How AI will help us predict and influence future mobility choices
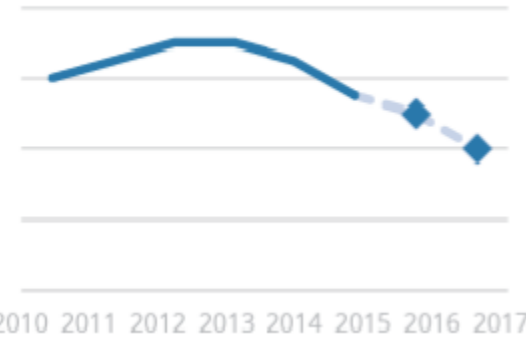
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MODUL Technology

- Non-profit research institute spun out from MODUL University Vienna
- Specialising in content annotation, knowledge acquisition and data analytics for various domains (media, mobility, sustainability, tourism)

- In AI-CENTIVE, we collect online data (Web and social media) capturing news and public opinion around mobility options in Austria.
- We annotate data items with relevant concepts drawn from a mobility knowledge graph we are building and maintaining.
- We will deploy AI models to predict future mobility behaviour and the incentives needed to change behaviour to be more sustainable.

- **Deep Learning**/Neural Networks have shown better accuracy for forecasting tasks compared to classical approaches (ARIMA, regression...)

- Models can be trained with **additional features** besides the core time-series data. We can learn which features contribute to model accuracy and weigh/remove them appropriately.

