
DiDi
FAST-ER
FAST EMERGENCY RESCUE

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AGENDA

- Motivation & Golden hour theory
- Objectives
- Proposed Solution
- Dataset description
- Early results
- A Look into The Future

MOTIVATION — DEATHS CAUSED BY VEHICLE CRASHES

VEHICLES CRASHES

1.35

Million deaths per year

8TH

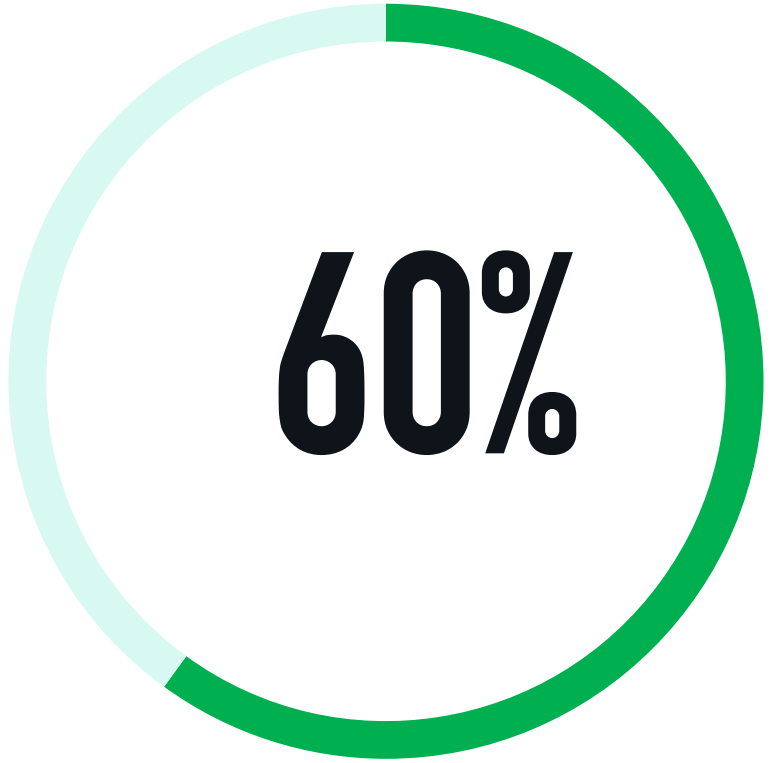
Leading cause of deaths

#1

Cause of death for Children and young

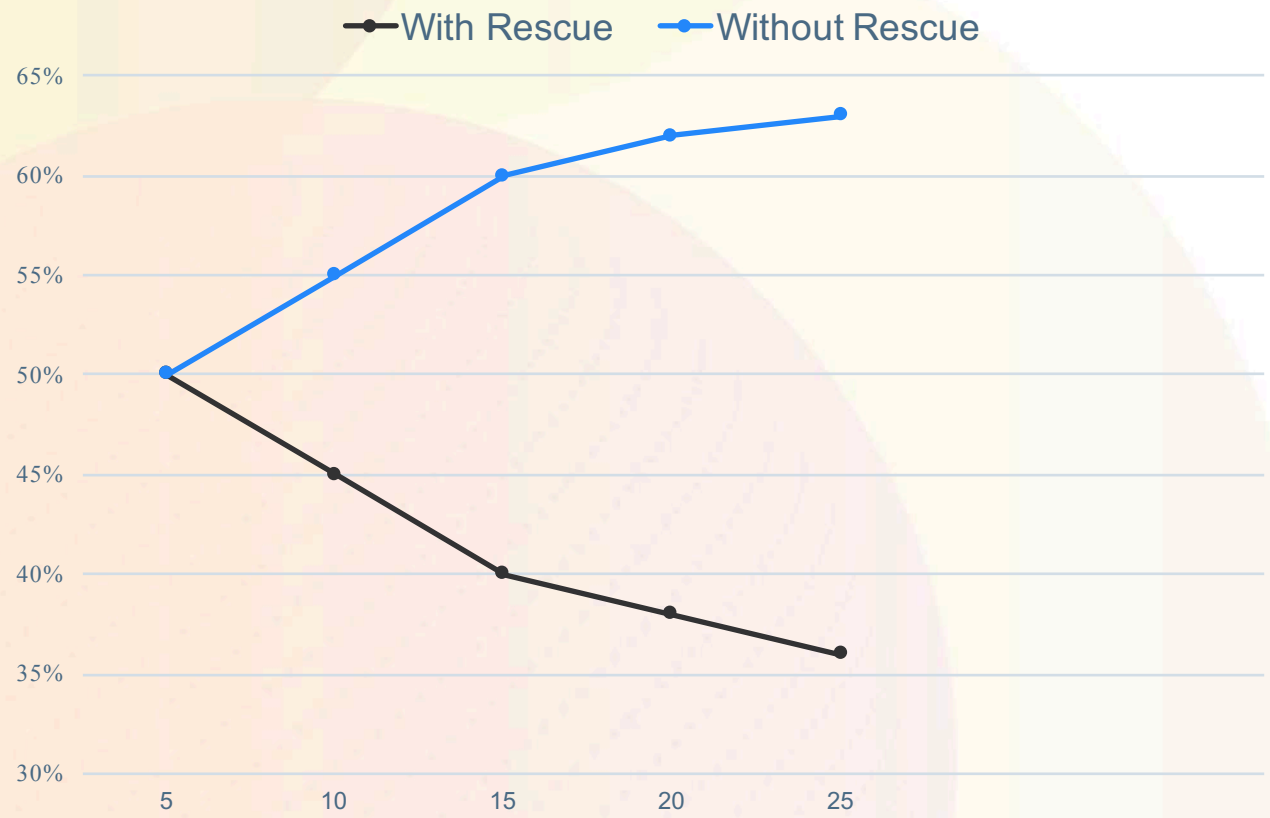
MOTIVATION — RESCUE TIME

People involved in accidents died in China(Compared with 3% in the US)



Deaths happen on the way to hospital

MOTIVATION — RESCUE TIME



Deaths happen on the way to hospital

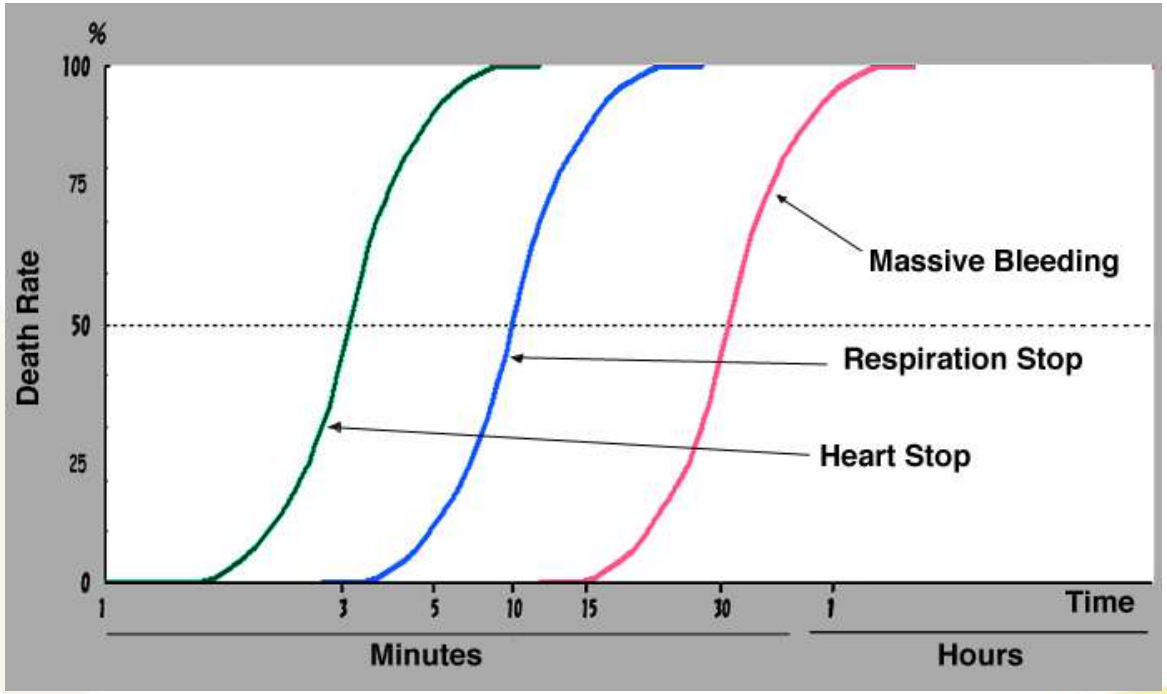
90%

Deaths happen within the 30min after the crash

GOLDEN HOUR THEORY

- The golden hour is the period of time following a traumatic injury during which there is the highest likelihood that prompt medical and surgical treatment will prevent death.

