ESEM 2022

DOES ROAD DIVERSITY REALLY MATTER IN TESTING AUTOMATED DRIVING SYSTEMS?

A REGISTERED REPORT

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LANE KEEPING ASSIST SYSTEM

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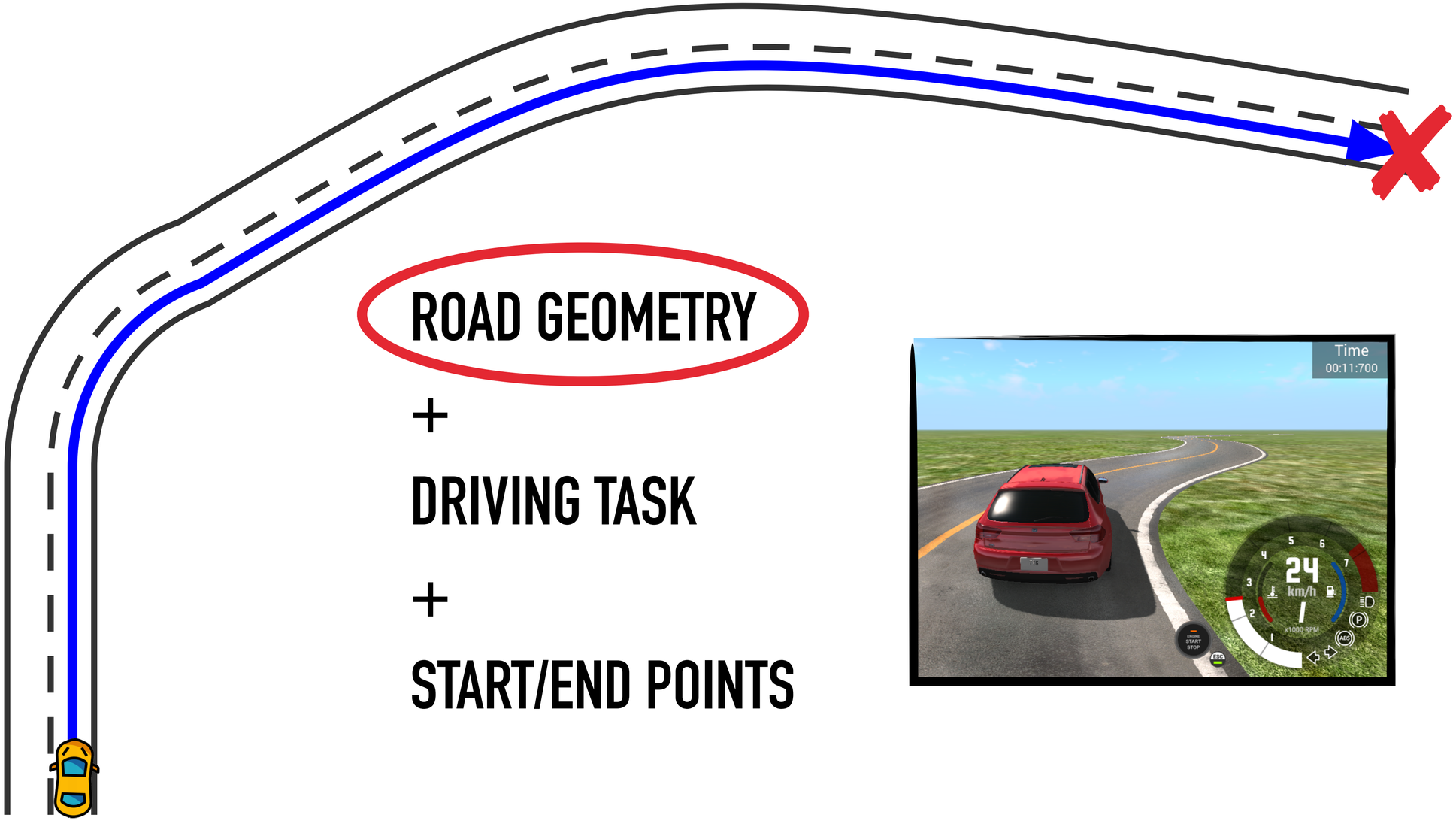
TEST INPUT



