

# ML FOR SOCIAL GOOD: PEDESTRIAN MOVEMENT

# 2016

MIT INTELLIGENT TRANSPORTATION SYSTEMS LAB



SIMMOBILITY  
INTEGRATED SIMULATION PLATFORM

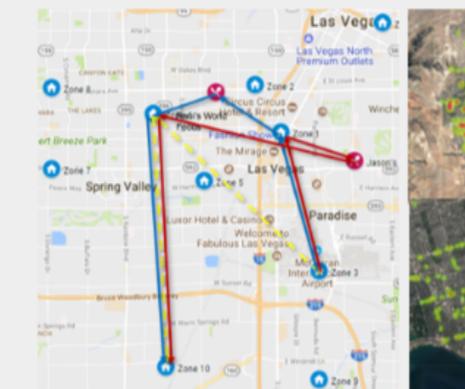
# 2017-18

## NYU BEHAVIORAL URBAN INFORMATICS, LOGISTICS, AND TRANSPORT LAB

**CHALLENGES**

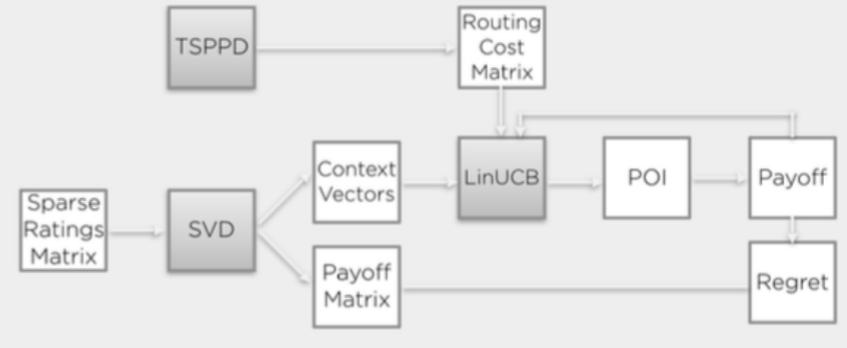


- contextual
- sparse data
- scalability
- cold start




**OUR SOLUTION**

use insertion heuristic to derive routing cost and upper confidence bound based algorithm to identify POI to be recommended

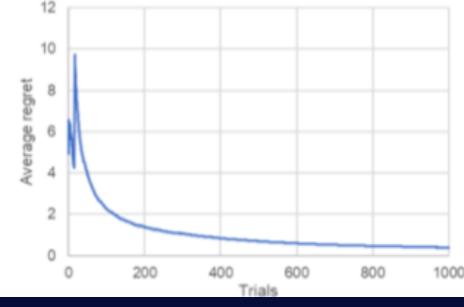


**system framework**

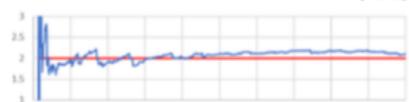
**SIMULATED SCENARIO**

System verification on 10x10 grid

Average regret



RATING True: 2 Learned: 2.095 (4.7%)

TIME True: -0.1 Learned: -0.103 (2.7%)



**APPLICATION TO REAL DATA**

Manhattan with a single shuttle

5-point Yelp ratings of sampled restaurants

Rating	Count	Percent
1.5	1	0.1%
2.0	2	0.2%
2.5	11	11%
3.0	32	3.2%
3.5	157	15.5%
4.0	585	57.8%
4.5	208	20.6%
5.0	16	1.6%
Sum	1,012	100.0%

