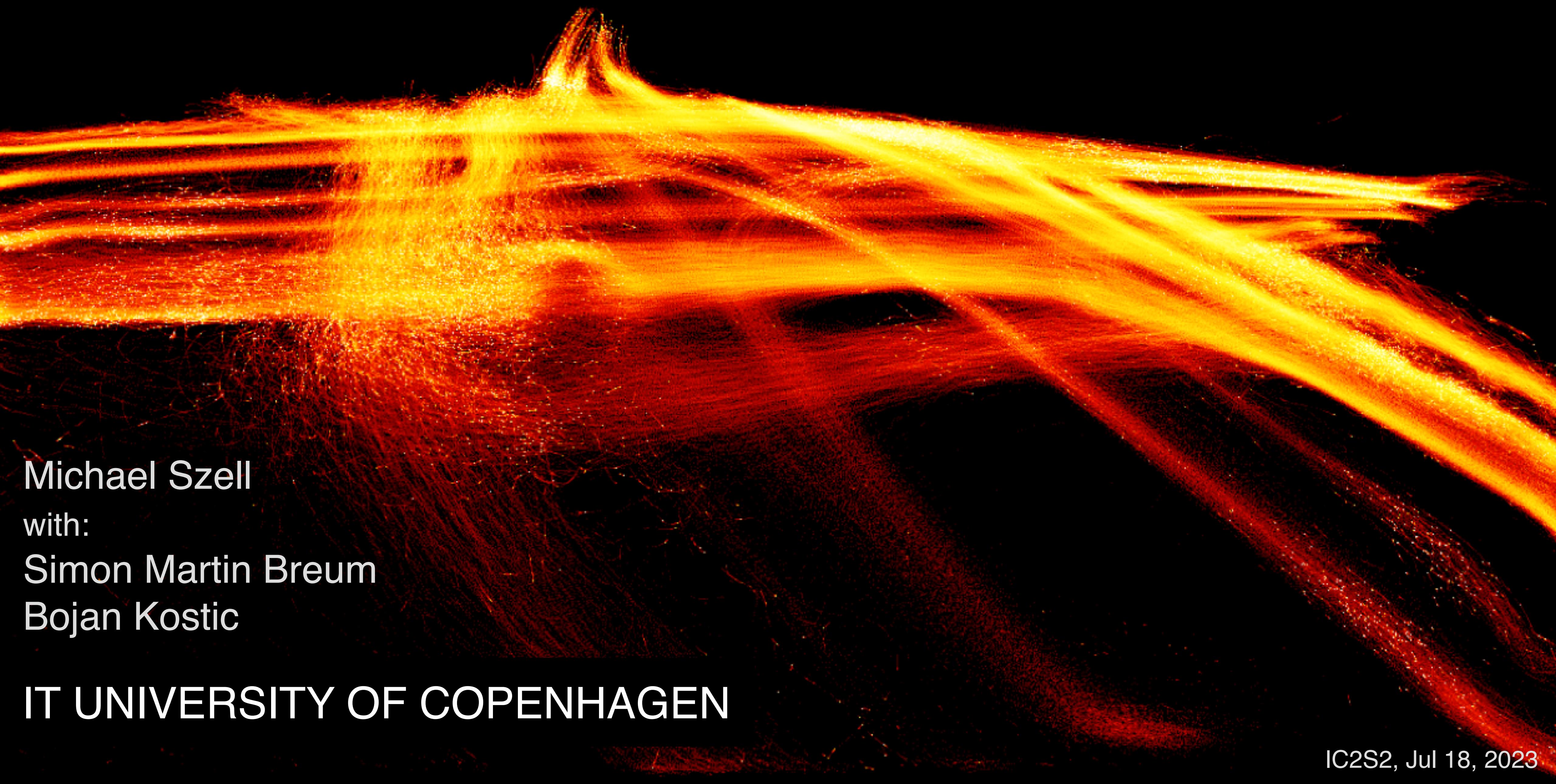


Computational Desire Line Analysis of Cyclists on the Dybbølsbro Intersection in Copenhagen



Michael Szell

with:

