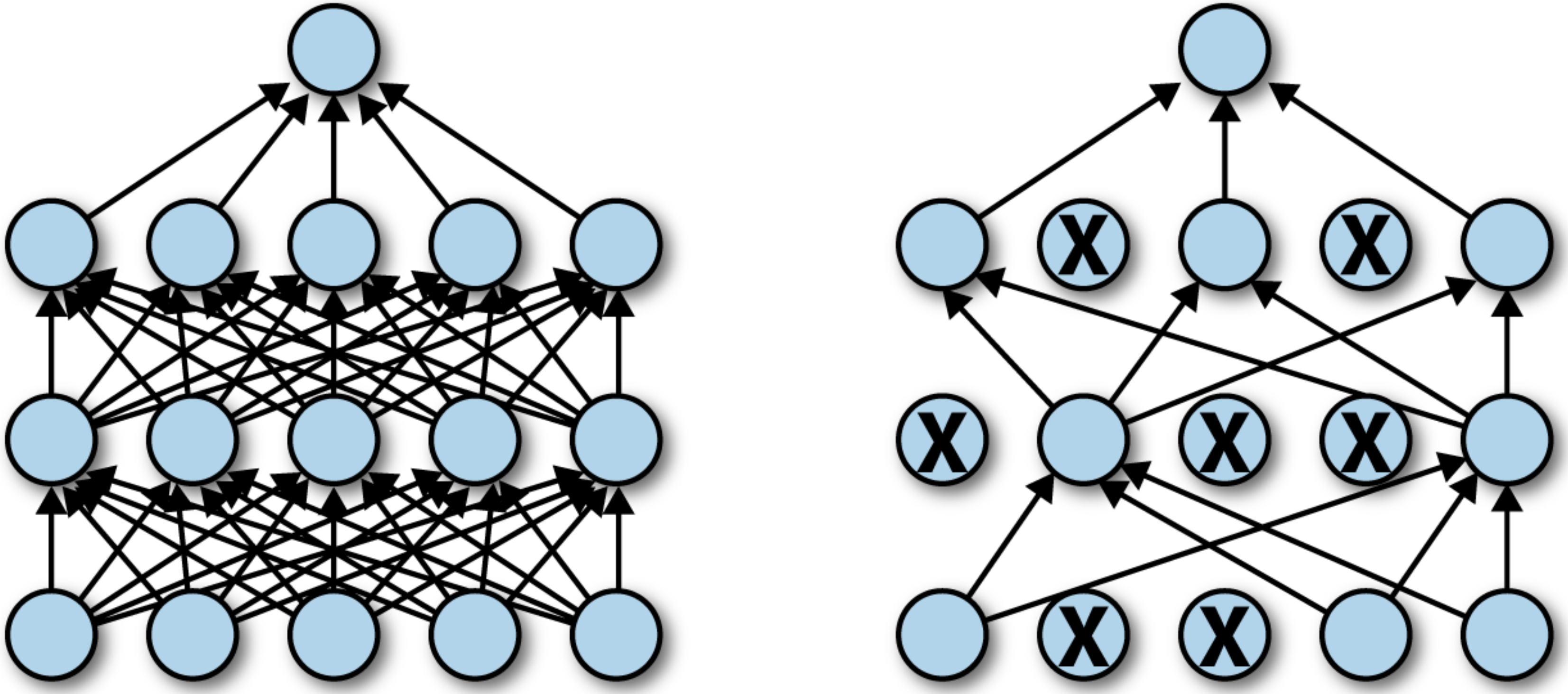
Weight Agnostic Neural Networks

Standard idea: fully-connected net

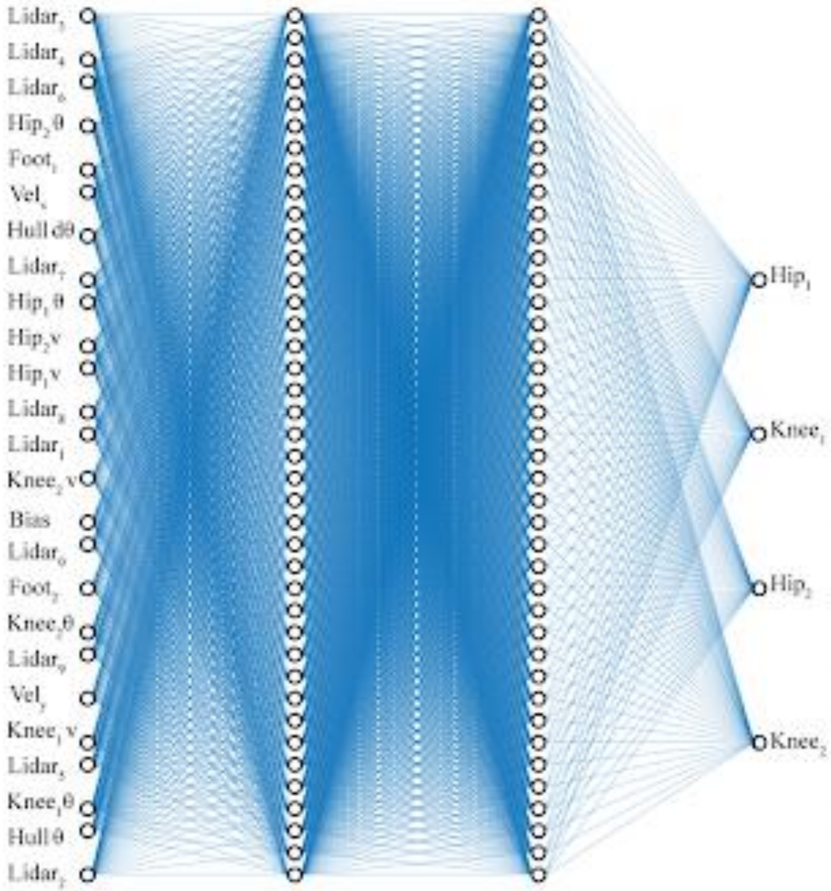


