Incentivization in Federated Learning: A Game of Rational Agents

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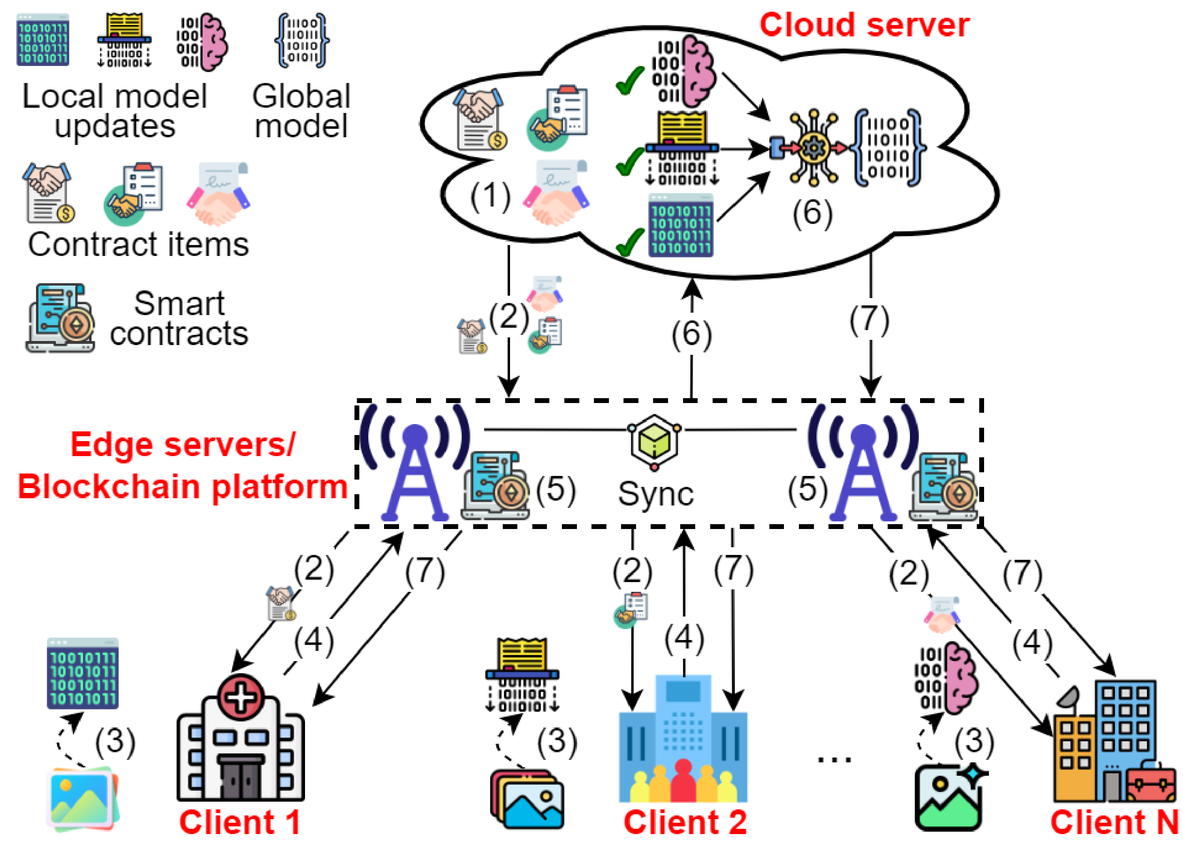
ABSTRACT **- My research focuses on incentivization in Federated Learning (FL), aiming to design an *adaptive* (capturing temporal dynamics), *fair* (based on client contributions), and *robust* (accounting for system heterogeneity, statistical heterogeneity, and competition) incentive framework. My incentive framework is crucial for attracting and retaining clients, enhancing training efficiency, and improving model performance and social welfare in data-sharing applications such as healthcare and data/AI model marketplaces.**

