ML5G-PS-001: Federated Traffic Prediction for 5G and Beyond

Vasileios Perifanis

PhD Student

Dept. of Electrical and Computer Engineering

Democritus University of Thrace

Greece

Team Euclid

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DEMOCRITUS UNIVERSITY OF THRACE | DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

IMT Atlantique
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Base Station Traffic Forecasting

Main Challenges:

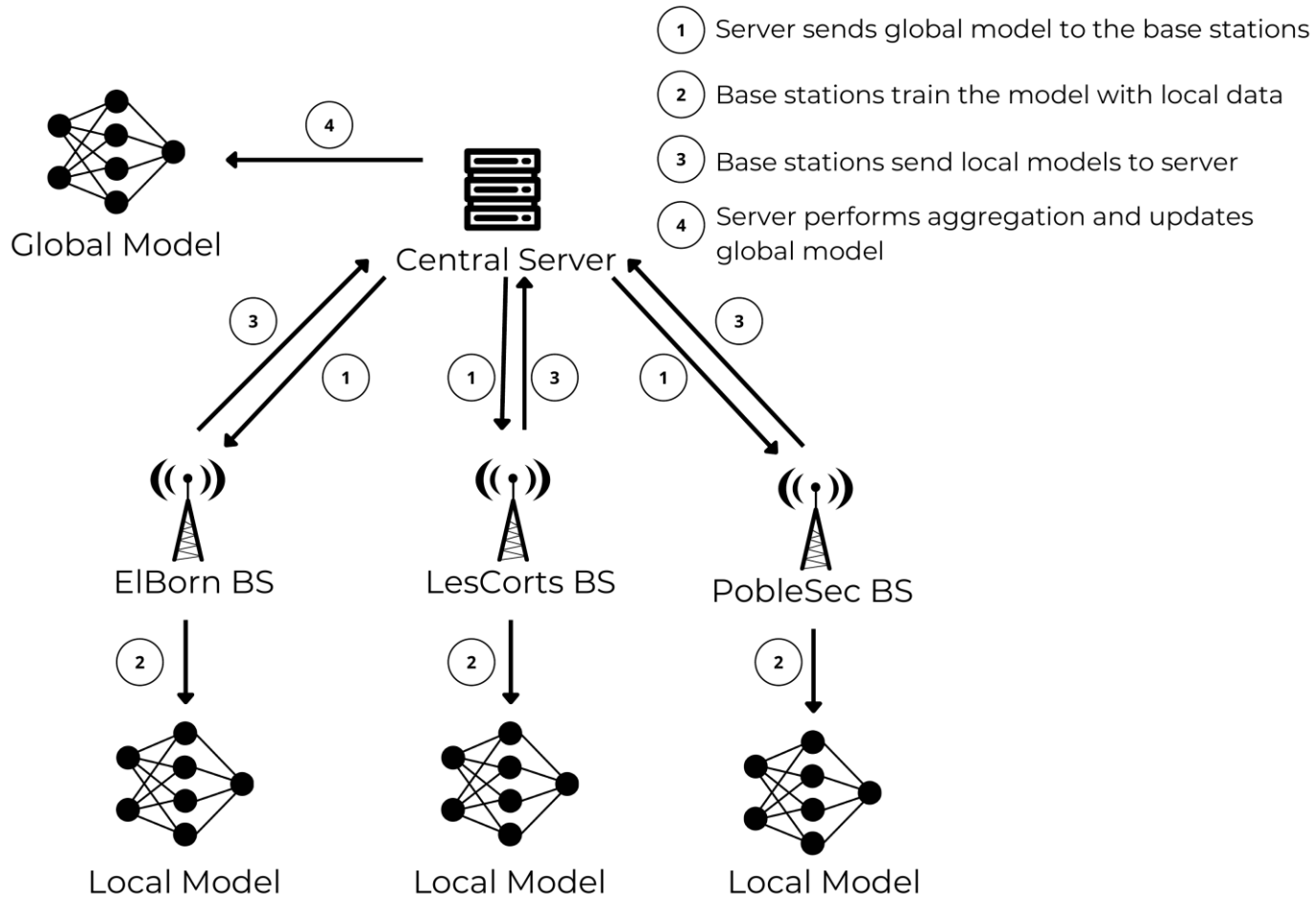
- Data privacy
- Real-time accurate predictions
- Robust against non-iid data

* This image has been generated using DALL·E 2

Federated Learning Approach

Advantages:

- Privacy by-design
- Low server latency
- Generalization



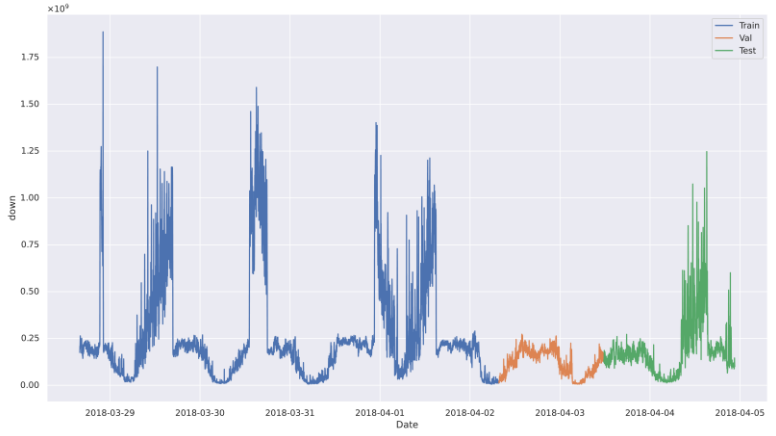
Challenges: non-iid data

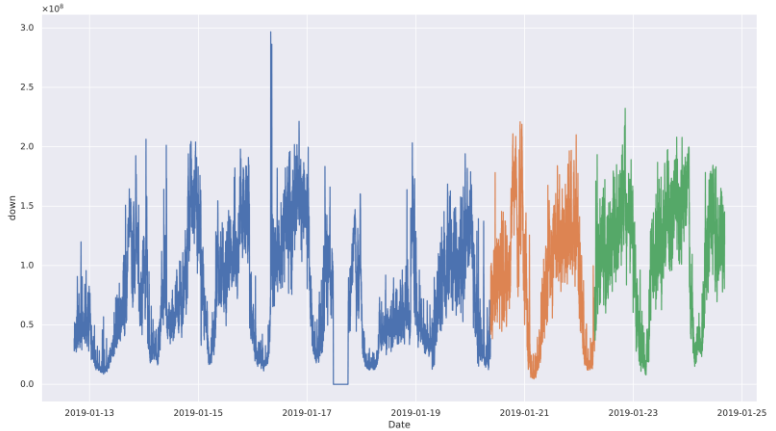
Three base stations in Barcelona, Spain.
Differ in:

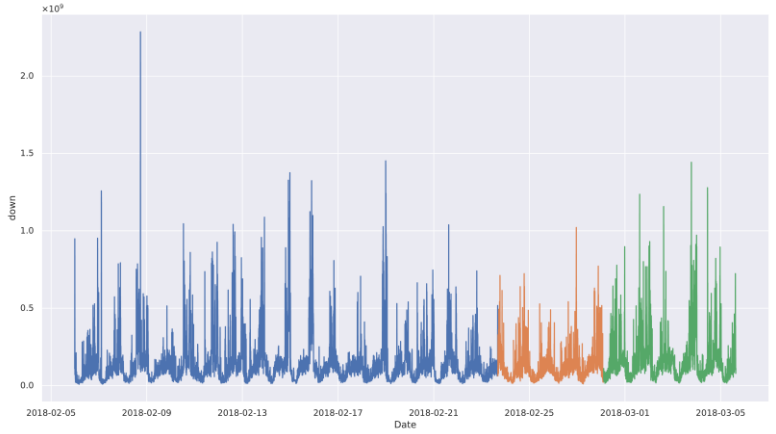
1) Quantity
2) Distribution
3) Temporality

?

How can we generalize a federated model?







Experiments

Key Observations

01 **Pre-processing**
Local pre-processing heavily influences the learning performance