(a) Standard Neural Net

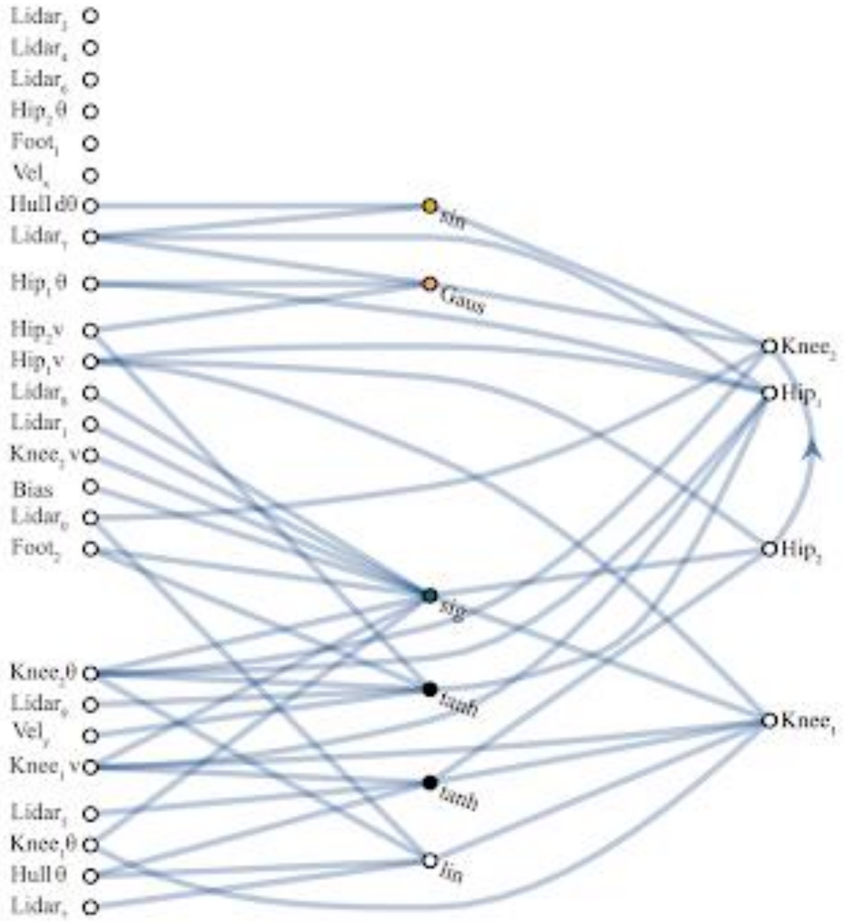
(b) After applying dropout

+ optimize weight {w_i}

Weight Agnostic Net: Idea