Acceptance rate

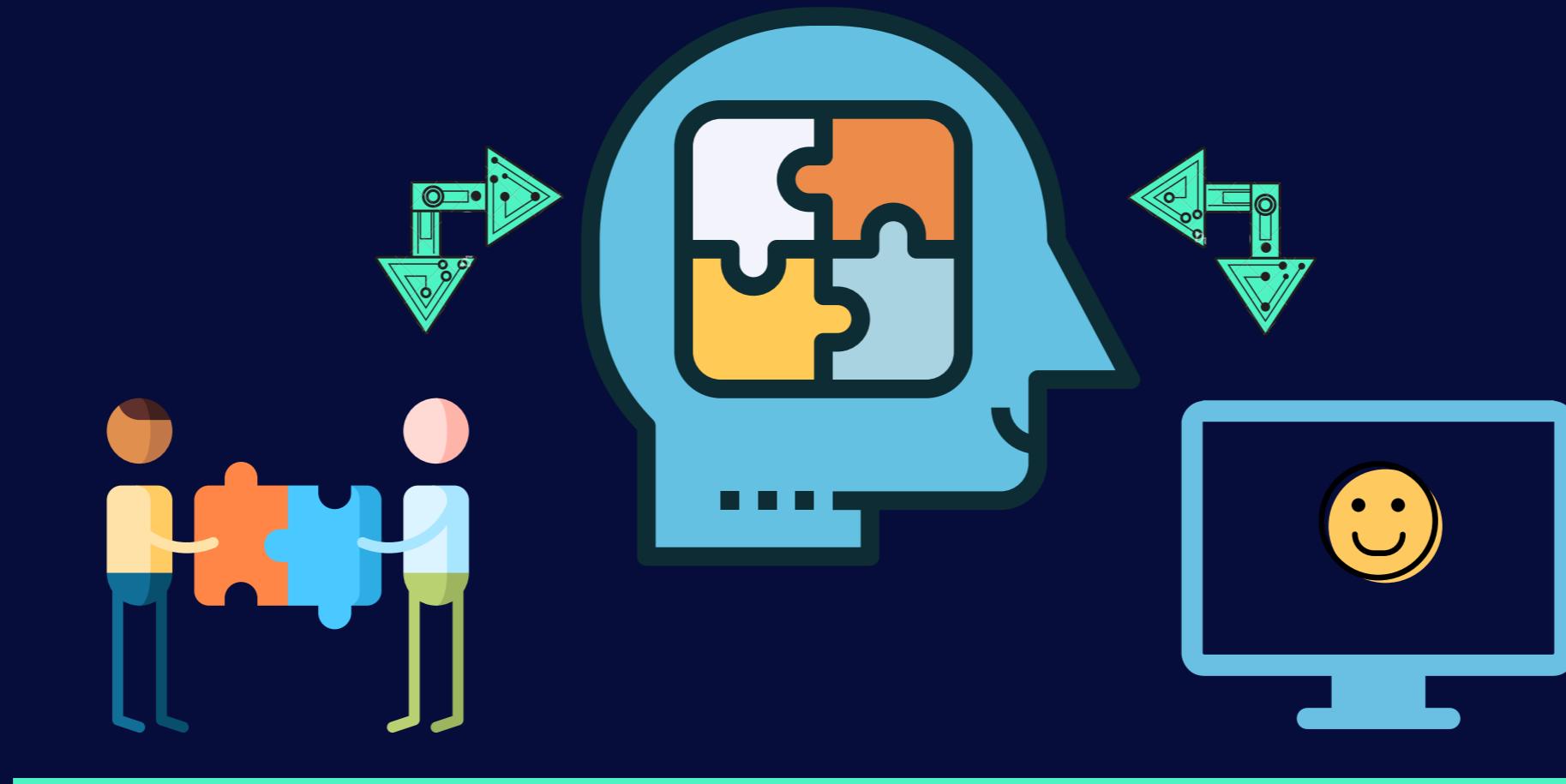


## INTEGRATION OF AI IN MOBILITY SERVICES TO IMPROVE SENIORS' ACCESSIBILITY

# EMPIRICAL STUDY OF HUMAN CROWD MOVEMENT HAVE STARTED > 50 YEARS AGO



BUT PEDESTRIAN MOVEMENT ON INTERSECTIONS  
HAVE NOT BEEN STUDIED EXTENSIVELY



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OBSERVE -> UNDERSTAND -> SIMULATE

# Why use simulation modeling?

To solve real-world problems safely  
and efficiently.

# Why it needs to be interactive?

Inspecting processes and interacting  
with a simulation model in action  
builds both understanding and trust.

