Efficient Evolution of Neural Network Topologies

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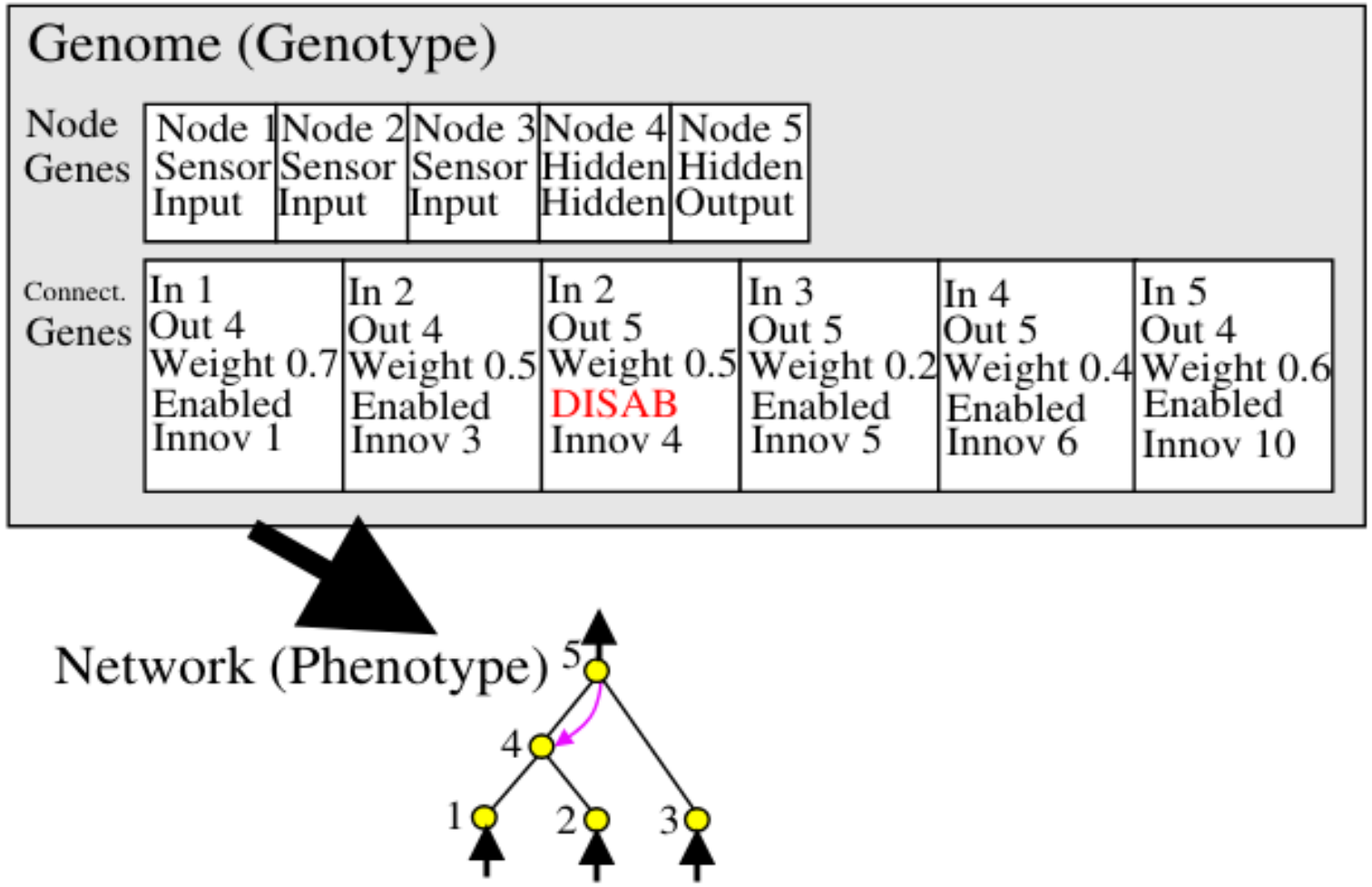
NeuroEvolution of Augmenting Topologies (NEAT)

