Revolutionising the management of virtualized mobile networks via AI-driven traffic insights

Paul Patras

netAi

THE UNIVERSITY of EDINBURGH
informatics


>100 Exabytes of mobile traffic per month globally


MECH-MIND
MECH-MIND
PHILIPS


Limo
LIFE OF MOBILITY
자율주행자동차 시험운행
롯데정보통신
ohmio
1165
Limo
자율주행자동차 시험운행
롯데정보통신

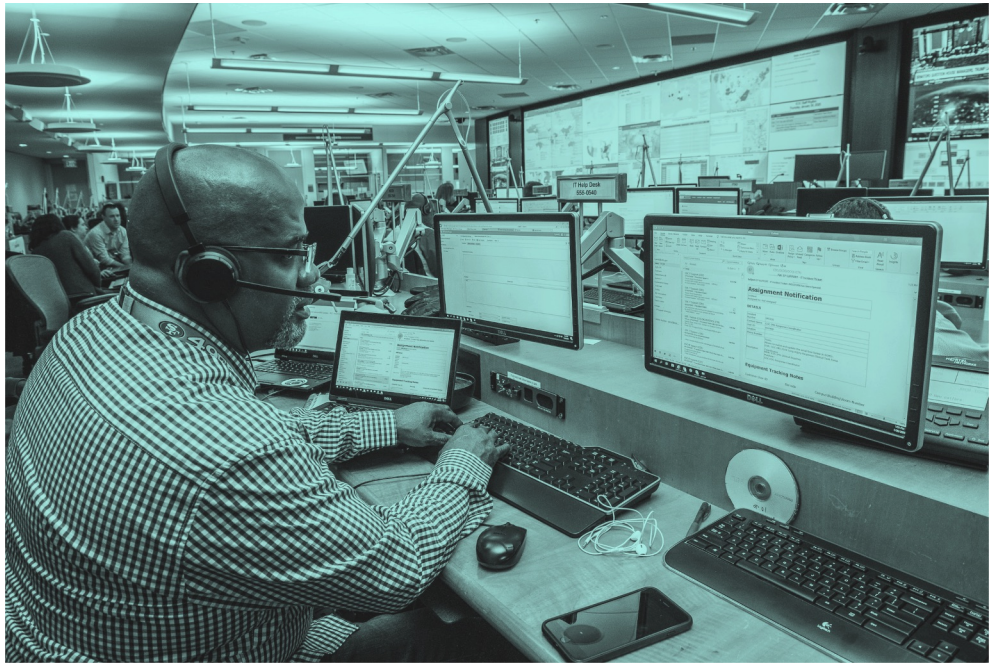
Problem

Mobile networks are increasingly complex, hard to manage, and their performance sucks.