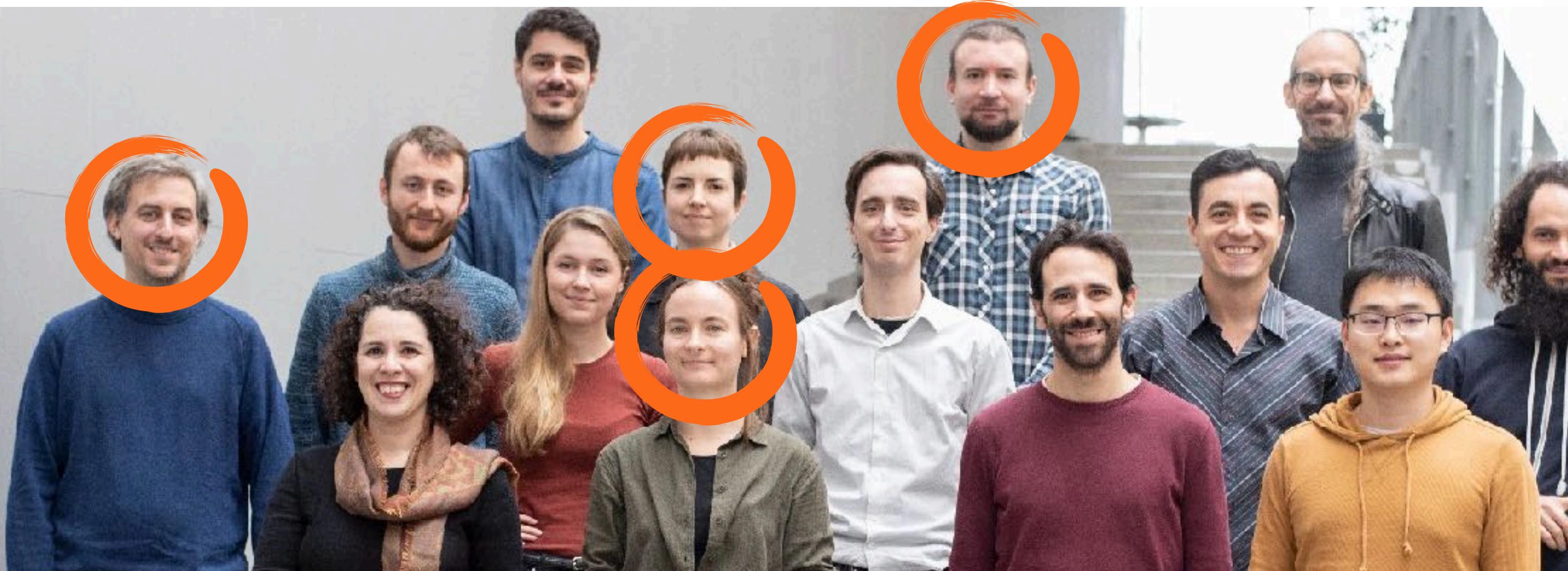
Simon Martin Breum

Bojan Kostic

IT UNIVERSITY OF COPENHAGEN

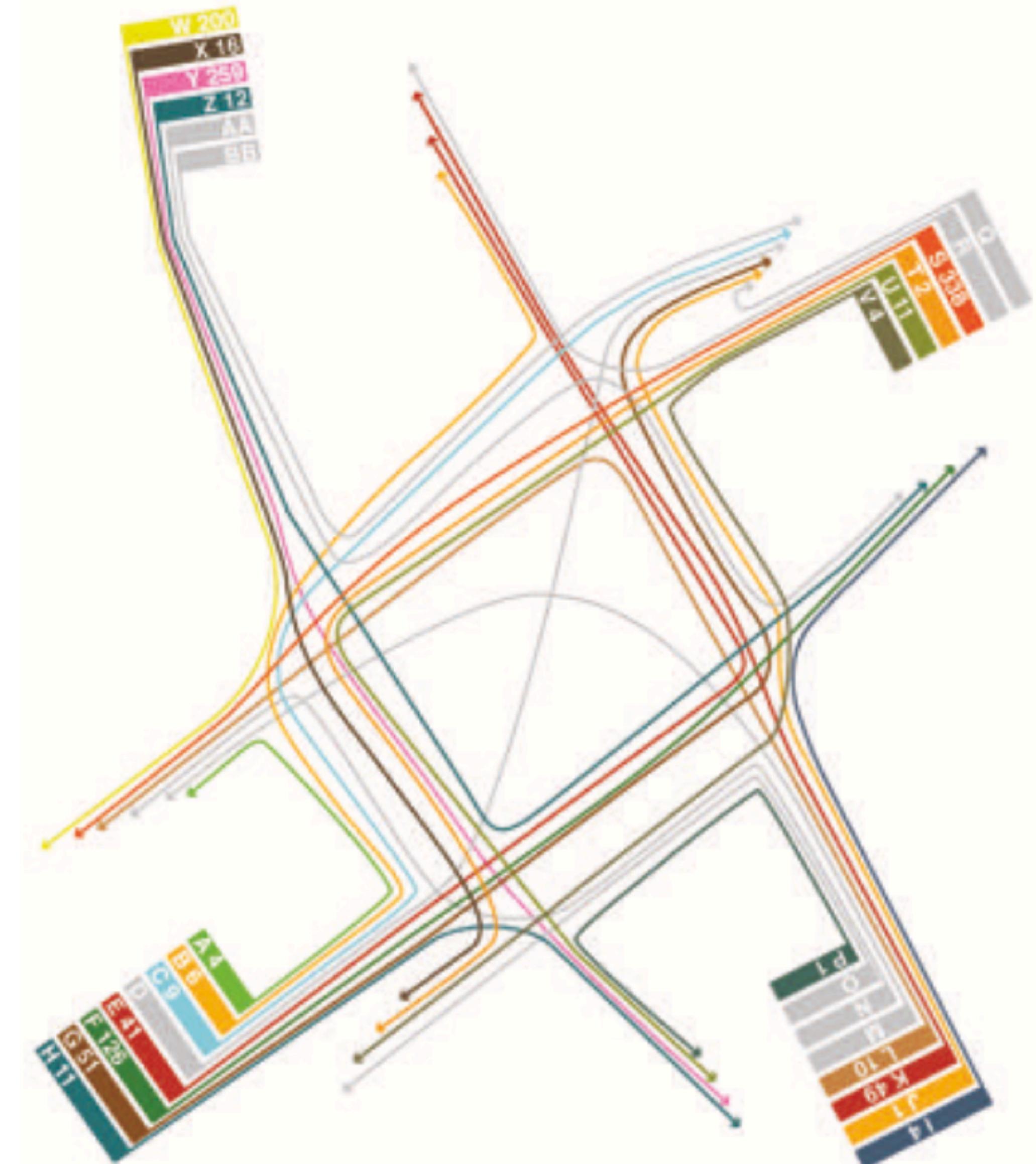
We are NERDS

Our goal: Data-driven tools & research
to help sustainable urban planning



Desire line analysis is important

It uncovers discrepancy between cyclist behaviour and design



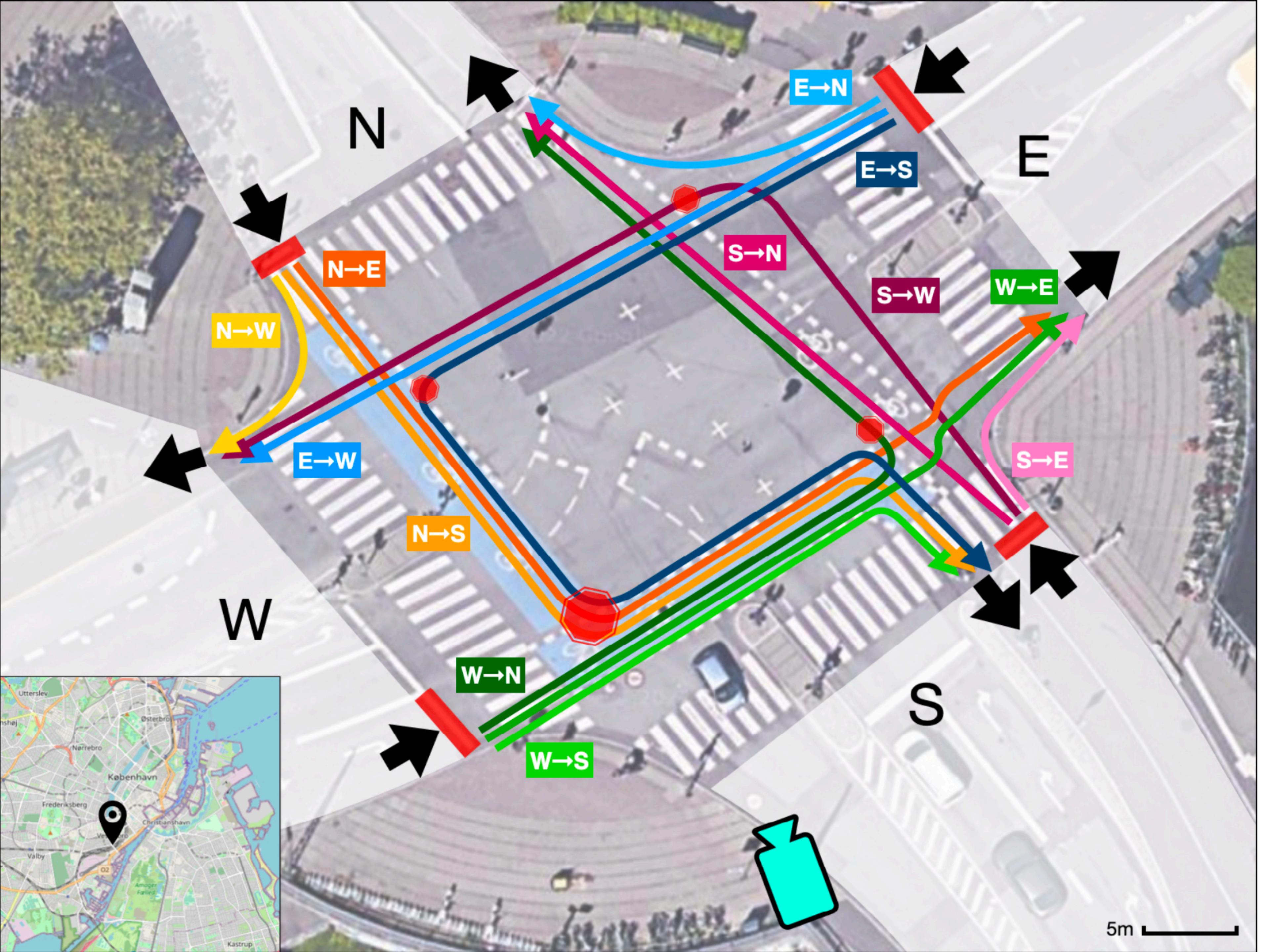
The Dybbølsbro intersection is infamous