- Our goal with AI is not just to predict what trips will be taken in the future but **how** (choice of mobility service)
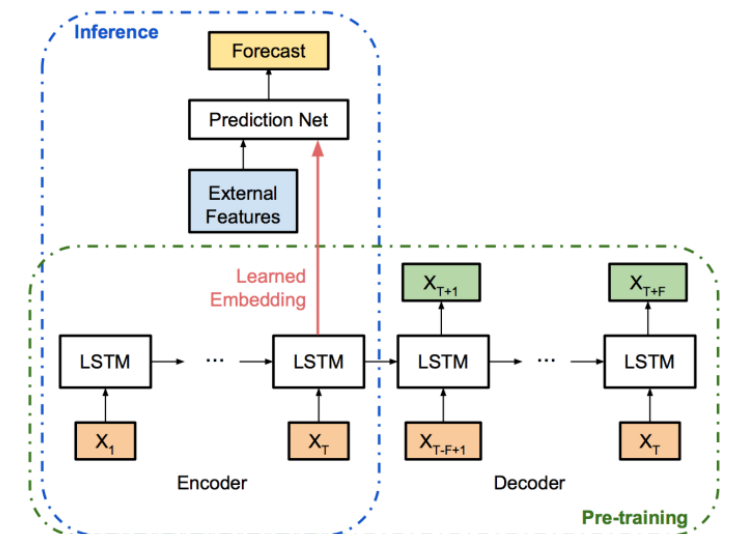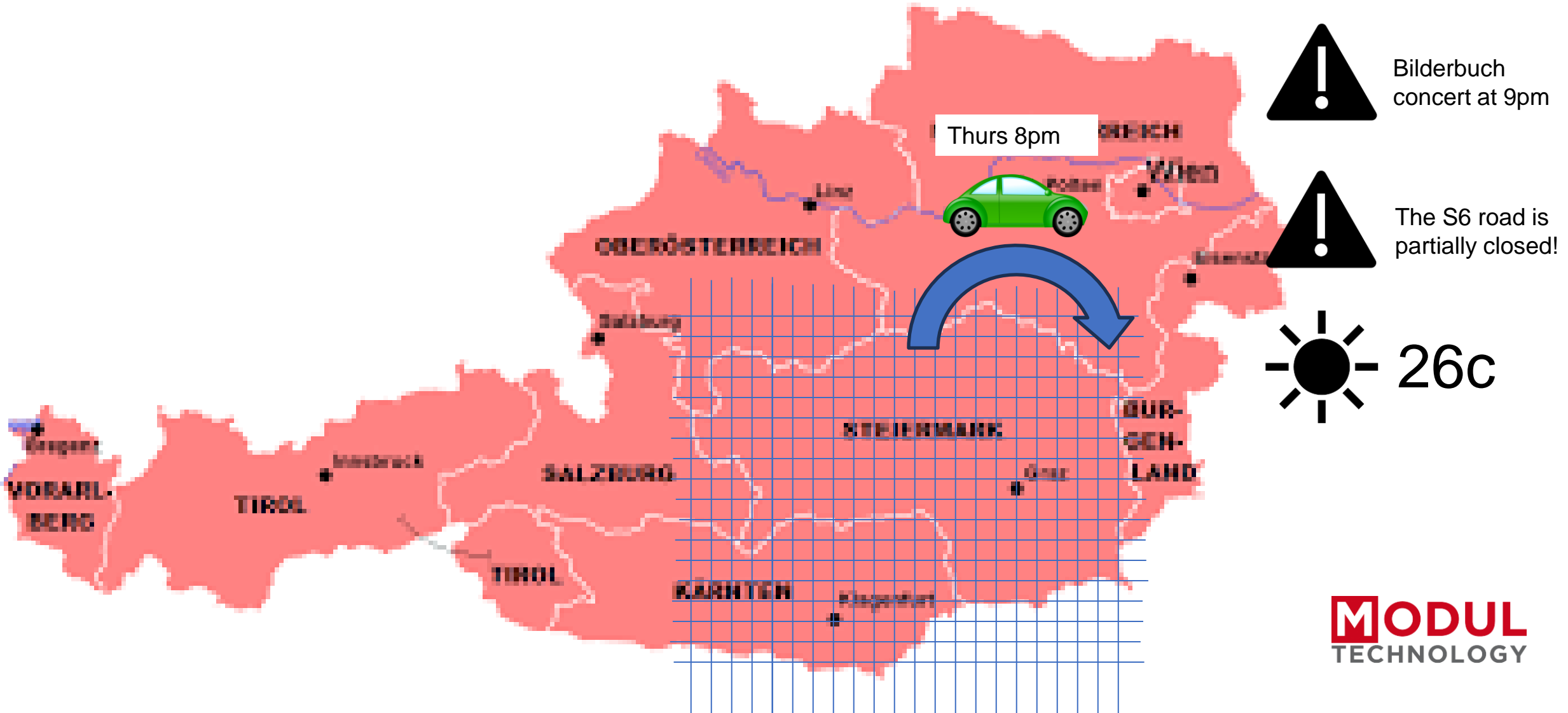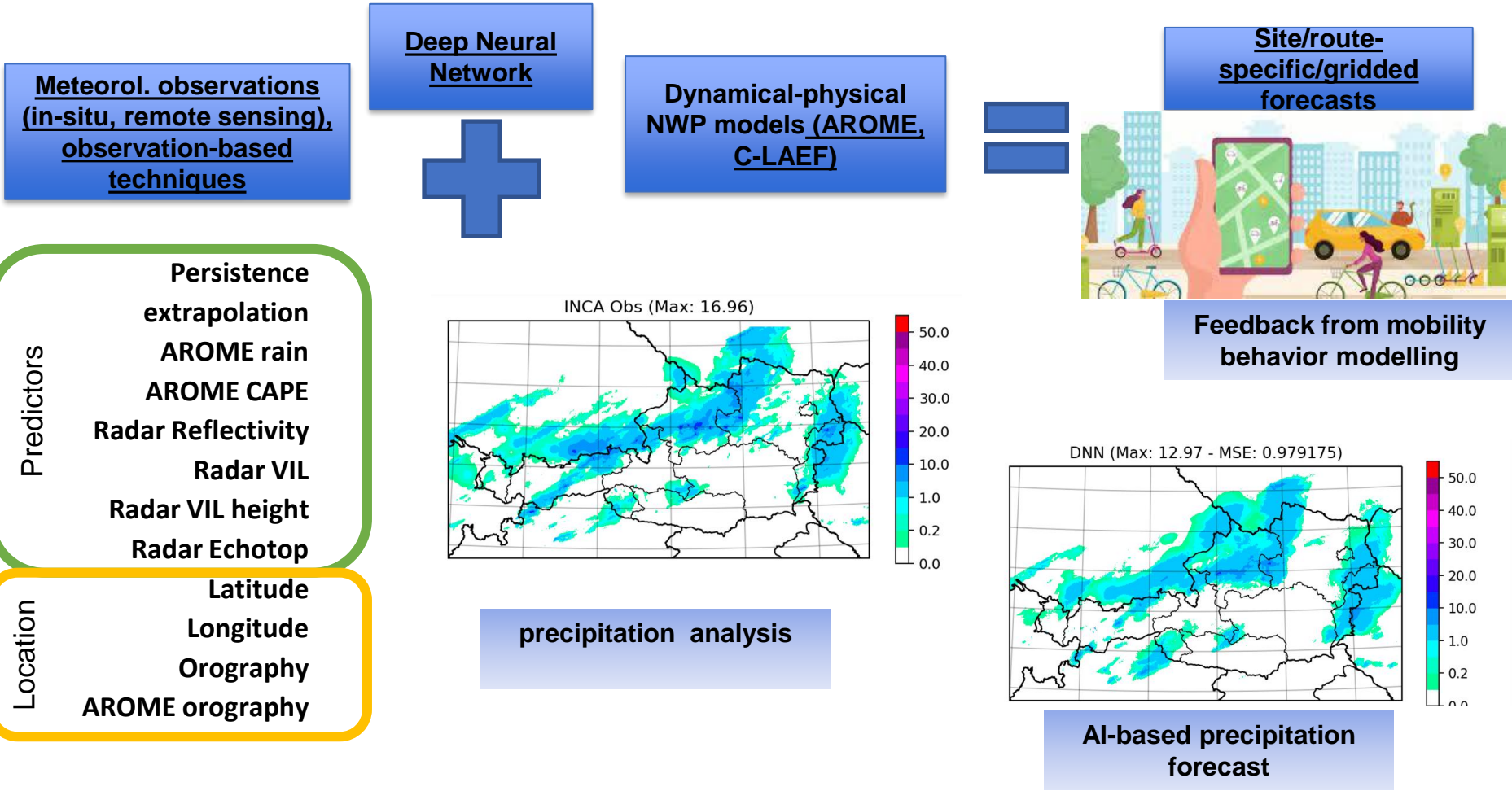
Opportunities with AI (Deep Learning and Forecasting)