ROAD GEOMETRY

+

DRIVING TASK

+

START/END POINTS

TESTING AUTOMATED DRIVING SYSTEMS

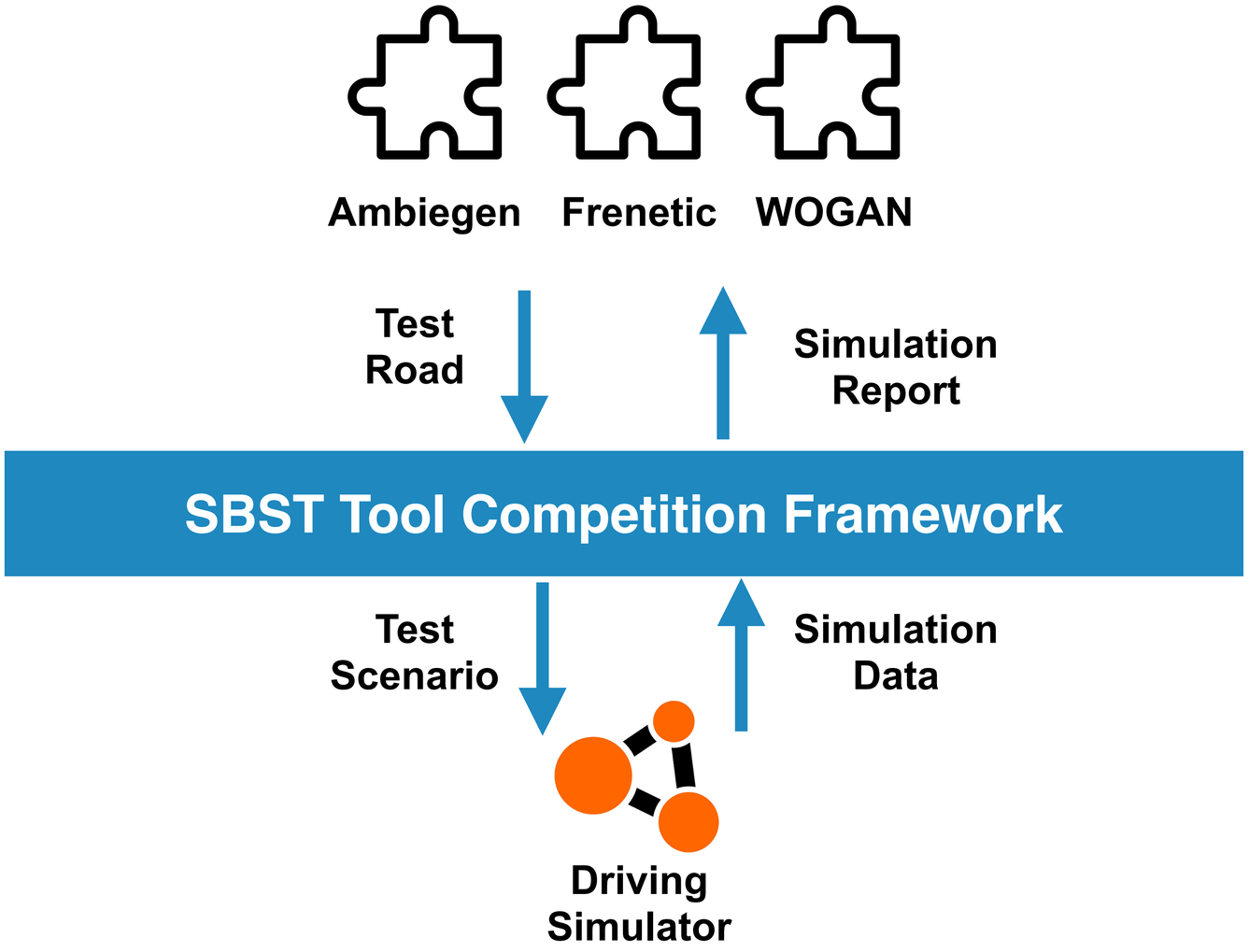
THOROUGHLY TEST THE AUTOMATED DRIVING SOFTWARE

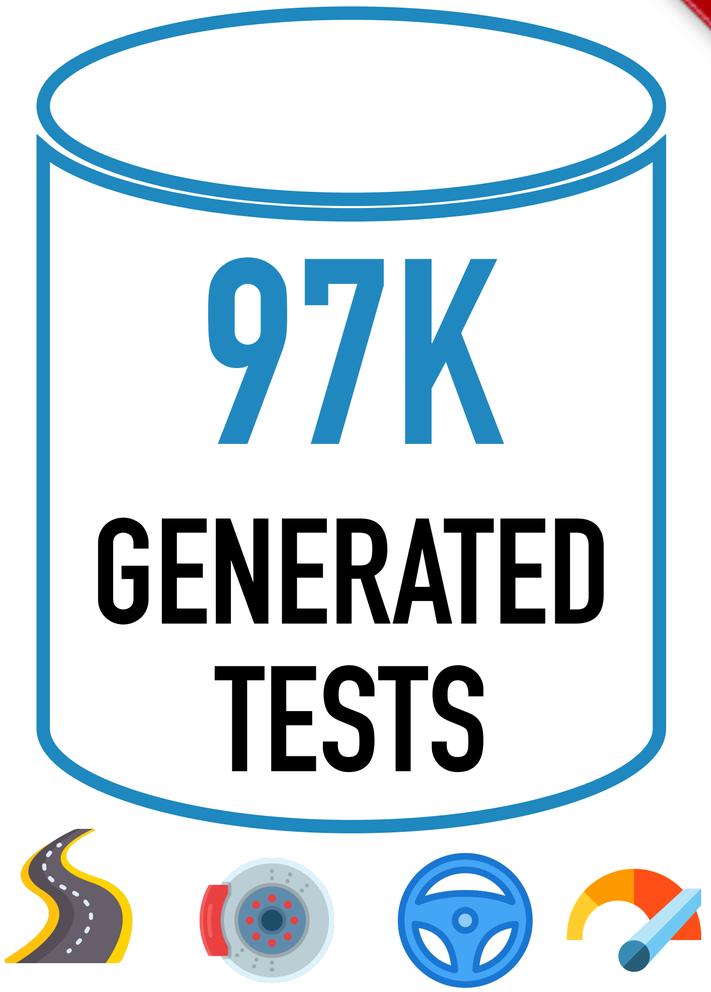
DIVERSE TEST ROADS → DIVERSE EXPOSED BEHAVIOURS ?

RESEARCH SUBJECTS

47 DIVERSITY MEASURES

ROAD DATA SET





Fork me on GitHub

[HTTPS://GITHUB.COM/SE2P/TOOL-COMPETITION-AV](https://github.com/se2p/tool-competition-av)