Local Round-Up: City planners rethink problematic Fisketorvet junction – again!





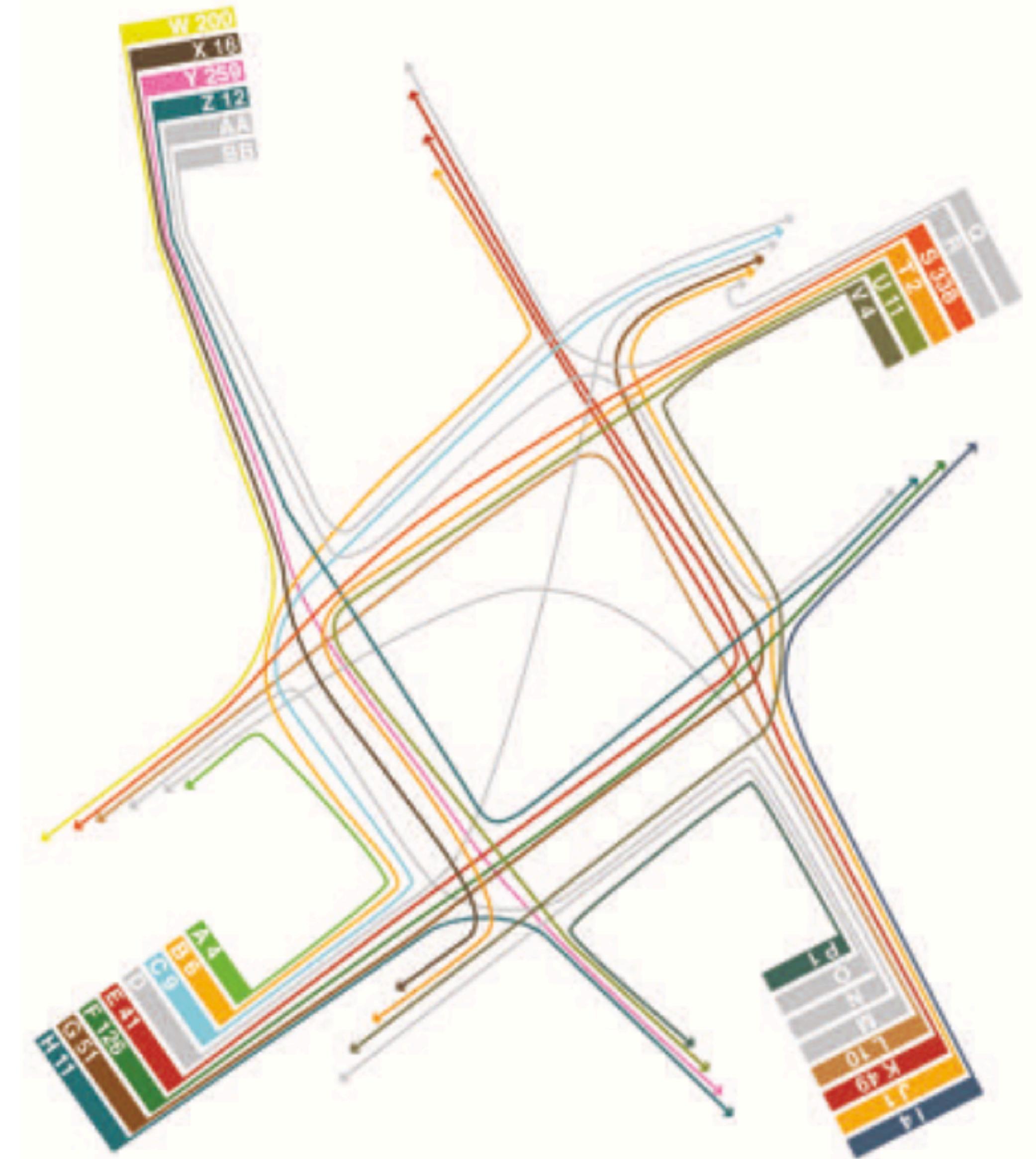


Desire line analysis is manual, therefore **costly**

*What I learned from staring
at 106,000 cyclists*



Can count paths, but not
quantify them rigorously



Copenhagenize

Automated methods have some problems

Heavy-weight



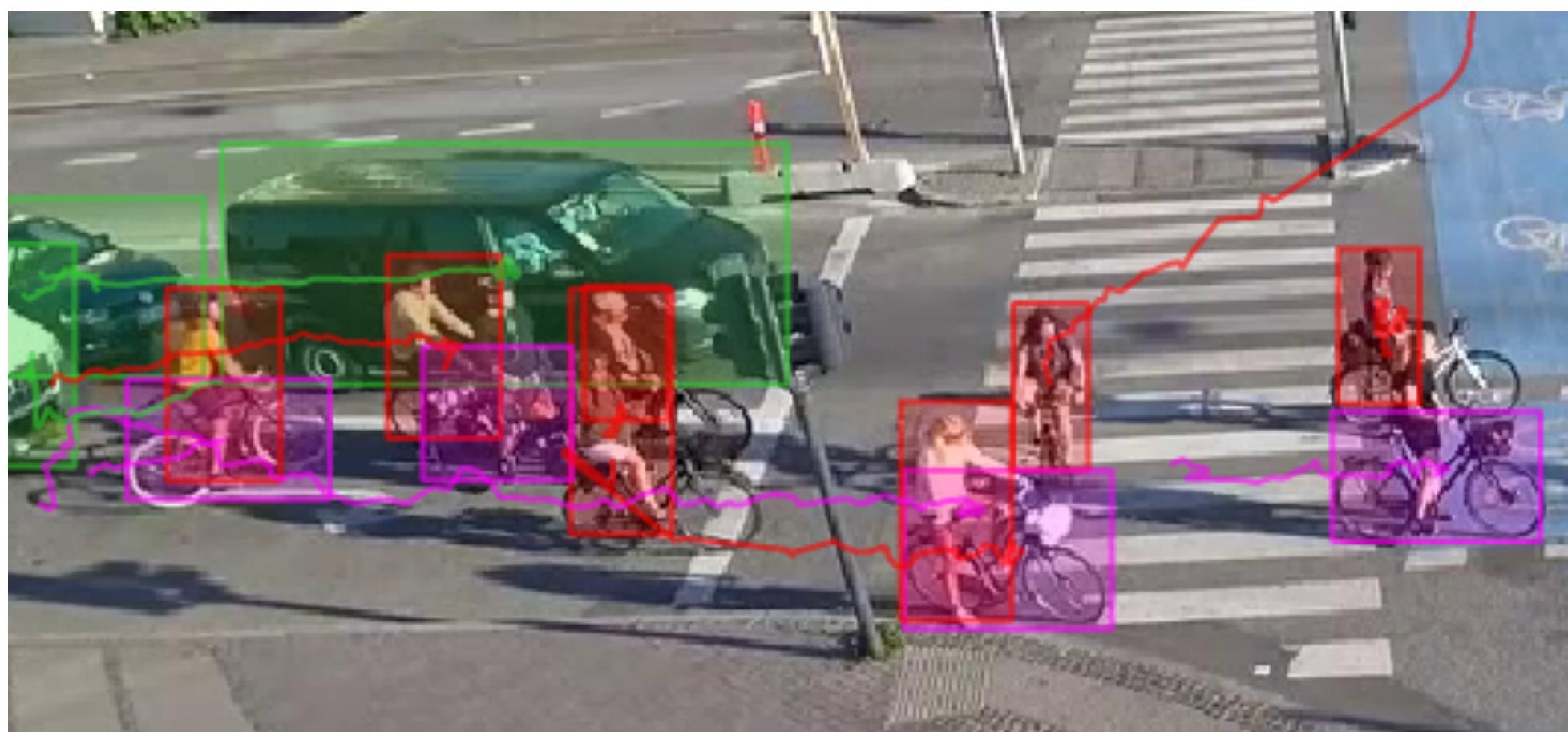
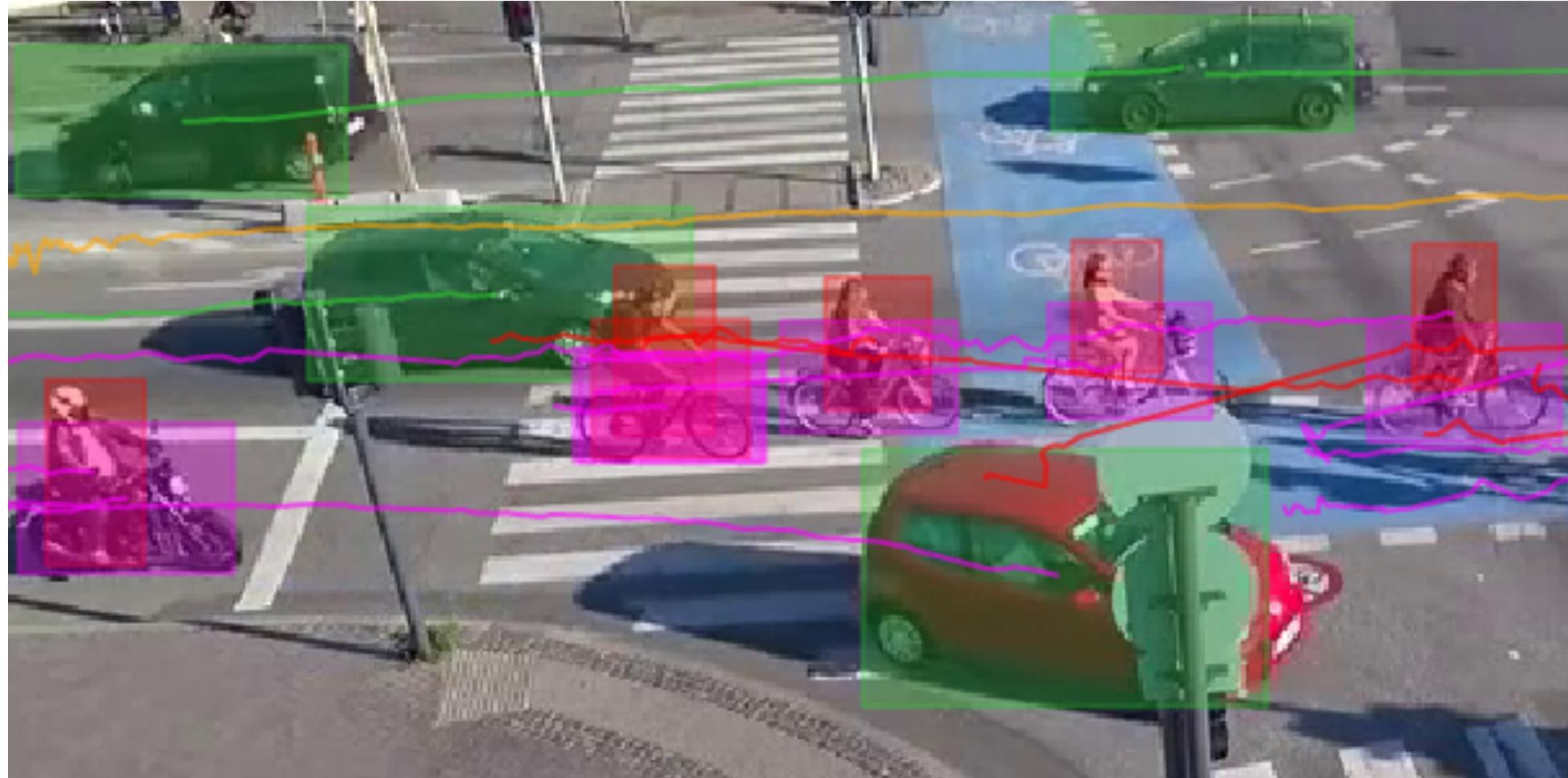
Car-centric