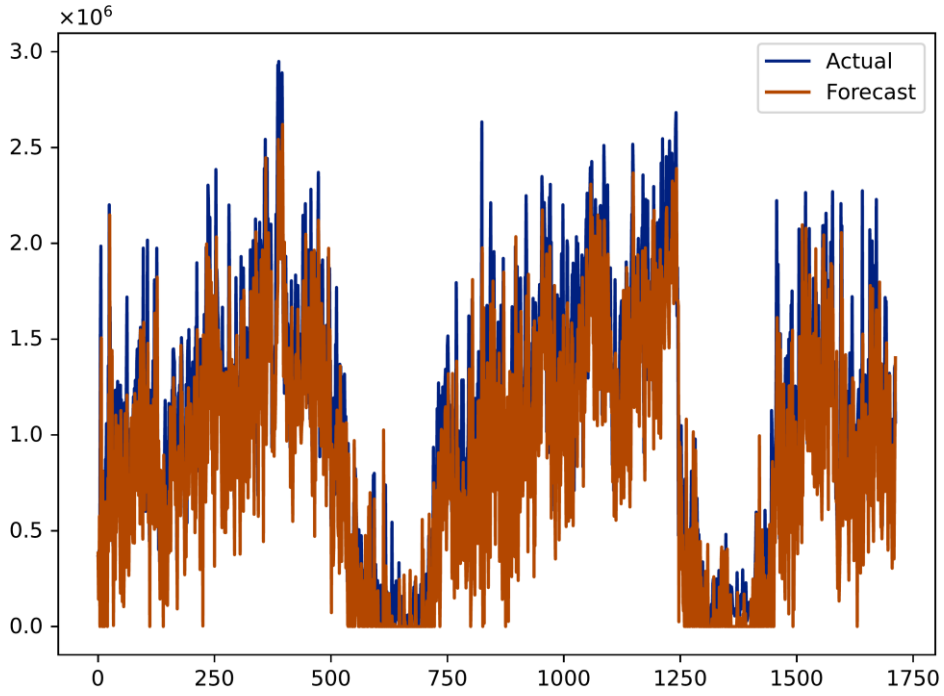
02 **Aggregation Algorithms**
Aggregators specifically desinged to handle the non-iid data issue do not significantly outperform simple baselines

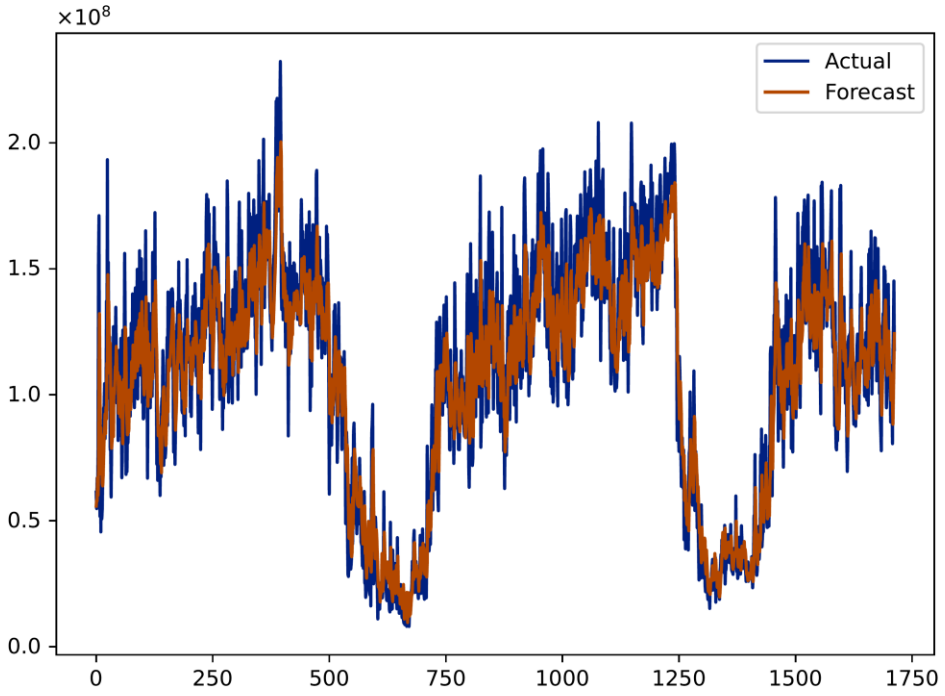
03 **Predictive Accuracy**
Models trained under the federated setting provide almost equivalent prediction errors to their centralized and local counterparts.

04 **Carbon Footprint**
Federated models leads to lower energy consumption and carbon footprint than centralized methods

REQUIREMENTS	FEDERATED	CENTRALIZED	LOCAL
Collaborative Training	✓	✓	
Privacy	✓		✓
Dynamic Execution	✓		✓
Generalization	✓	✓	

Federated Learning Results





Less CO2 emissions, power consumption

New research directions

Thank you!

Team Euclid

Vasileios Perifanis

PhD Student

Contact: vperifan@ee.duth.gr

Nikolaos Pavlidis

PhD Student

Contact: npavlidi@ee.duth.gr

Remous-Aris Koutsiamanis

Associate Professor

Contact: remous-aris.koutsiamanis@imt-atlantique.fr

Pavlos Efraimidis

Associate Professor

Contact: pefraimi@ee.duth.gr

pefraimi@athenarc.gr

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