DRIVING AGENTS

DAVE-2

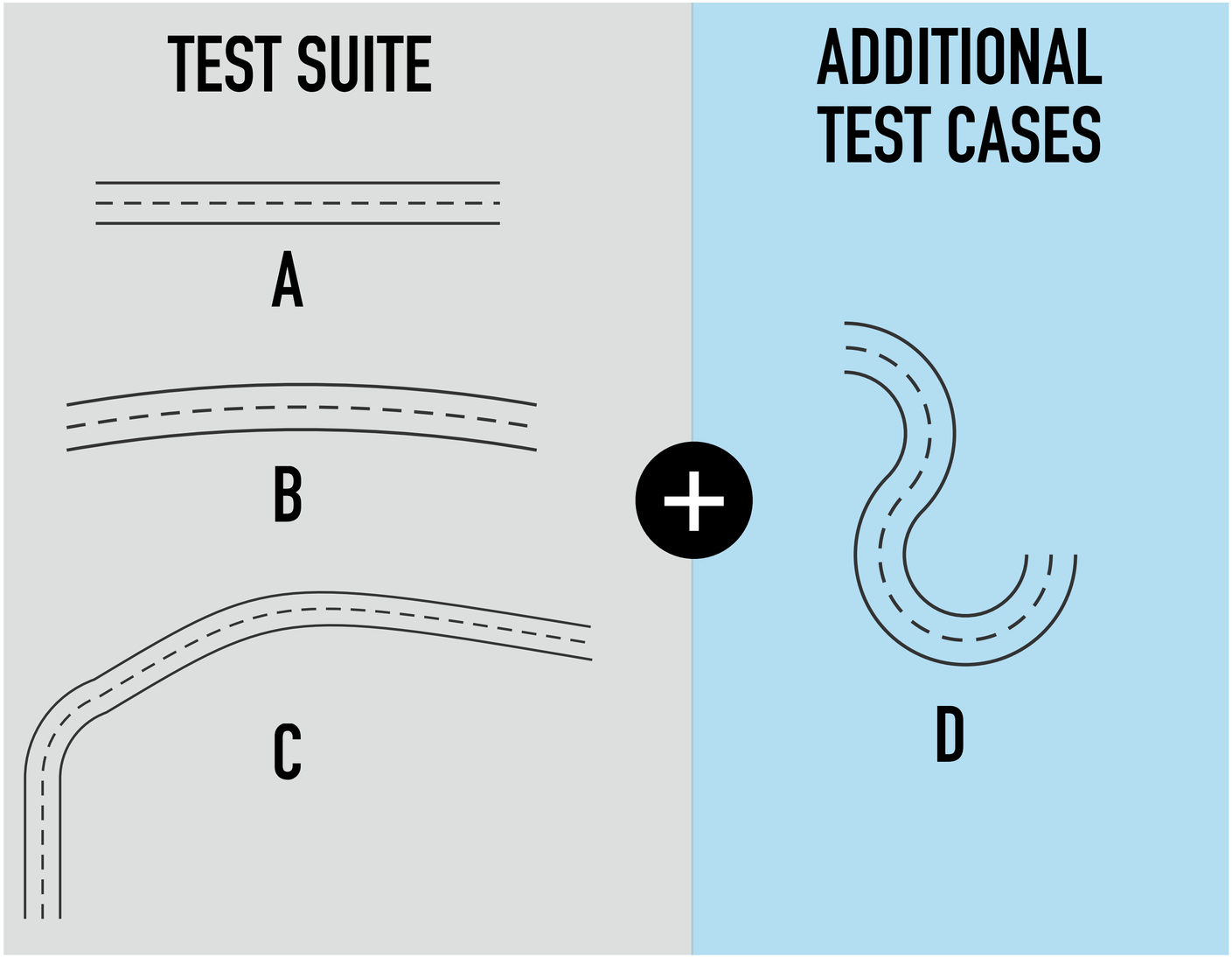
- BOJARSKI ET AL. [NVIDIA]
- DEEP LEARNING COMPONENT
- ONLINE DECISION BASED ON CAMERA IMAGE