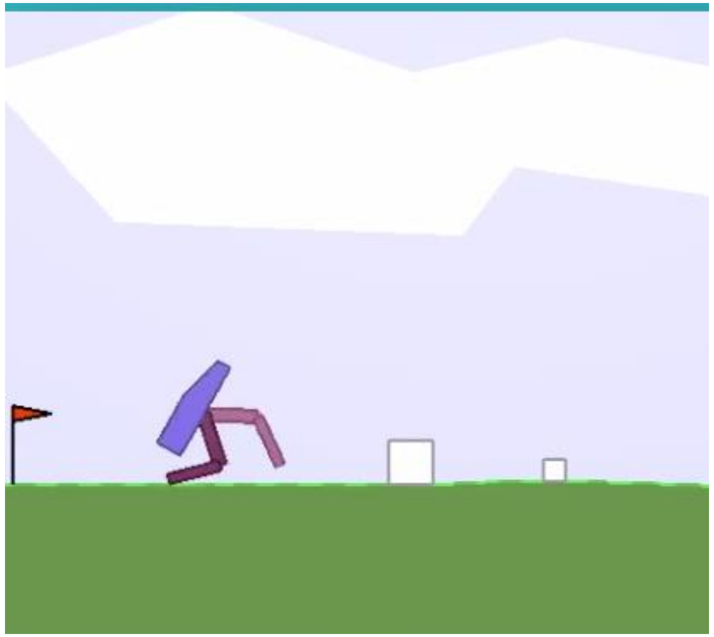


2760 weight parameters



44 connections

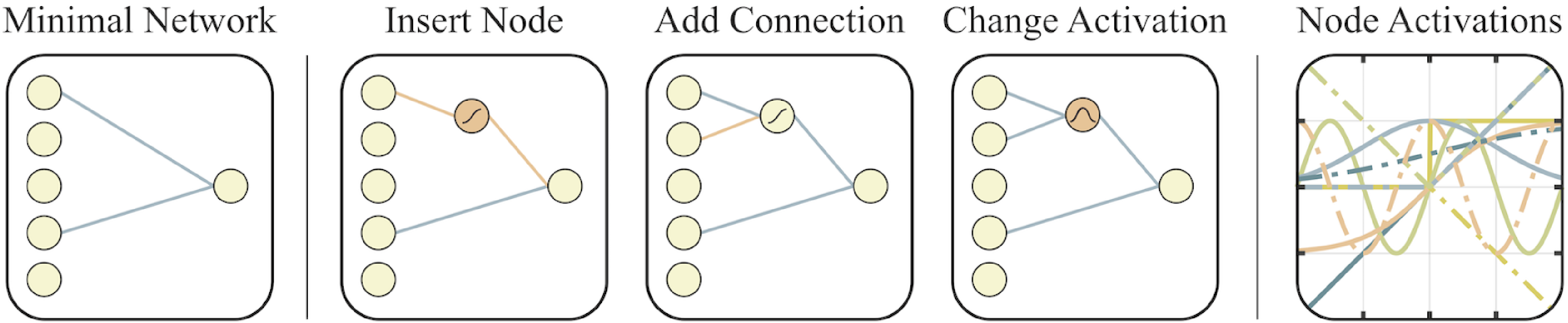
- Single weight
- Search for optimal architecture