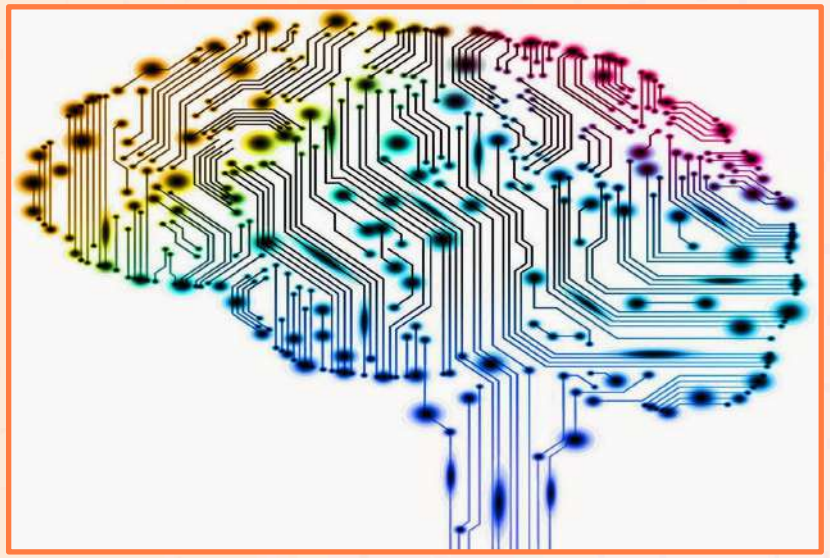
- Recommendations for emergency medical services is less than 10 minutes at the location of the trauma before transporting.

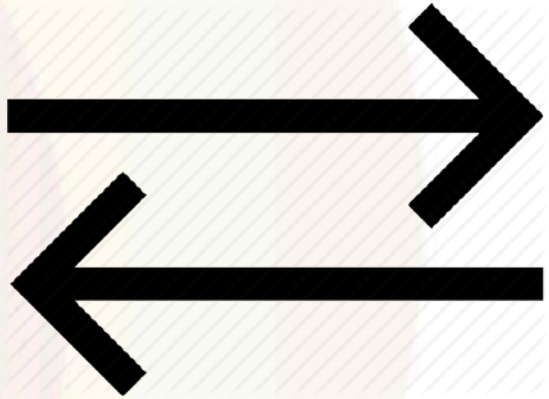


GOAL

- **Artificial Intelligence for Social Good**

- Can **artificial intelligence** and the **smart/connected vehicles** cope together to reduce the number of fatalities and the time to rescue victims of car accidents?





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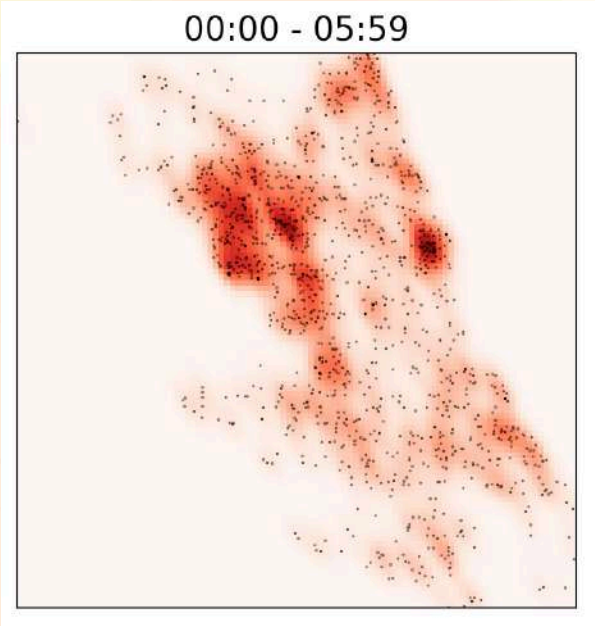
FAST-ER — FAST EMERGENCY RESCUE

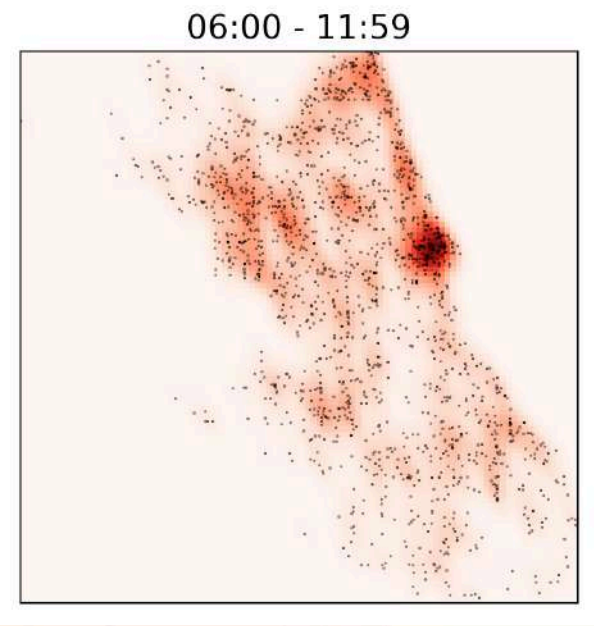
- Estimating Traffic accidents (density)
- Predicting high density areas
- Predicting future traffic conditions
- Optimizing placement of ambulance station based on traffic
- Computing rescue route

