Global Indoor Positioning Powered by a Supercomputing-Driven Architecture

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Background & Research Purpose

Background

Indoor localization is rapidly becoming foundational to modern urban services

- enabling emergency response, asset tracking, autonomous navigation, and context-aware applications

Research Purpose

Enable accurate, low-latency **city-scale** localization using cellular network measurements.

Research Problem & Approach

Monolithic approaches do not scale

- High labeling and re-training cost for city-wide coverage.
- Local variations degrade global-model accuracy.

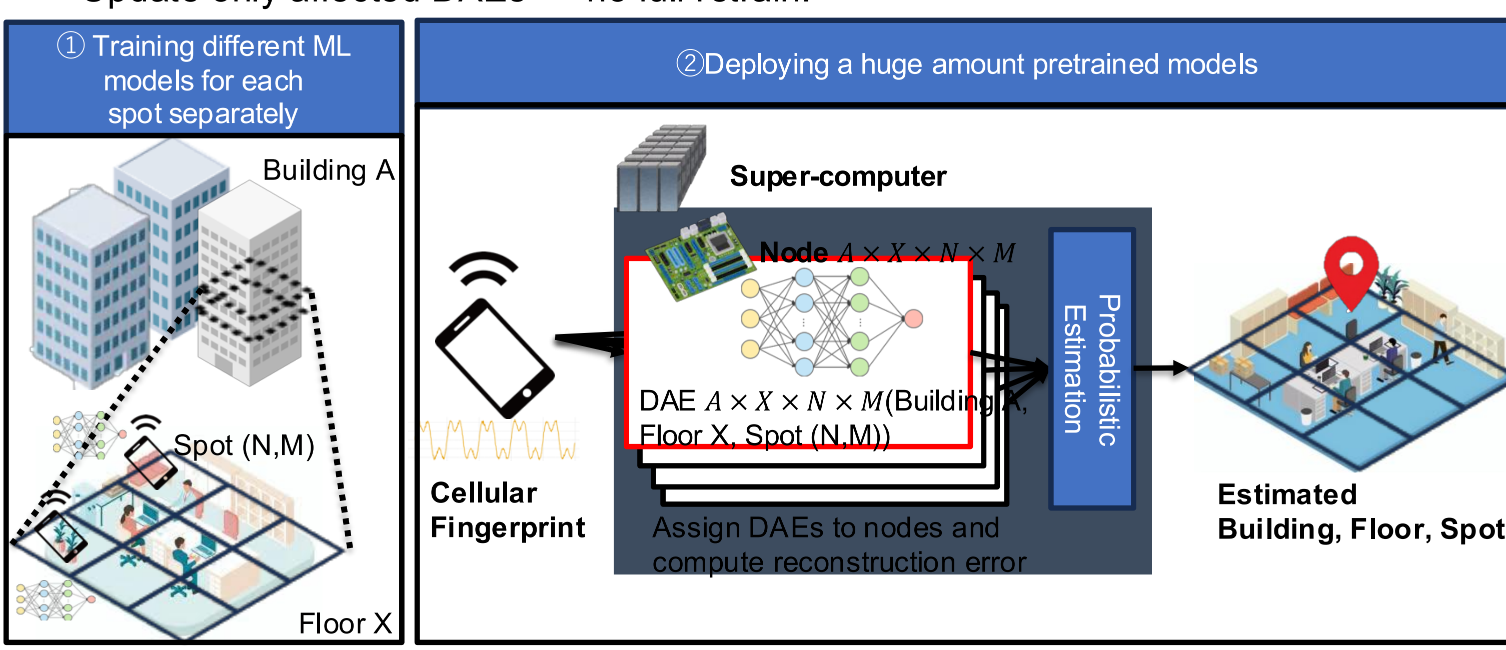
Decompose city-scale localization into many independent local problems

- Determine whether the subject is at that spot using a spot-specific model.

Proposed Method

Combine many lightweight local models with an efficient routing/selection layer to achieve accurate, low-latency, and easily updatable city-scale localization.

- Per-spot lightweight DAE (offline trained).
- Parallel reconstruction scoring across spot models.
- Select spot with minimal reconstruction error.
- Update only affected DAEs — no full retrain.



Future Work

Inference speed benchmarking:
Quantitatively compare runtime and latency against monolithic models and naïve multi-model baselines.

Scalability analysis:
Evaluate performance as the number of spots increases to city-scale deployments.