Focus on counting

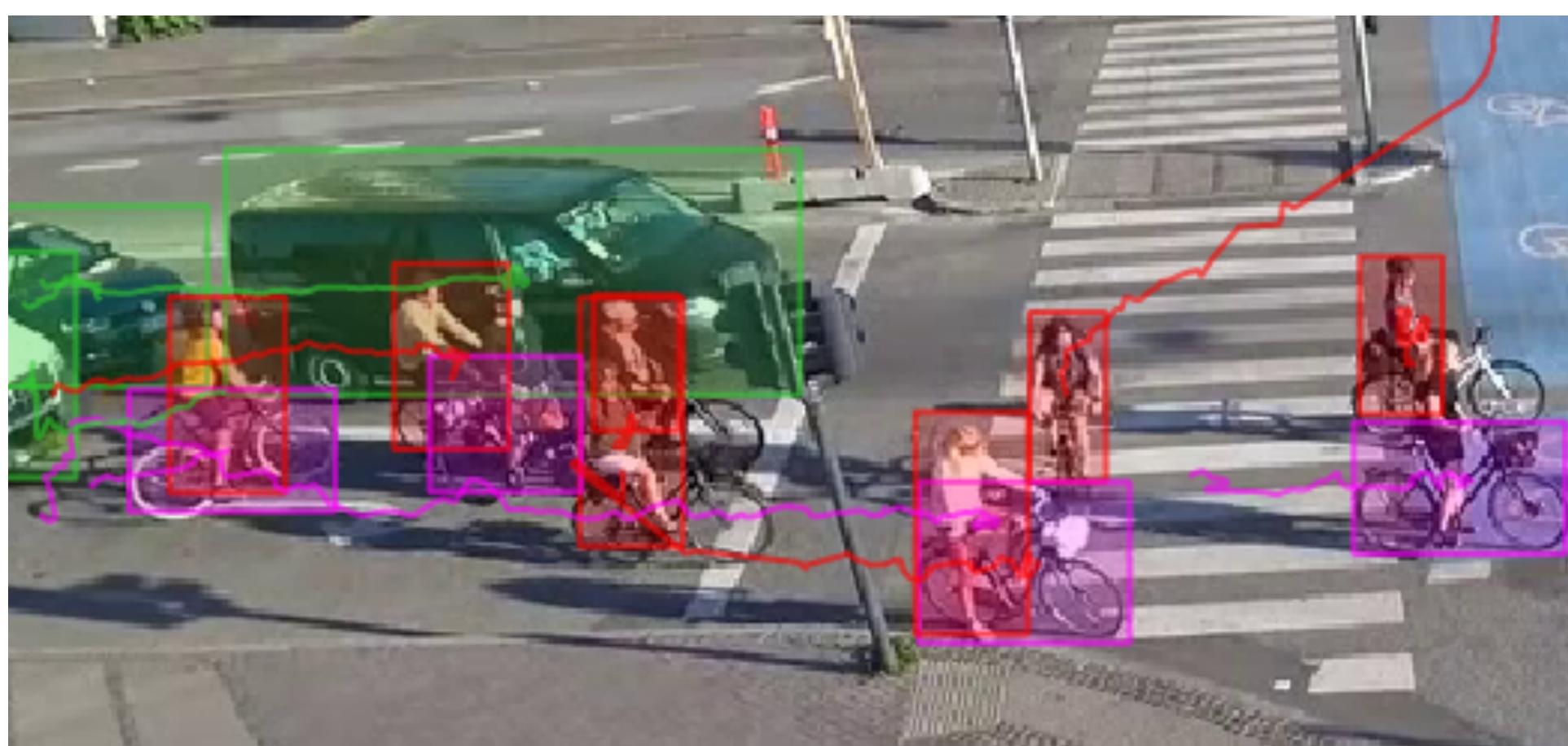
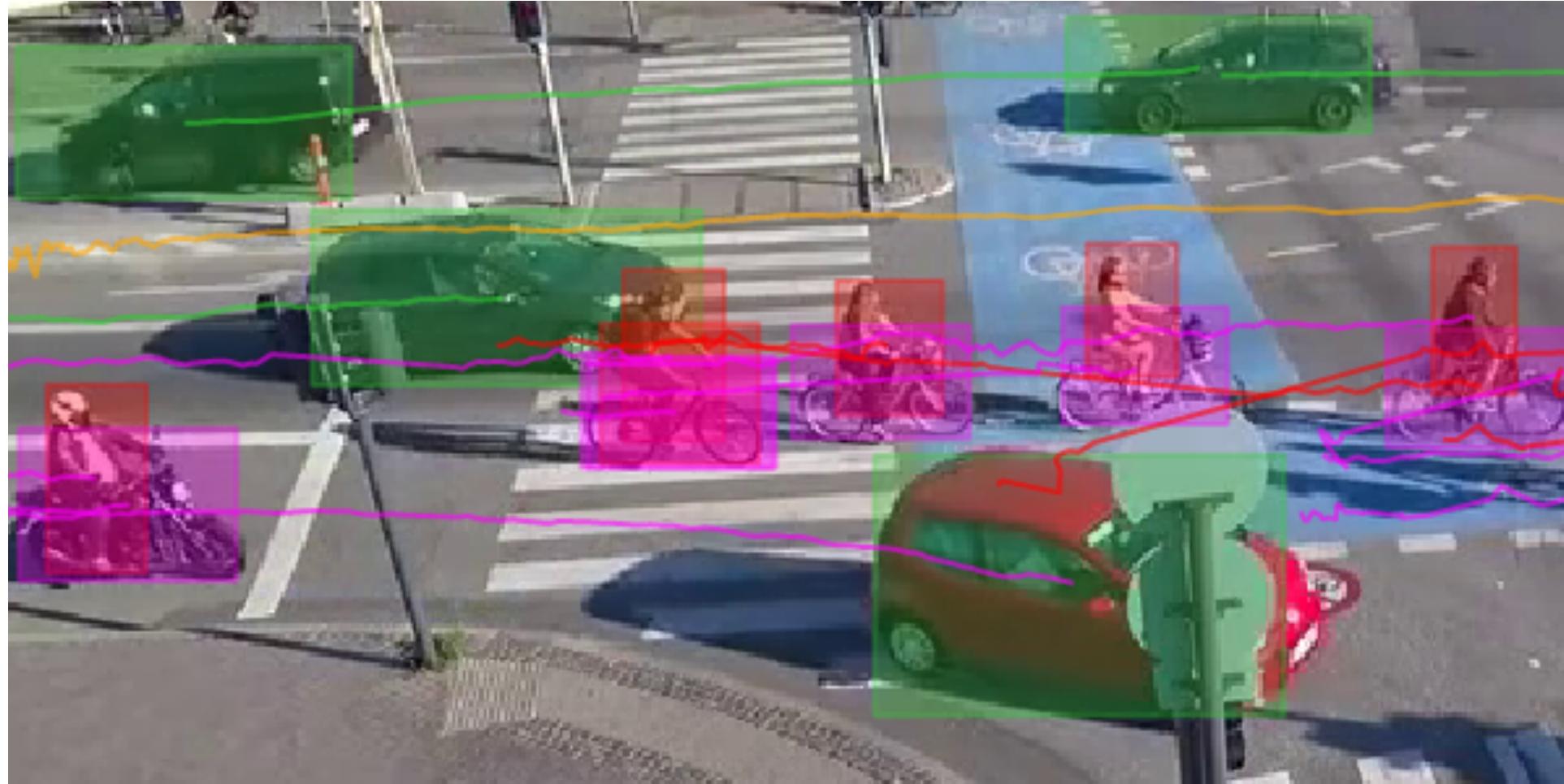
To fix this, we trained a detection algorithm for cyclists

