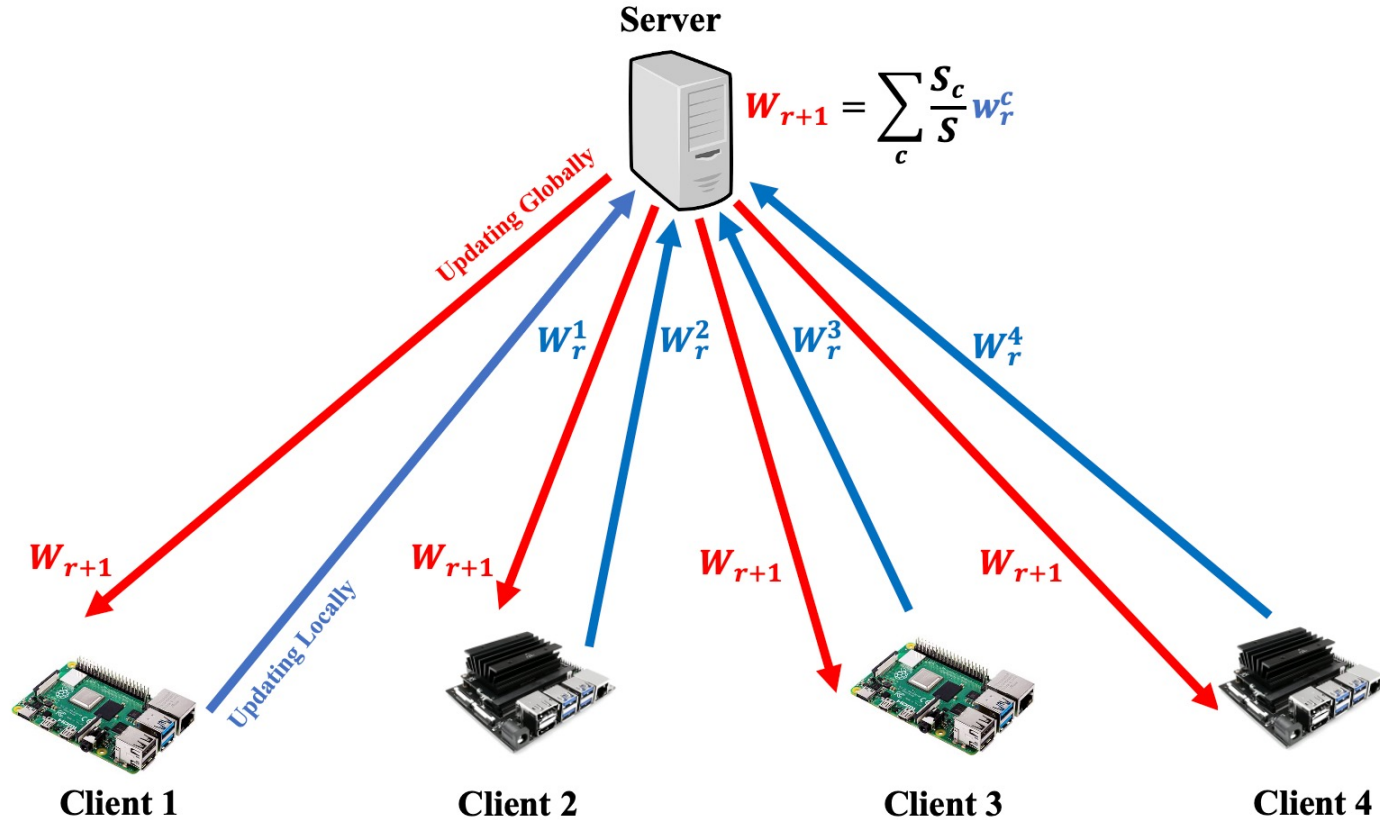


Stockholm
University

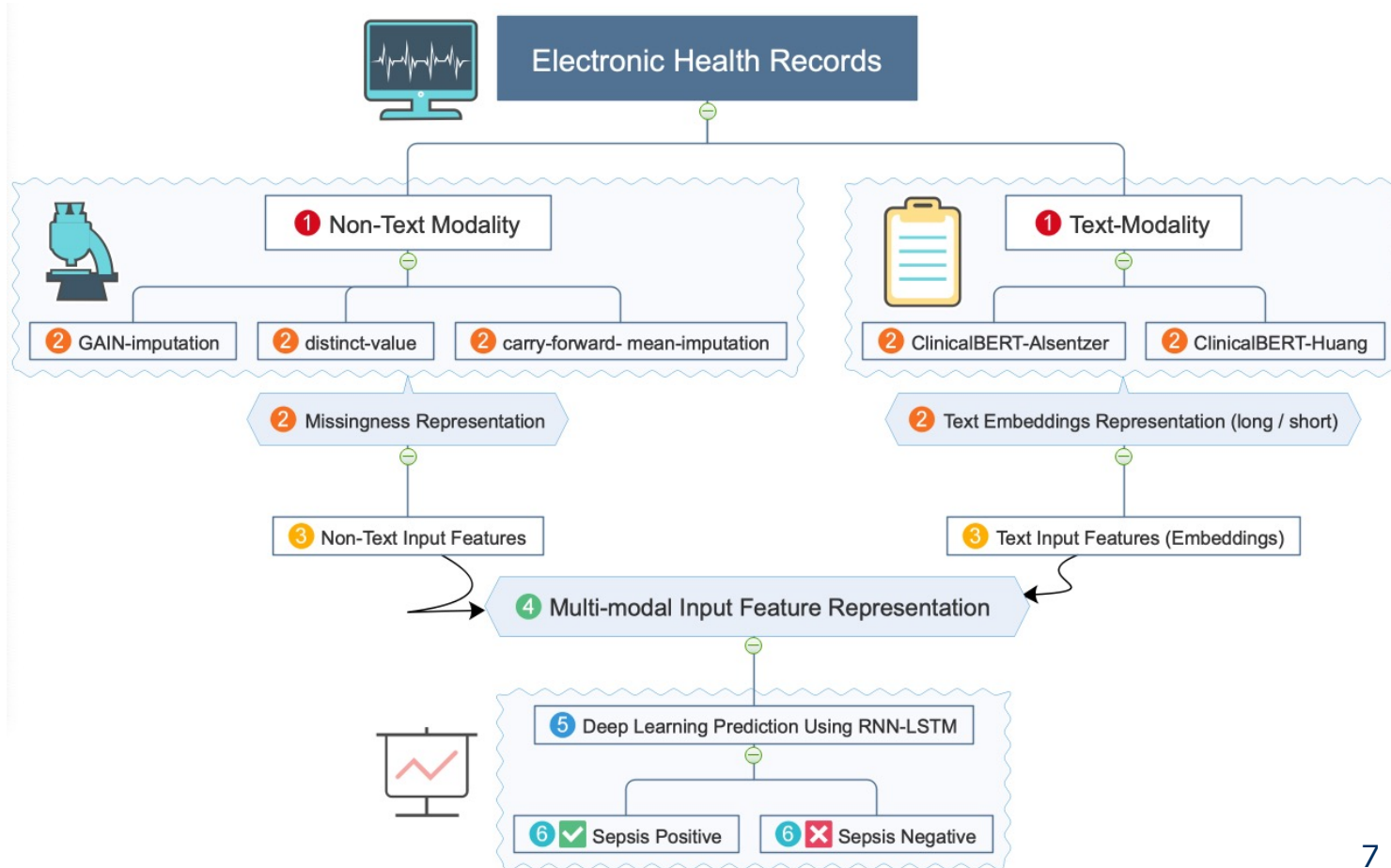
Representing Electronic Health Records Data



