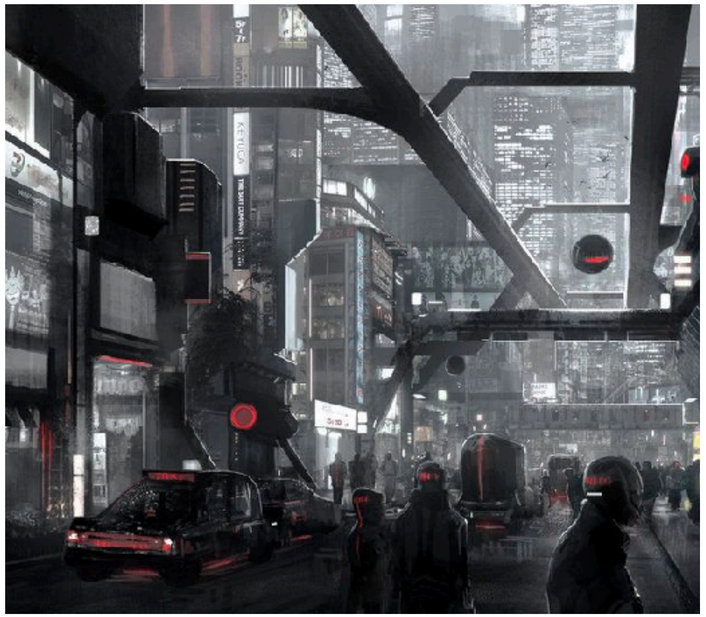
COeXISTENCE

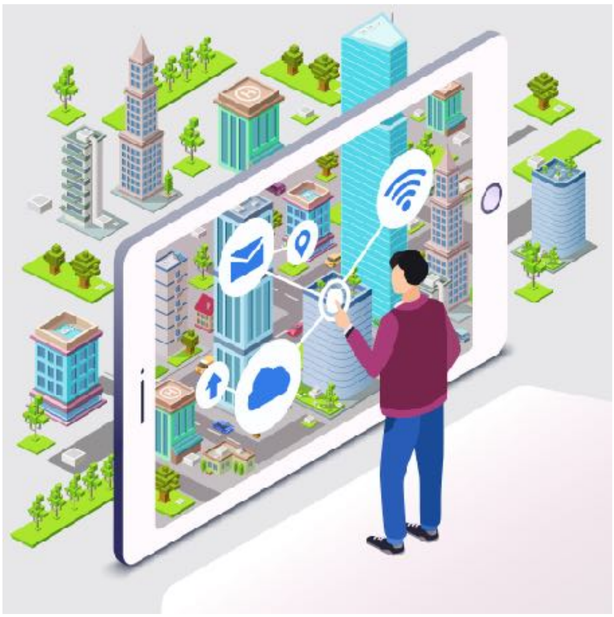
framework to discover
if and how machine intelligence
may take over our urban mobility
and how to avoid it

what happens in the future when intelligent machines and humans share limited resources of urban mobility?



machine-dominated dystopia

or



synergy of human-machine COeXISTENCE

Rafał Kucharski,
Jagiellonian University,
est. 1364,
Kraków, Poland

COeXISTENCE

novel hypotheses to verify:

crucial for the shape of our future cities

CONFLICTS

Hypothesis 1:

in urban mobility games with limited resources intelligent machines

will win
at the cost of humans

COeXISTENCE

Hypothesis 2:

by reformulating the deep learning paradigms

human-machine conflicts **can be mitigated**

Conflicts

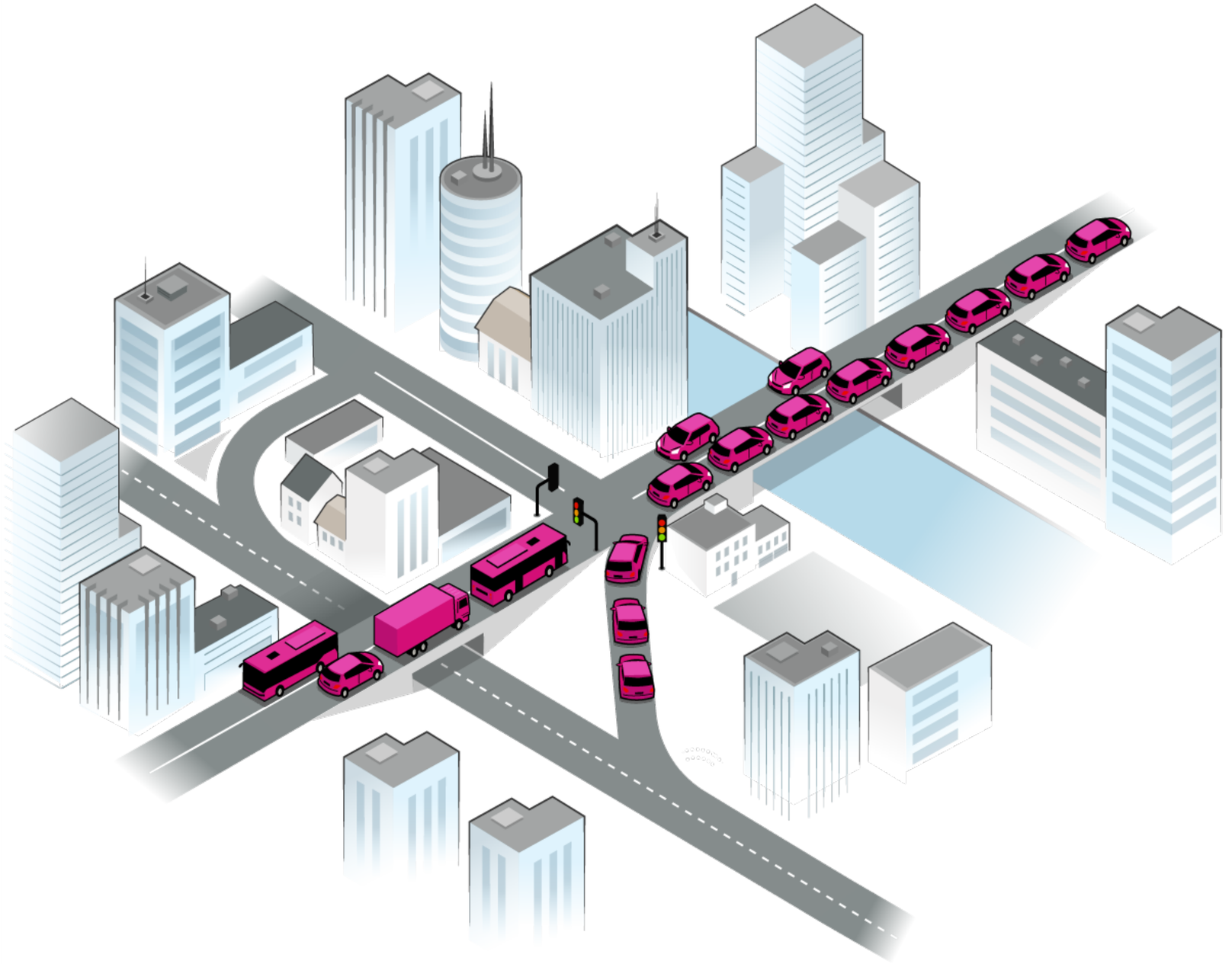
novel phenomena

congested bottleneck with
limited capacity

we (humans) rationally