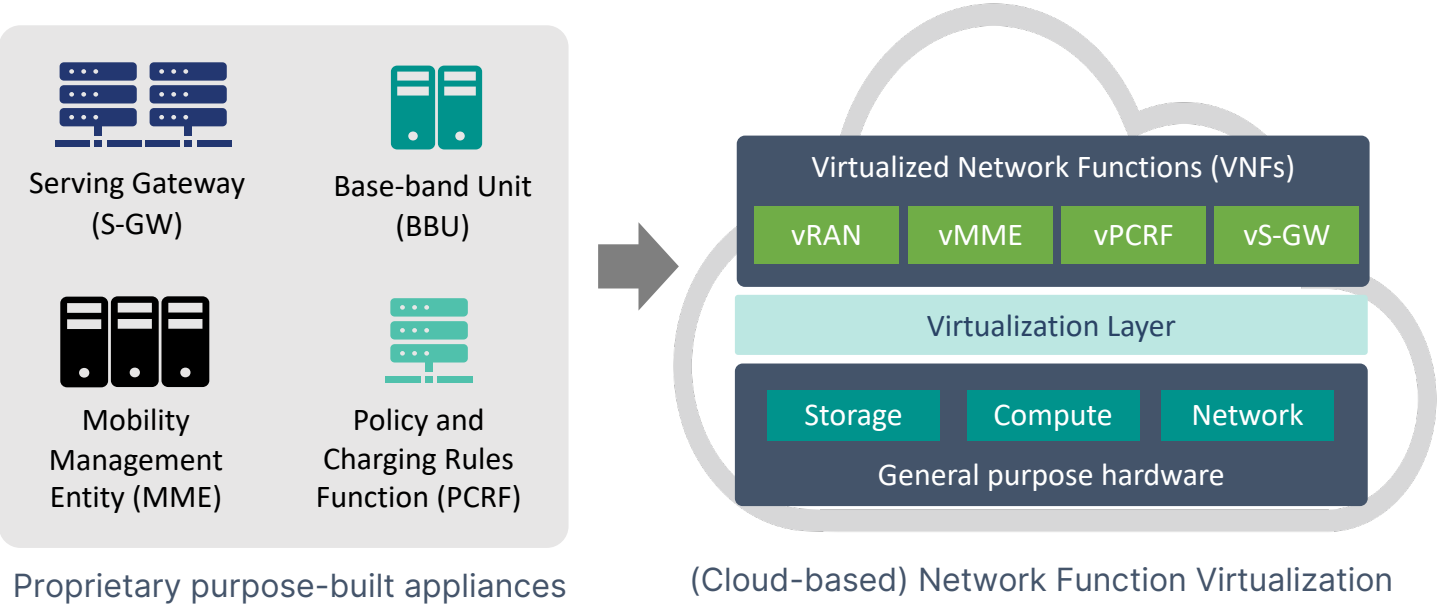
Poor RoI: operating costs amount to 65.3% of revenues. Infrastructure managed based on **information** that is **too-late to be useful**.

Poor customer experience: monitoring using dashboards and anomaly detection is **not sensitive** enough.

No reliable real-time insights: Forecasting based on simple models that are **inaccurate** and **do not scale**.



Network virtualization enables mobile network operators to switch from expensive custom hardware to software-intensive architectures.



Proprietary purpose-built appliances

(Cloud-based) Network Function Virtualization

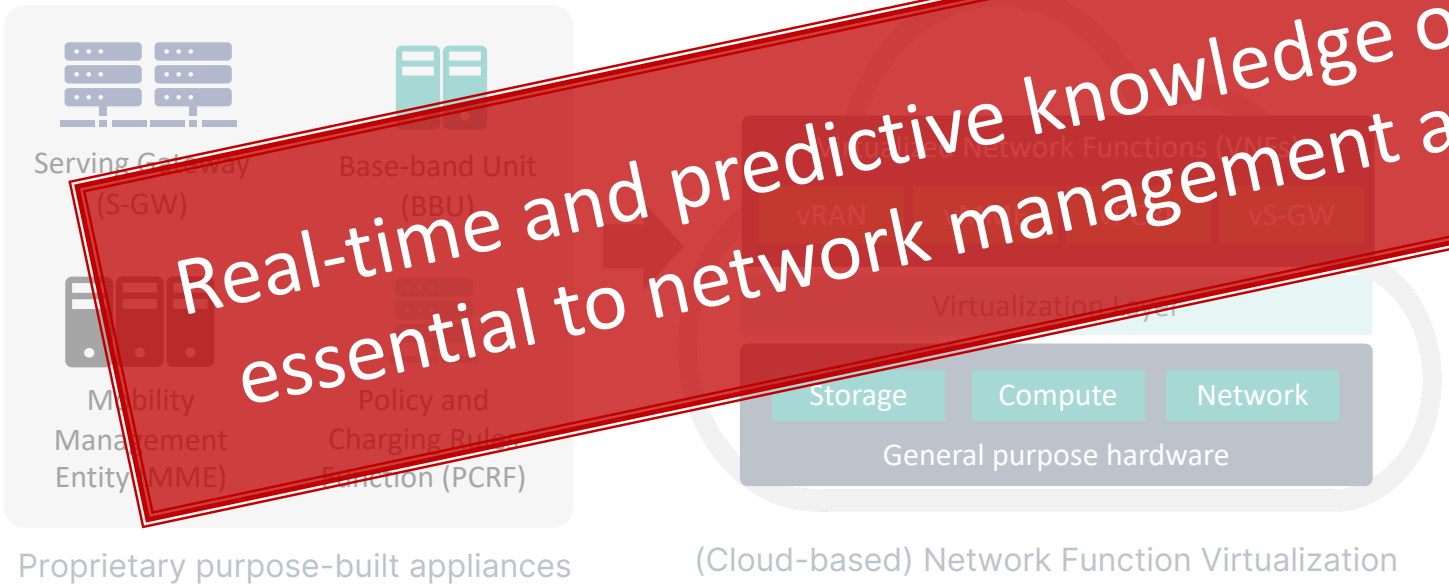
More flexibility, **vendor independence**.