Federated Learning Architecture



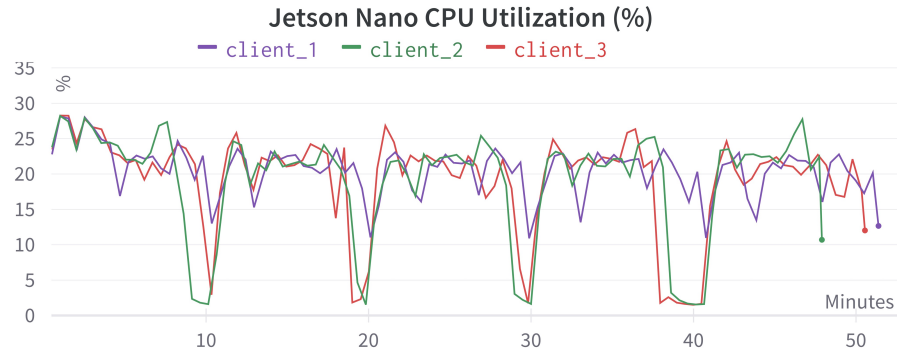
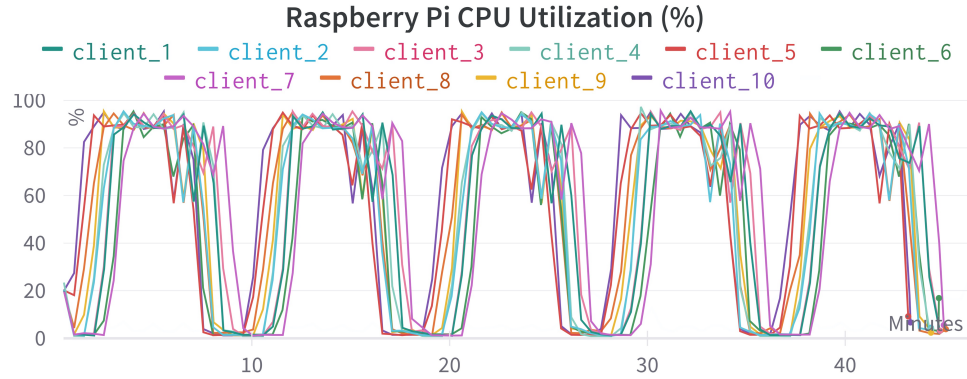
Schematic Diagram of FedSepsis



