‘Caffeine’ car controller

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Neural Network models

- Reservoir network
- Logistic Regression
- **Multilayer Perceptron with 3 outputs**
- Multilayer Perceptron with single output
- Evolutionary approach with NEAT

Training our models

- Data acquired from a basic race driver on 6 tracks:
  - CG Speedway Number 1, CG Track 2, CG Track 3, Oval A-Speedway, Oval D-Speedway, Aalborg
  - Sigmoid activation function and normalization of data to [0, 1]
  - Backpropagation

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Evolutionary approach

- NEAT
- Fitness functions:
    - Timing performance (hard to obtain with Torcs)
    - Training data accuracy
- We were not able to evolve the driver to be competitive versus our standard MLP approach.

Heuristics

- Neural network predictions for acceleration, steering and braking produces a slow and careful driver.
- We adjust acceleration based on front sensor distance to increase aggressiveness.
- Simple braking policy when approaching corners to prevent crashes with high speeds.

Evaluation

- Data collected from tracks
- Data collected with noisy sensors
- Cross-validation

Conclusion

- Evolutionary approach didn’t work better than pure NN
  - Fitness function cannot be computed efficiently for a large population with Torcs.
- Pure NN approach performed well, but slow.
- Heuristics helped to improve results.