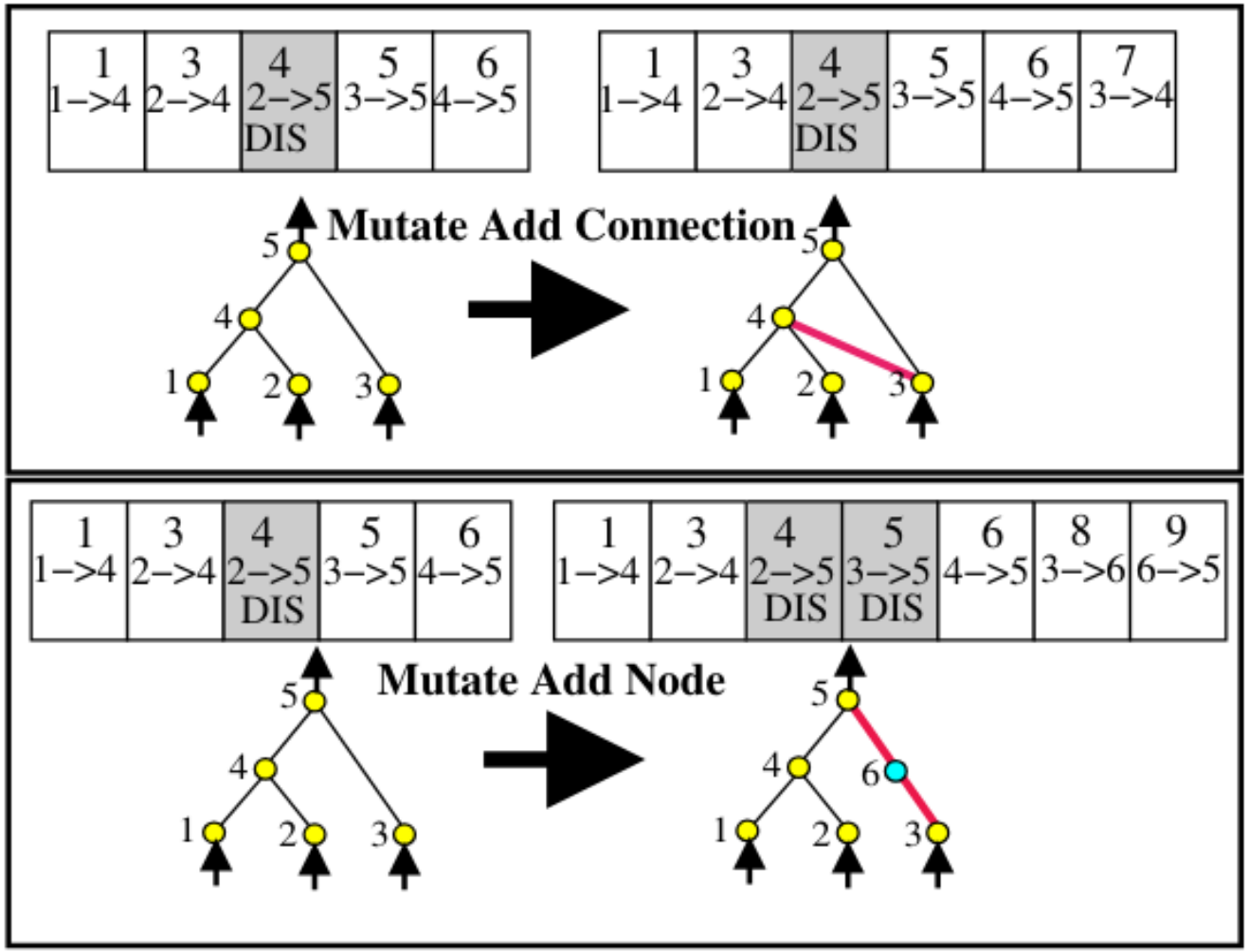
- Neuroevolution : Artificial evolution of neural networks using genetic algorithms, effective in reinforcement learning tasks, especially those with hidden state information.
  - Challenge

  NEAT:
  - Outperforms best fixed-topology methods in challenging reinforcement learning benchmarks.
  - Reasons for Success:
    - Principled Crossover
    - Speciation
    - Incremental Growth