TRAFFIC ACCIDENTS ESTIMATION

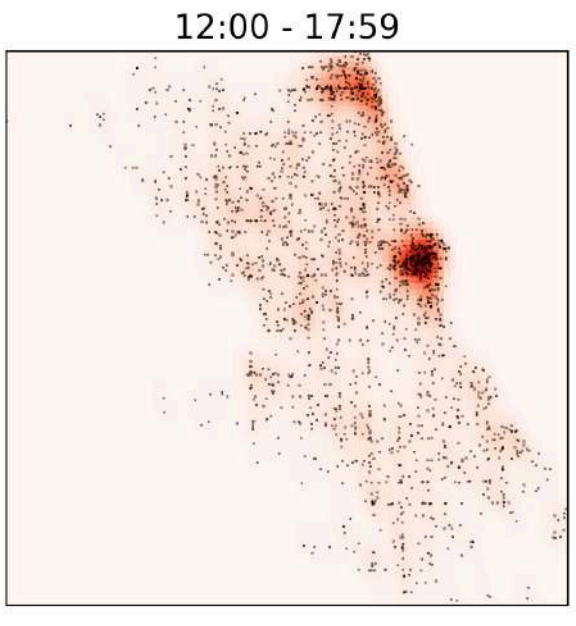
- Spatio-temporal correlation



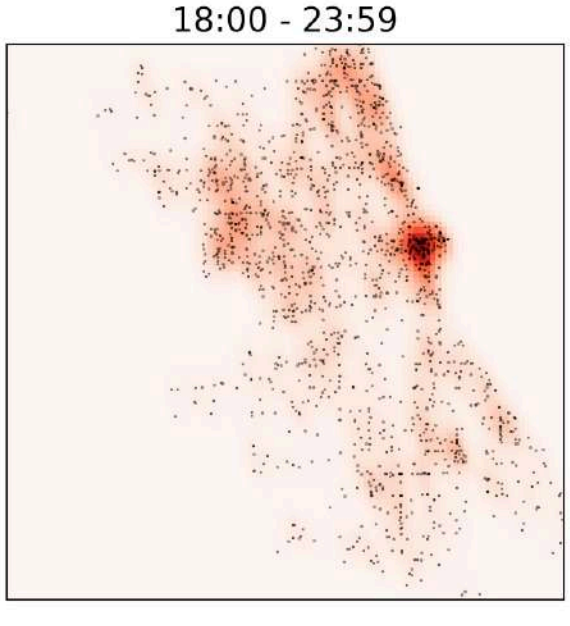
Dawn



Morning



Afternoon



Night

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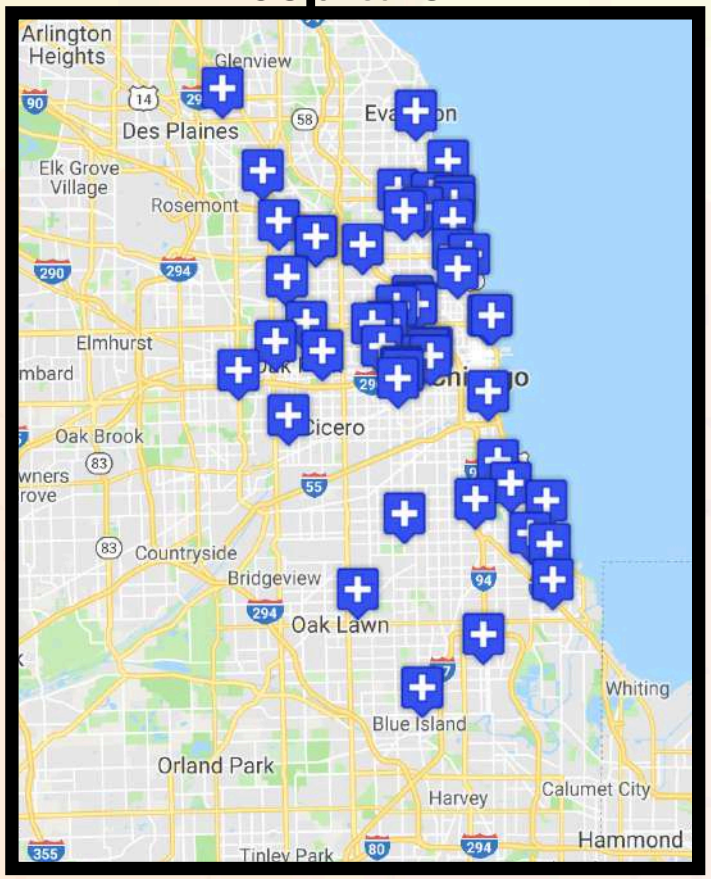
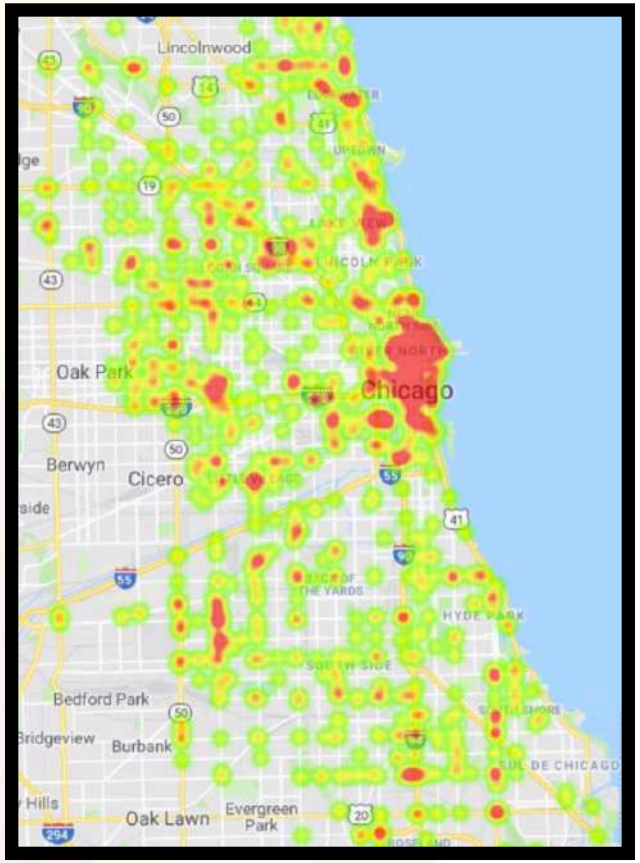
Hospitals



Traffic Accidents



Traffic condition

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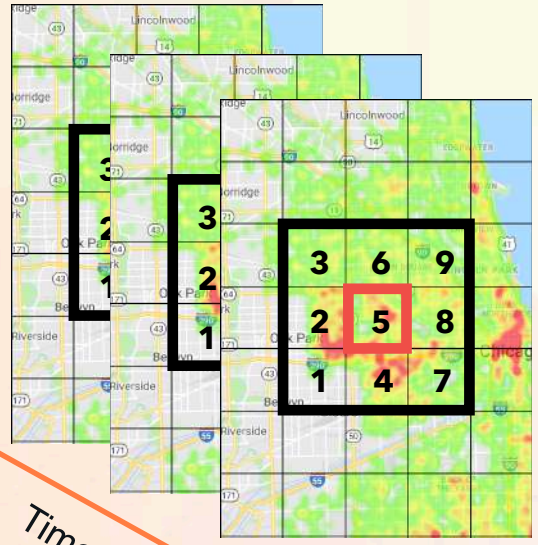
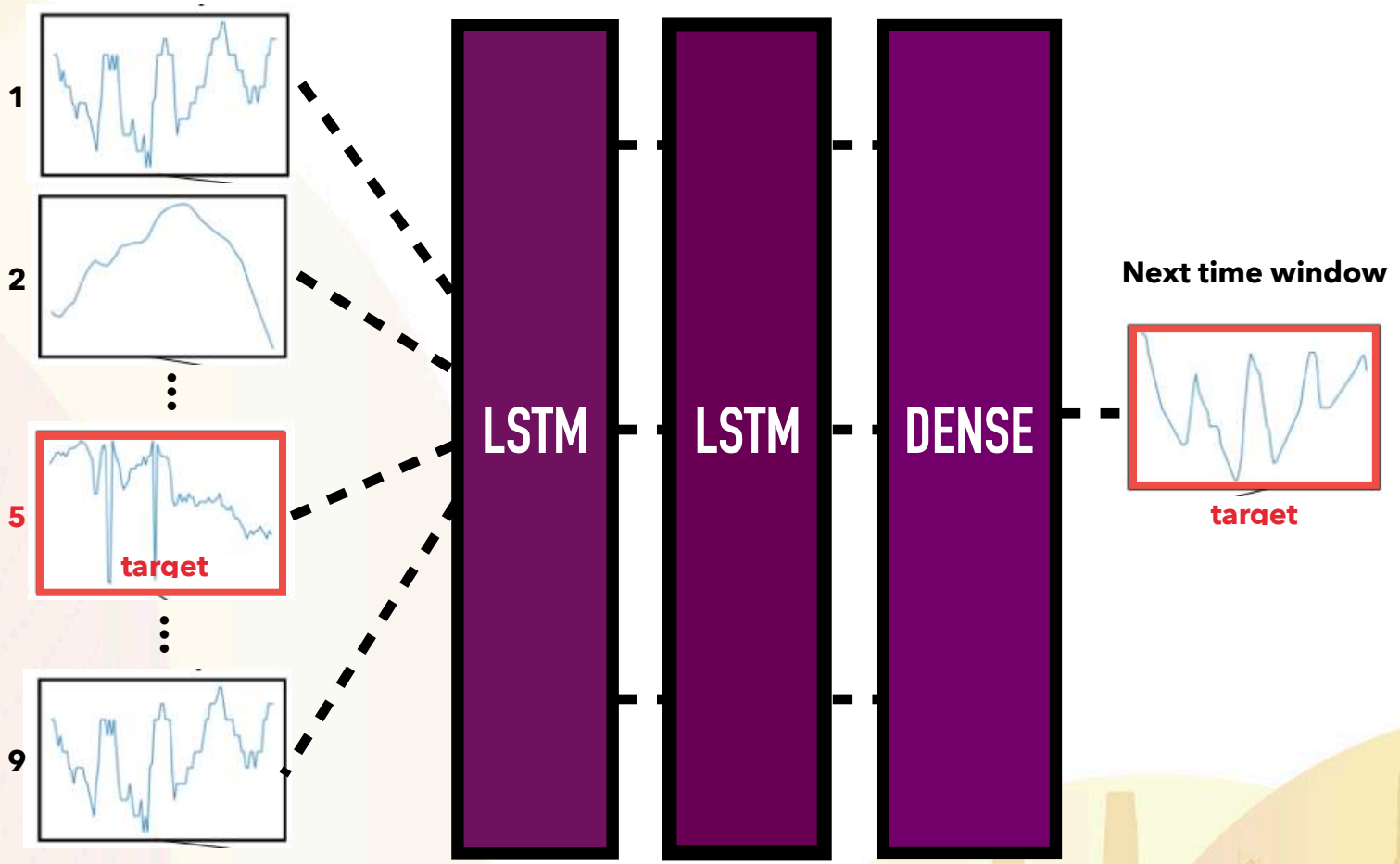
PREDICTING TRAFFIC ACCIDENT DENSITY & TRAFFIC CONDITION

