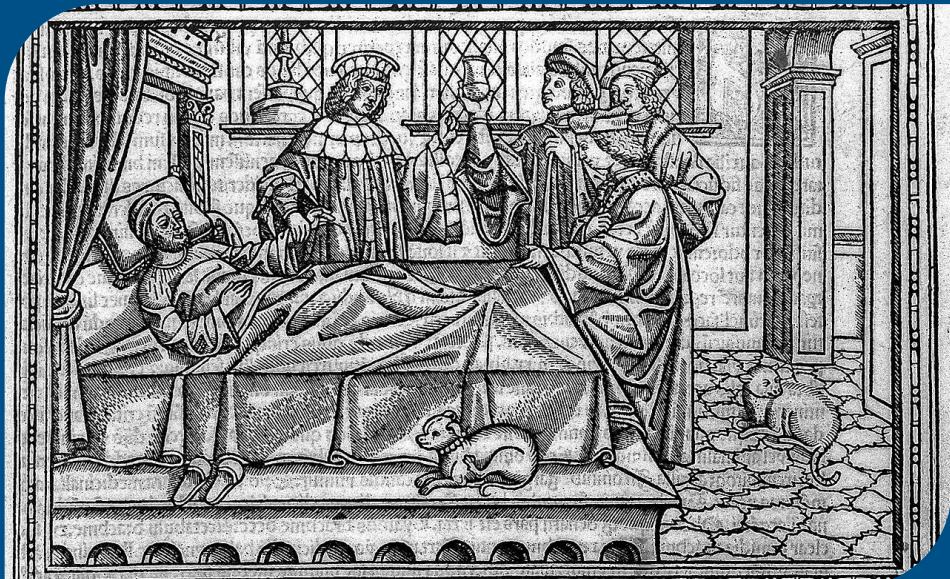


# Project Aethelgard: Decentralized Clinical Intelligence via Federated RAG

The MedGemma Impact Challenge  
Google Research

Aliaksei Kaliutau



# 01 The Diagnostic Odyssey

The average rare disease diagnosis takes 4.8 years and 7.3 physicians. The answers exist, but they are trapped in silos.

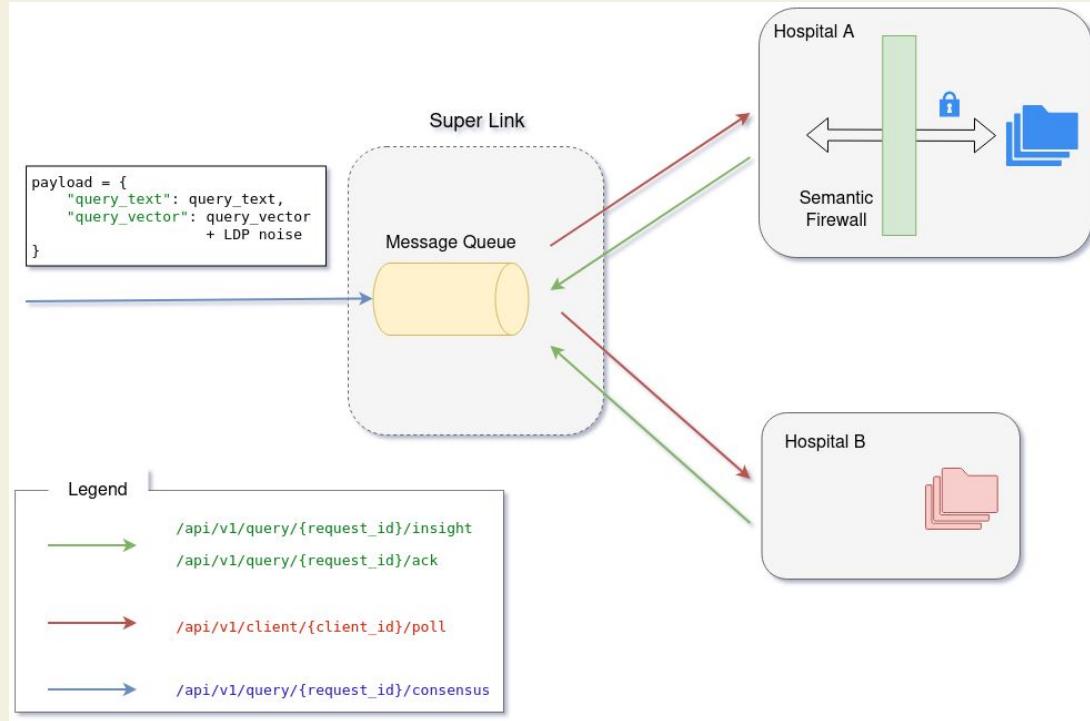
ID	Age (years) at interview	Condition	Gender	Location (Australia)	Location classification	Time to diagnosis (years)	Year of diagnosis
001	30–39	Myositis	Female	QLD	Major cities	3–4	2015–19
002	70–79	Myositis	Male	ACT	Major cities	10 plus	2015–19
003	60–69	Sarcoidosis	Female	NSW	Inner regional	10 plus	2015–19
004	60–69	PID	Female	NSW	Major cities	10 plus	2005–09
005	40–49	PID	Female	NSW	Major cities	3–4	2015–19
006	50–59	Sarcoidosis	Female	NSW	Major cities	5–7	2010–14
007	60–69	Myositis	Male	WA	Remote	10 plus	2020–21
008	30–39	Sarcoidosis	Male	VIC	Major cities	5–7	2015–19
009	under 20	PID	Female	QLD	Major cities	less than 0.5	2020–21
010	60–69	PID	Male	VIC	Major cities	10 plus	2010–14
011	60–69	PID	Female	SA	Major cities	10 plus	2005–09
012	50–59	Sarcoidosis	Female	ACT	Major cities	8–10	2005–09
013	20–29	PID	Female	VIC	Inner regional	8–10	2010–14