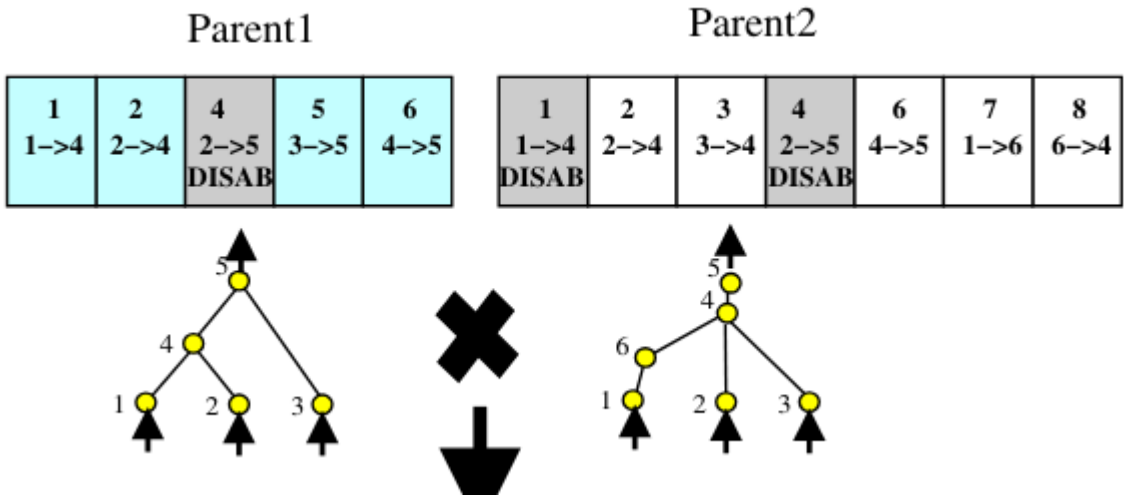
A genotype to phenotype mapping

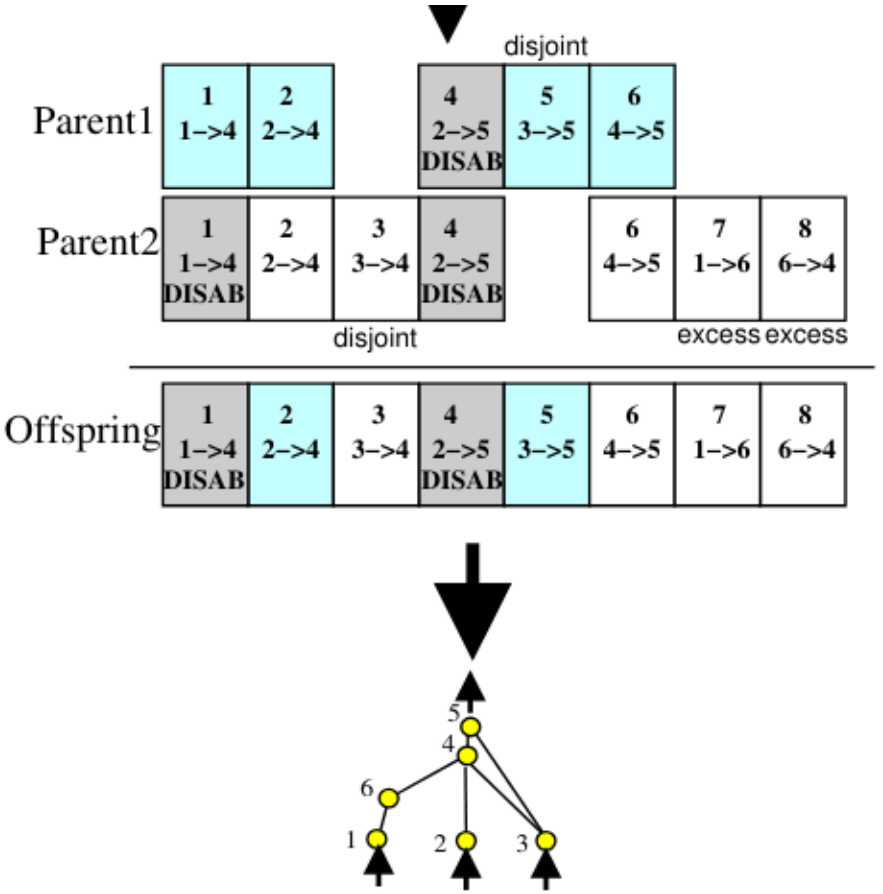


The two types of structural mutation in NEAT