Traffic accident density



Traffic condition

Road ID, timestamp, travel time
Road ID, timestamp, travel time
Road ID, timestamp, travel time
Road ID, timestamp, travel time
…
Road ID, timestamp, travel time



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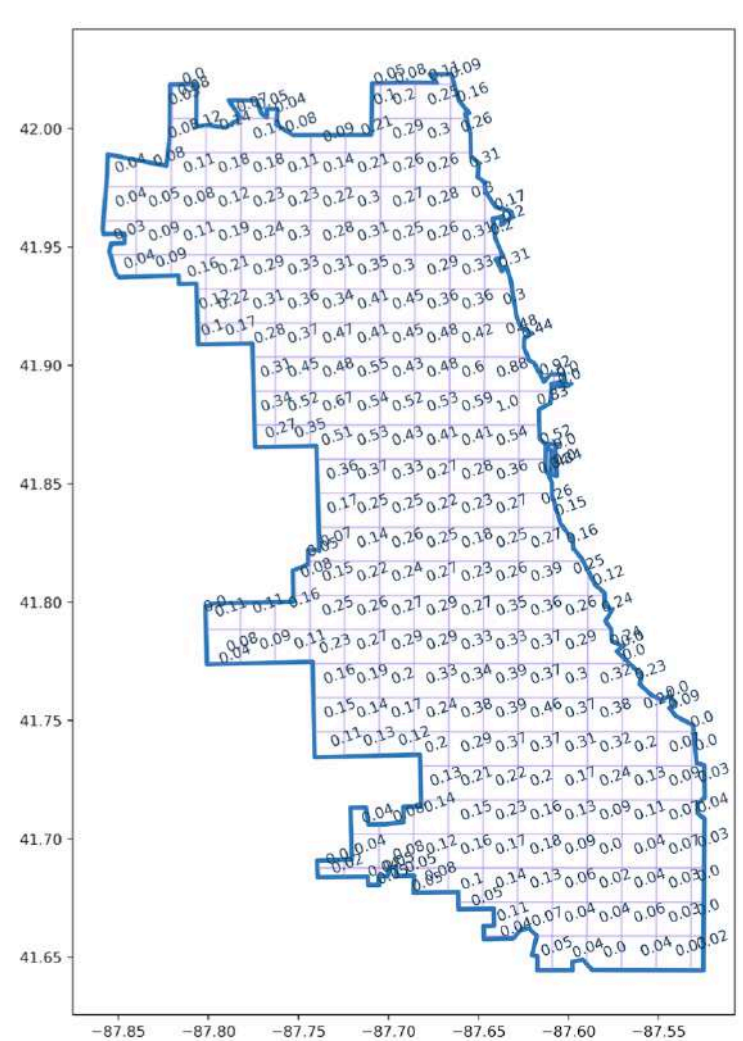
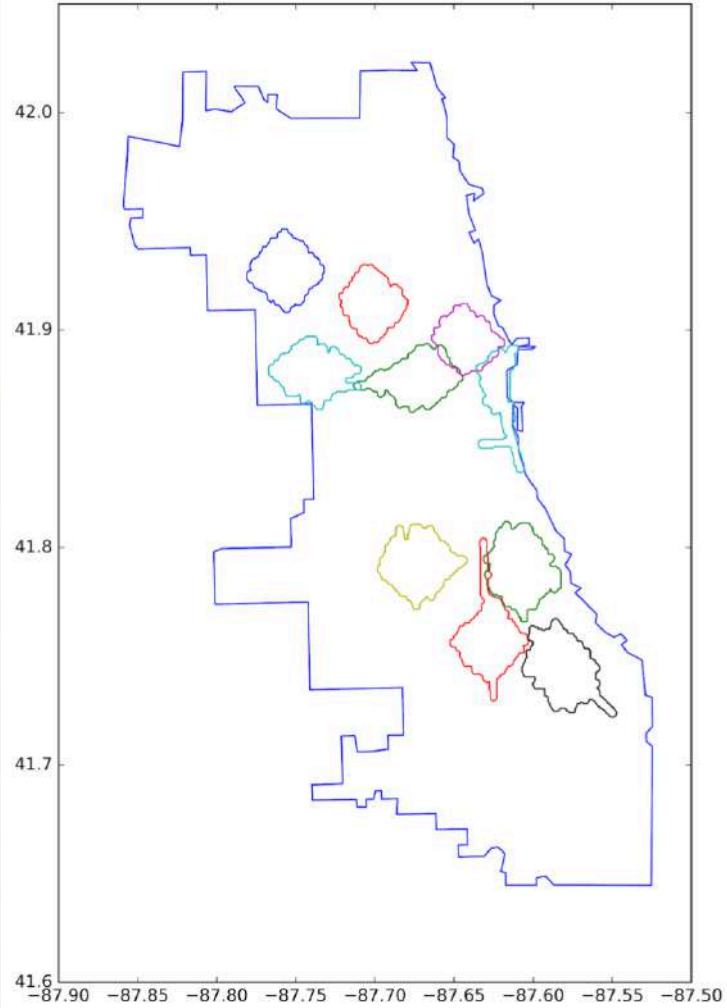
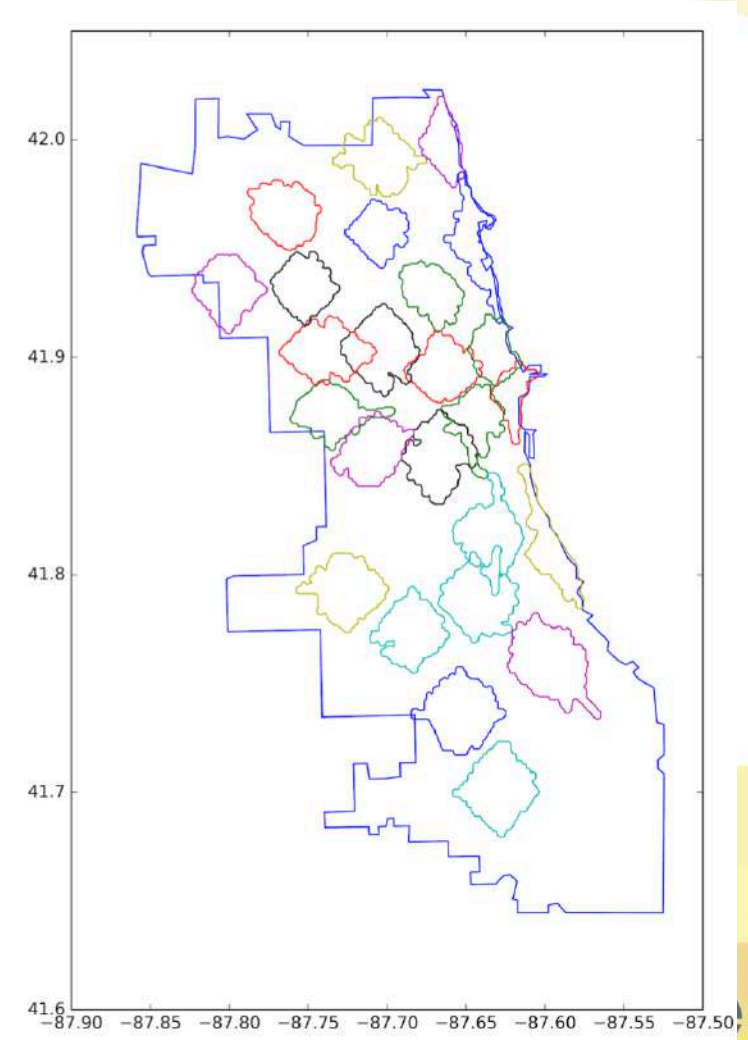
OPTIMIZING AMBULANCE STATION PLACEMENT