BipedalWalker task

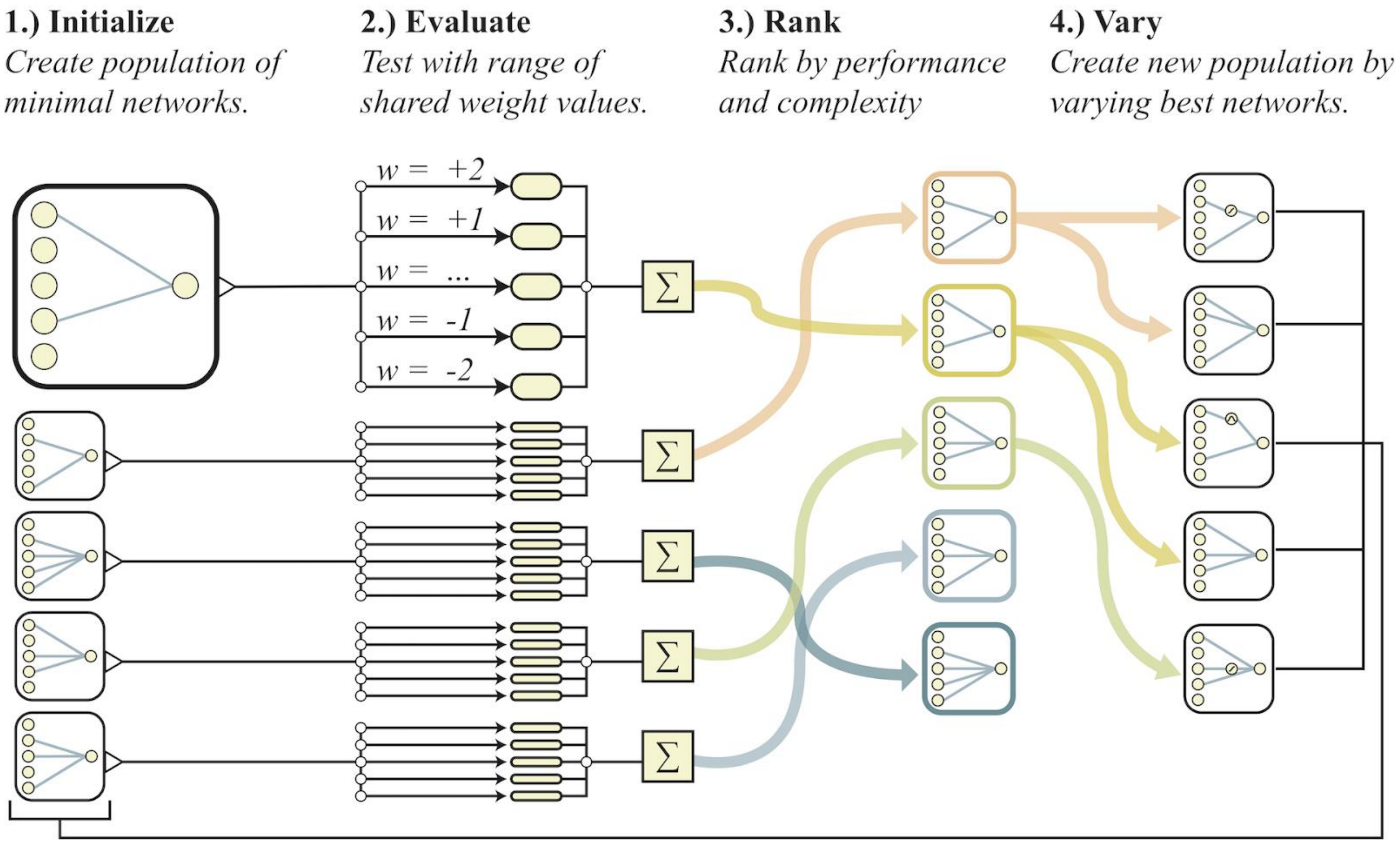
Finding WANNs: main idea

Set of minimal candidates + topology search algorithm (NEAT)