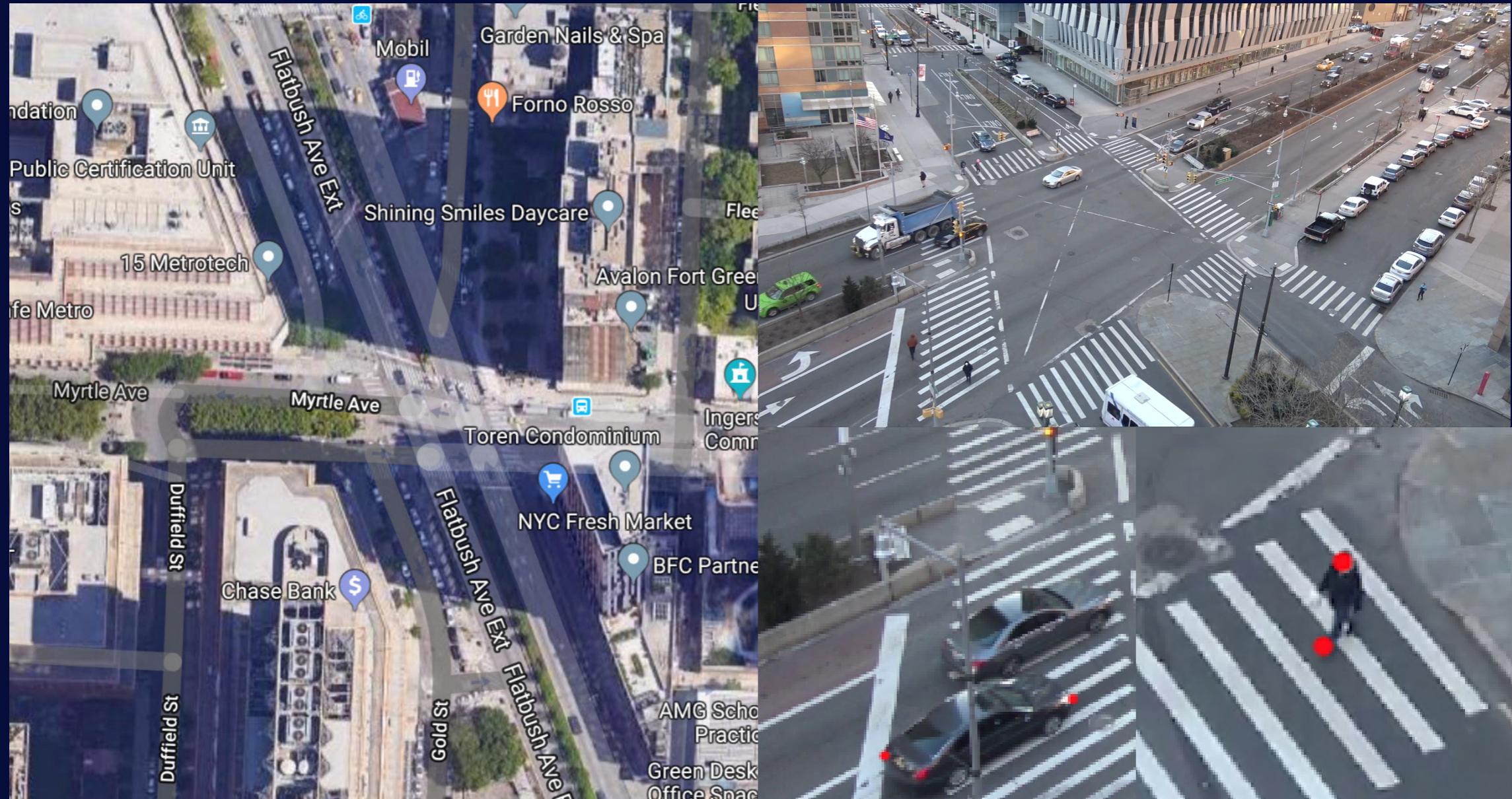
# ? UNDERLYING BEHAVIORAL RULES THAT PEDESTRIANS FOLLOW ?

## **Objective:**

Demonstrate empirically that  
collective behaviors emerge

# Project plan:

- Collect agent trajectory data
- Design an agent based model
- Cluster agents
- Estimate transition probabilities
- Extract behavioral rules
- Calibrate agent-based model