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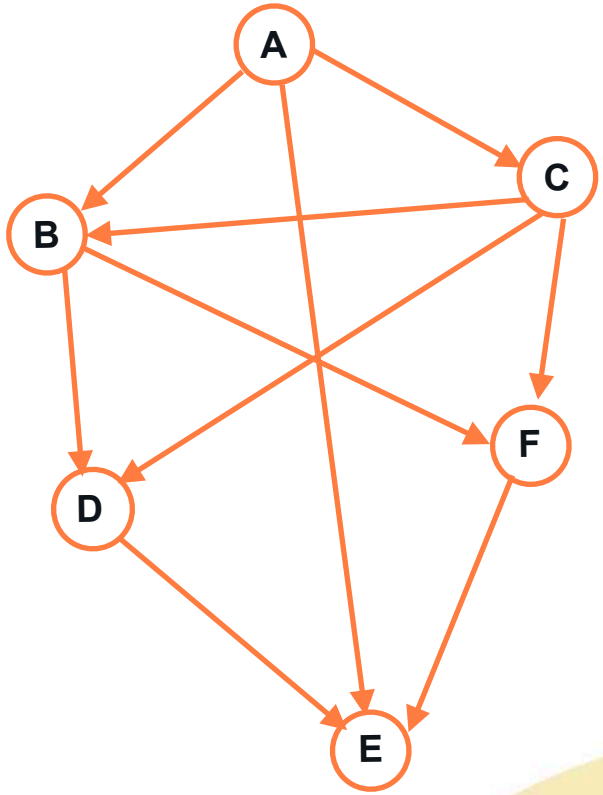
COMPUTING RESCUE ROUTE

- Route computed based on a direct graph
  - Weights based on the traffic predictions (i.e., travel time)
- **Rescue route:**
  - Shortest path between ambulance location and the accident location
  - Shortest path between accident location and the nearest hospital



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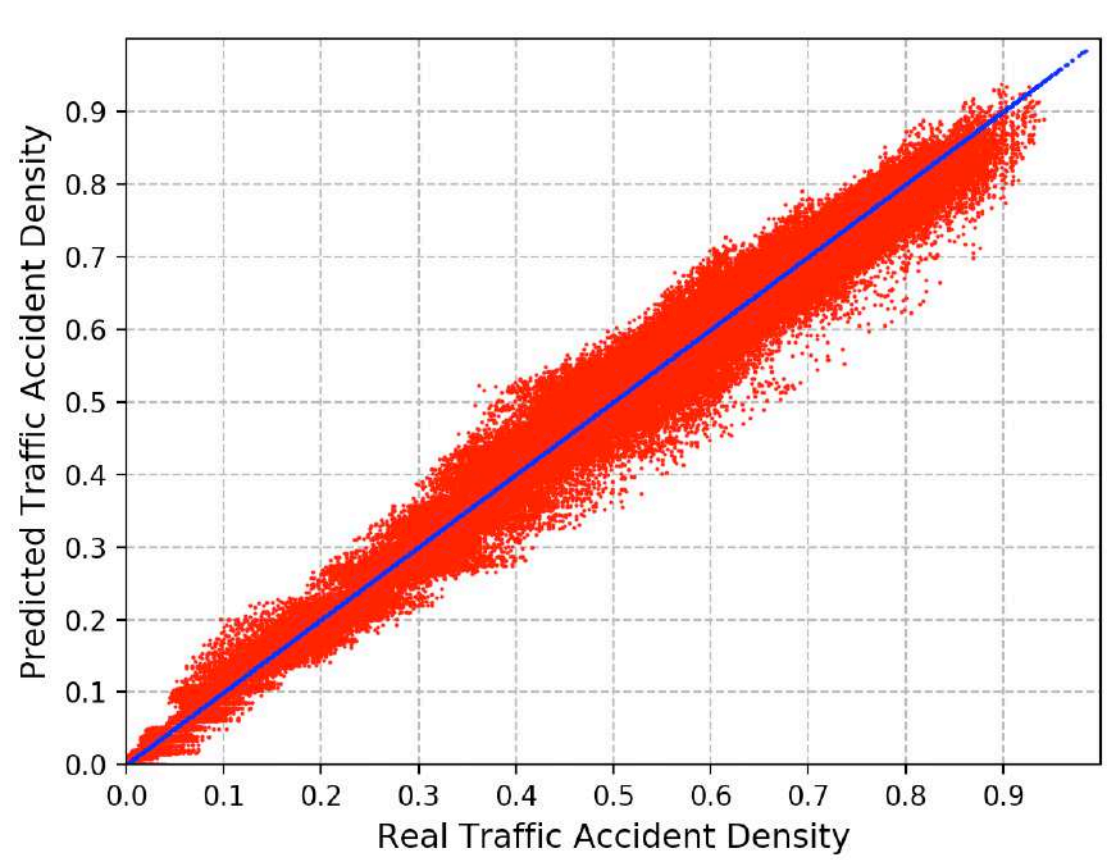
PROOF OF CONCEPT AND VALIDATION

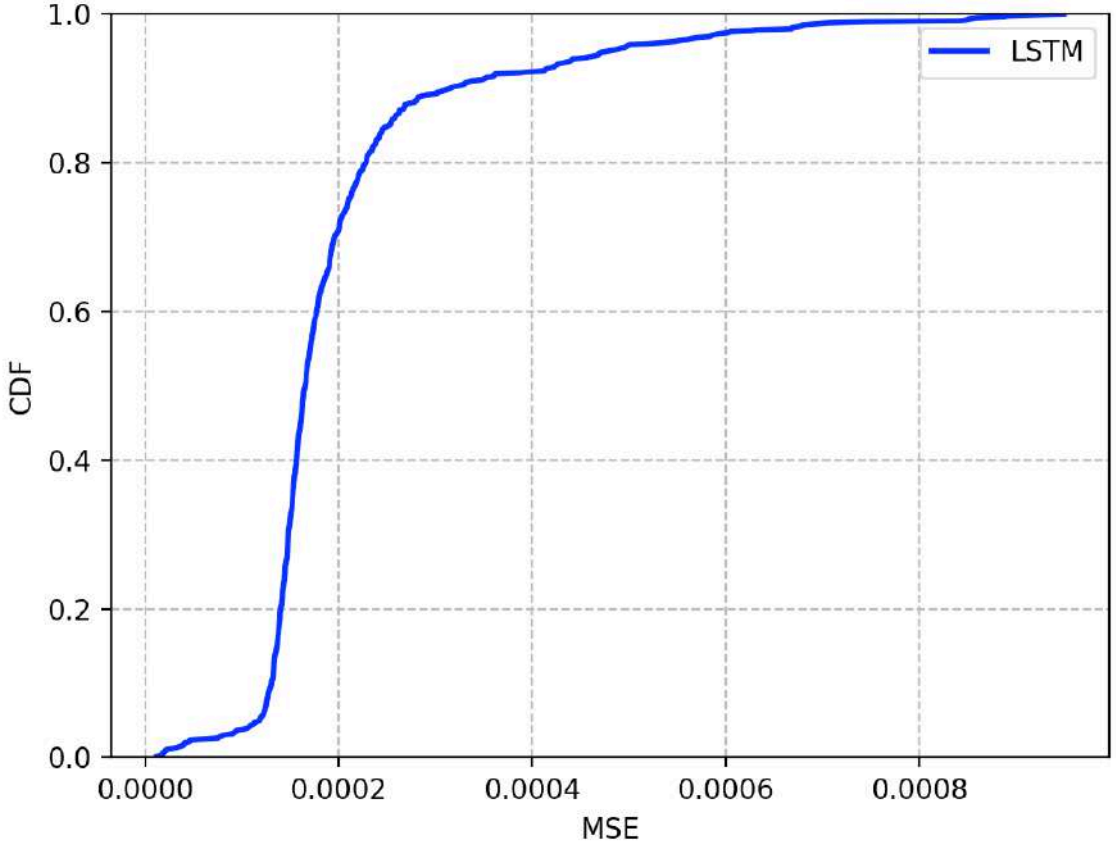
- **Tools:**
  - SUMO – Simulator of Urban Mobility
  - OMENT++ Network Simulator
  - Veins – Vehicular Network Framework
  - TraCI – Traffic Command Interface
  - TensorFlow
- **Dataset:**
  - Open Chicago Portal
  - Traffic and accident history