● Uniquely in AI-CENTIVE we can extract and use various features that can influence consumer's mobility choices (whether they travel; what route they travel; how they travel).

● We want to anticipate the **future mobility choices** so that we can influence that choice to be more sustainable!

Input Features
Trip start and end, expressed as segments, with **mobility choice**
Trip characteristics such as distance, duration, day and hour, purpose (home or work)
Static mobility events extracted from calendars and Web data (e.g. elections, concerts, sport finals)
Dynamic mobile events extracted from Web data streams (e.g. road and rail closures)
Climate (weather conditions, temp., wind..)
Spatial lag (characteristics of segments such as extent of mobility offers present, pop. density)

AI Model Training

- Frequency of trips between segments
- Mobility options available
- Distribution of mobility choices
- Contexts which affect the choices

Prediction: future trips
Starting segment
Ending segment
Starting day and hour
User (anonymised ID)
Mobility form
...

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Feature Selection and Extraction

Combining observations and physics with AI techniques

GeoSphere Austria

Meteorol. observations (in-situ, remote sensing), observation-based techniques

Deep Neural Network

+

Dynamical-physical NWP models (AROME, C-LAEF)

=

Site/route-specific/gridded forecasts

Feedback from mobility behavior modelling

Predictors
- Persistence
- extrapolation
- AROME rain
- AROME CAPE
- Radar Reflectivity
- Radar VIL
- Radar VIL height
- Radar Echotop

Location
- Latitude
- Longitude
- Orography
- AROME orography

INCA Obs (Max: 16.96)

precipitation analysis

DNN (Max: 12.97 - MSE: 0.979175)

AI-based precipitation forecast

AI-CENTIVE Predictive Model for User Mobility Choice

User id 8Af4b7Fex12
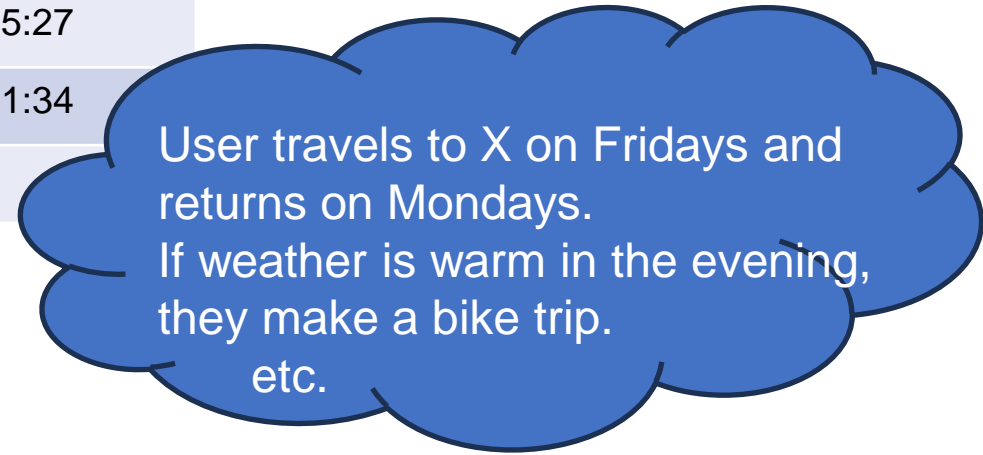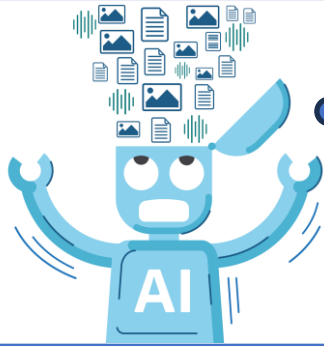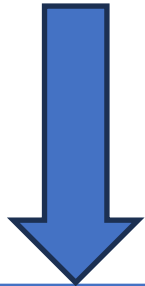
(48.1, 16.3)	(48.2, 16.4)	TRAIN	10/6/23 – 12:30	10/6/23 – 12:58
(48.2, 16.4)	(47.8, 15.6)	CAR	10/6/23 – 14:32	10/6/23 – 15:27
(47.8, 15.6)	(47.8, 15.6)	BICYCLE	10/6/23 – 20:18	10/6/23 – 21:34
…..	……	…….	…….	……..

