Adaptive Charging Network
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Opportunity

CA 2025 goal
- 1.5 million zero emission cars

Painpoint
- Overcrowding, EV shuffling nightmare

Adaptive charging network (ACN) values
- Provide target charging capacity at smaller infrastructure and operating costs (30%-60%)
- Provide ancillary energy services

Technology

Network of adaptive EV chargers
- Real-time sensing, communication, optimization
- Scalable scheduling algorithms
- Optimally meet user energy demands
- ... without exceeding infrastructure capacity
- Real-time optimization and control
- Mobile app, monitoring, alert

Online LP algorithm
Suppose costs are uniformly monotone:
\[ C(r) := \sum_i \sum_r c \quad \text{with } c_i \text{ increasing in } r \]

Theorem
Online LP attains offline optimal

Deployment

ACN tracking PV generation in real time
- JPL demo, October 2016

Performance

Real charging data
- Caltech, Google
- 52,362 charging sessions over 4,900 charging days at 104 locations
- Significant power savings even at low laxity

People
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