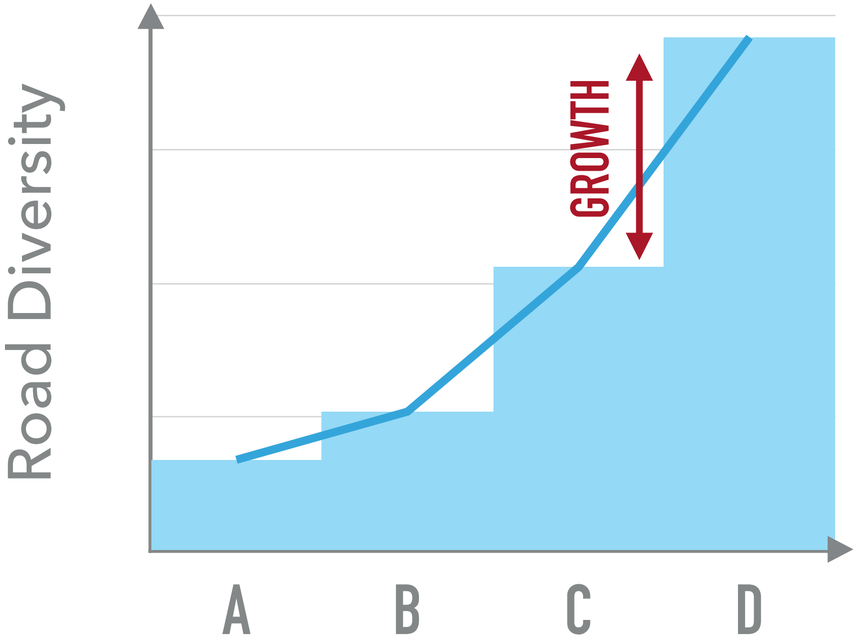
BEAMNG.AI

- SHIPPED WITH BEAMNG.TECH SIMULATOR
- RULE-BASED
- PRIOR KNOWLEDGE OF THE ROAD GEOMETRY

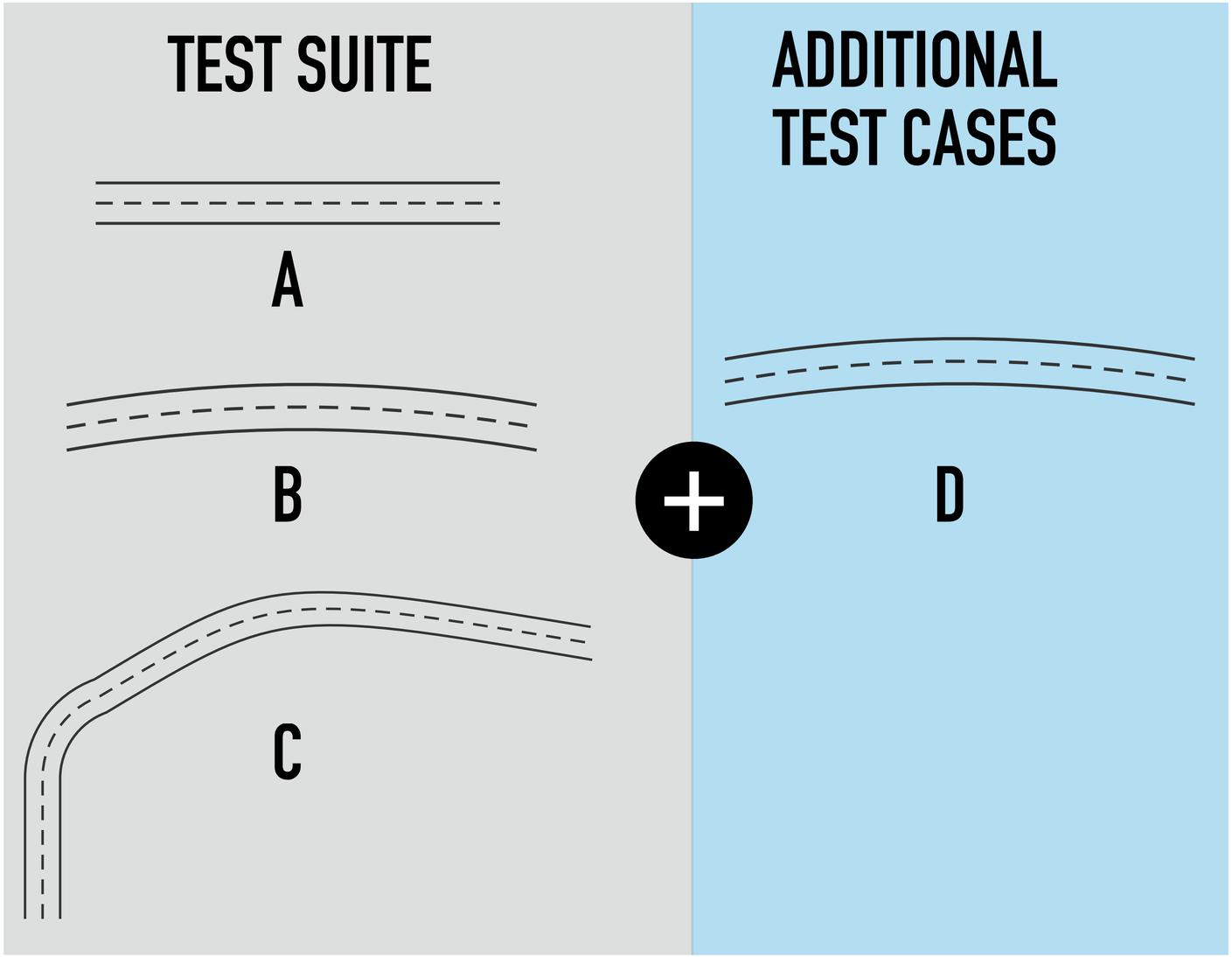
DIVERSITY MEASURES PROPERTIES

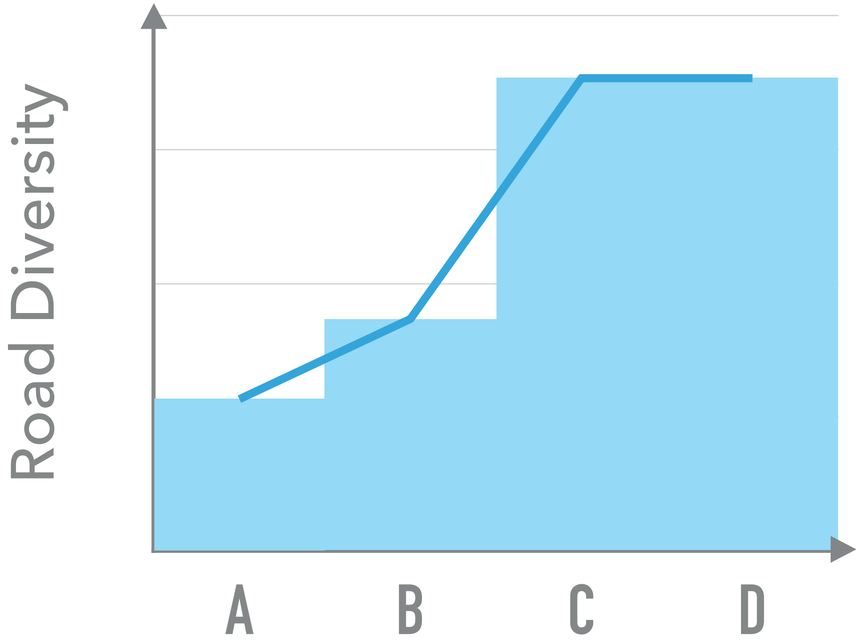
RQ1: MONOTONICITY AND GROWTH



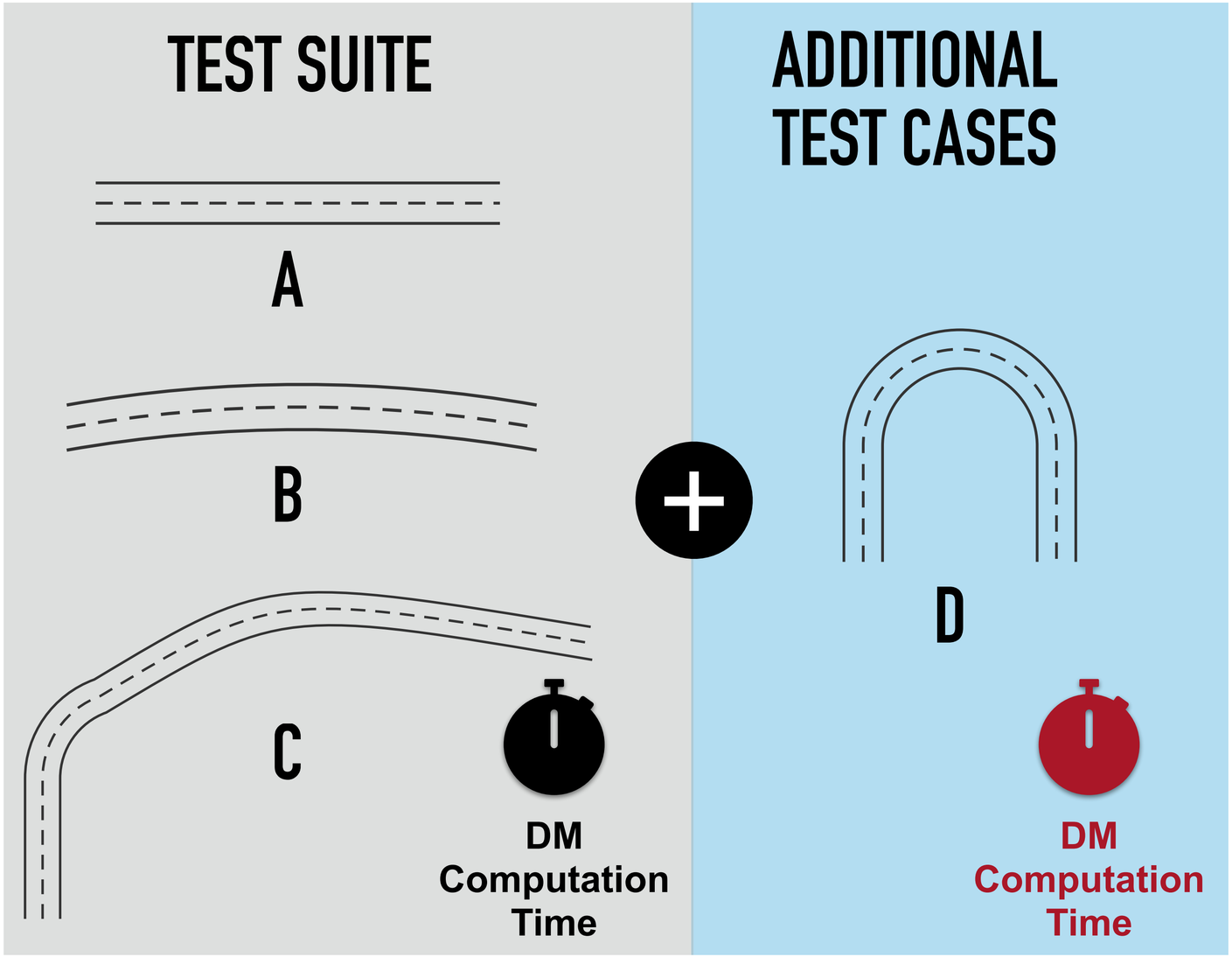


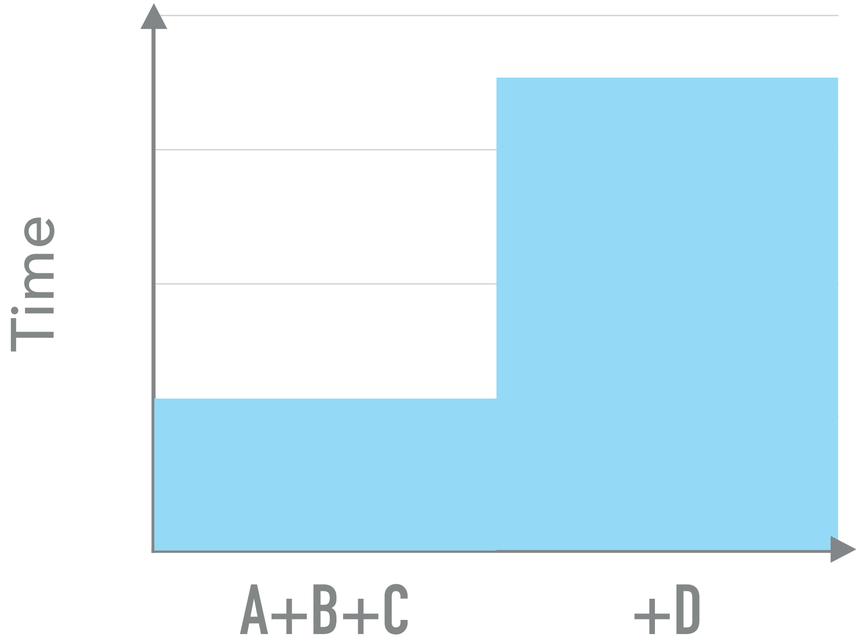