Good detection → easier tracking

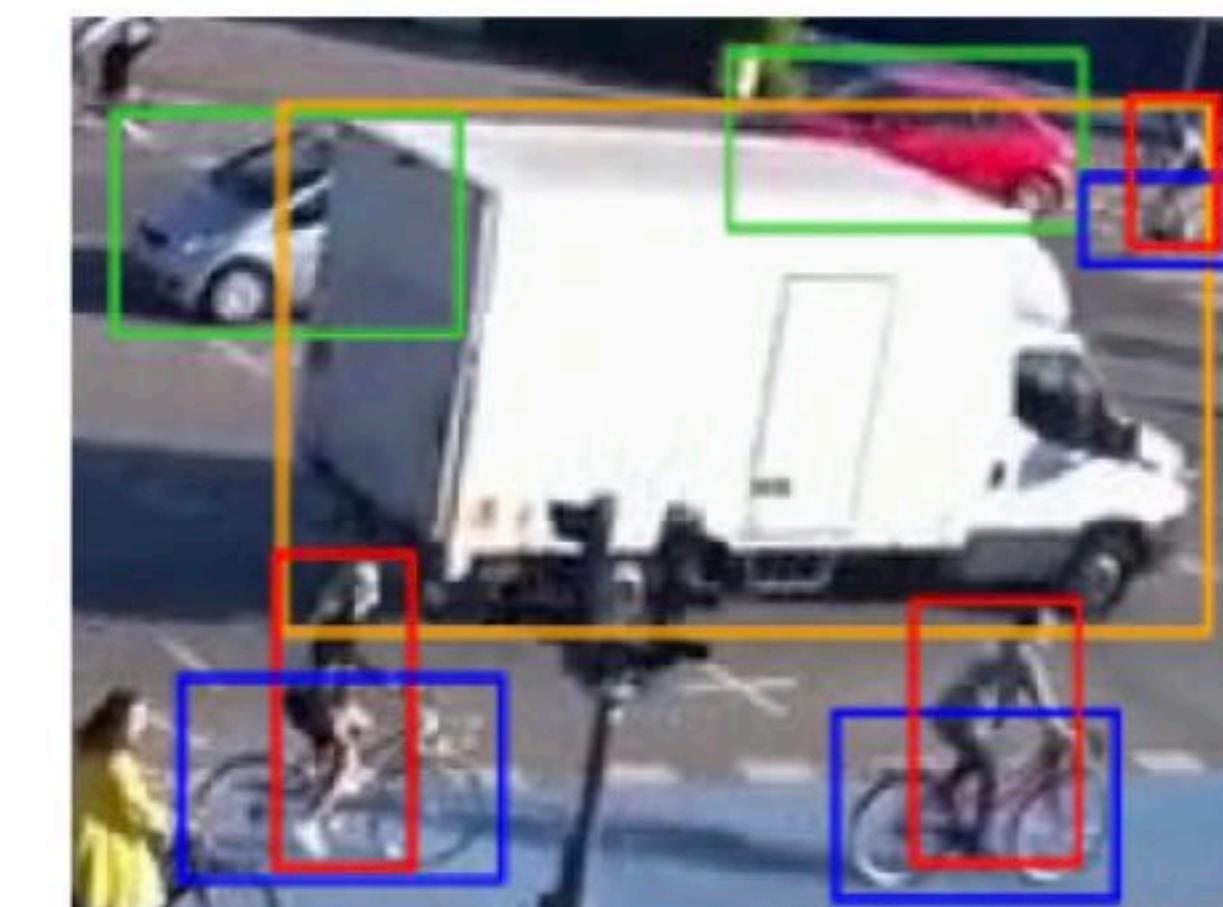


To fix this, we trained a detection algorithm for cyclists

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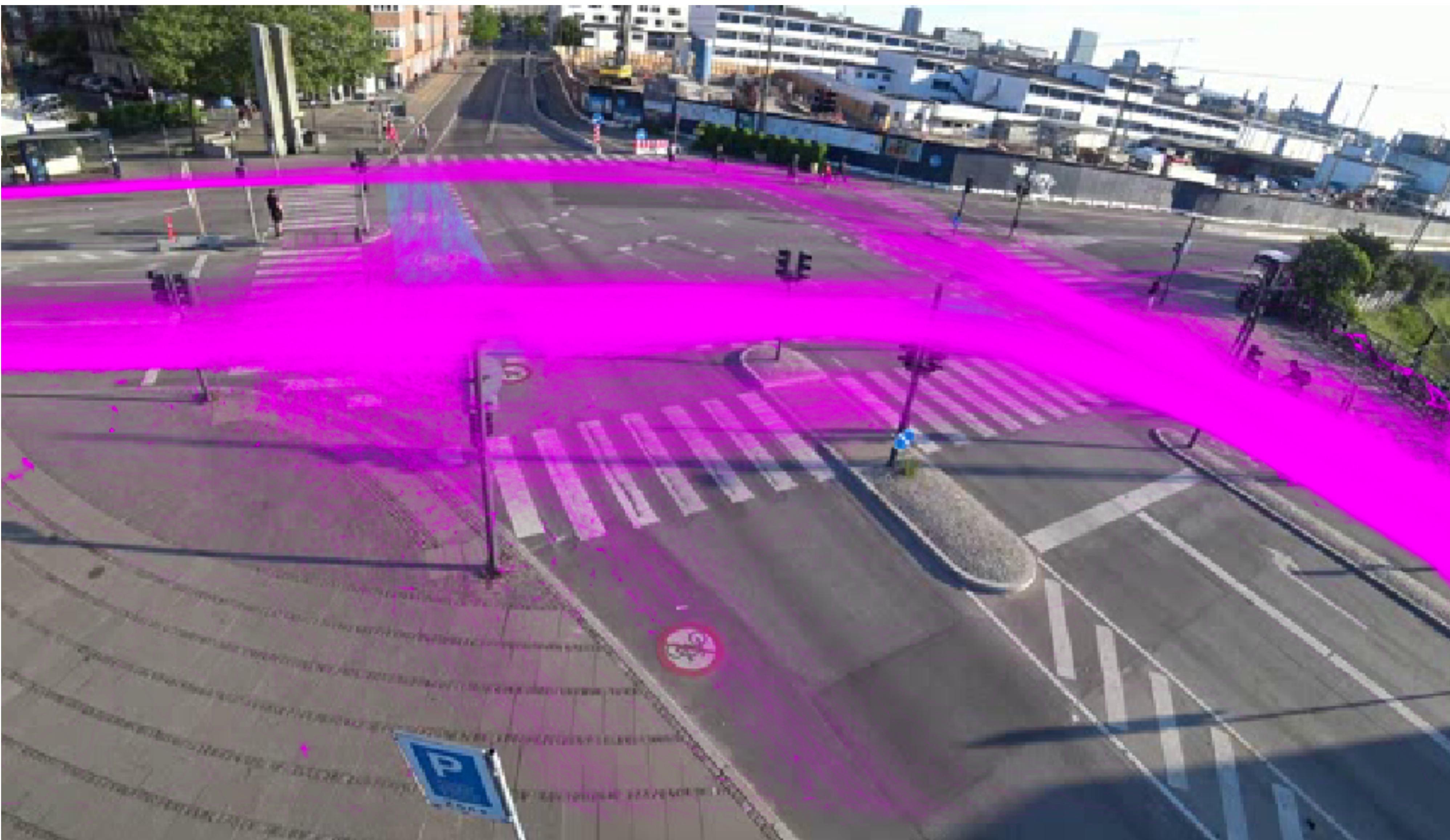
Bad detection → difficult tracking



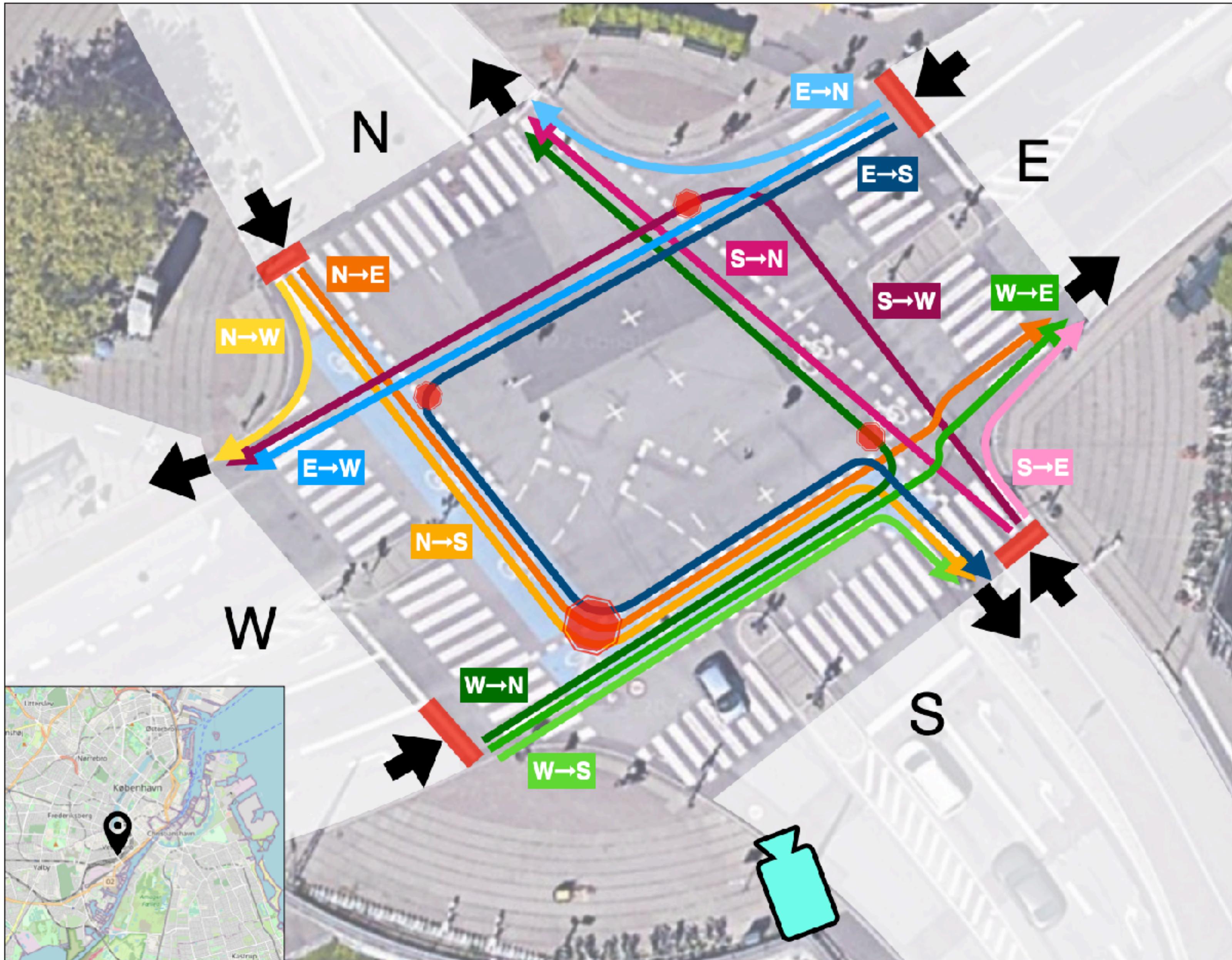
There are still many issues...