Lower total cost of ownership (TCO).

Underpinning **new multibillion dollar industries** incl. industrial automation, autonomous transportation, etc.

Transition

Network virtualization enables mobile network operators to switch from expensive custom hardware to software-intensive architectures.



Proprietary purpose-built appliances

(Cloud-based) Network Function Virtualization

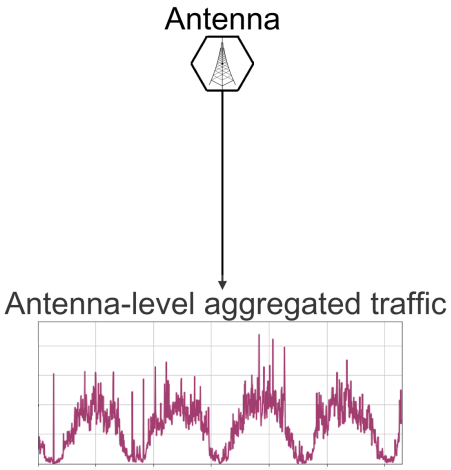
Real-time and predictive knowledge of traffic demands essential to network management and monetization

...ore flexibility, **vendor independence**.

Lower total cost of ownership (TCO).

Underpinning **new multibillion dollar industries** incl. industrial automation, autonomous transportation, etc.

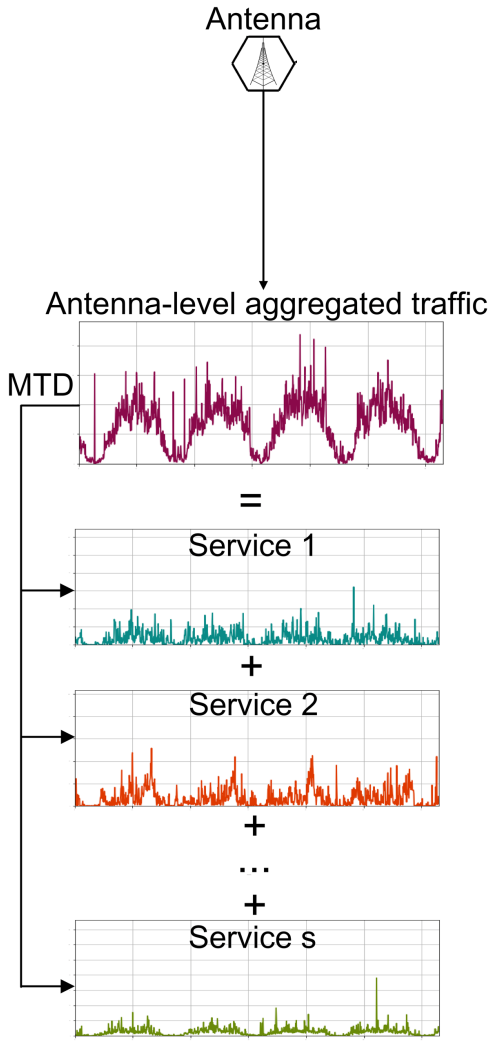
AI-driven mobile traffic decomposition



- Breaking down time series of traffic aggregates into separate time series corresponding to individual services.