## 02 Why Current AI Fails

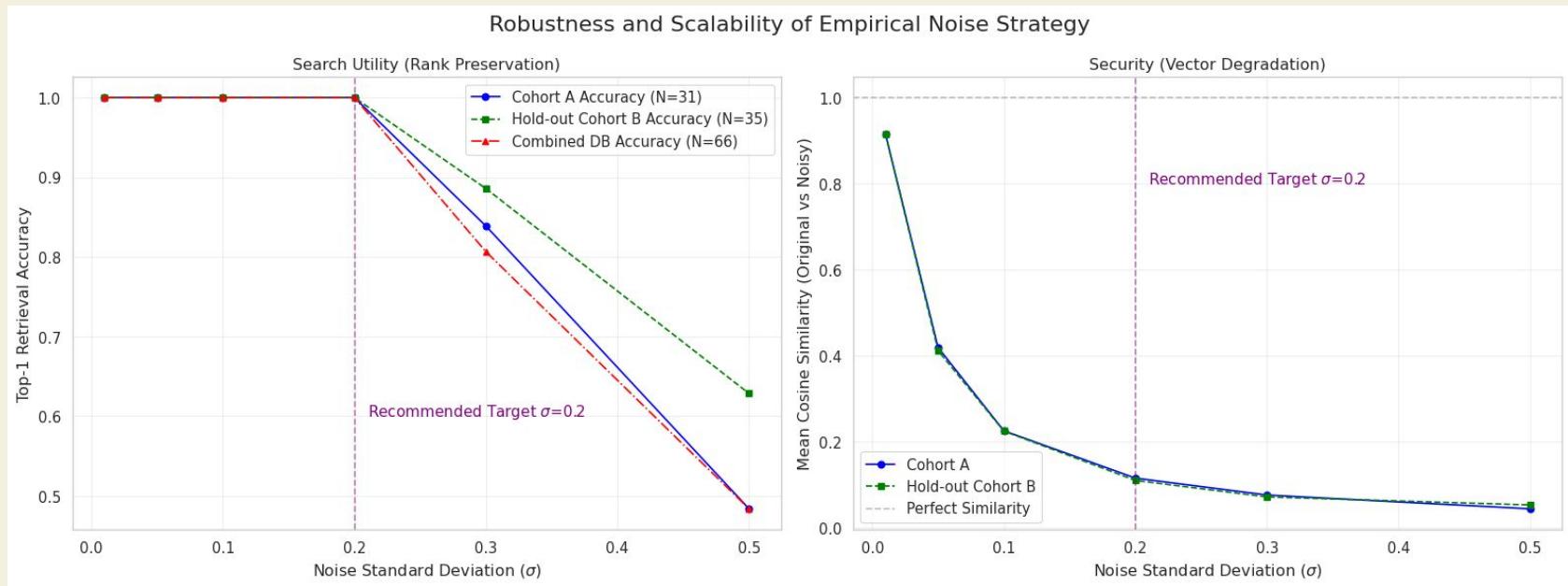
- (Centralized Big Data): Fails due to privacy risks and legal friction (DUAs). Documents in any form are not allowed to leave hospital.
- (Federated Learning): Fails due to "Catastrophic Forgetting." Generalizes data, erasing the exact "needle in the haystack" reference patients.

Inference-time learning on edge nodes is the only practical solution.

# 03 The FedRAG Paradigm Shift



# 04 Semantic Firewalls and Generative Privacy



# 05 Time for demo!

**Aethelgard Local Intelligence Node** Status: Online

1. Local Medical Record Context

RESET / LOAD NEW

Patient ID: patient00077  
65 yo Female

HR: 110 BP: 100/65 mmHg SpO2: 90%

Local Diagnosis: Spontaneous Pneumothorax

Admission Note / Clinical History:

Admission Note

Patient: Jane Doe Age: 65 Sex: Female Date: 2024-02-29 Time: 14:35

SHOW FULL RECORD

2. Query the Federated Network

Data is processed locally. Only anonymous vectors leave this node.

Add a specific clinical question (Optional)

SEARCH NETWORK

# Project Aethelgard.

## Absolute Privacy. Global Reach.



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