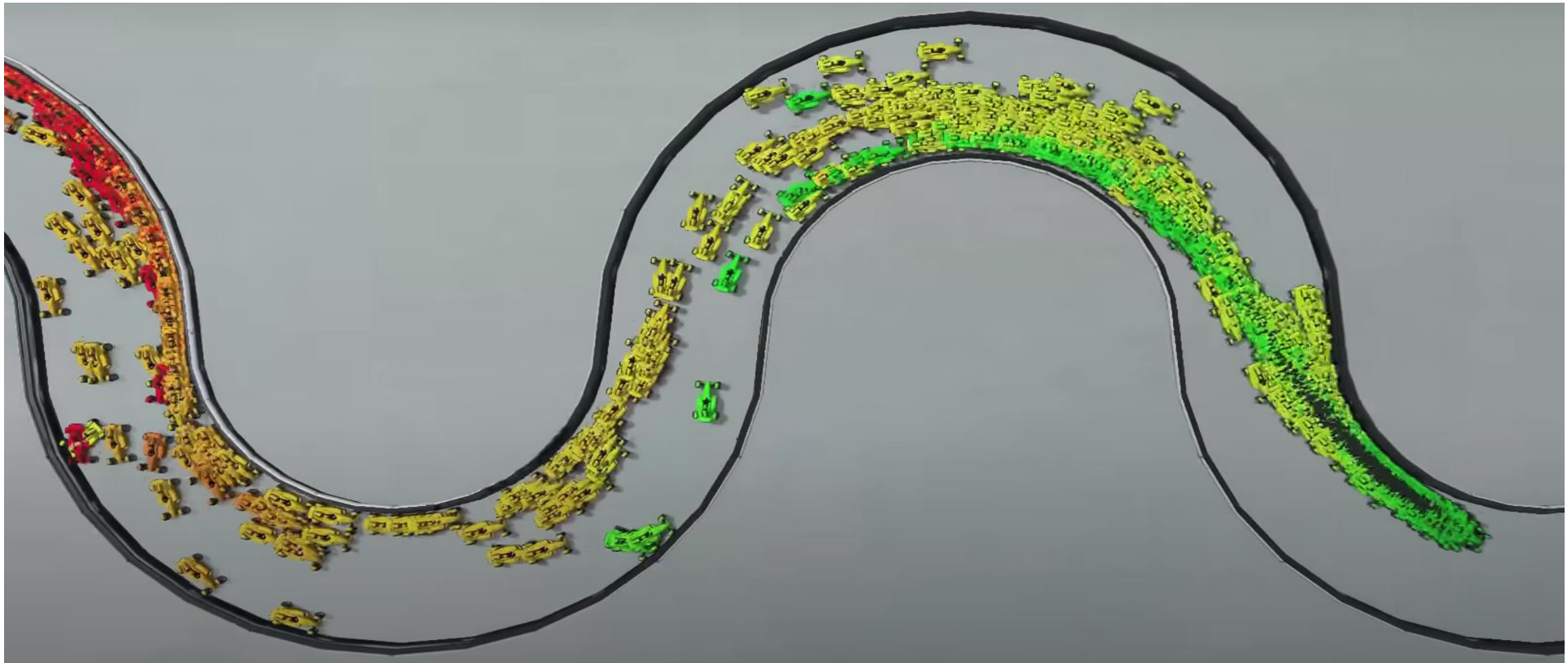


NEAT: Crossover with Historical Markings

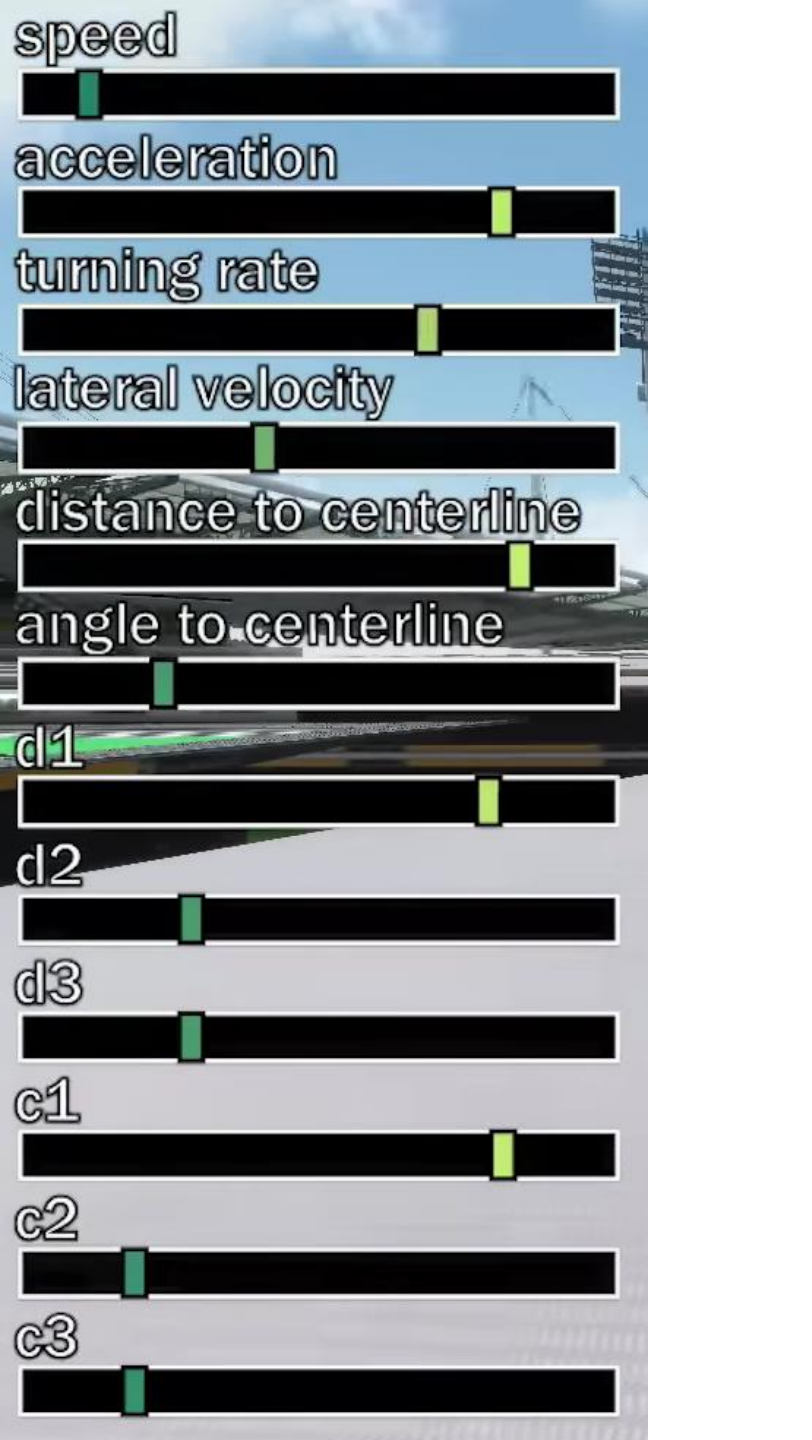




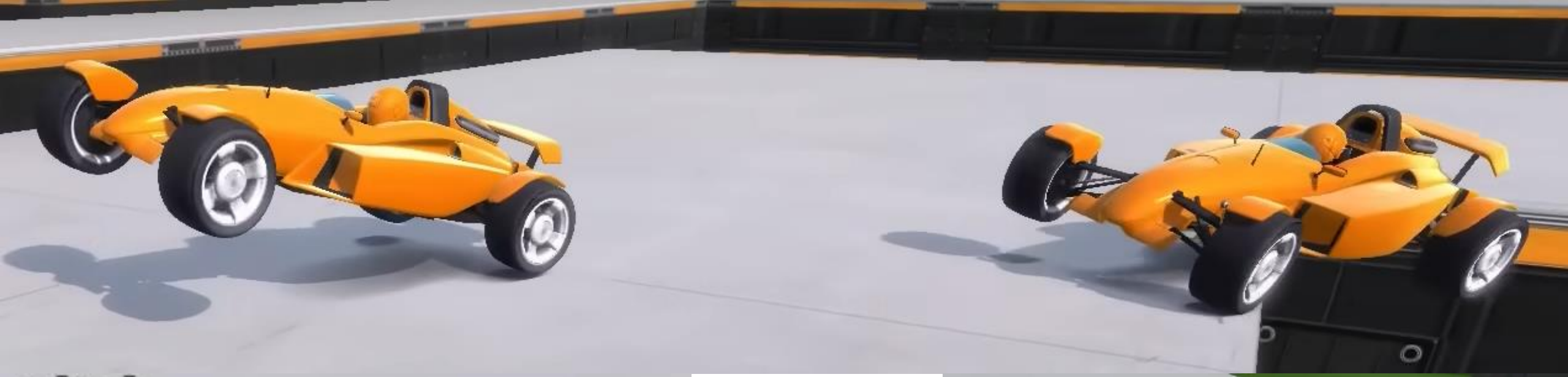
Trackmania



https://www.youtube.com/watch?v=Dw3BZ6O_8LY


speed
acceleration
turning rate
lateral velocity
distance to centerline
angle to centerline
d1
d2
d3
c1
c2
c3