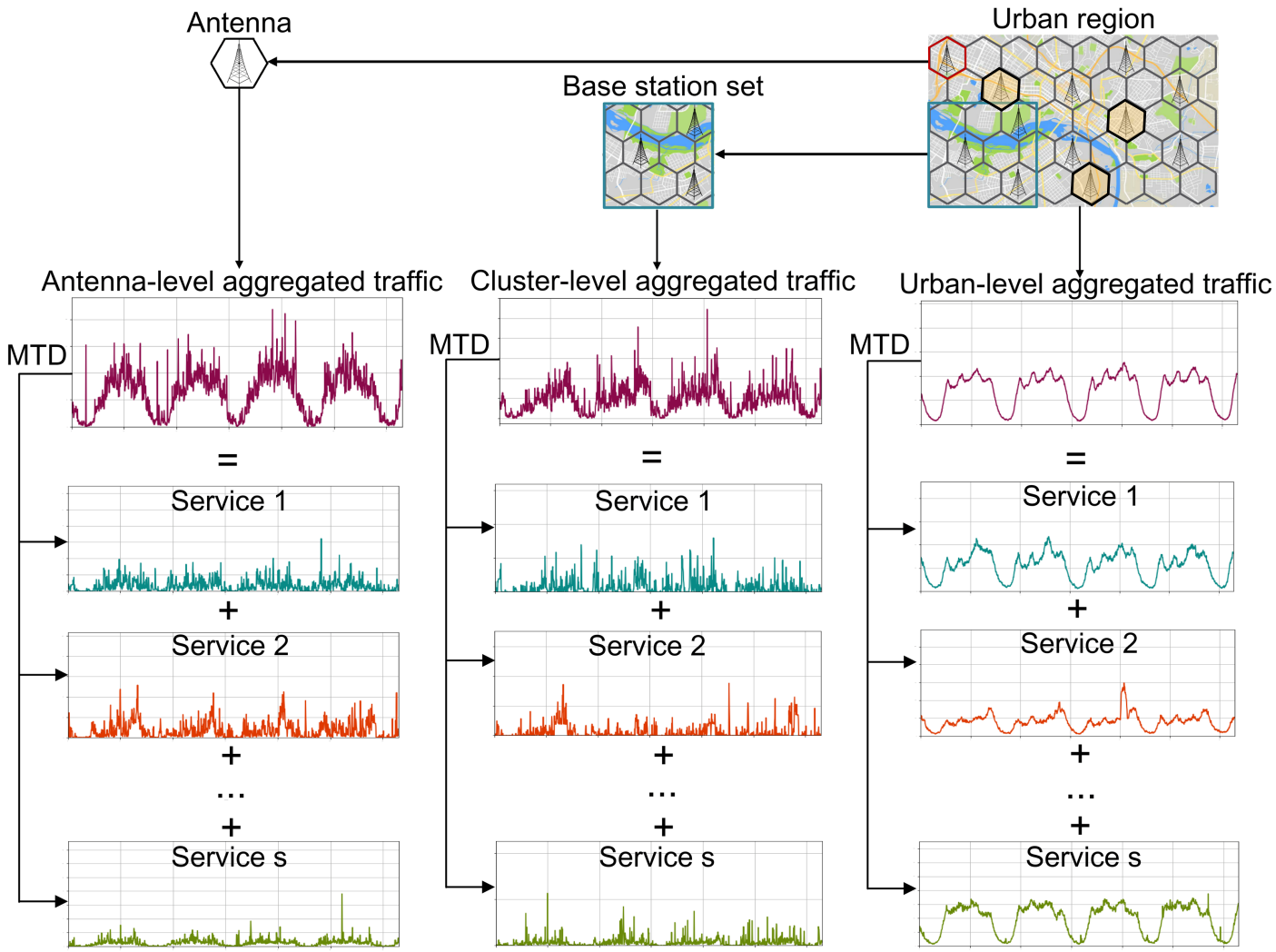
Solution

AI-driven mobile traffic decomposition



- Breaking down time series of traffic aggregates into separate time series corresponding to individual services.
- Operating at various levels, as required by different application scenarios.