PROOF OF CONCEPT AND VALIDATION

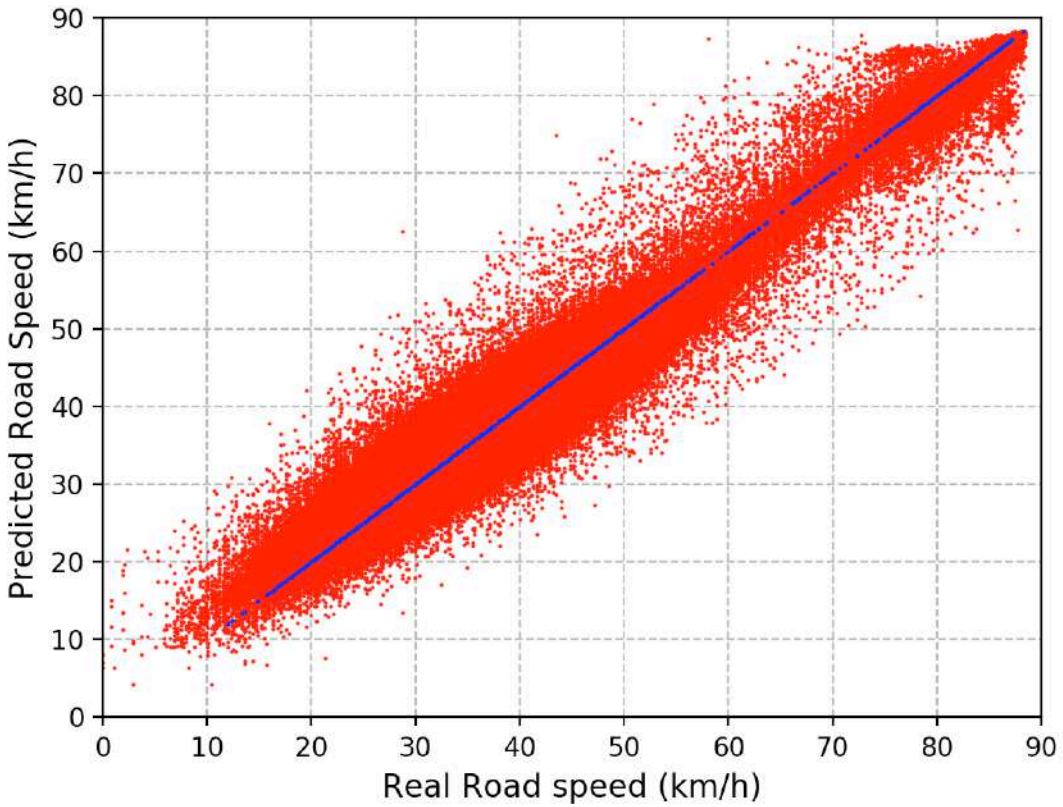
- **Metrics:**
  - **Mean Squared Error (MSE)**
    - *Traffic and accident density precision*
  - **Ambulance station placement**
    - *Accident coverage*
  - **Rescue time**
    - *Time spent to reach the accident location & time loss during the rescue*

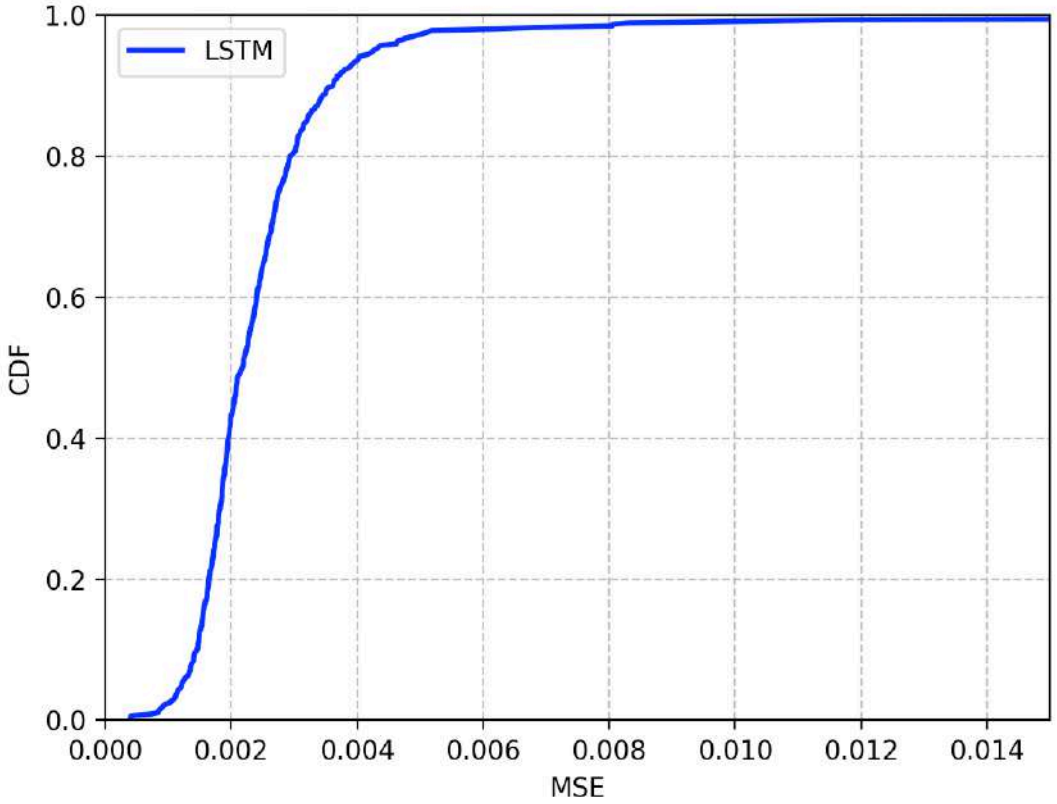
RESULTS — TRAFFIC ACCIDENT DENSITY PREDICTION