Here we work with 11,553 cyclist trajectories

Wednesday, June 9th, 2021, 7:00-8:00



We spatially cluster trajectories into origin-destination clusters

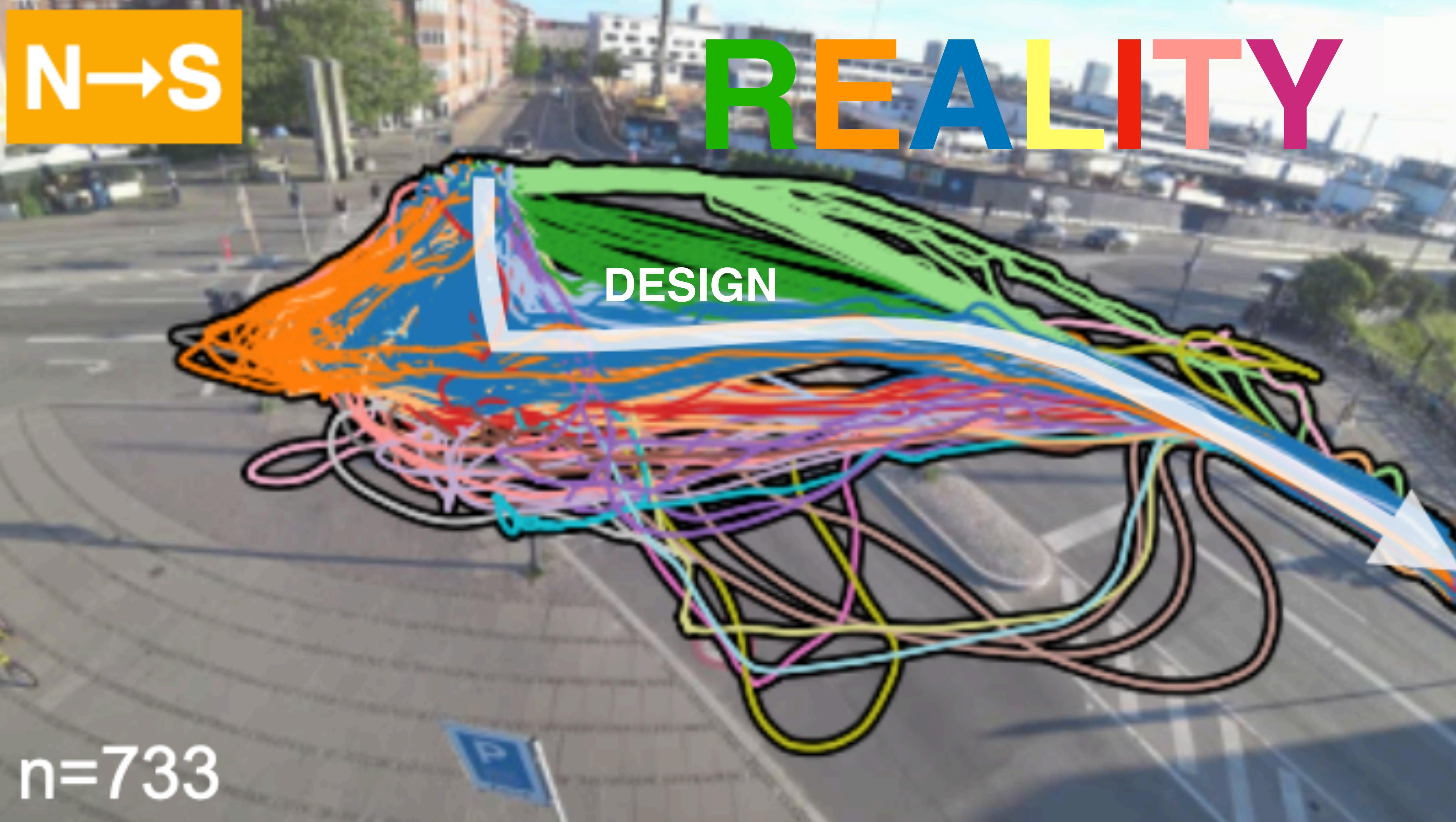


12 possible
intended paths

N→S

DESIGN





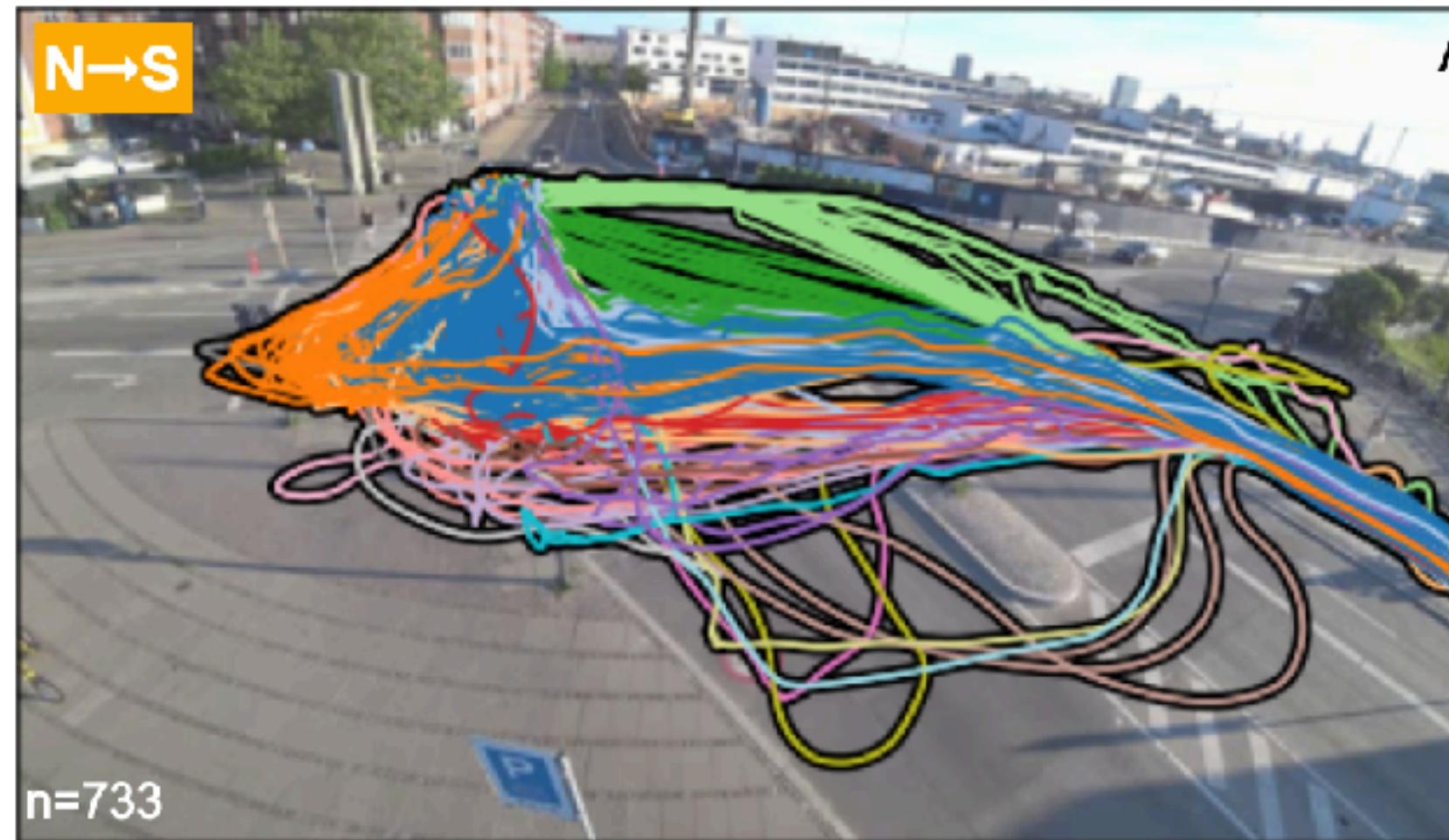
N→S

REALITY

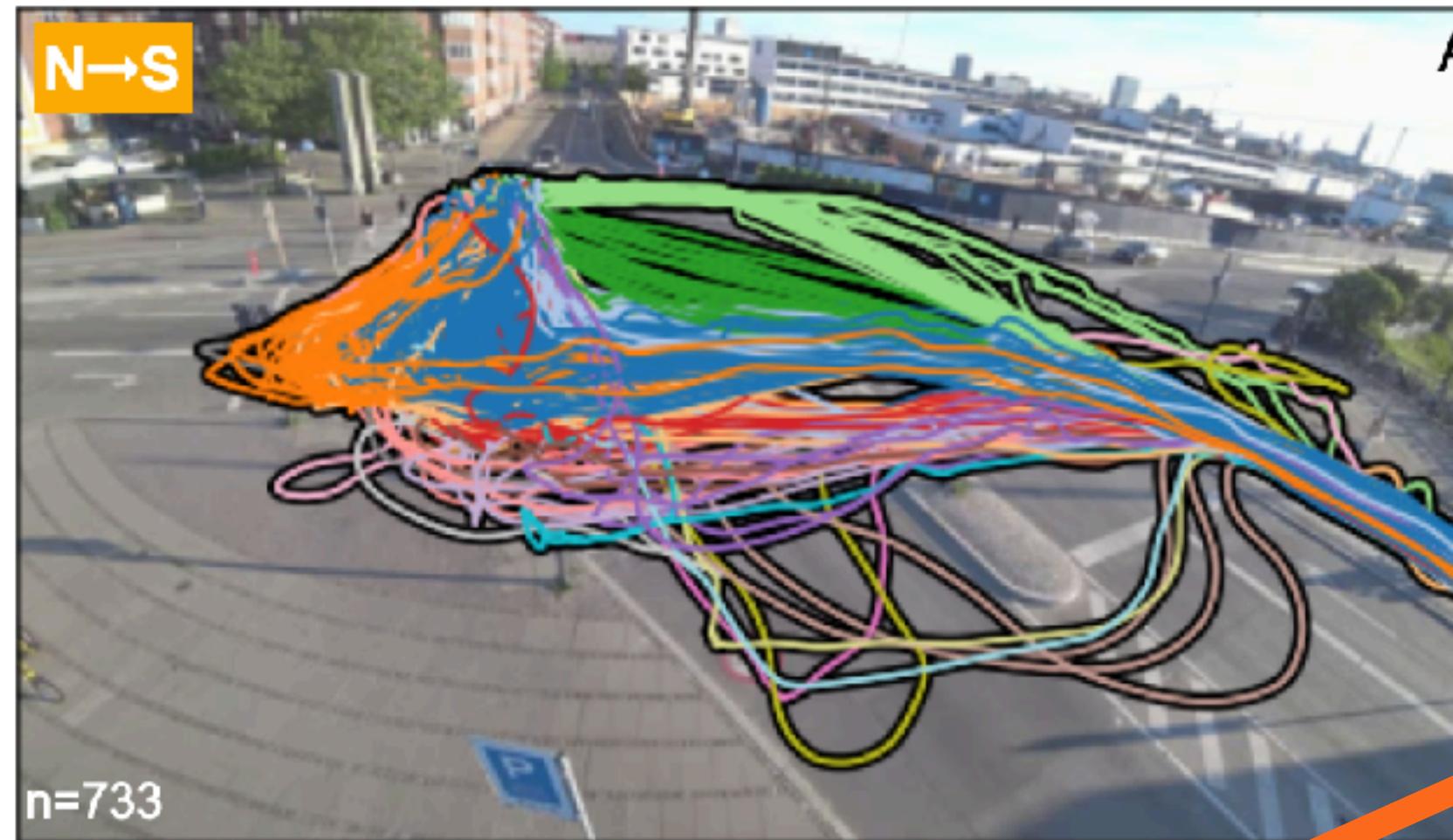
DESIGN

n=733

We separated trajectories into path-clusters with dynamic time warping



We separated trajectories into path-clusters with dynamic time warping

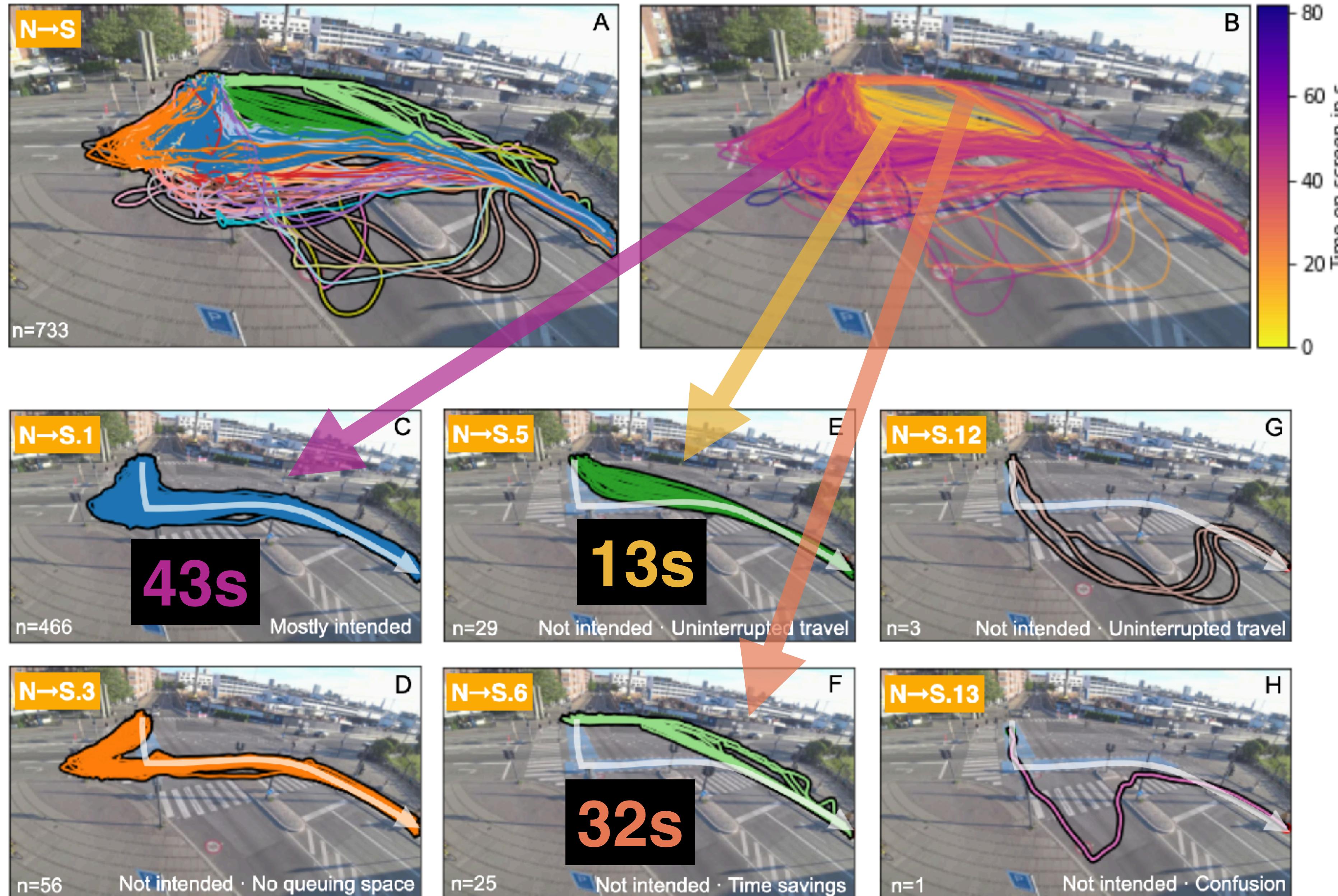


Only 466 are "mostly intended"
Mismatch: 36%



In just
1 hour!

Cyclists prefer uninterrupted travel, which the intersection fails to provide





Breum, Simon Martin, Bojan Kostic, and Michael Szell. 2022. "Computational Desire Line Analysis of Cyclists on the Dybbølsbro Intersection in Copenhagen." *Findings*, December.

TRANSPORT FINDINGS

Computational Desire Line Analysis of Cyclists on the Dybbølsbro Intersection in Copenhagen

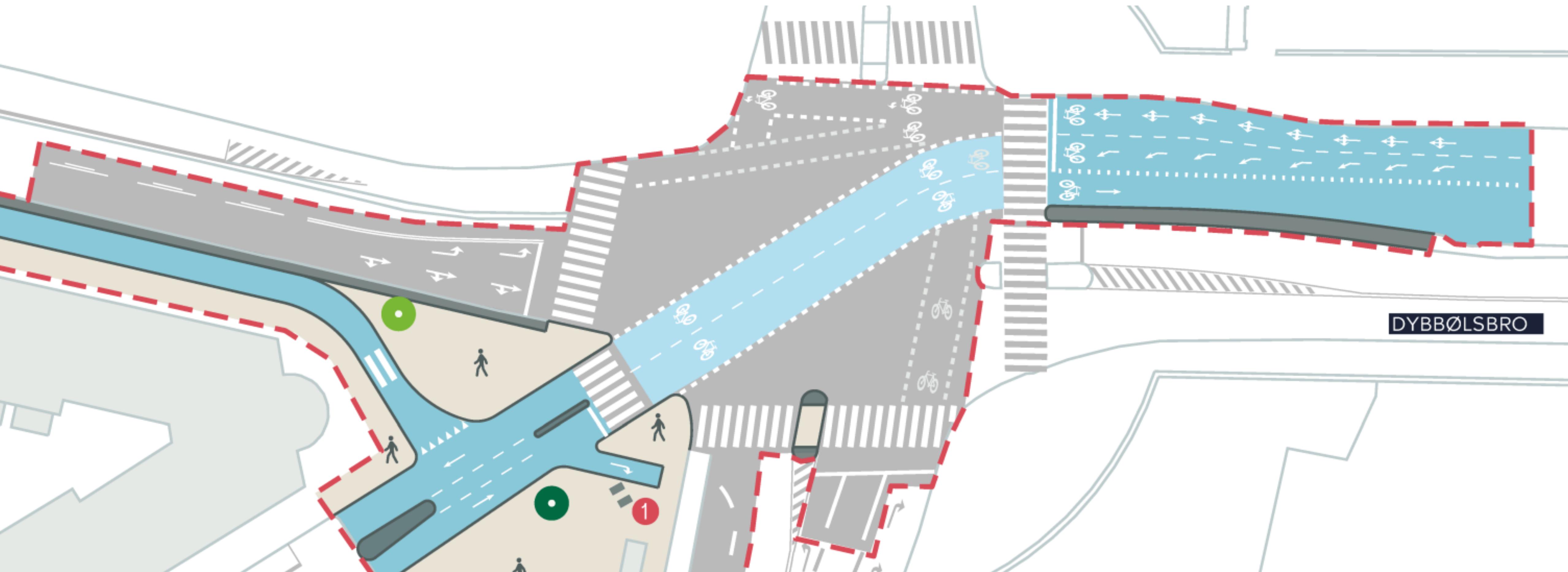
Simon Martin Breum¹ , Bojan Kostic¹ , Michael Szell^{1,2,3}   ^a

¹ Computer Science, IT University of Copenhagen, ² ISI Foundation, ³ Complexity Science Hub Vienna

Keywords: urban data science, cycling, traffic behavior, intersection design, human-centric planning