AI-driven mobile traffic decomposition



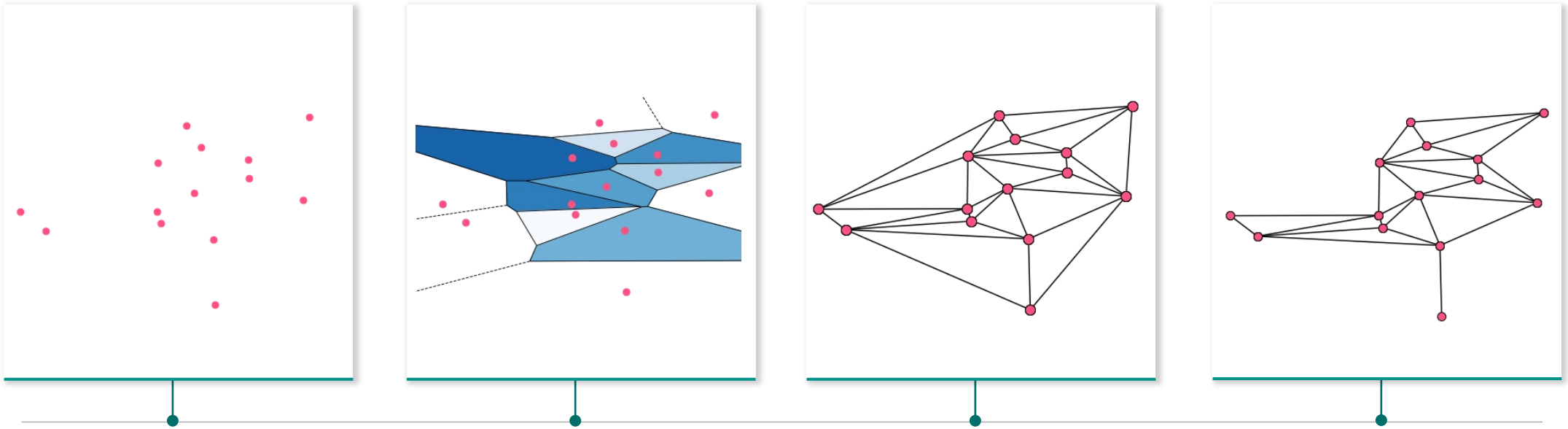
- Breaking down time series of traffic aggregates into separate time series corresponding to individual services.
- Operating at various levels, as required by different application scenarios.
- Exploiting spatiotemporal correlations characteristic to mobile network traffic.

C. Zhang, M. Fiore, C. Ziemlicki, and P. Patras, "Microscope: Mobile Service Traffic Decomposition for Network Slicing as a Service", ACM MobiCom, Sept. 2020.

