

# R & D About the Reader

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Who will be the typical reader of the report?

- Researchers/students in the field of computer science, evolutionary robotics and energy efficient vehicle control

Who should be able to understand at least half of it?

- Anyone that understand the high level concepts of evolutionary algorithms, artificial neural networks and that has a good mathematical background
- Anyone with the ability to understand and follow abstract concepts, algorithms and ideas.

What knowledge do you expect the reader to have on a...

- General level

- Basic functionality of an artificial neural network
- ANNs can be used for control tasks
- EAs can be used to design ANNs
- There are algorithms to apply EAs to ANNs
- literature: Haykin, Simon, and Neural Network. "A comprehensive foundation." Neural Networks 2.2004 (2004).

- More Specific Level

- Weights and the topology determine the functionality an ANN represents
- EAs can evolve the weights and the topology of an ANN w.r.t. a given task
- literature: Haykin, Simon, and Neural Network. "A comprehensive foundation." Neural Networks 2.2004 (2004).

- Detailed Level

- -none-
- literature: -none specific-

# What shall the reader gain/learn?

## General Level

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- SOA approaches use Graph Search
- ANNs are able to outperform Graph Search approaches
- Transferring solutions onto real devices is non-trivial
- ANNs can be evolved for optimal energy efficient control
- Evolved ANNs have not been used on real devices for energy efficient vehicle control so far

# What shall the reader gain/learn?

## Specific Level

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- Graph Search approaches have memory problems
- ANNs do not need much storage
- Problem with reality gap stems from inaccurate simulations
- Accurate simulations need too much computation time and memory

# What shall the reader gain/learn?

## Detailed Level

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- The higher the level of discretization the more memory Graph Search does need
- ANNs do not require a previous discretization of the problem
- NEAT is an SOA approach that can be used to design an ANN for energy efficient vehicle control
- The reality gap can shrink using more elaborate motor models
- The transferability approach can minimize the reality gap

# Estimation of Work Spend on Different Problems

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- Current SOA and deficiencies: ca 3 pages
  - Using Graph Search for Vehicle Control
  - Neuroevolution
  - Reality Gap
- Explaining used algorithms and concepts
  - NEAT: ca 2-3p
  - Reality Gap: ca 2-3p