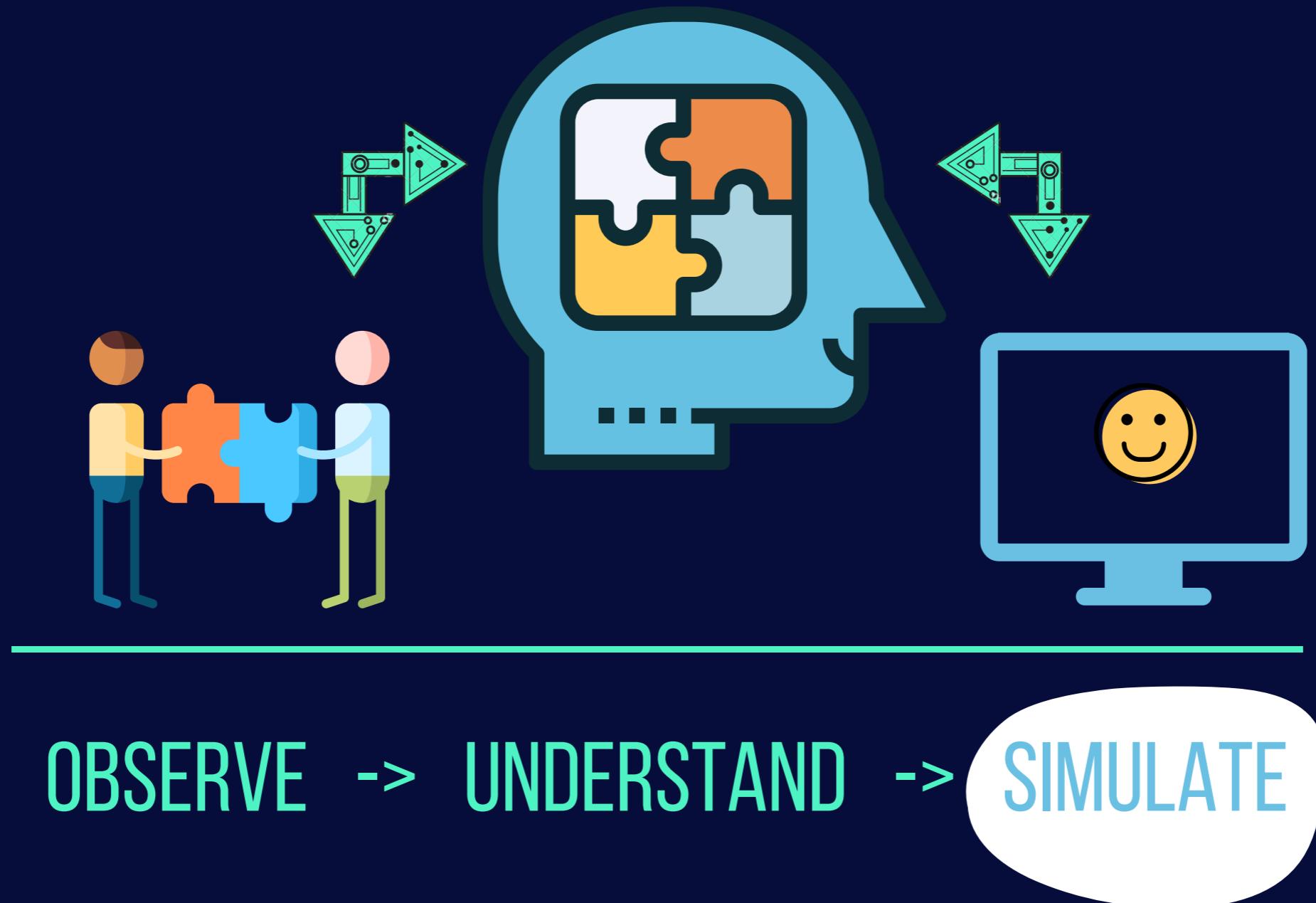


Track ID	Type	Traveled Dist. [px]	Avg. Speed [Kpx/h]	Trajectory(x [px])	y [px]	Speed [Kpx/h]	Total Accel. [pxs-2]	Time [ms]
24	Pedestrian	172.19	58.301515	418.02	493.53	74.7351	1.2375	837.1854
25	Car	1857.86	488.626219	143.7	957.55	792.3138	7.7271	1674.3707
26	Car	1727.75	366.891236	343.05	920.35	1060.411	61.4999	2092.9634
27	Pedestrian	150.55	58.588504	425.68	349.56	62.0984	11.2864	2720.8525
28	Car	474.95	618.886811	581.26	897.96	680.6742	13.2322	3641.7564
29	Car	1880.36	452.985914	157.56	943.43	1031.7474	17.7275	4855.6751
30	Heavy Vehicle	1474.52	281.80456	603.08	872.27	825.5005	52.0904	5232.4086

# Project plan:

- ✓ Collect agent trajectory data
- ✓ Design an agent based model
- ✓ Cluster agents
- ?
- Estimate transition probabilities
- Extract behavioral rules
- Calibrate agent-based model