RQ1: INSENSITIVITY TO DUPLICATES





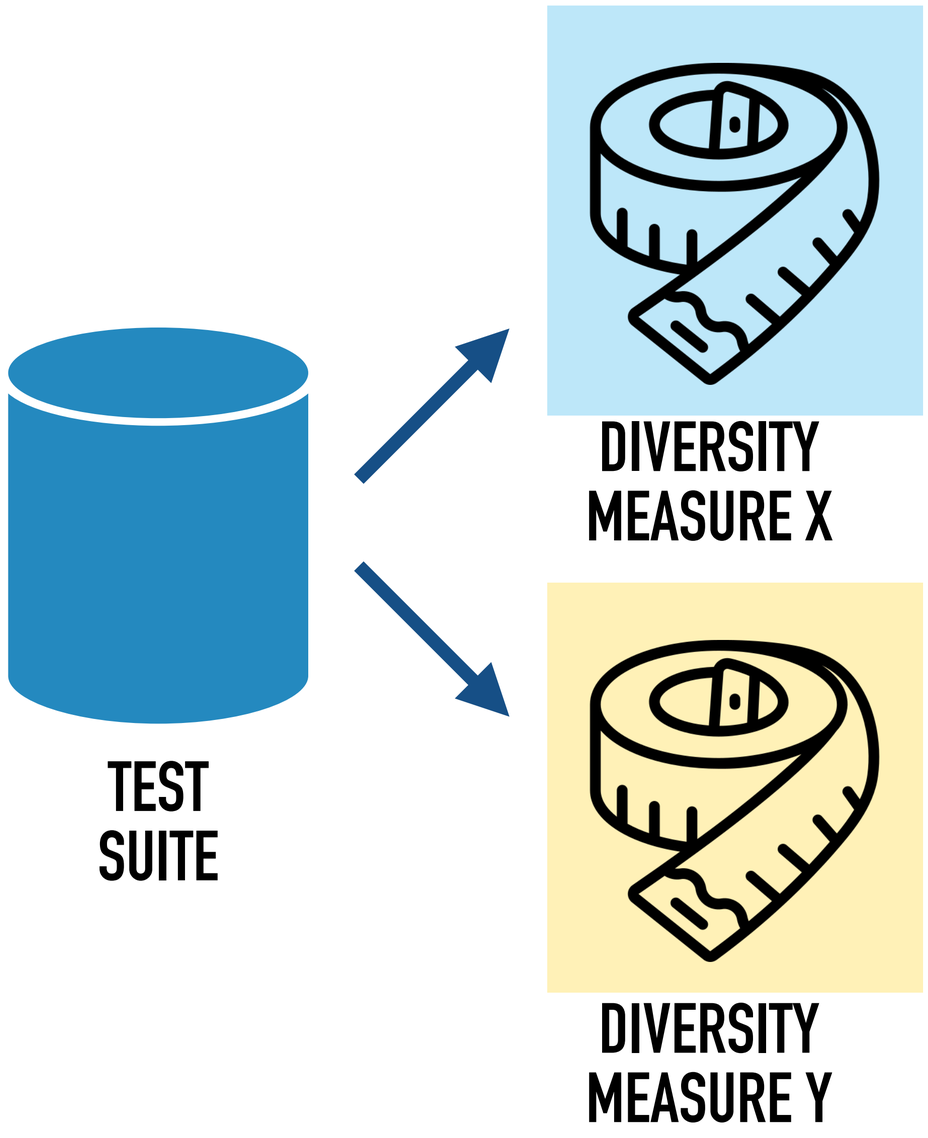
RQ1: EFFICIENCY AND ADDITIVITY

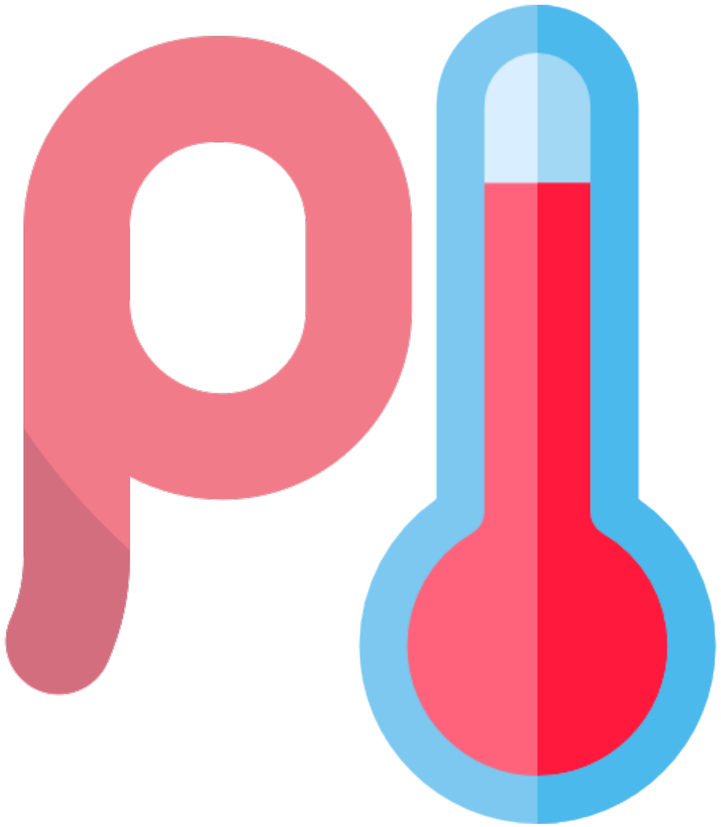




PAIRWISE CORRELATION OF DIVERSITY MEASURES

RQ2: PAIRWISE CORRELATION OF DIVERSITY MEASURES

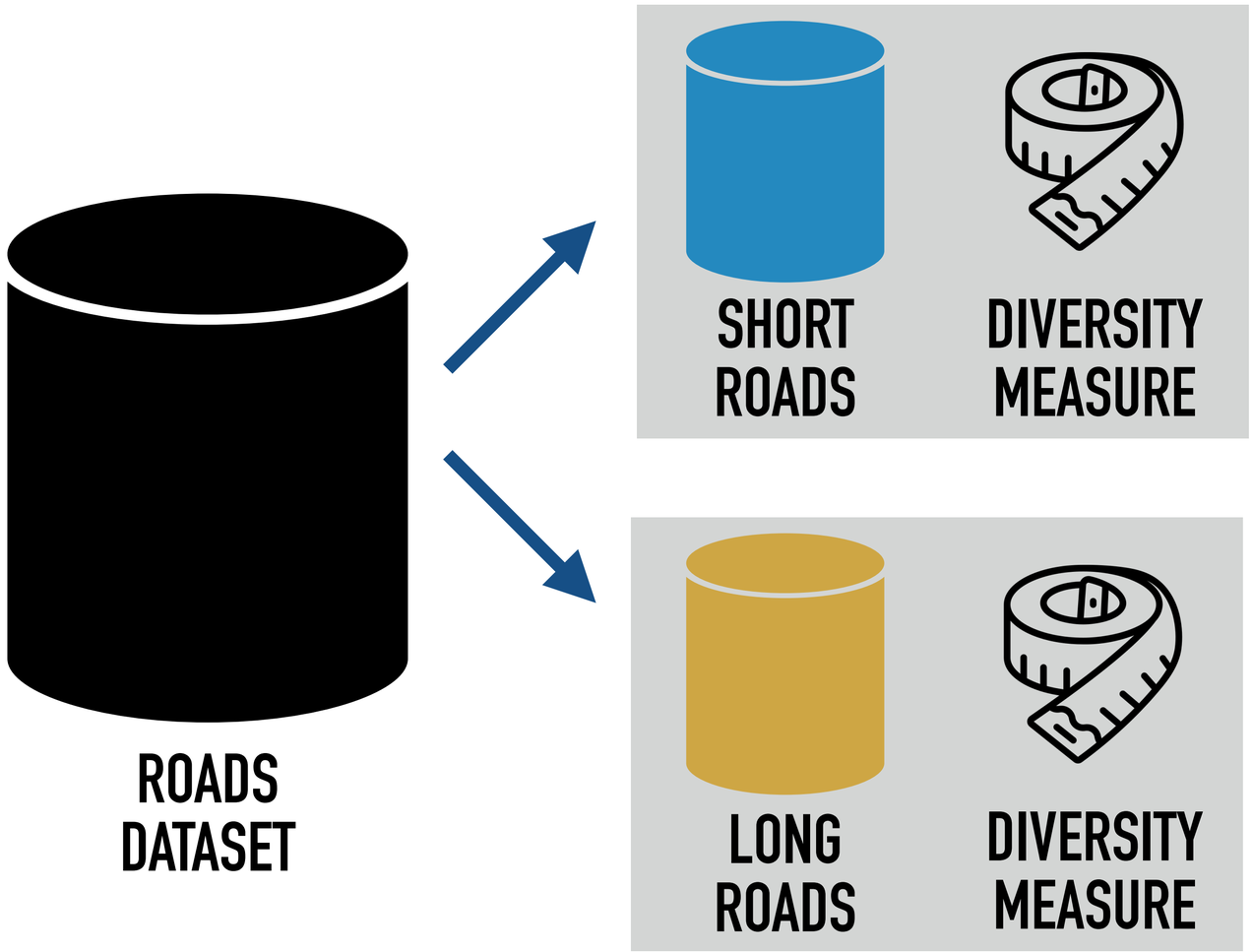


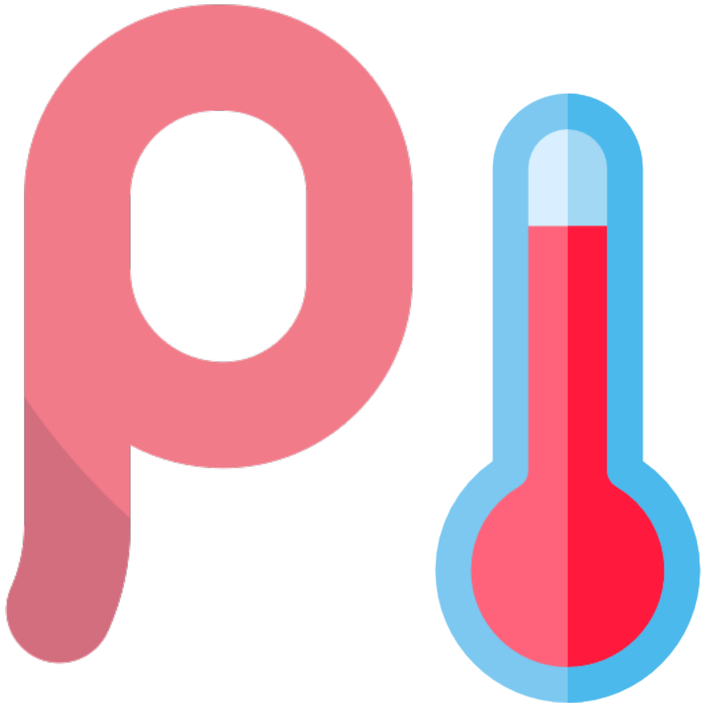


- VERY HIGH
- HIGH