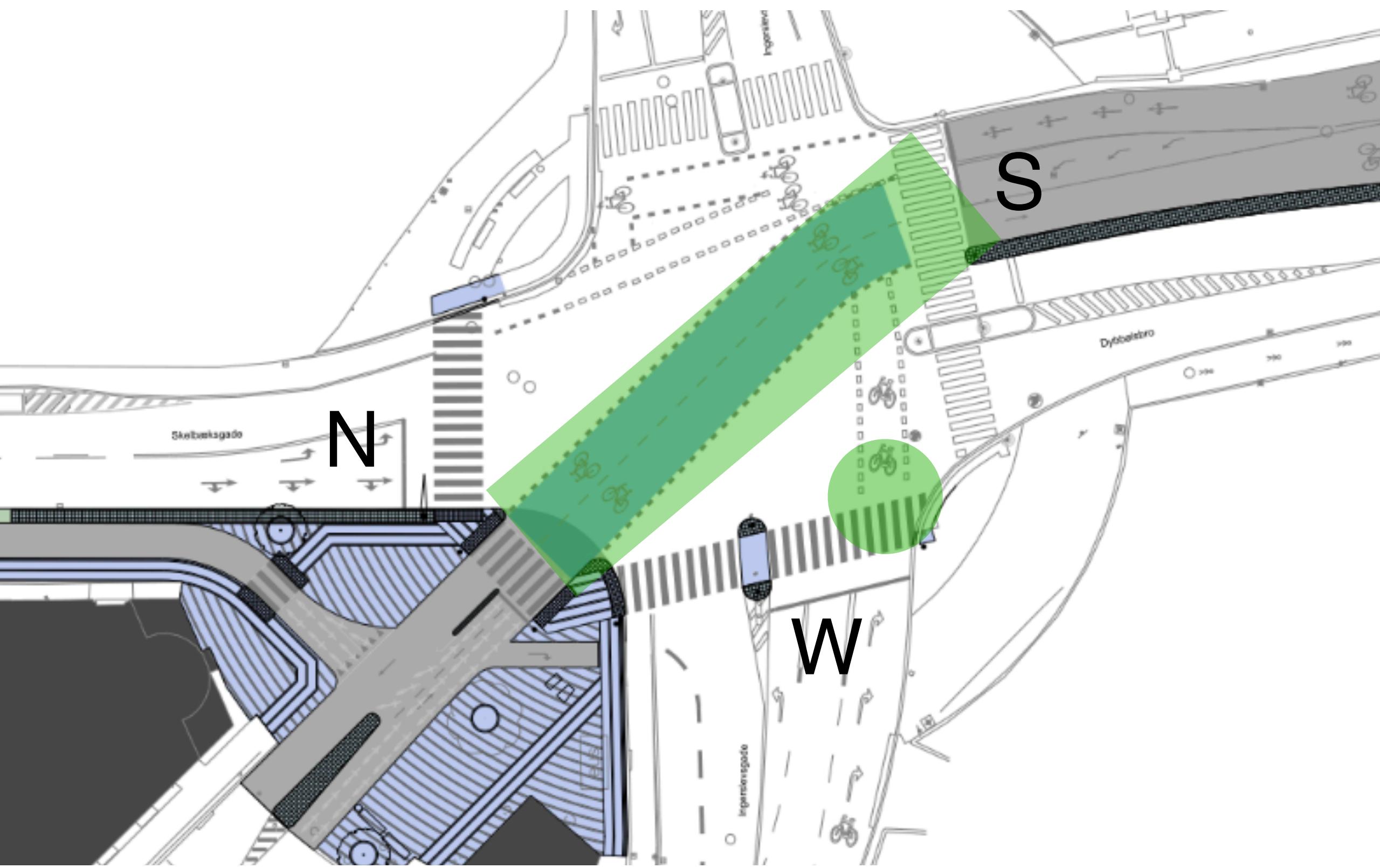
<https://doi.org/10.32866/001c.56683>

The re-design



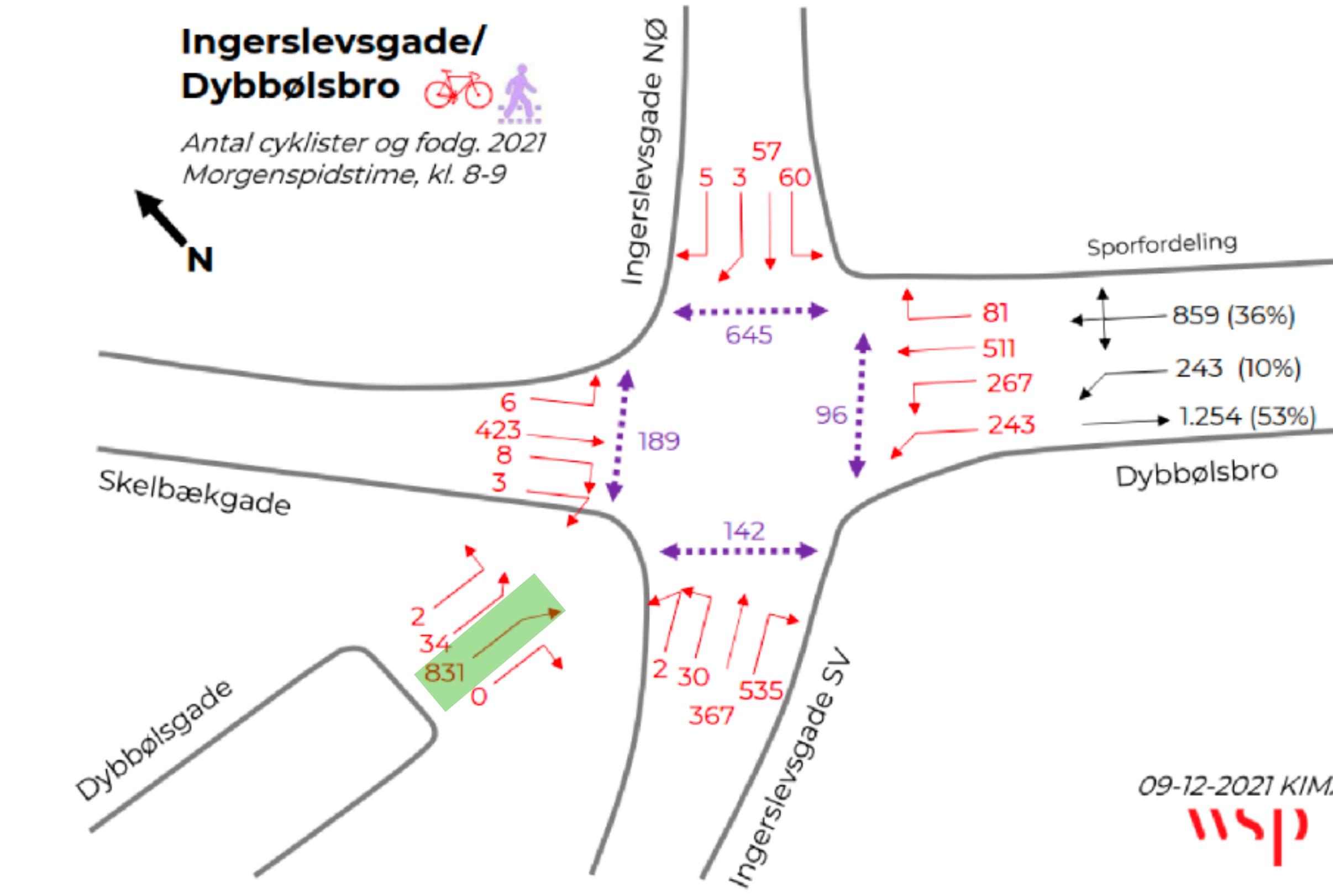
Fixed issues

E



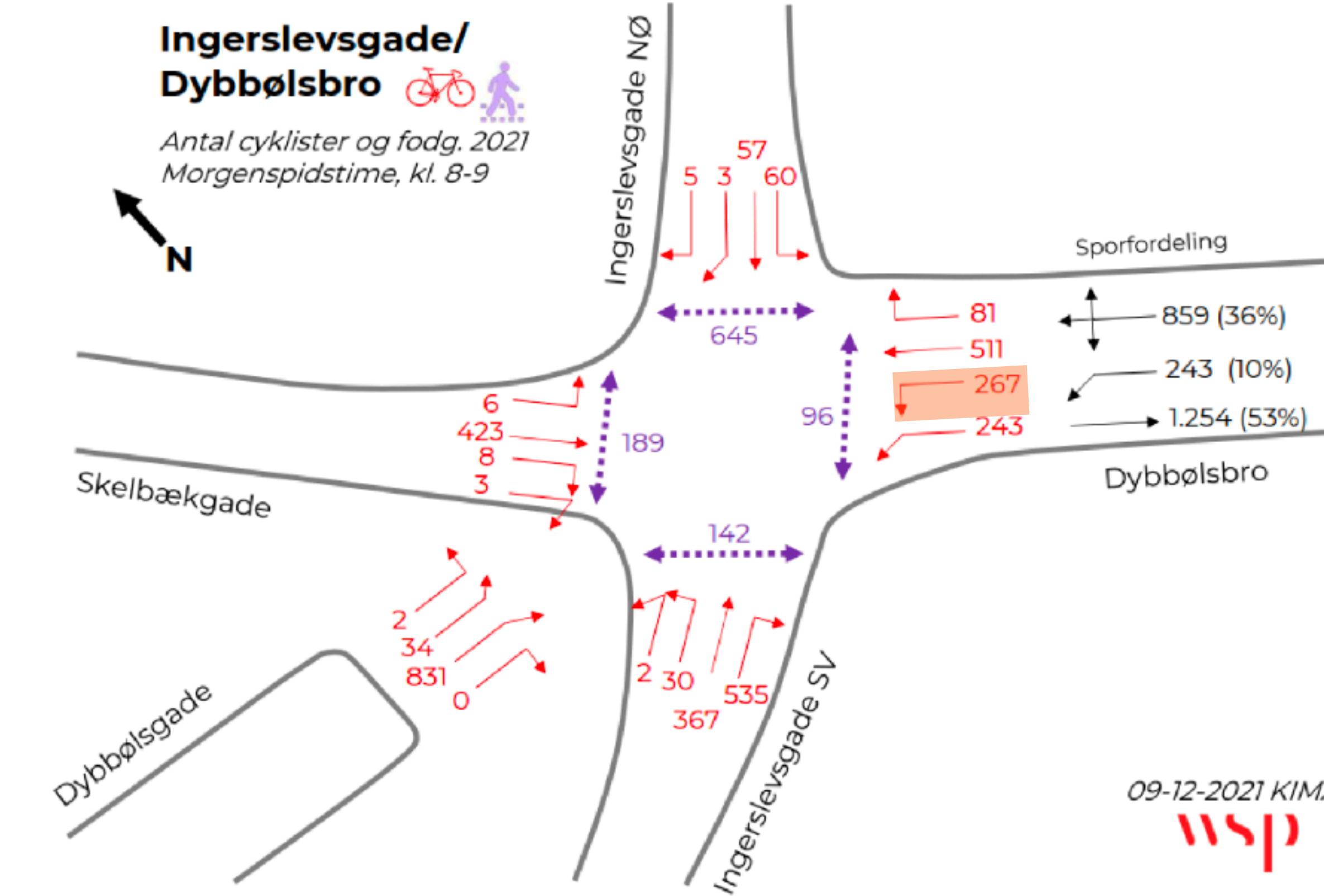
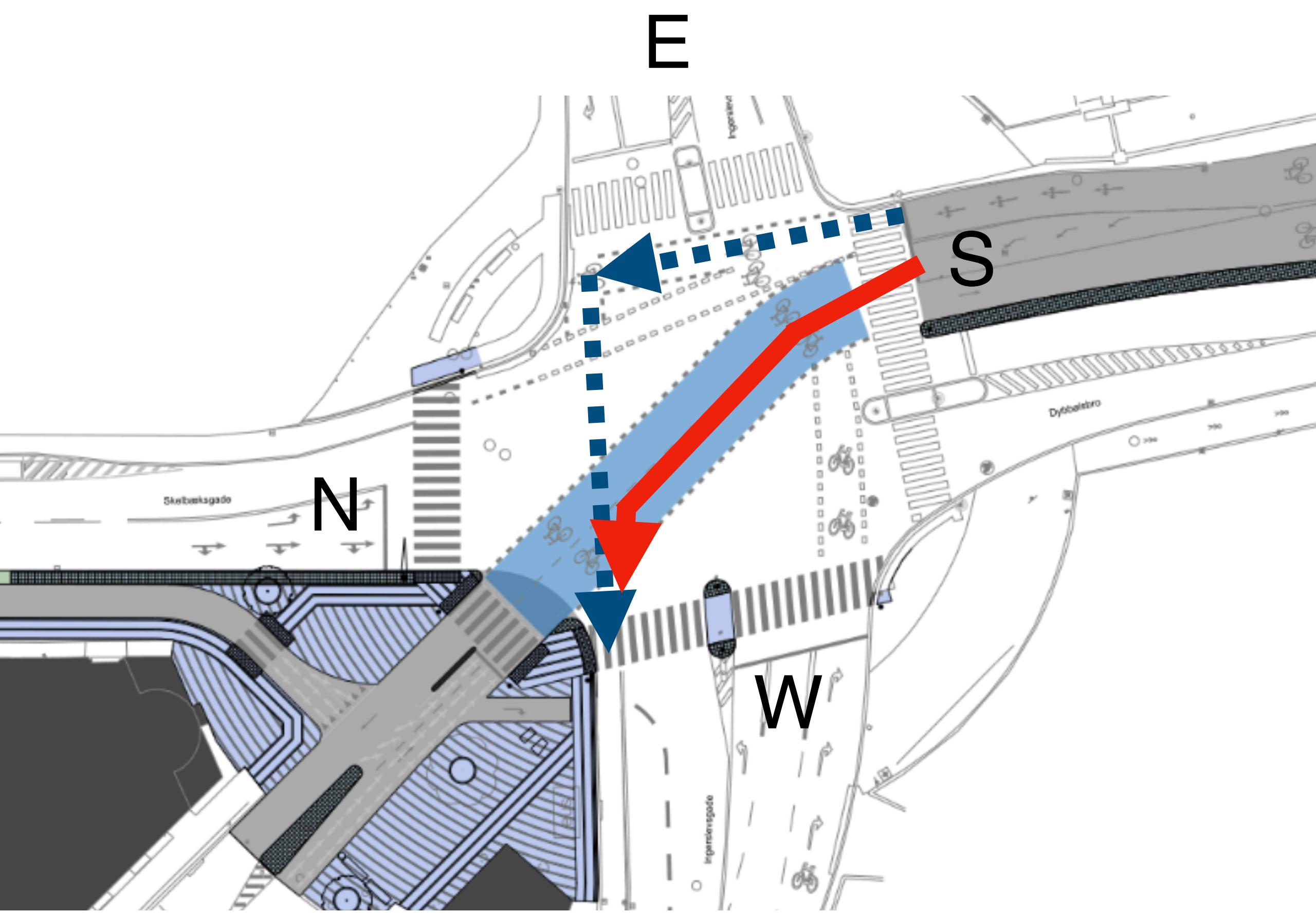
Ingerslevsgade/ Dybbølsbro

Antal cyklister og fodg.
Morgenspidstime, kl. 8-9



Diagonal lane provides uninterrupted N→S travel

Anticipated issues (2022)



New problem: S→W

Anticipated issues are now becoming

REALITY

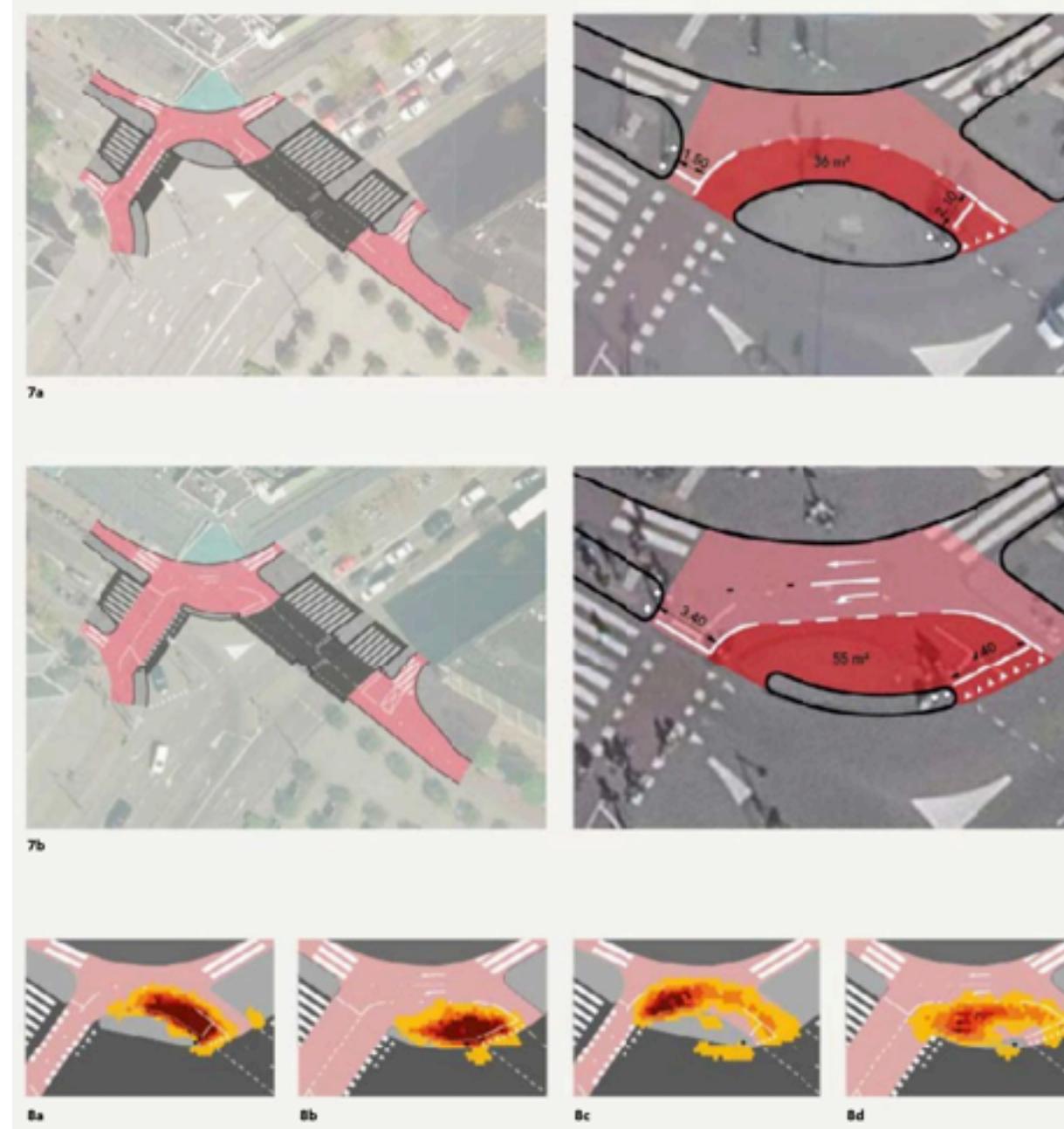
The bigger issue..