**EXTRACTED RULES ARE UNACCEPTABLY  
DIFFERENT FROM OBSERVED BEHAVIOR**



# WEB-BASED INTERACTIVE SIMULATION



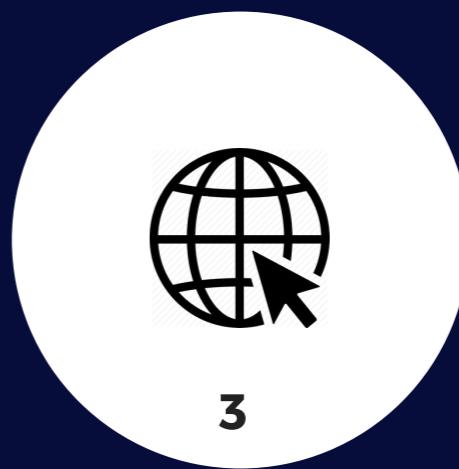
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**ANYLOGIC  
SIMULATION**



2

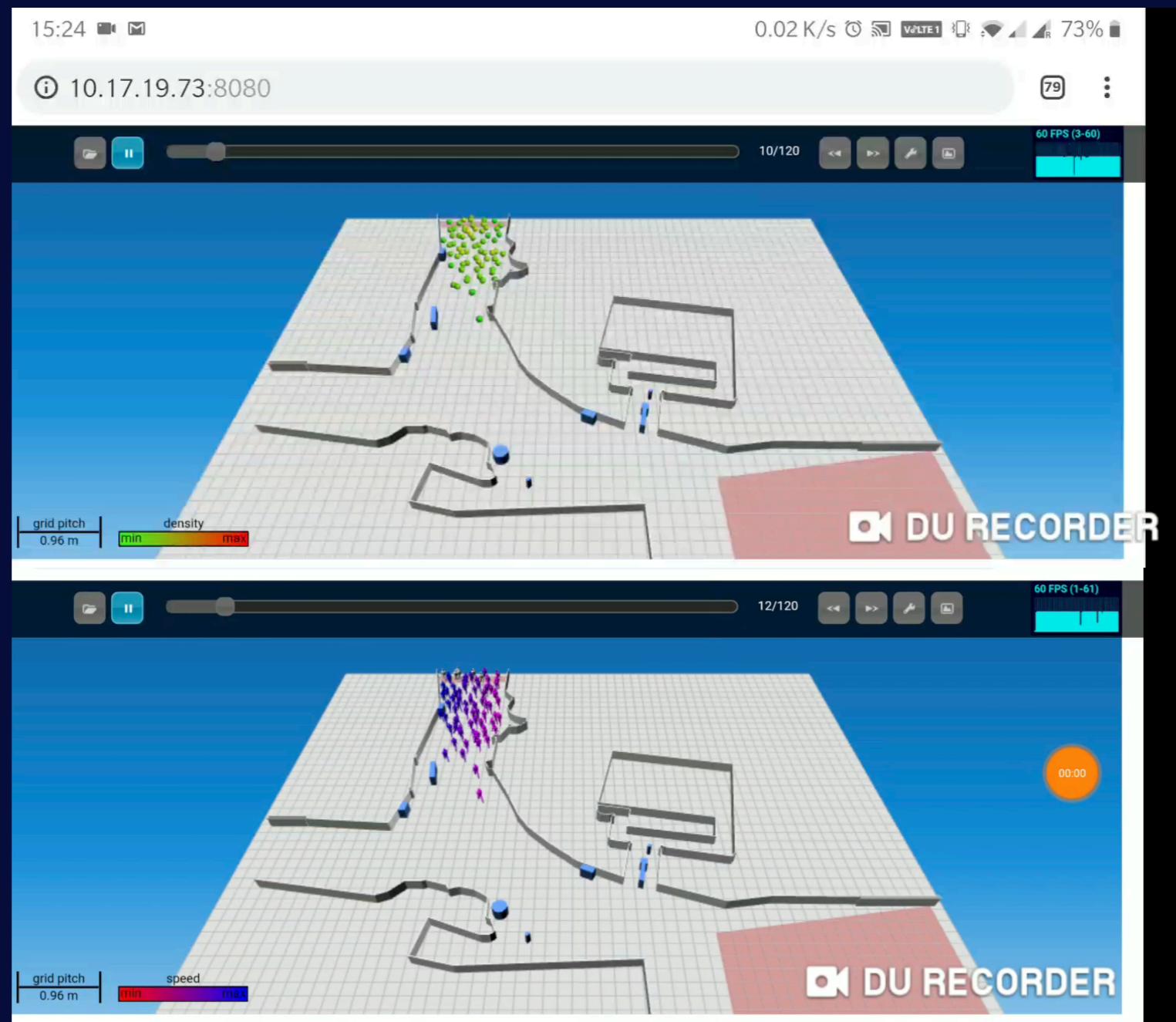
**INPUT FILES:  
TRAJECTORIES  
GEOMETRY**