NetSibulla

Uncertainty- and capacity-aware traffic forecasting

Geolocation-preserving representation



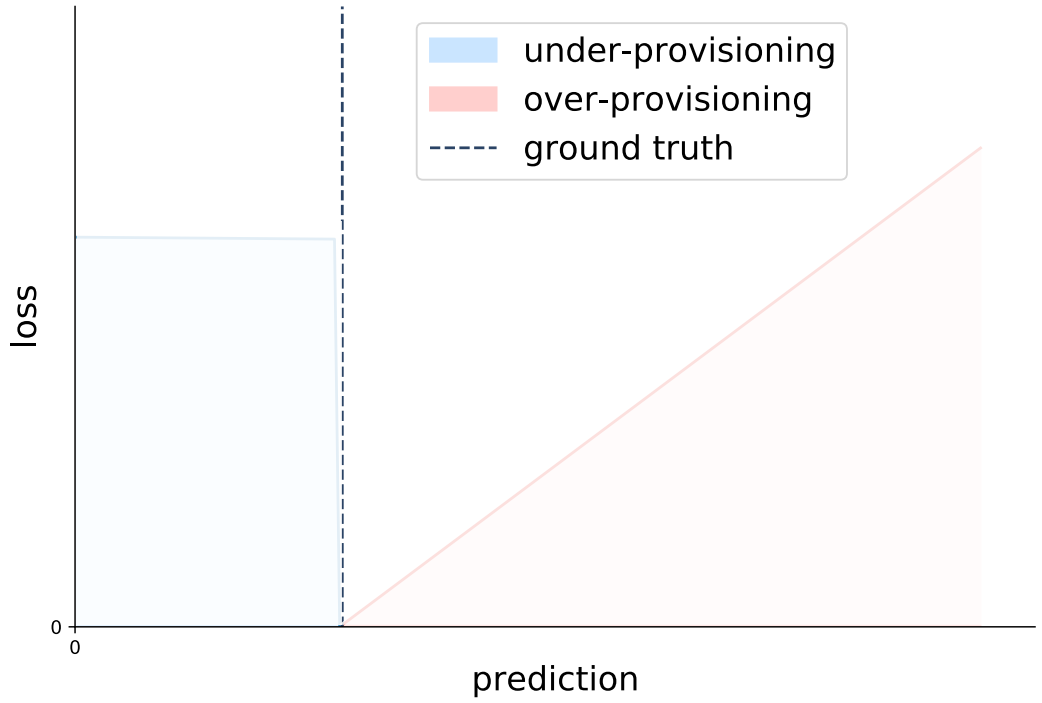
Point-cloud Abstraction

Coverage Area Separation (Voronoi)

Graph Generation

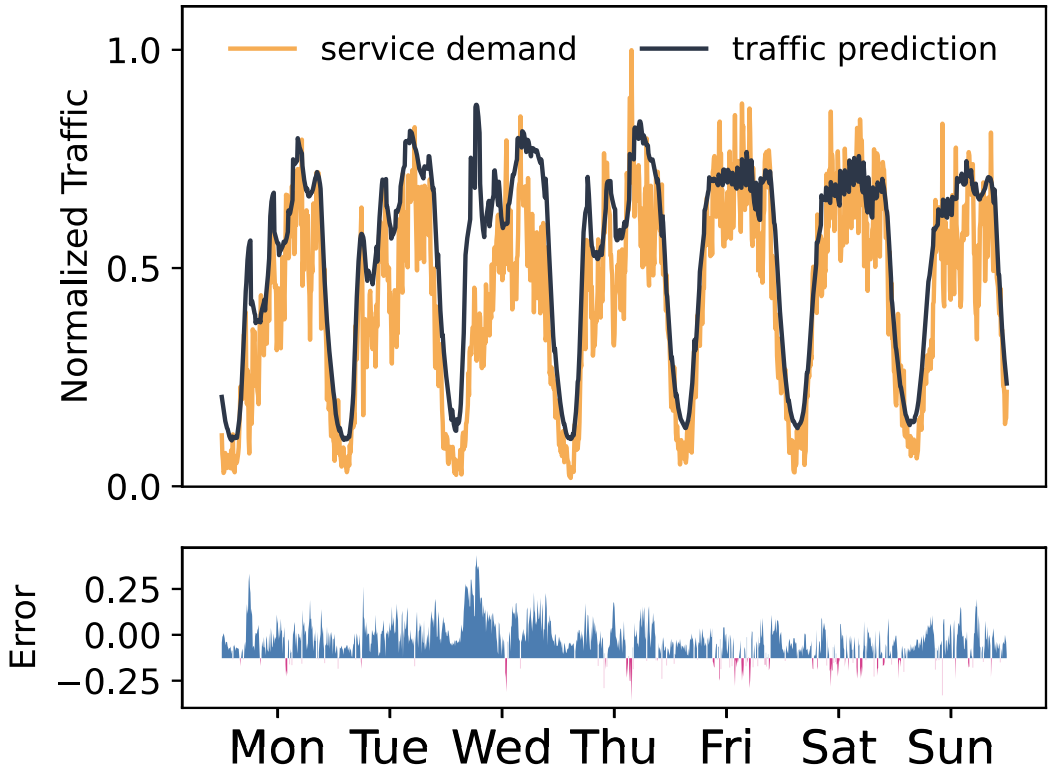
Trimming edges

Dedicated training objective: Operator monetary cost



- Under-provisioning causes Service Level Agreement (SLA) violation and fixed monetary penalty for mobile operator
- Over-provisioning results in redundant allocation of resources

