

Can We Predict Truck Parking Availability Without Sensors?

Current information systems are often fragmented and rely heavily on expensive physical sensors.

Why it matters: Transportation agencies cannot install and maintain sensors at every truck parking facility. Without consistent availability estimates, planners cannot easily compare corridors, identify recurring shortages, prioritize investments, or measure whether parking programs are working. This study shows how fragmented parking data can be turned into a scalable national planning resource.

BY THE NUMBERS

- **11,500+** facilities analyzed across 48 states
- **5** distinct facility groups by capacity, traffic, amenities, and fees
- **14** public facilities validated against sensor/camera ground truth
- **Mean absolute error: 18.6%.** Accurate enough for planning use.

WHAT WE FOUND

- **Similar lots behave alike.** Facilities that match on size, cost, services, and traffic fill on similar schedules, so a lot with no data can be estimated from lots that resemble it.
- **Public vs. private is too coarse** for planning. Five operational groupings separate the network far better than the ownership split most state inventories use.
- **Coverage without capital cost is achievable.** Crowdsourced driver reports, when combined with predictive modeling, can substitute for costly sensor deployment.
- **Weekly cycles are predictable.** Weekday peaks and weekend drop-offs are consistent enough for planning.

HOW PLANNERS USE IT

- **Strategic monitoring.** Track usage trends at the operational cluster level rather than treating every facility as an isolated data point, and compare parking performance across facilities, regions, and states on a consistent basis.
- **Shortage detection.** Identify corridors and facility types with recurring parking shortages instead of discovering them from driver complaints.
- **Targeted investment.** Direct capacity expansion, maintenance, and data collection toward the high-demand clusters with chronic shortages, not spread evenly across the inventory.
- **Funding evidence.** Supply quantified utilization numbers for freight plans and federal grant applications.

LIMITATIONS

- **Report volume drives accuracy.** Facilities with few driver reports, typically low-traffic sites, are estimated less reliably.
- **Routine cycles only.** The model tracks standard weekly patterns and does not adjust for real-time shocks such as severe weather, crashes, or sudden road closures.