Extracted features
- weekday, holiday
- distance, duration

Derived features
- weather
- events

User travels to X on Fridays and returns on Mondays.
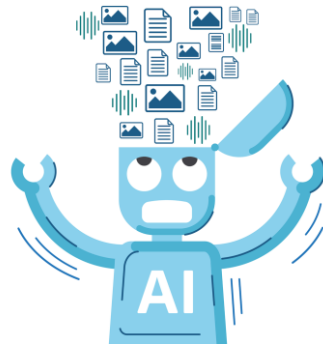If weather is warm in the evening, they make a bike trip.
etc.

User id 8Af4b7Fex12

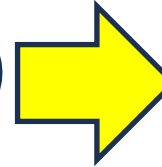|				
(47.8, 15.6)	(48.2, 16.4)	CAR	10/9/23 – 08:15	10/9/23 – 09:30
(48.2, 16.4)	(48.2, 16.4)	E-SCOOTER	10/9/23 – 11:04	10/9/23 – 11:59
(48.2, 16.4)	(48.1, 16.3)	TRAIN	10/9/23 – 13:06	10/9/23 – 13:34
…..	…..	……	……	……

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AI-CENTIVE Incentive Model for Sustainable Mobility

Identify more sustainable alternatives for routes.

Identify incentives which lead to change in mobility choice.

There is a **bus** on this route, which is more sustainable. Users have chosen the bus over private car when they were offered a **drinks voucher**.

User id 8Af4b7Fex12				
(47.8, 15.6)	(48.2, 16.4)	CAR	10/9/23 – 08:15	10/9/23 – 09:30
(48.2, 16.4)	(48.2, 16.4)	E-SCOOTER	10/9/23 – 11:04	10/9/23 – 11:59
(48.2, 16.4)	(48.1, 16.3)	TRAIN	10/9/23 – 13:06	10/9/23 – 13:34
…..	…..	……	……	……

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● The latest AI approaches can also be effective in the task of mobility (choice) prediction

● The ability to train AI models with different features will allow us to learn which features are more determinant in people's mobility choices

● Knowing what people will do, we hope to have the opportunity to incentivise them to make a more sustainable decision
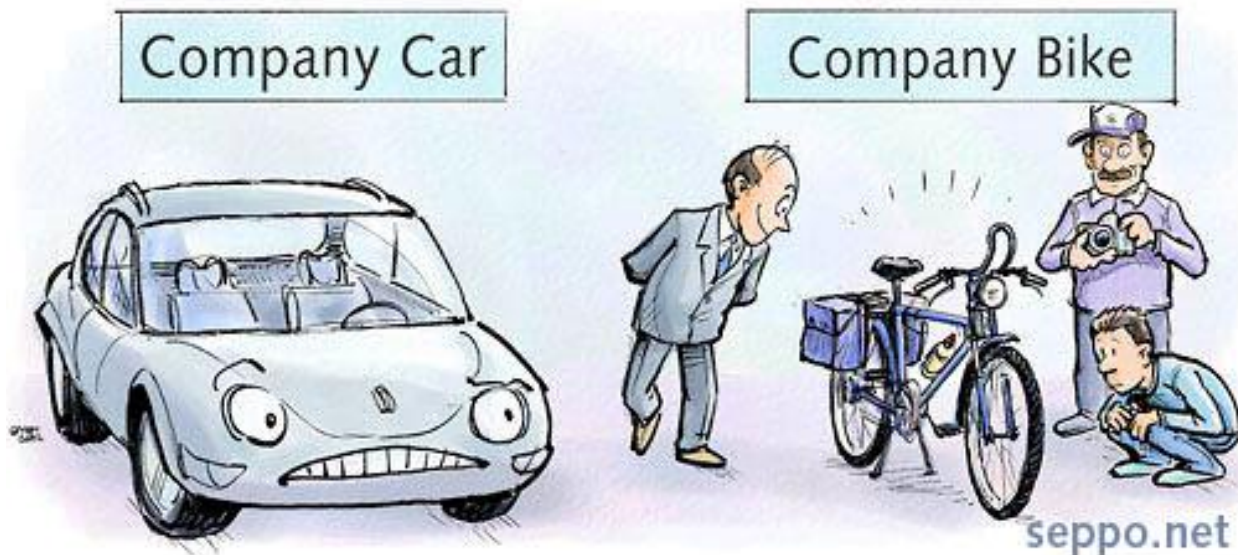
Thank you for your attention!

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