Transportation Research Board
97th Annual Meeting
January 7–11, 2018 • Washington, D.C.

Doctoral Student Research Session 456
Monday, January 8, 2018, 3:45 – 5:30 pm
Convention Center, Salon B

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TRANSPORTATION RESEARCH BOARD
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Comparative Analysis of Driving Efficiency Using Optimization Techniques for Large-Scale Smartphone Data

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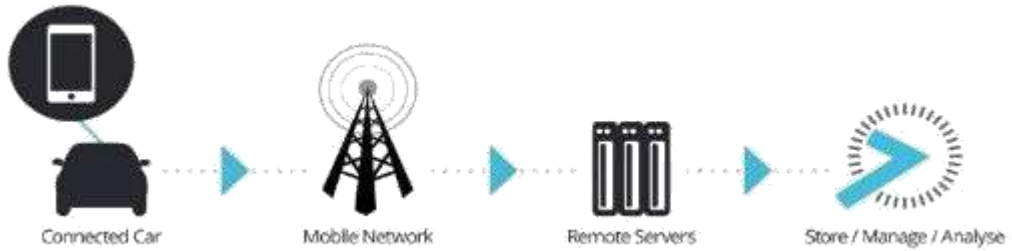
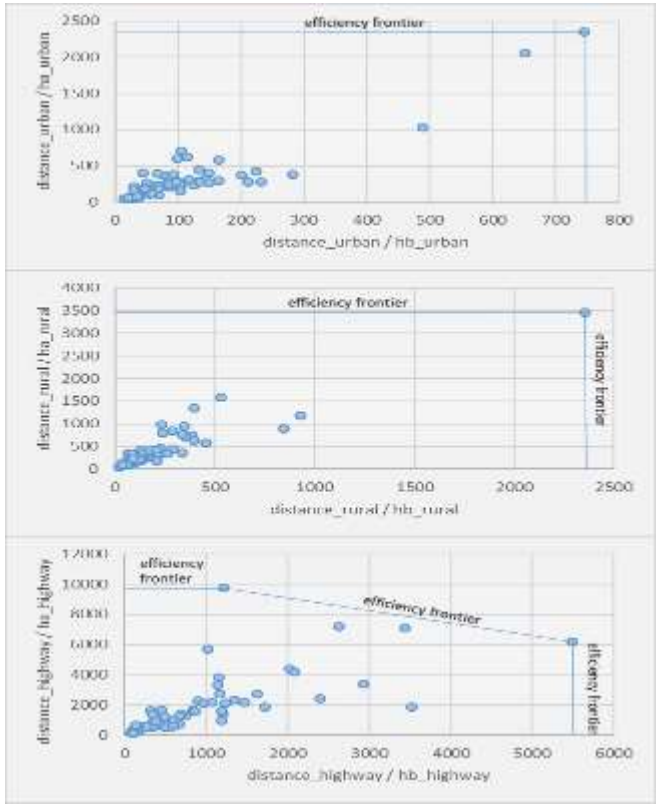
Objectives – Methodology

- Comparatively evaluate safe driving efficiency
- Travel and driving behaviour metrics collected from smartphones
- Data envelopment analysis (DEA) techniques
- Large-scale data
- Computation time of DEA LPs using transport data
- Standard DEA, Reduced Basis Entry (RBE) and Convex Hull DEA
- Input-oriented DEA
- Per driver analysis
  - road types
  - total driving behaviour
  - decision making unit (DMU)
- Python

Data collection – Findings (1/2)

- Mobile App:
  - hardware sensors
  - a variety of APIs to read sensor data
- 6-months driving experiment
- 250 drivers
- 49,722 trips collected
- Questionnaire





- Efficient drivers lie on the efficiency frontier
- Speed limit violation and mobile usage distraction -> key factors for safety efficiency index estimation
- Drivers classification (K-means) -> non-efficient, weakly efficient and most efficient

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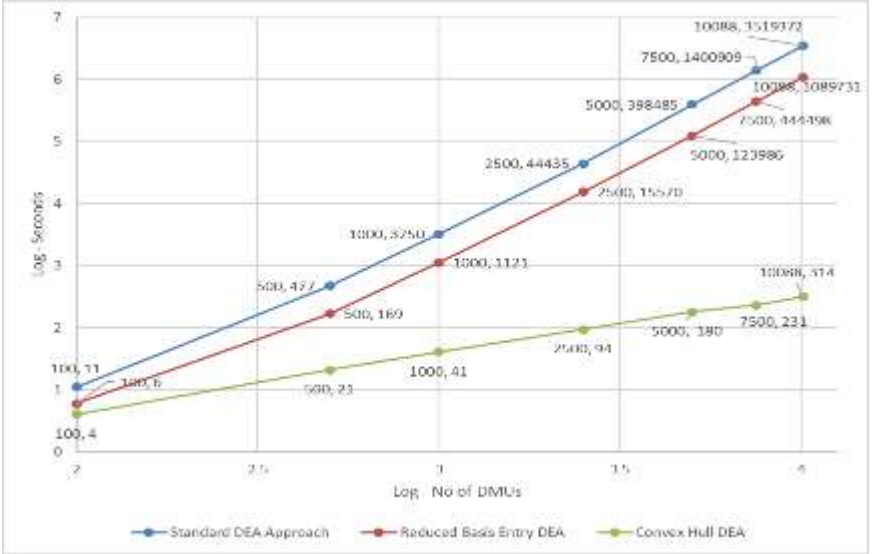
Findings (2/2) - Contribution

- Computation time results are obtained for the test sets of 100, 500, 1000, 5,000, 7500 and 10,088 DMUs
- Convex Hull technique significantly outperforms the rest (41)



- A relative efficiency measure to compare different drivers based on their driving efficiency
- Optimal level of inputs and outputs
- Reduce DEA running time with multiple inputs and outputs

- Smartphone app
- Insurance pricing

- Less computational expensive methods for driving evaluation

The authors would like to thank OSeven Telematics, for providing all necessary data to accomplish this study

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