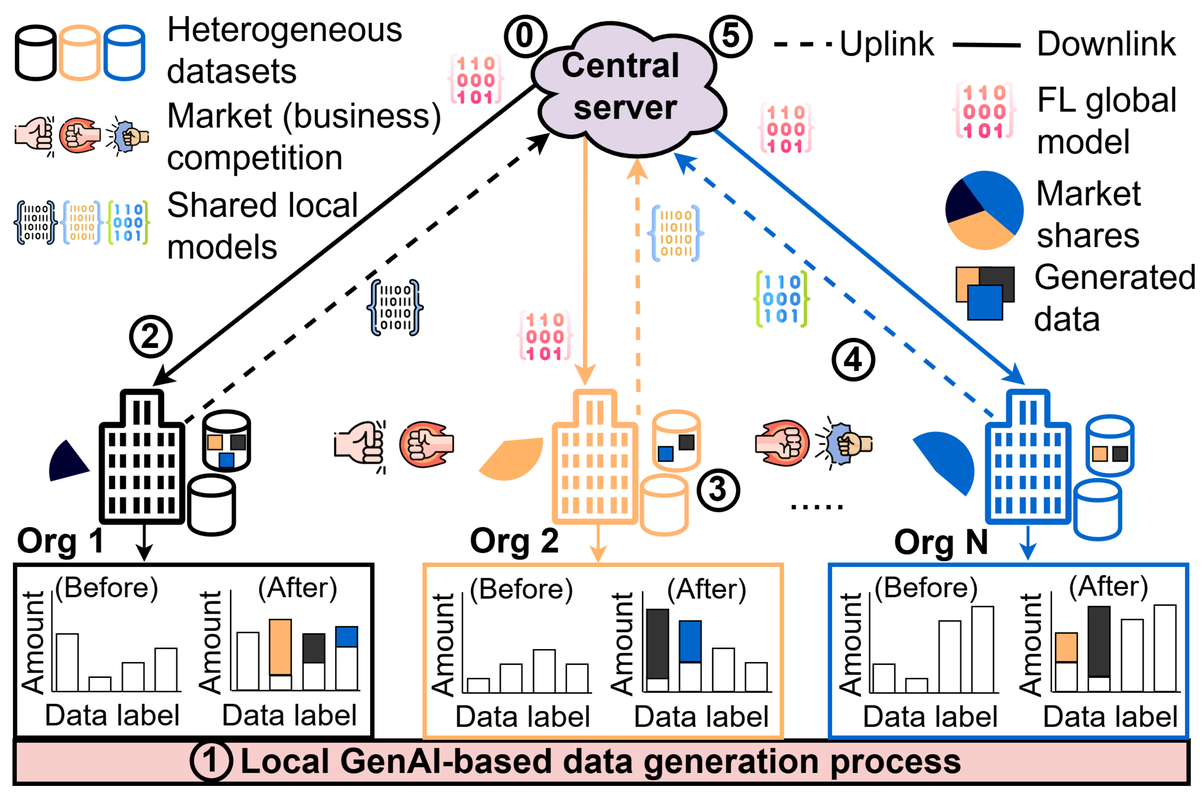
RESEARCH QUESTIONS & PROPOSED SOLUTIONS

#RQ1: *How can we **incentivize** high-quality client contributions to improve **FL** efficiency and address information asymmetry during **critical learning periods**?*



R3T system model incorporating Blockchain with FL [1,2,3].

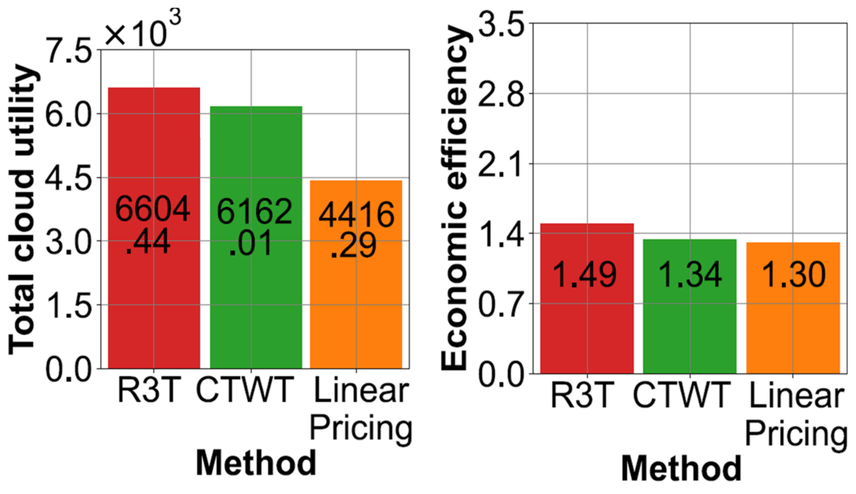
#RQ2: *How do **statistical heterogeneity** and **inter-organizational competition** in **FL** impact organizational decisions and social welfare, and how can we design an effective Generative AI (GenAI)-based **data generation** mechanism under these conditions?*