Traffic prediction

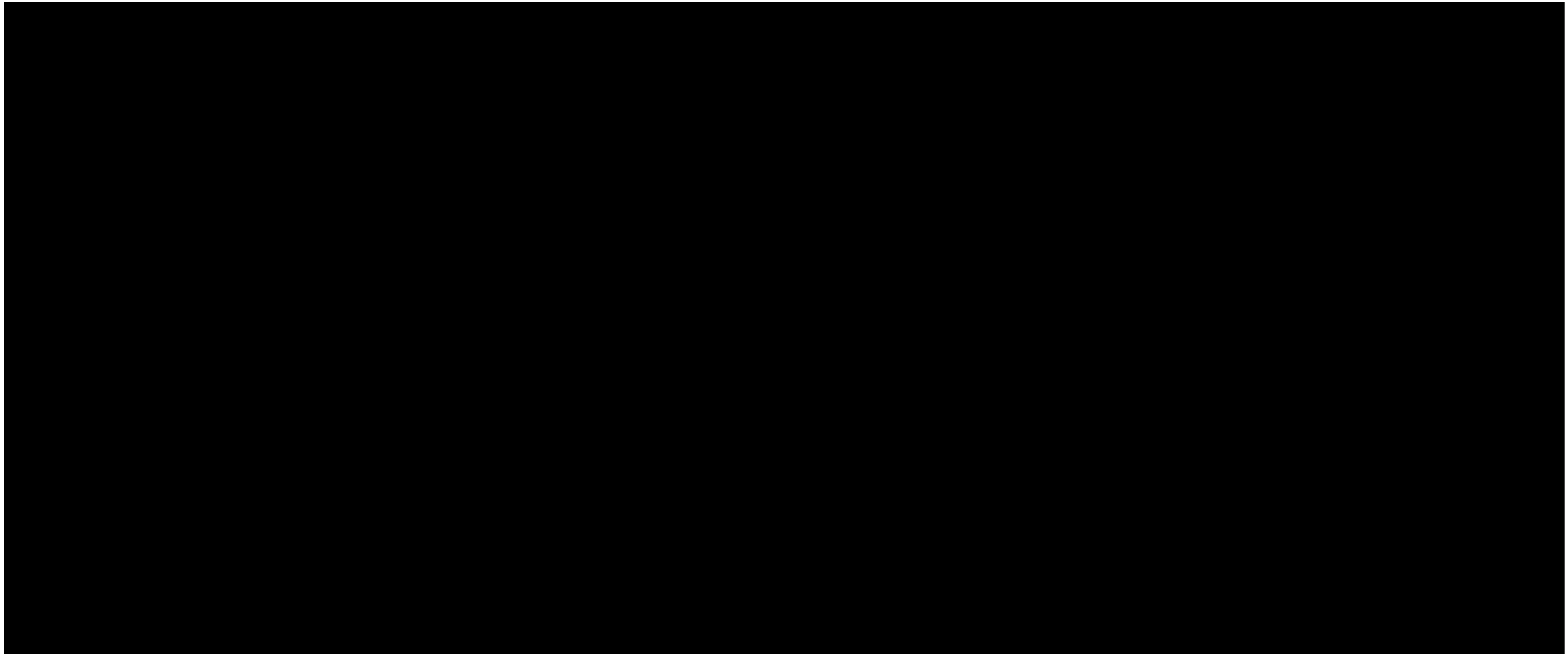


One neural model for an entire city-scale deployment:

Orders of magnitude fewer parameters to train than with LSTMs

In Action

Automating the allocation of compute resources



Revolutionising the management of virtualized mobile networks via AI-driven traffic insights

Paul Patras

netAi

THE UNIVERSITY of EDINBURGH
informatics