optimize our decisions

and reach **user-equilibrium:**

- democratic
- egalitarian



Conflicts

new players

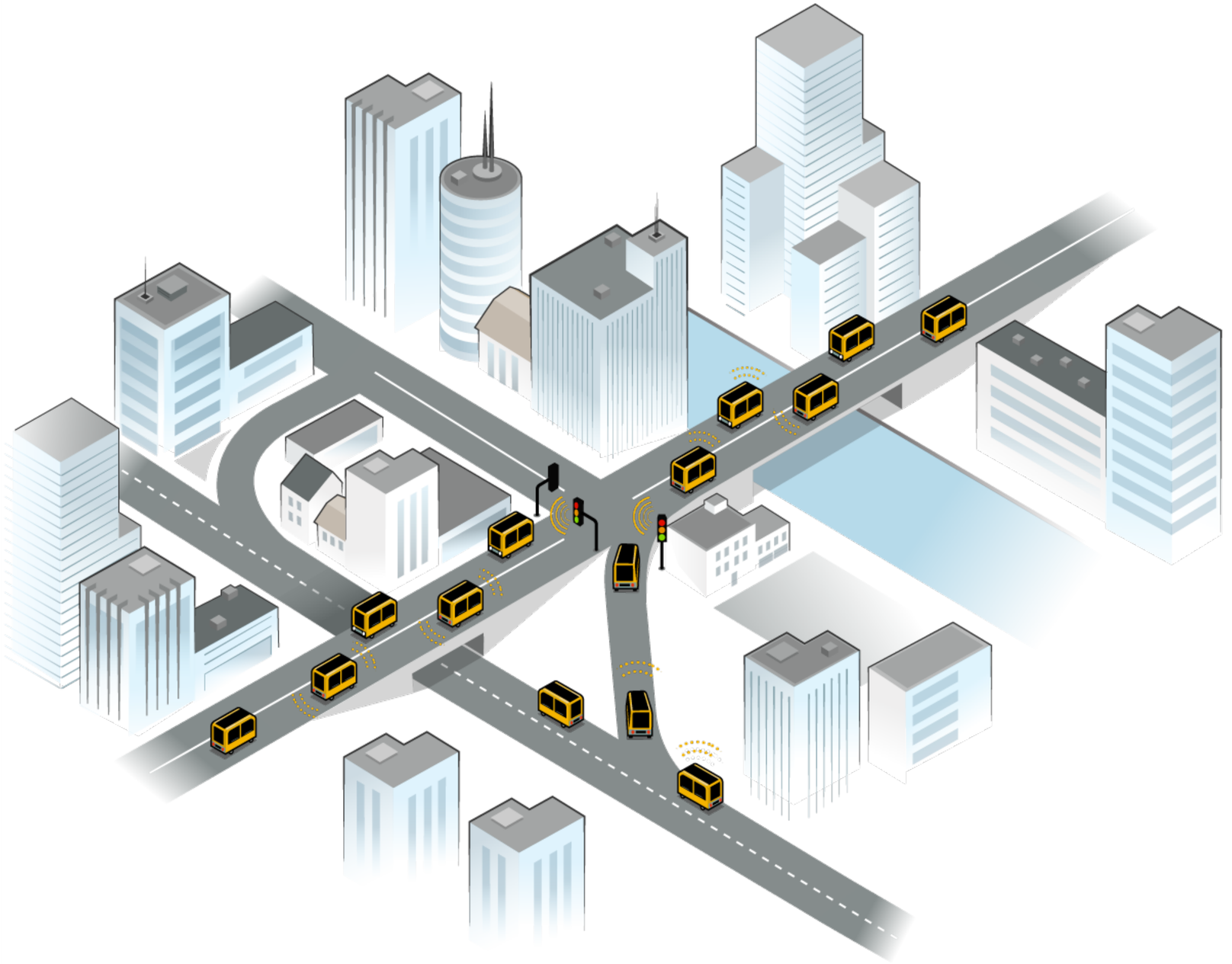
intelligent machines

change the rules of the game

better at:

- calculations
- access to data
- controllable
- collaborative

designed to win



Conflicts

by collaboration

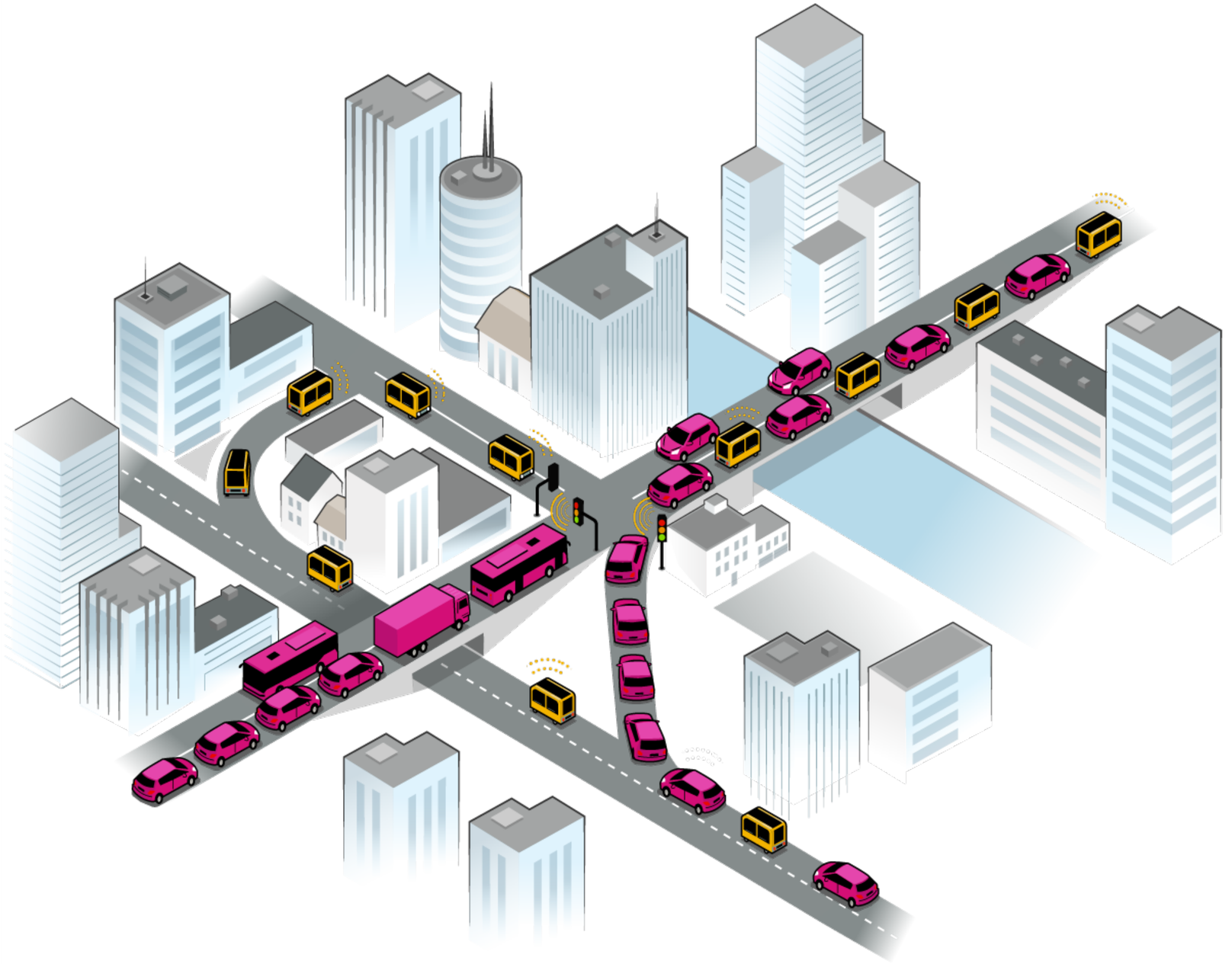
machines **trick**
the demand-actuated
traffic lights

collaboratively reroute

receive more green light

pass the bottleneck faster

humans queue longer



Method

A: SIMULATE

agent-based urban mobility simulation

where machines
deep learn
to interact with humans

B: DISCOVER

broad and deep expedition searching for **conflicts** by the:

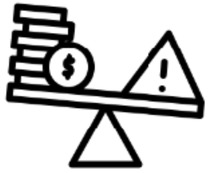
1. collaboration
2. adaptation
3. prediction
4. automation

