Future of Transportation....!
History

3500BC 1st century 1662 1817 1908

1910 1956 Now & Future

First road network  First affordable car
First public transport  First electric traffic light
First bicycle  First Wheel
Smart transportation systems  Highway
History

3500BC → 1st century → 1662 → 1817 → 1908
First Wheel

First road network → First affordable car
First public transport → First electric traffic light
First bicycle → Highway
Smart transportation systems → Now & Future
History

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First public transport → First electric traffic light

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Smart transportation systems
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History

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1st century: First road network
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1956: First electric traffic light
Now & Future

Smart transportation systems
History

- 3500 BC: First Wheel
- 1st Century: First road network
- 1662: First public transport
- 1817: First bicycle
- 1908: First affordable car
- 1910
- 1956: Now & Future
- 2023:
  - First electric traffic light
  - Highway
  - Smart transportation systems
History

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1st century → First road network
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1956 → Now & Future

Smart transportation systems
Highway
History

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1956: Highway

Now & Future

Smart transportation systems
Transportation Industry

Transportation

Engineering

Planning

Science & Research

Policy

Design

Management
Cutting-Edge Topics

Cooperative Vehicles
For rural and urban areas

Car Pooling or ride sharing

Multimodal Transportation
Smart Transportation

- **Smart Travellers**
  - From Drive Alone to Ride Sharing

- **Smart Vehicles**
  - From Human driven to Autonomous Driving

- **Smart Infrastructure**
  - From Independent Systems to Cooperative and connected Systems

- **AI**
- Big Data
- Transportation engineering
Smart Transportation

Platform

Maps

Data Collection

Analysis

Control

Mobility Services

Car pooling
Order dispatch

Route planning
ETA

GPS
Camera

Traffic jams
Accident analysis

Taxi
Public Transport

Signal control
Incident management
Maps in the modern Transportation

Navigation

Ride Hailing

City Transport management

Autonomous driving
Maps: Core Usage

Route planning and ETA

Map-matching

Positioning

Traffic
Map-Matching

Challenges:
- Large scale of GPS data
- Low quality GPS data from mobile devices
Route Planning

Classical problem: shortest path problem
- Dijkstra
- A* algorithm
- Customisable routing

Challenges:
- Travel Distance
- Travel Speed
- Traffic condition
- ...
ETA (Estimated Time of Arrival)

Route Planning

Ride Sharing
ETA

Historical Data

Preprocessing and segmentation

Global estimation

Statistical Machine Learning

Real-time traffic data
Floating cars data

Big Data + Machine Learning
Traffic

Traffic Estimation:
Building traffic data
Multiple source of data,
Data fusion,
Spatio-temporal spline
Traffic

Traffic Prediction:
Predicting the traffic speed for the next T

9:00 to 10:00

10h10; 10h20; 10h30; ....
Applications & Projects

Traffic status in the city of Rouen, France.
Applications & Projects

Map-matching in the city of Rouen, France.
Applications & Projects

Map-matching in the city of Tartu, Estonia.
Applications & Projects

Real-time Localisation and tracking based on Multi-sensor fusion
Applications & Projects

Urban Sensing:
From Mobility Analysis to Localisation

How to integrate new source of data such as mobile data?
Applications & Projects

Urban Sensing:
From Mobility Analysis to Localisation

Detect if the location was a:
- Move
- Stay
- Jump
Applications & Projects

Urban Sensing: From Mobility Analysis to Localisation
Applications & Projects

Urban Sensing: From Mobility Analysis to Localisation
Applications & Projects

Spatio-temporal Mobility Analysis for Community Detection in the Mobile Networks Based on CDR data

- Event-space slice of 100 subscribers represented as 3D scatter plot
- Heatmap of cross-user distance matrix (set of 50 subscribers)
- Subscribers grouped by similarity giving initial view of communities (set of 50 users)
Applications & Projects

Spatio-temporal Mobility Analysis for Community Detection in the Mobile Networks Based on CDR data
ITS Lab
Location: Ülikooli 17, 3rd Floor
Our website: its.cs.ut.ee
Our Courses

- Introduction to intelligent transportation systems - MTAT.08.040
- Transportation theory and applications - MTAT.08.043
- Coming Soon: Artificial Intelligent in Transportation