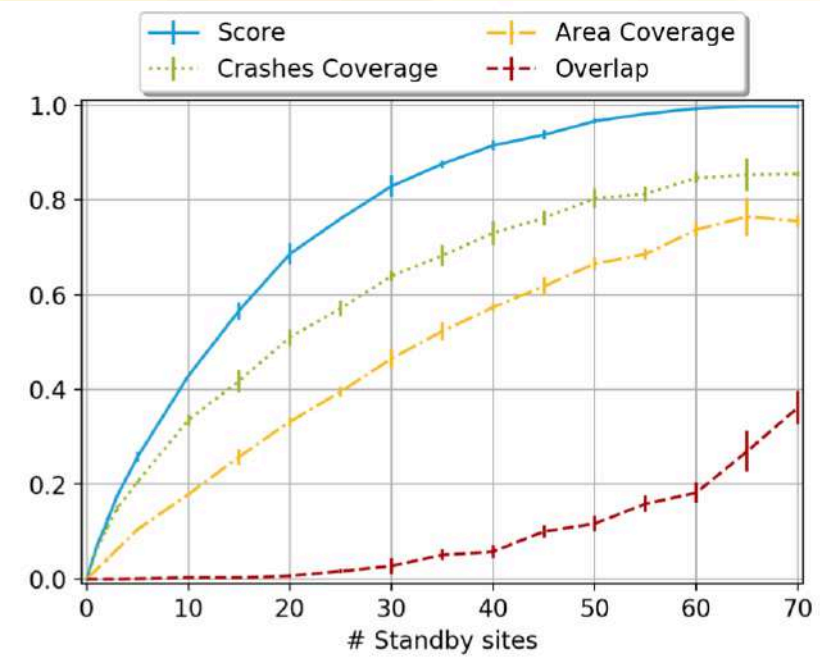


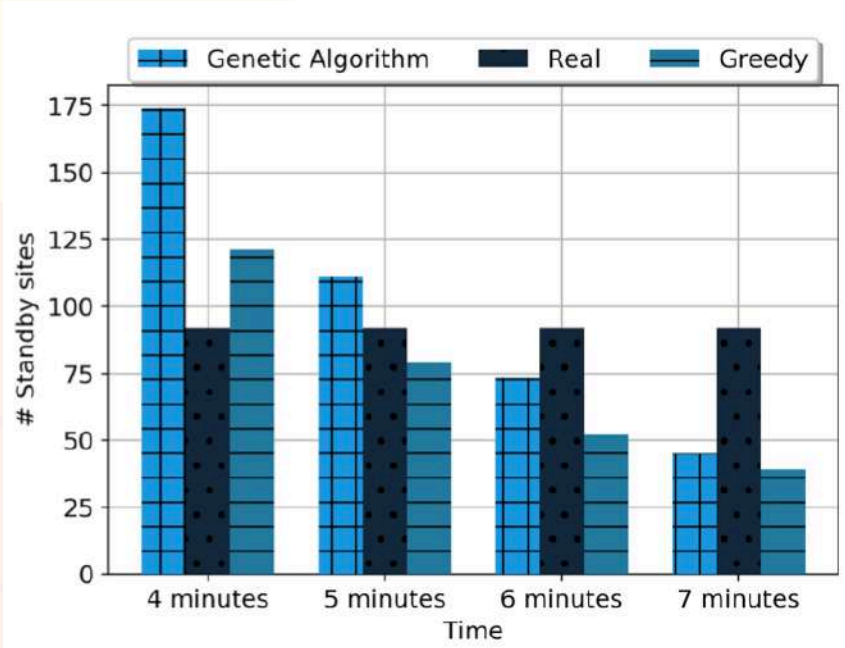
RESULTS — TRAFFIC CONDITION PREDICTION

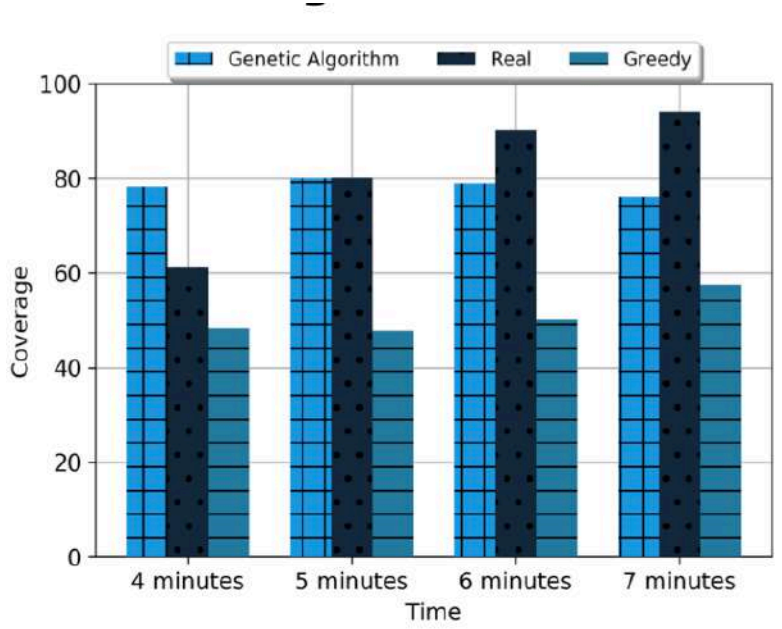




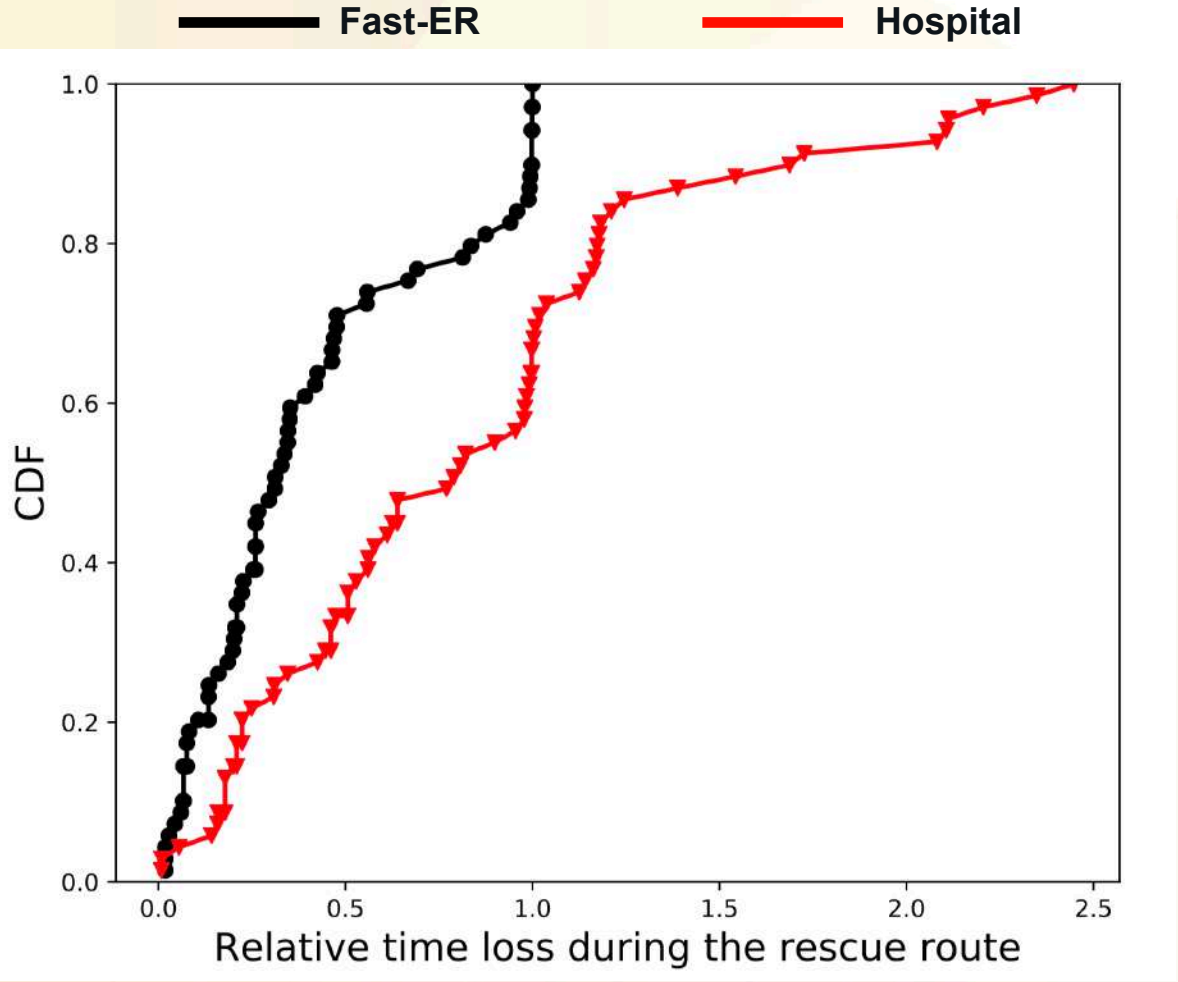
RESULTS — AMBULANCE STATION PLACEMENT

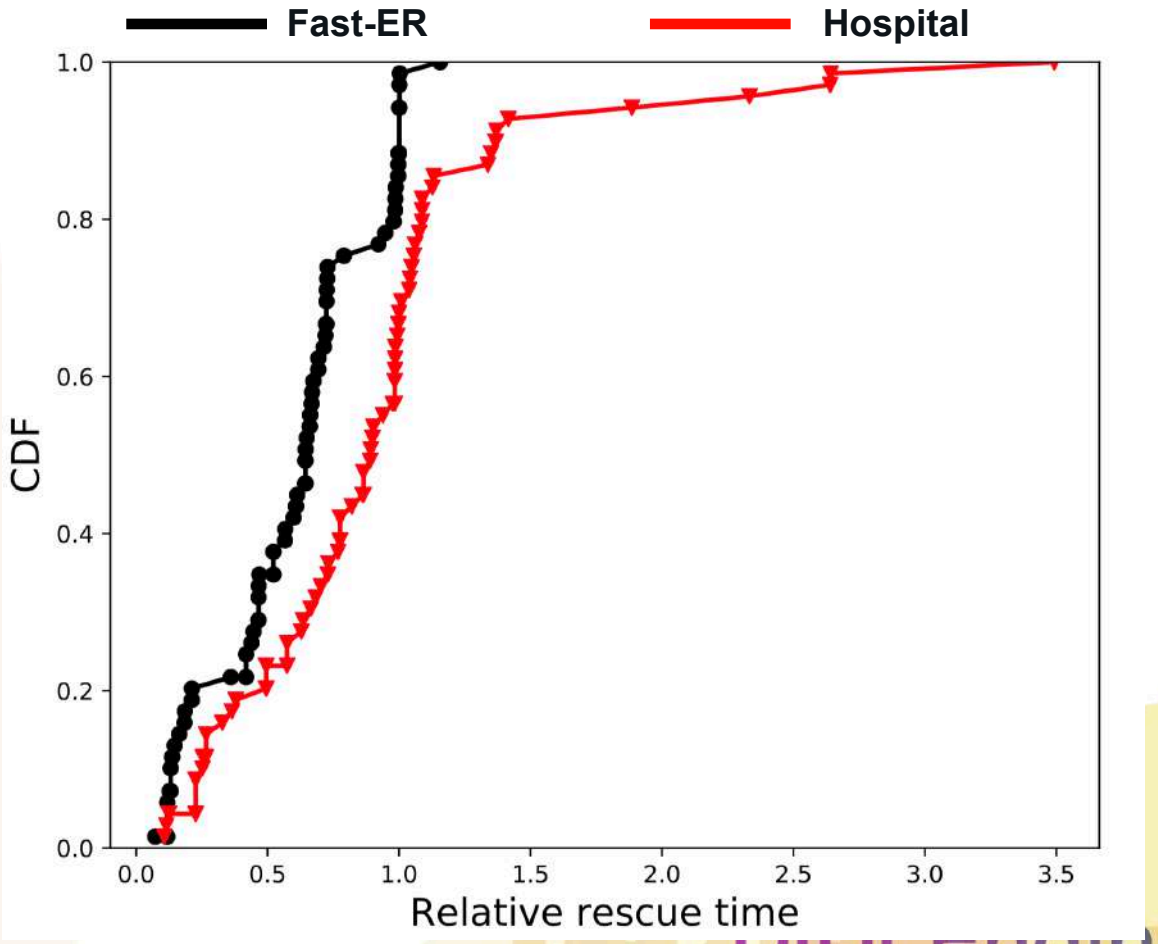






RESULTS — RESCUE TIME

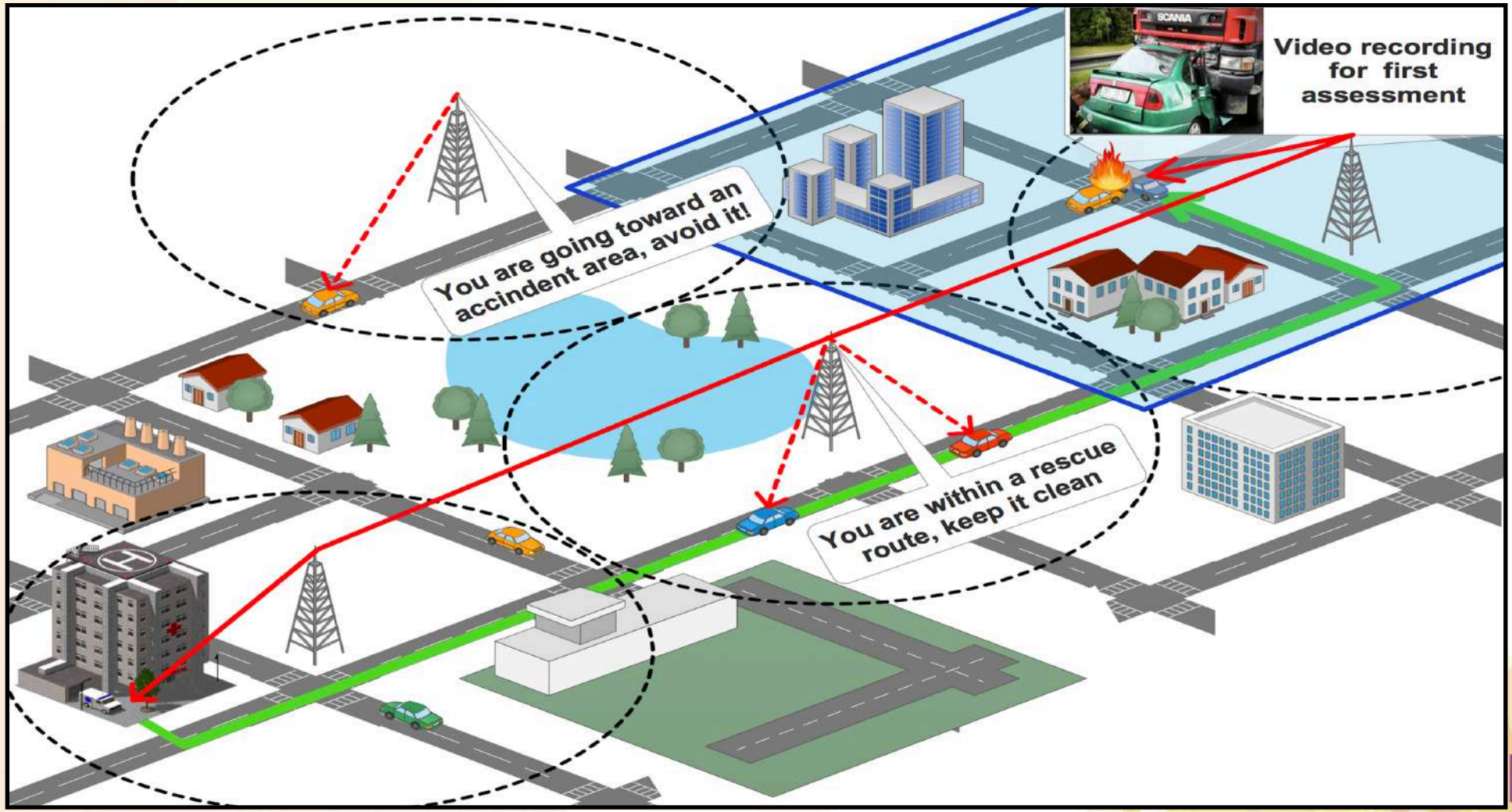




CONCLUSION & FINAL REMARKS

- **Conclusion**
  - The cooperation between AI and connected vehicles can reduce the rescue time
  - The reduction in the rescue time might reduce the number of fatalities
- **Final Remarks**
  - Neural network architecture optimization (NAS)
  - Ambulance placement improvement (GA)
  - Autonomous vehicles

A LOOK INTO THE FUTURE . . .



A LOOK INTO THE FUTURE . . .

Self-driving platform

1. Multi-functional
2. Medicine and Tools deployment
3. Fast Response for first-aid

THANKS!

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