- MODERATE
- LOW
- SLIGHT
- NO

EFFECT OF ROAD LENGTH ON DIVERSITY MEASURES

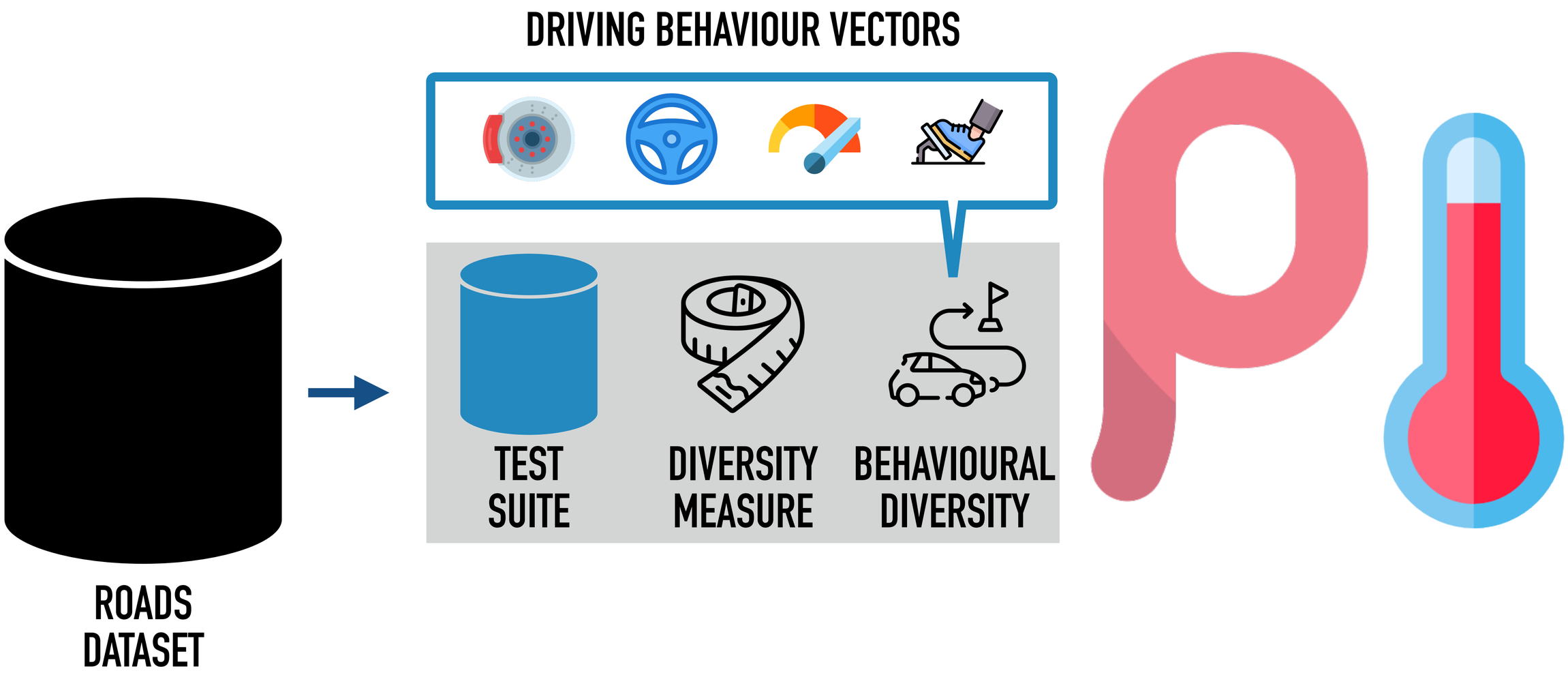
RQ3: CORRELATION OF DIVERSITY MEASURES AND ROAD LENGTHS



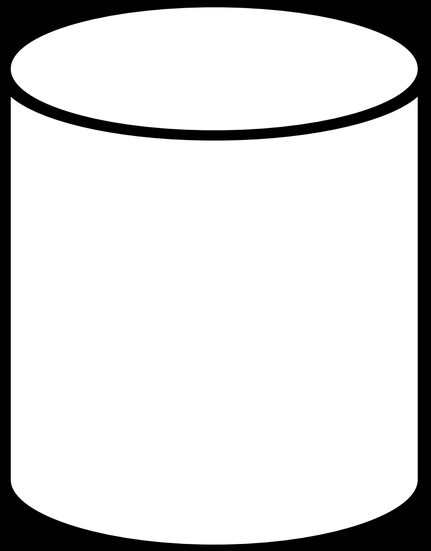


CORRELATION OF DIVERSITY MEASURES AND BEHAVIOURAL DIVERSITY

RQ4: CORRELATION OF DIVERSITY MEASURES AND BEHAVIOURAL DIVERSITY



CONTRIBUTION