The underlying problem is car-centric design

Why is vehicular traffic flow prioritized in CPH?
Goes against science and international best practices

The underlying problem is car-centric design

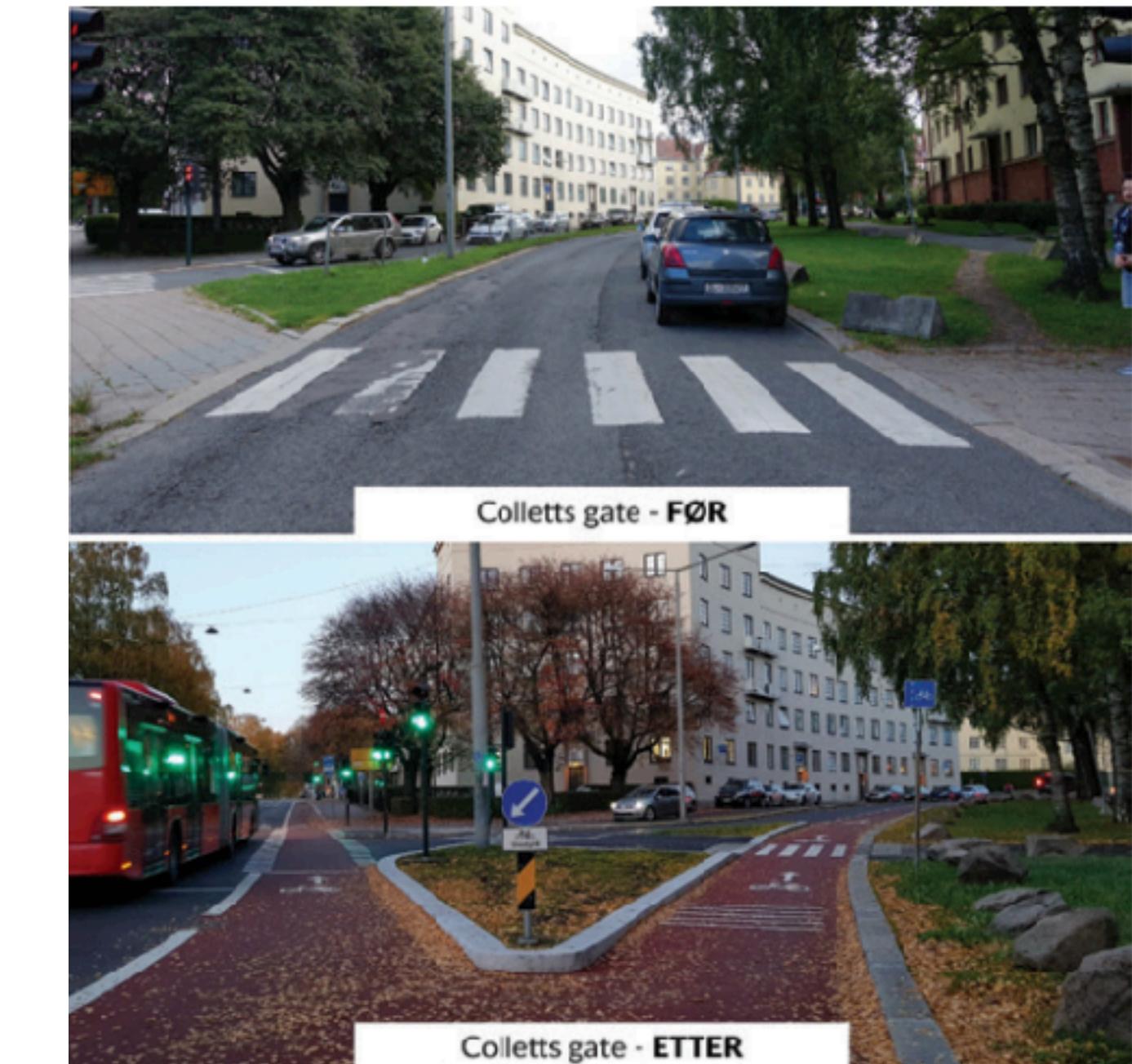
Why is vehicular traffic flow prioritized in CPH? Goes against science and international best practices



Evidence-based "agile" design



Remove traffic lights



Prioritize cycling desire lines

Drastic speed reductions to protect people from massive public health hazard of cars

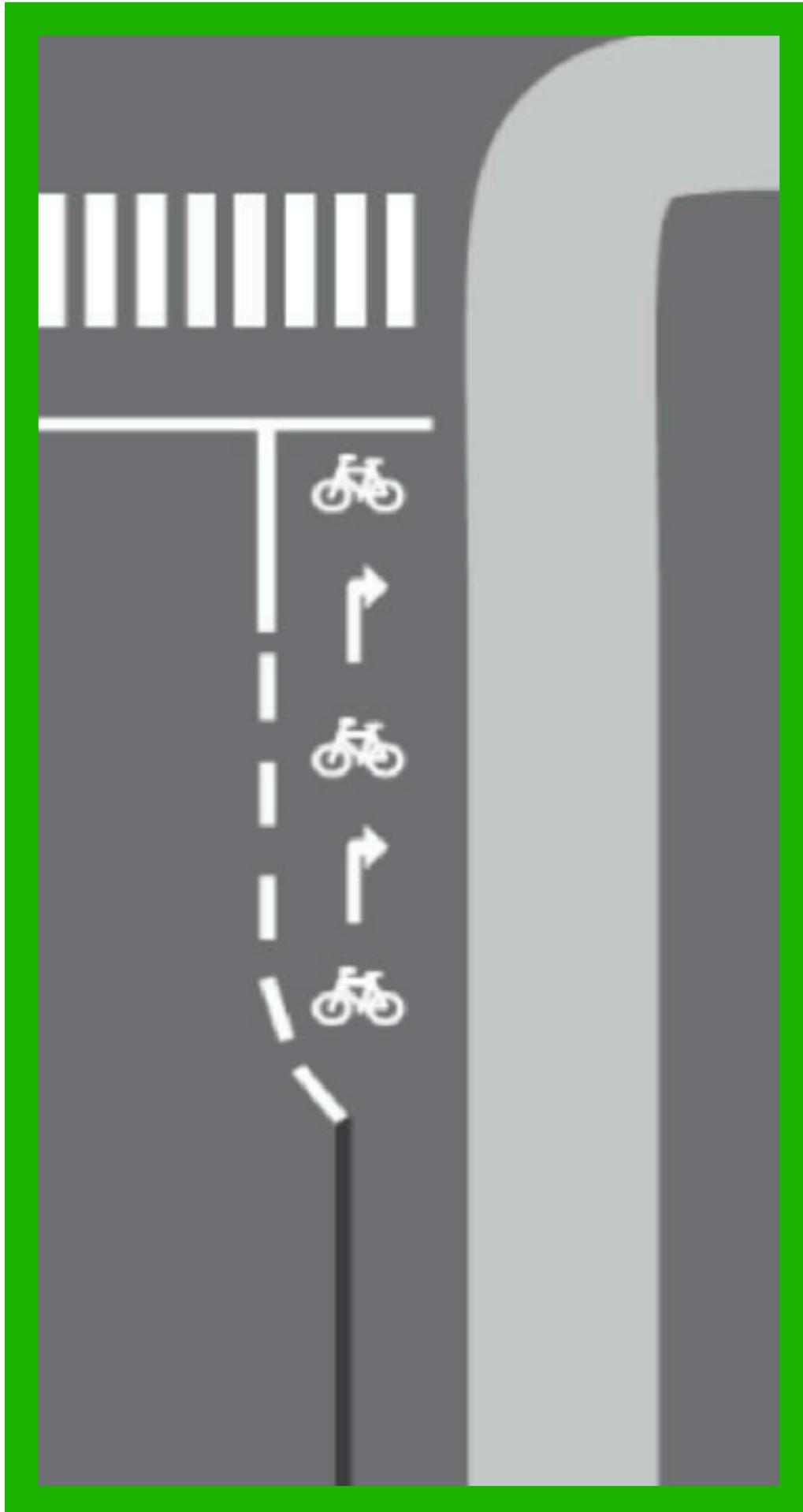
Hahn & te Broemmelstroet, Transp Res Int P 9, 100289 (2021)
Gemeente Amsterdam (2018)
Hartmann & Abel, ITE J 90(5), 32-38 (2020)
Klanjcic, Gavin, Tizzoni, Szell, EPJ Data Sci 11, 27 (2022)



Our cities should plan for HUMANS, not for cars



CPH planners try their best but are trapped in a car-centric planning system



For pre/post analysis, we should re-run our study after re-design

Use multiple cams to prevent occlusion/bias

Videos for counting already recorded, run our algorithm

Extend algorithm: Near-misses, social aspects, ...

Citizen science: Scale up to many intersections



We can improve technical
solutions and insights, but...

..building sustainable cities is a
political, not a technical question!



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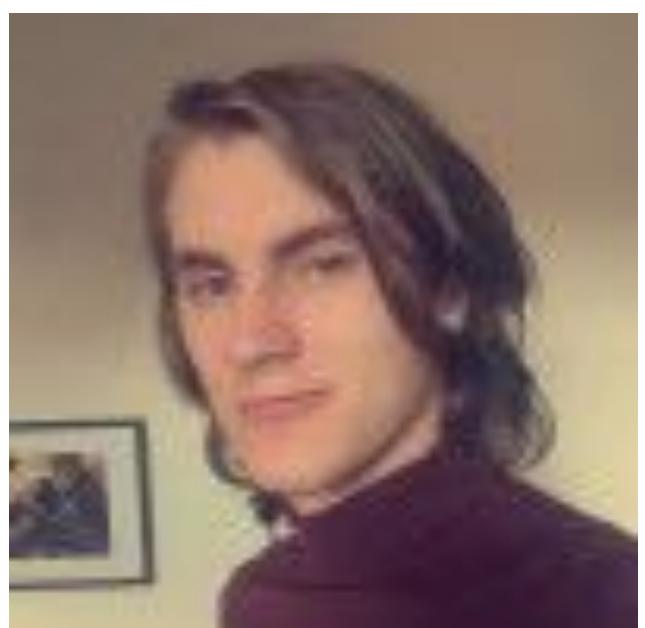
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