C: ASSESS

where conflicts are quantified from various perspectives

so that negative externality can be internalized

D: MITIGATE



machines become responsible
and mitigate conflicts

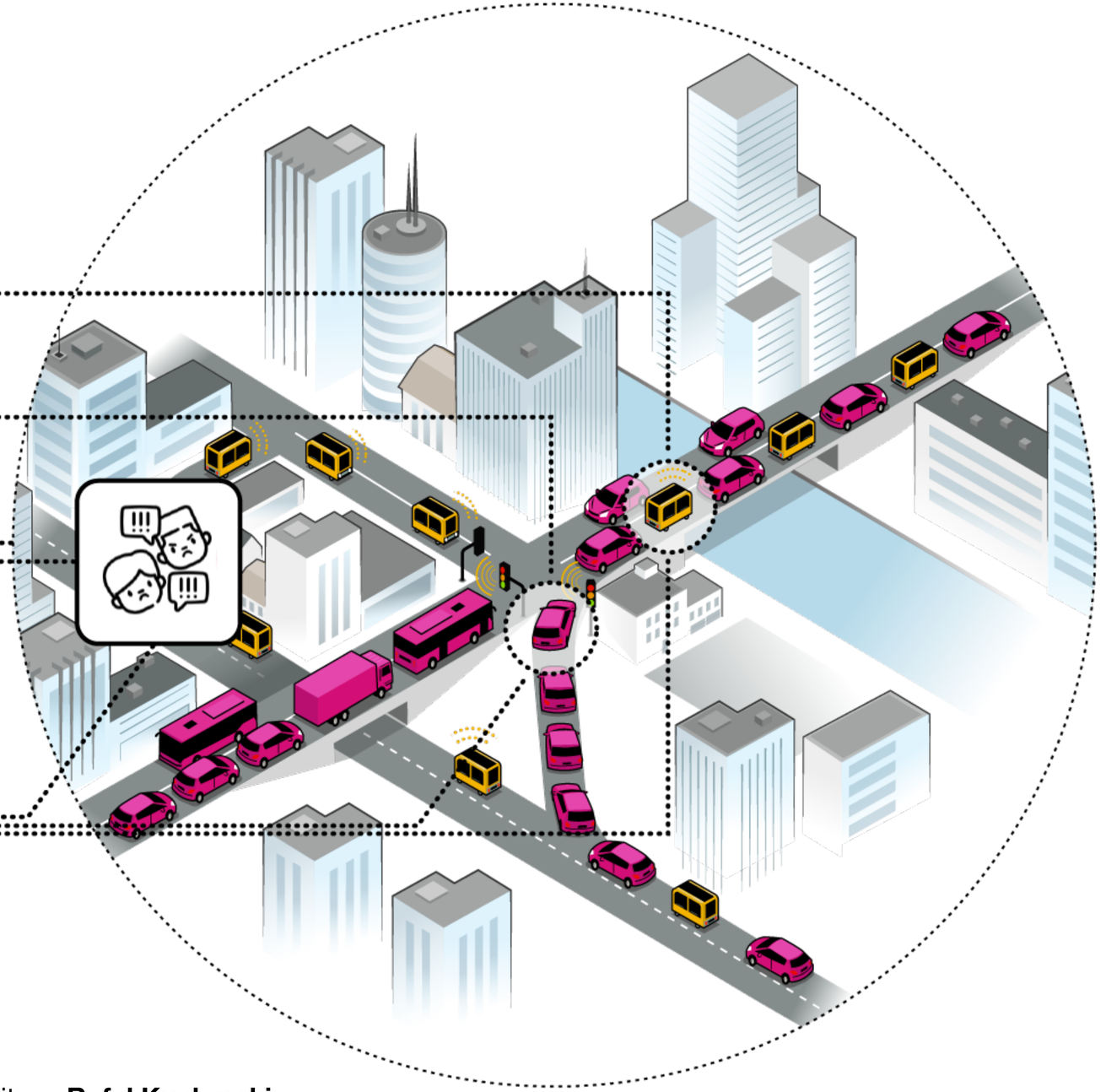
novel multi-objective deep reinforcement learning framework

Method

interdisciplinary, challenging

PI

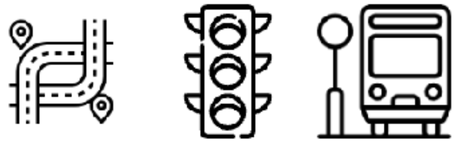
- human travel behaviour — **PhD**
- deep reinforcement learning — **PhD**
- agent based modelling — **PD**
- computational social science — **PhD**
- multiobjective reinforcement learning — **PD**



COeXISTENCE

framework to discover how machine intelligence may take-over our urban mobility and how to avoid it

URBAN MOBILITY = SUPPLY + DEMAND + INTELLIGENT MACHINES



sustainability
efficiency

infrastructure

people

COeXISTENCE

anticipate
demonstrate
resolve

paradigm shift in urban mobility

Rafał Kucharski, Jagiellonian University, est. 1364, Kraków, Poland