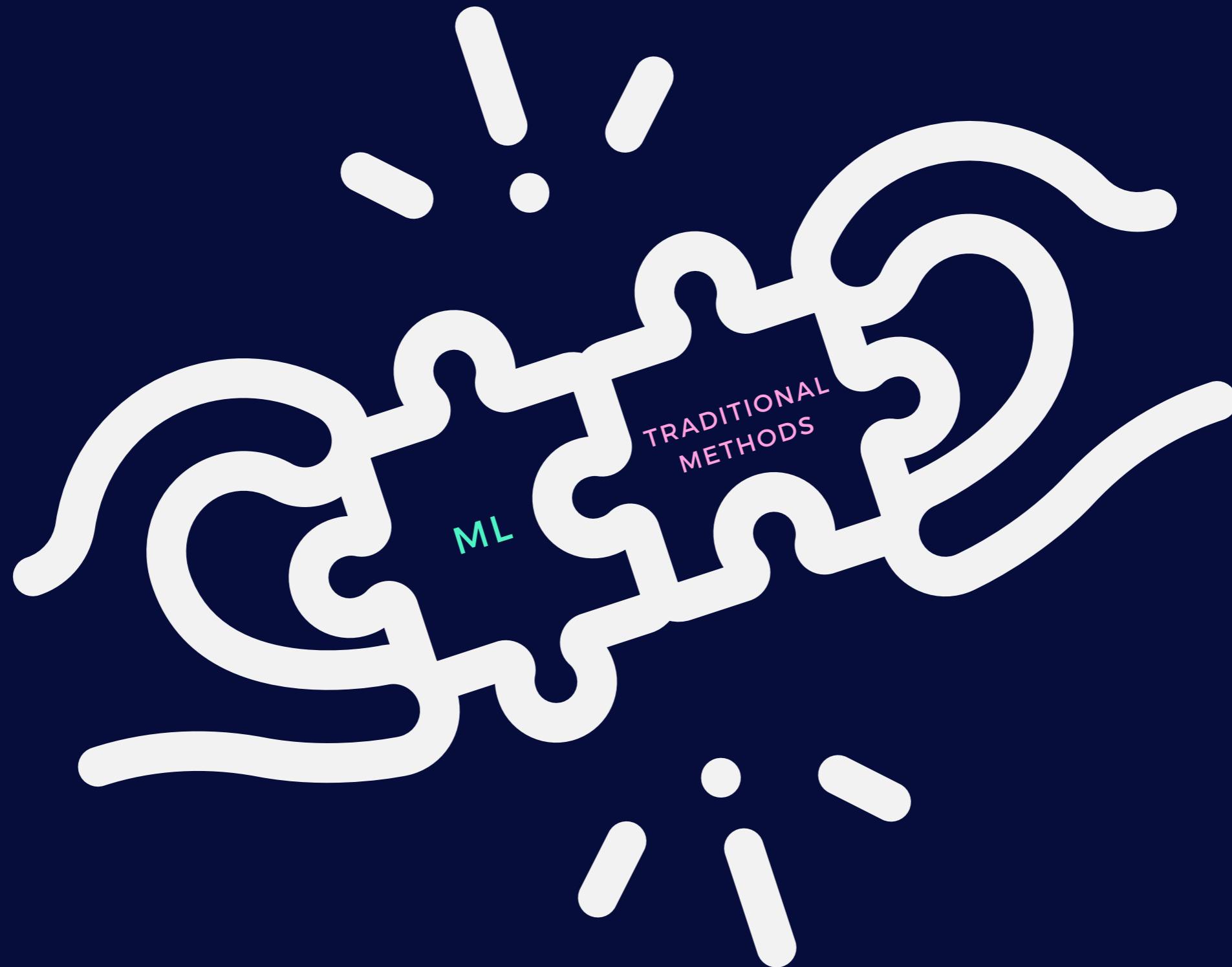
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**WEBAPP:  
POSTPROCESSING**

# WEB-BASED INTERACTIVE SIMULATION



# CONCLUSION & NEXT STEPS



# THANK YOU

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