Raspberry Pi (Left) and Jetson Nano (Right) Edge Devices Used in the Experiments



CPU Utilization Comparison

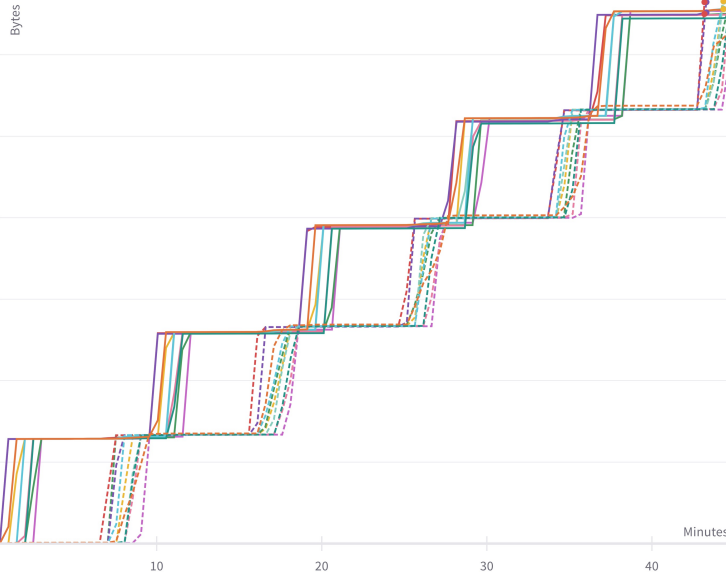


Network Traffic Comparison

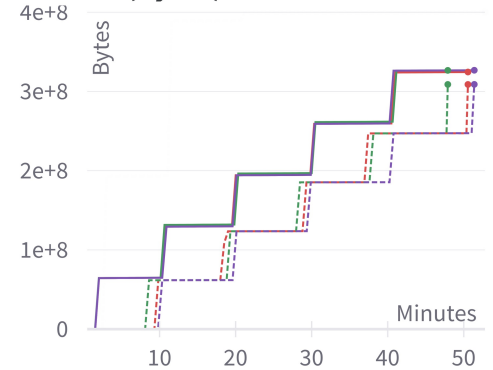
- client_1 Received
- client_2 Received
- client_3 Received
- client_1 Sent
- client_2 Sent
- client_3 Sent

Raspberry Pi Network Traffic (bytes)

- Showing first 10 runs
- client_1 Received
 - client_2 Received
 - client_3 Received
 - client_4 Received
 - client_5 Received
 - client_6 Received
 - client_7 Received
 - client_8 Received
 - client_9 Received
 - client_10 Received
 - client_1 Sent
 - client_2 Sent
 - client_3 Sent
 - client_4 Sent
 - client_5 Sent
 - client_6 Sent
 - client_7 Sent
 - client_8 Sent
 - client_9 Sent
 - client_10 Sent



Jetson Nano Network Traffic (bytes)



FedSepsis, At A Glance (1)

- ❑ **An internet of medical things-based clinical decision support system application for early detection of sepsis**
- ❑ **Utilizes federated learning**
 - ❑ **a distributed machine learning approach to ensure security and privacy**
- ❑ **Uses multi-modality**
 - ❑ **By analyzing the data using different associated forms or modalities to ensure better performance and to mimic the real-world diagnosis process**
- ❑ **Uses a cutting-edge technique to handle missing non-text data**
 - ❑ **Missingness is a crucial issue in electronic health records**

FedSepsis, At A Glance (2)

- ❑ **Uses cutting-edge ClinicalBERT models to generate improved features from text data**
- ❑ **Practical and ensures that low-cost and low-capacity device usage is possible to ensure practicality and usability for wider stakeholders**
- ❑ **We thoroughly investigated the system-level aspects of low-end devices such as Raspberry Pi and Jetson Nano**
- ❑ **The data and code are publicly available so that everybody can benefit from them**
- ❑ **The prediction scores are entirely satisfactory and the possibility of relatively low-cost device usage can benefit all the stakeholders**

FedSepsis Details

- ❑ **Read the full article here:**

<https://doi.org/10.3390/s23020970>

- ❑ **Code Repository Link:**

<https://github.com/anondo1969/FedSepsis>

Thank You!

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