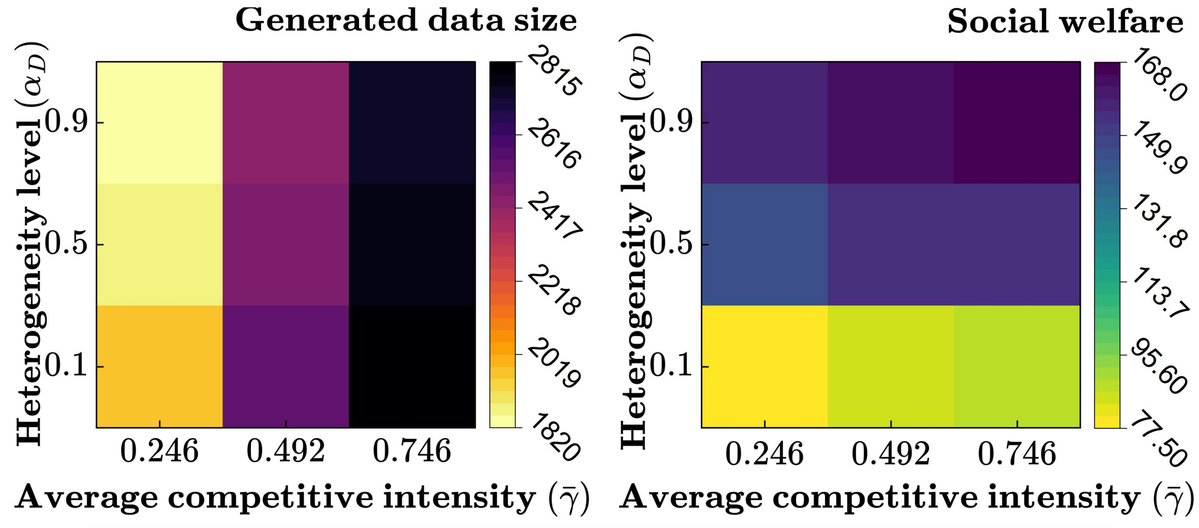


CoCoGen framework [4].

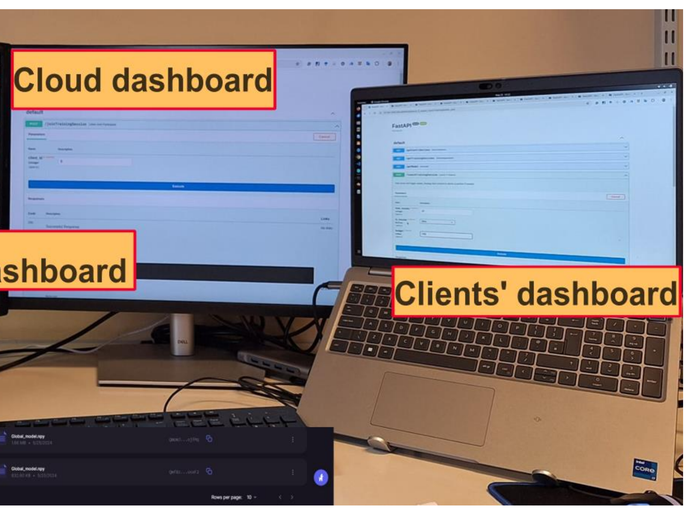
KEY RESULTS

Pay less, Get even more!

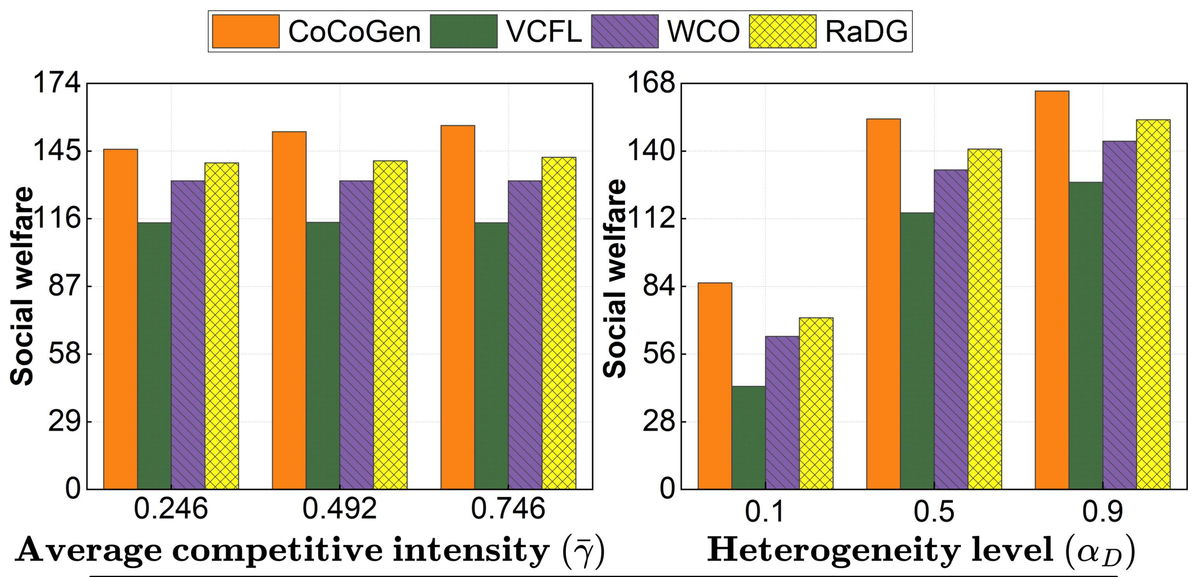




Greater competition $\bar{\gamma}$ and heterogeneity α_D require more generated data but reduce social welfare.



R3T Proof of Concept



CoCoGen is more robust to $\bar{\gamma}$ and heterogeneity α_D, outperforming benchmarks in terms of social welfare.

REFERENCES

[1]. **Thanh Linh Nguyen**, et al, Blockchain-Empowered Trustworthy Data Sharing: Fundamentals, Applications, and Challenges, *ACM Computing Survey*, vol. 57, no. 8, Aug. 2025.
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[3]. **Thanh Linh Nguyen**, Quoc-Viet Pham, "Right Reward Right Time for Federated Learning", Under Review in *IEEE Transactions on Mobile Computing (IEEE TMC),* 2025.
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