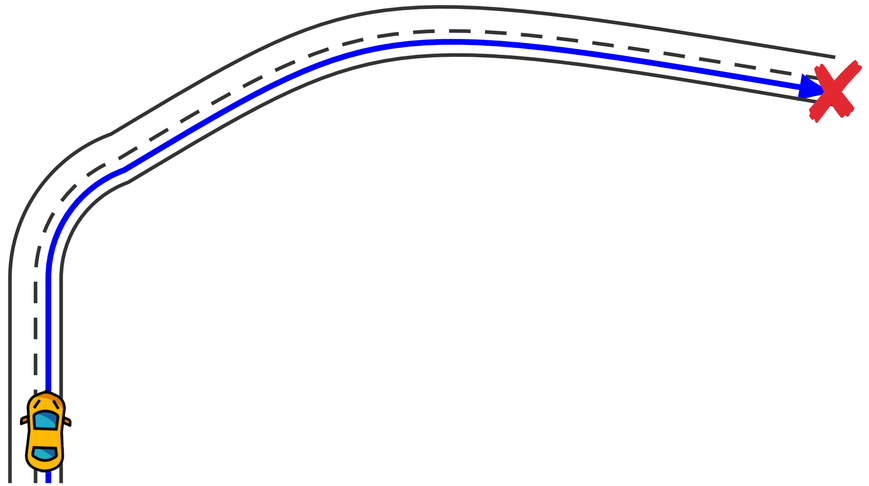
DIVERSITY MEASURES

CATALOGUE OF DIVERSITY MEASURES ENSURING BEHAVIOURAL DIVERSITY OF DRIVING AGENTS

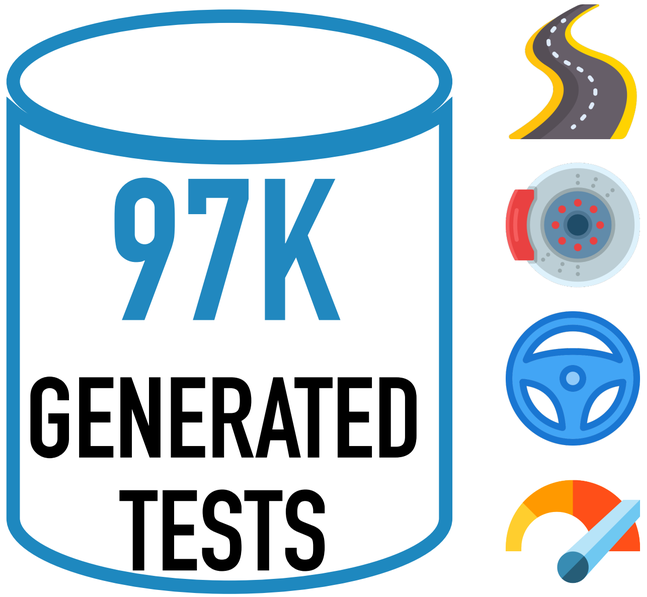
IMPACT

FITNESS FUNCTION FOR SEARCH-BASED TEST GENERATORS

GUIDANCE FOR TEST MINIMISATION/ PRIORITISATION



distance entropy
normalised relative angle
47 DIVERSITY MEASURES
hull of curve
partial curve mapping
averaging
convex hull
discrete fréchet distance
weitzman aggregation



- RQ1: DIVERSITY MEASURE PROPERTIES
- RQ2: PAIRWISE CORRELATION OF DIVERSITY MEASURES
- RQ3: CORRELATION OF DIVERSITY MEASURES AND ROAD LENGTHS
- RQ4: CORRELATION OF DIVERSITY MEASURES AND BEHAVIOURAL DIVERSITY

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