d3
c2:Left
c3:Right
d2
c1:Left
d1



pitch

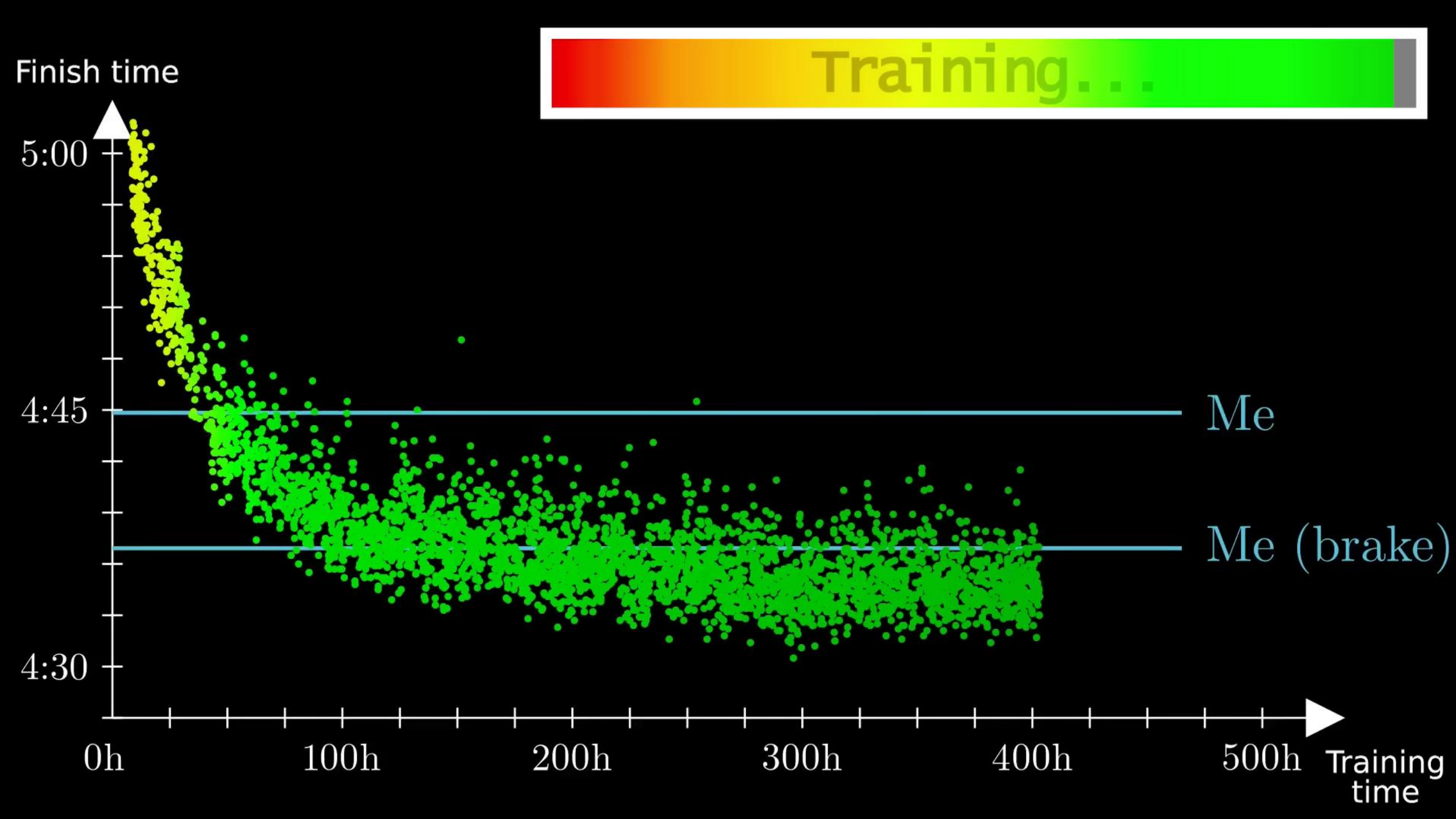
roll

wheels contact

1 2 3 4

wheels sliding

1 2 3 4


Training...
Finish time
5:00
4:45
4:30
Me
Me (brake)
0h
100h
200h
300h
400h
500h
Training time

Thank You for Your Attention!

discussion