

2025 T-CAIREM CONFERENCE



Temerty Centre for AI Research
and Education in Medicine
UNIVERSITY OF TORONTO

MEDFL: A COLLABORATIVE FRAMEWORK FOR FEDERATED LEARNING IN MEDICINE

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PROMOT
Performing a Rare Disease-Oriented
Master Observational Trial



McGill
UNIVERSITY



Université de
Sherbrooke

PRESENTATION PLAN

1. Context
2. Objectives
3. Results
4. Future work
5. Conclusion

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CONTEXT
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2



2

Expertise gap : A difference in expertise between medical and computer science researchers.

Analysis and Processing of Medical Data



1

1

Data confidentiality: the use of medical data is strictly regulated, which limits the progress of medical research.

SOLUTION

Problem



Solution

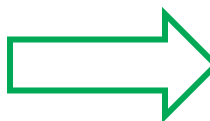
Problem 1



S1

Solution 1

Problem 2



S2

Solution 2

SOLUTION 1

FEDERATED LEARNING

S1

- Introduced by Google in 2016.
- Enables model training **without direct access to raw data.**
- **Promotes data confidentiality** by avoiding data centralization.

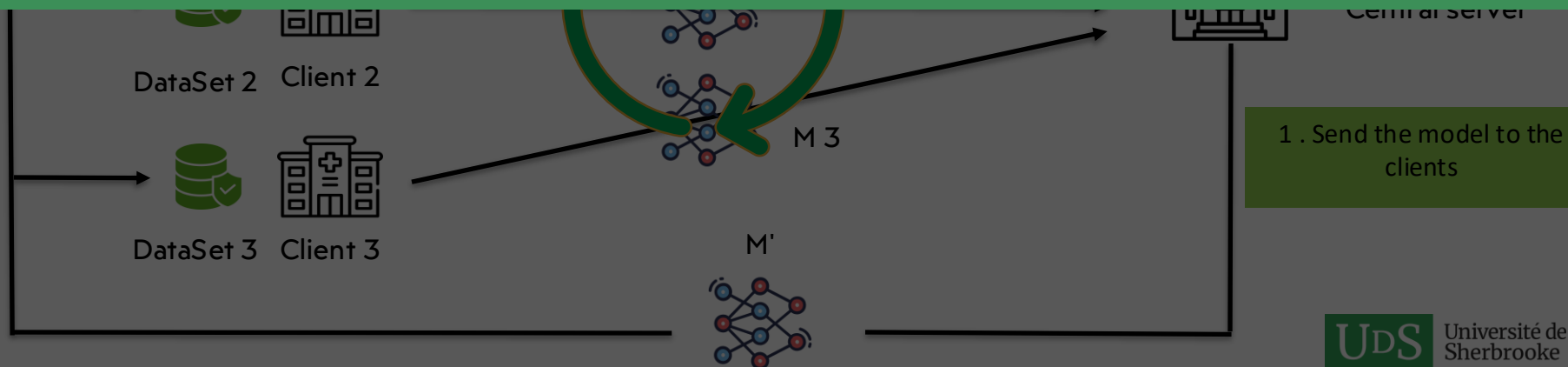
DEFINITION OF FEDERATED LEARNING

2 . Local training of the model

3. Sending parameters to the central server

4 . Results aggregation

Federated Learning allows training an AI model **without sharing data**, thereby promoting **confidentiality and security**.



SOLUTION 2

MEDFL APPLICATION

S2

- Facilitates the creation and training of **federated learning pipelines**.
- Integrates **differential privacy** mechanisms.
- Incorporates **Transfer learning**.
- Provides **hyperparameter optimization** tools.

SOLUTION 2

MEDFL APPLICATION

S2



The **MEDfl package** facilitates collaboration between **medical researchers** and **data scientists**.

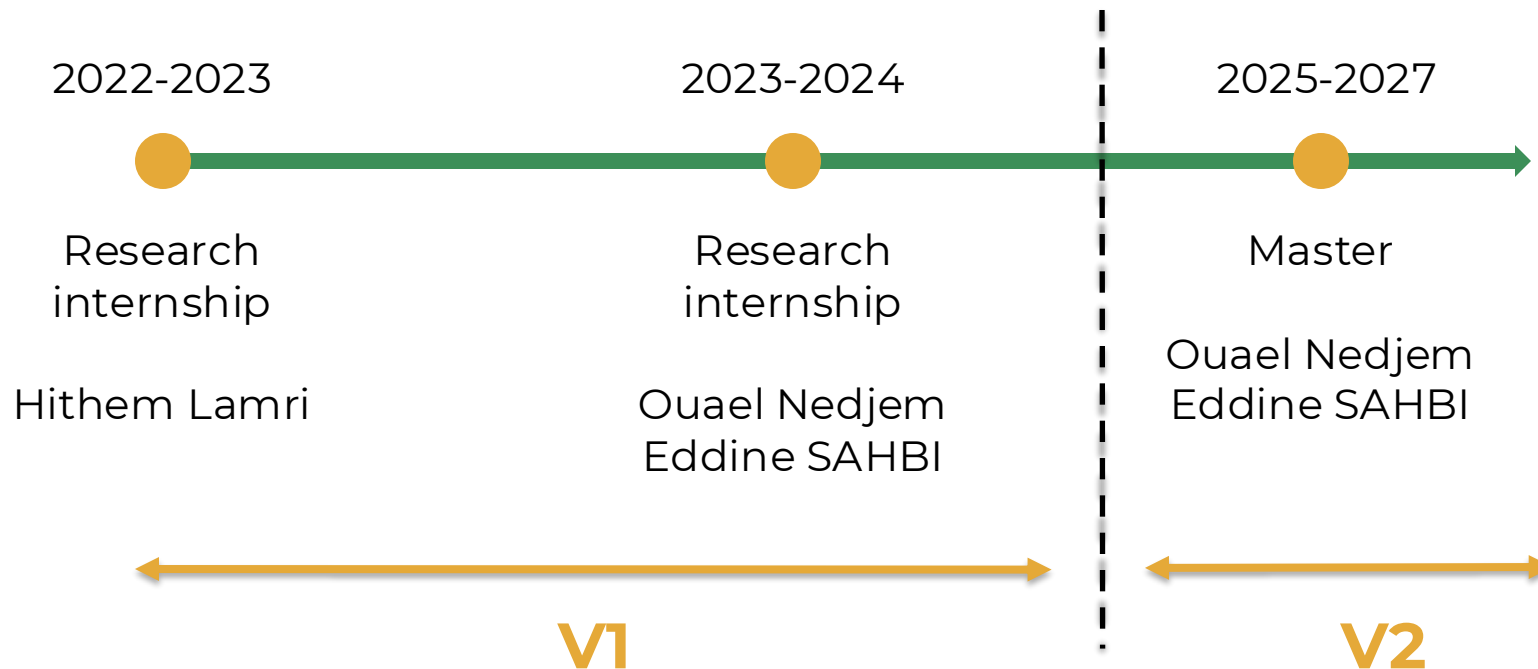
Backend



Front-end

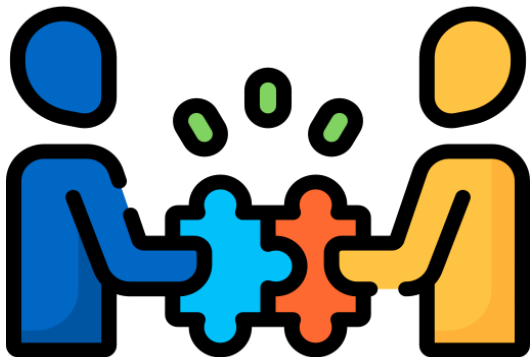


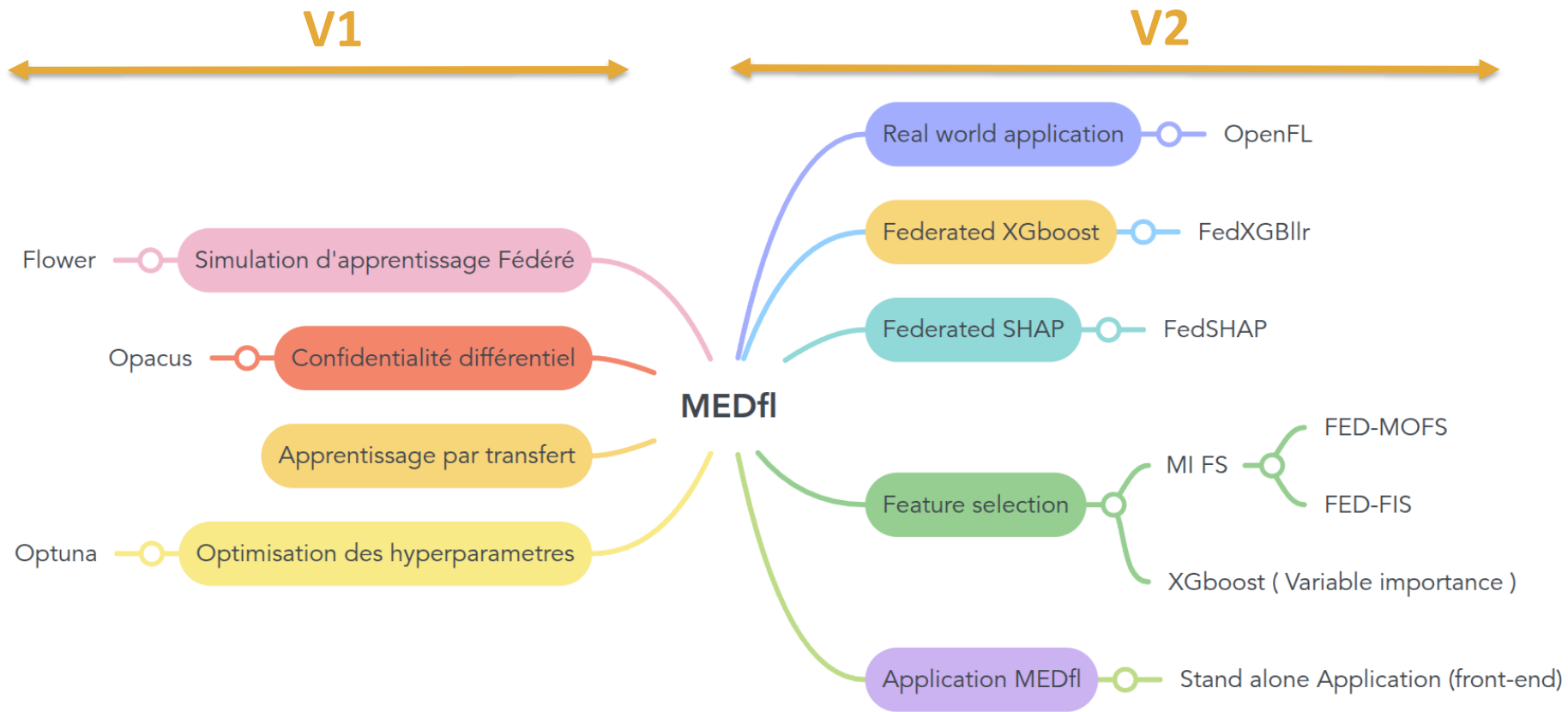
Development of MEDfl



OBJECTIVES

OUR MAIN OBJECTIVES





RESULTS

OUR RESULTS

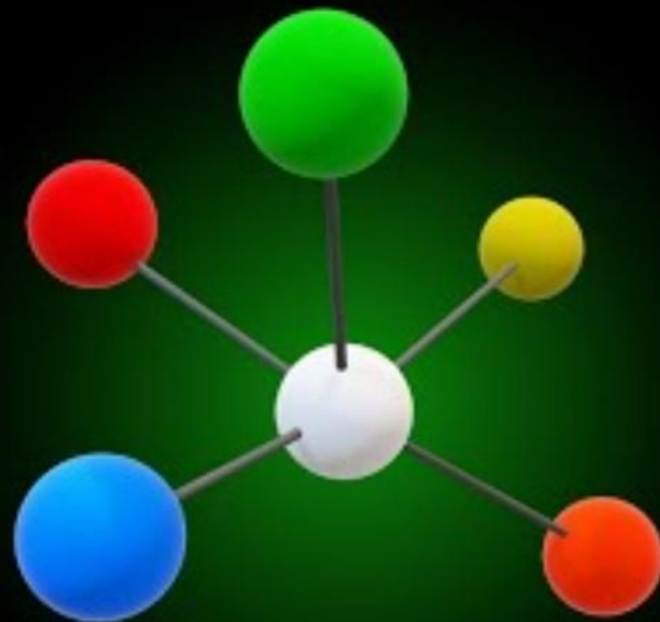
1. Our **Python package** is now available on **PYPI**
2. **MEDfl Desktop application** with a **easy to use** interface for both **data scientist** and **medical researchers**
3. **Open source** github repositories
4. A complete **Documentation** with **tutorials** and **videos**



MEDfi!

Introduction To The Federated Learning Module

MEDomicsLab



FUTURE WORK

FUTURE WORK

- Identify patterns in datasets using **GLM models**
- Perform general **statistical analyses** (variance, covariance, etc.).

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CONCLUSION
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Define the hypotheses



Simulation



Validation



Déploiement

THANK YOU