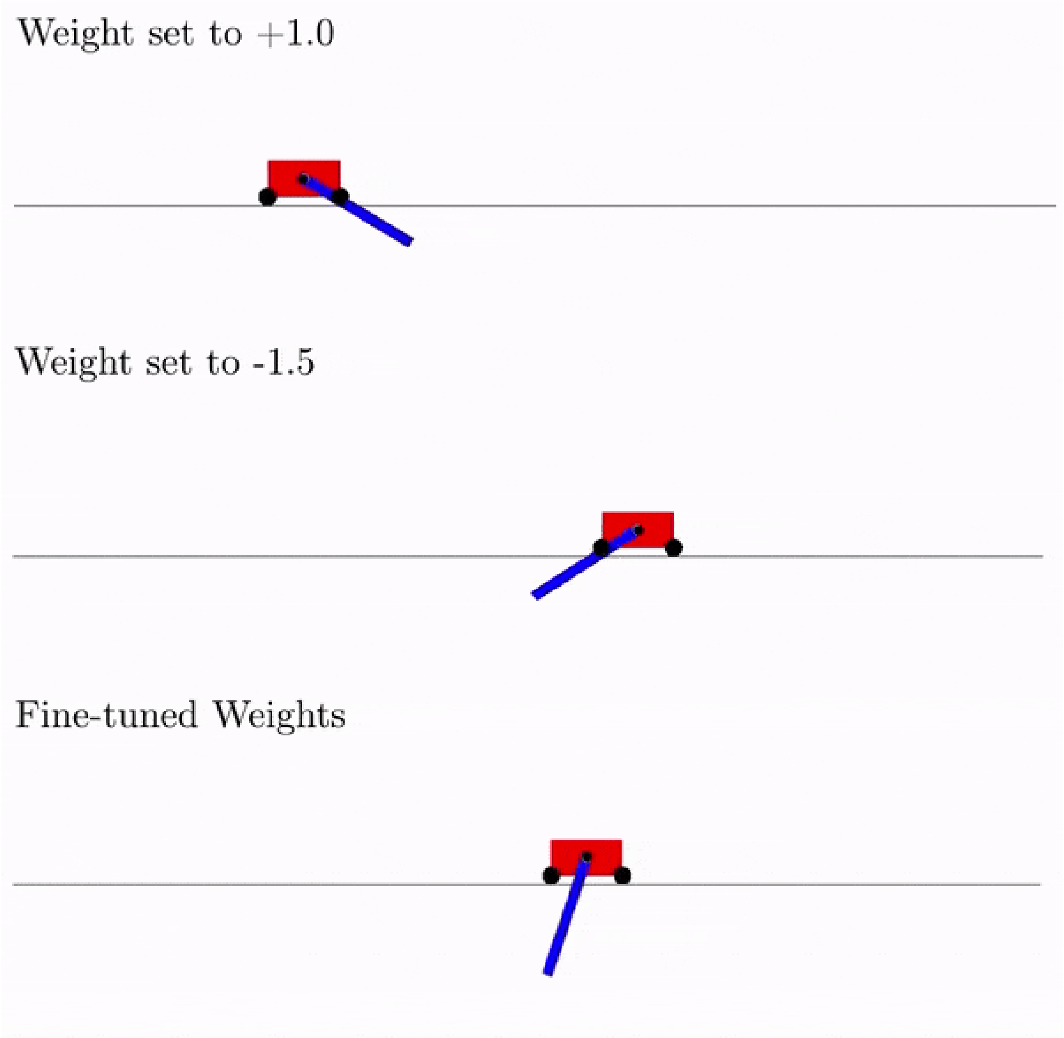


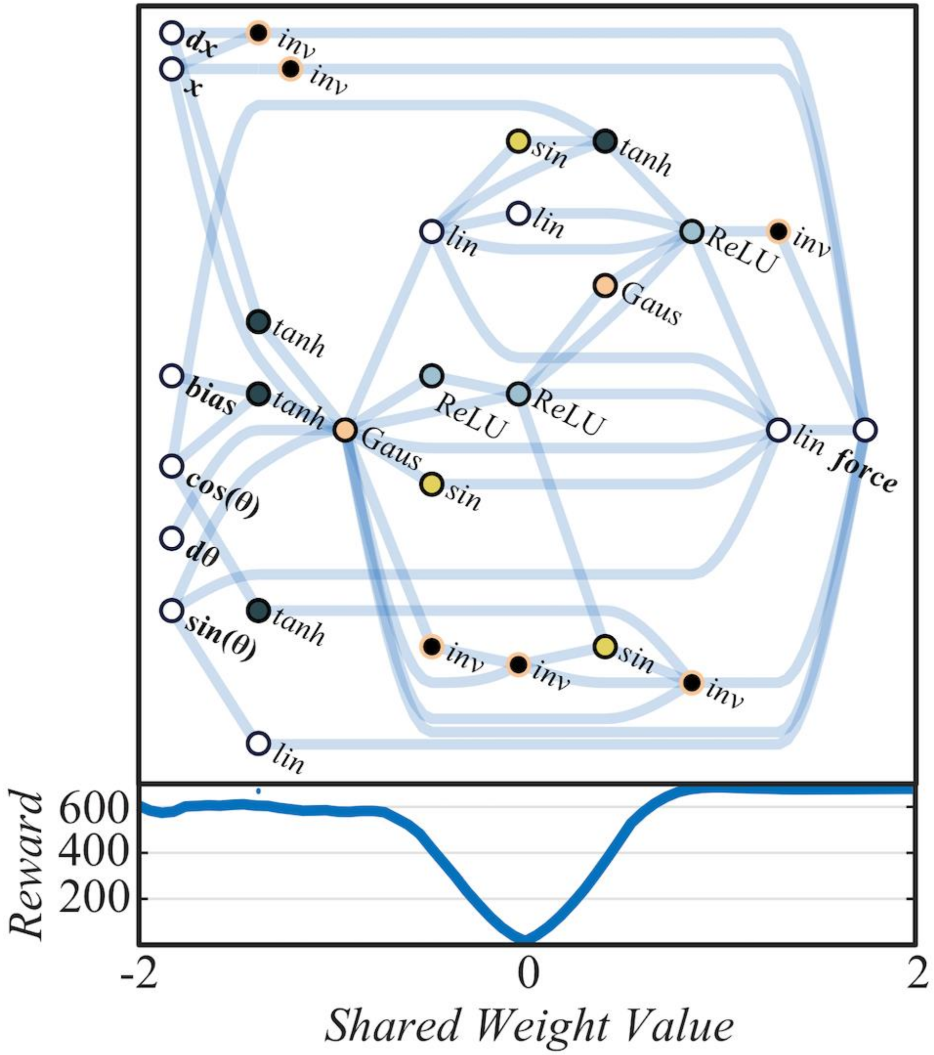
Fixed single (random) weight for all connections

Finding WANNs: algorithm

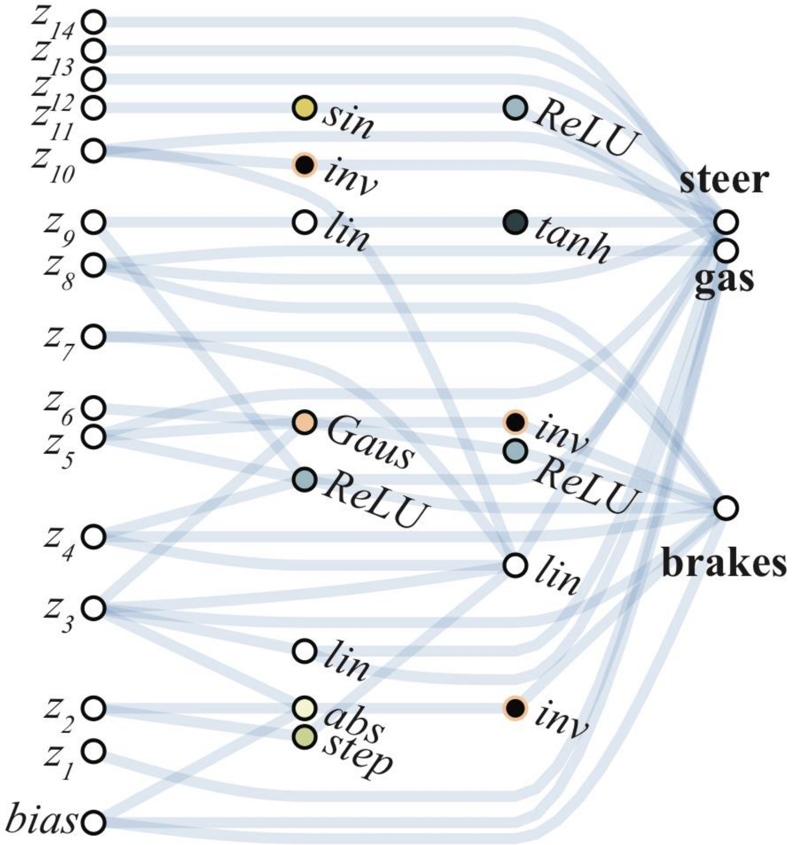

1.) Initialize
Create population of minimal networks.
2.) Evaluate
Test with range of shared weight values.
3.) Rank
Rank by performance and complexity
4.) Vary
Create new population by varying best networks.
w = +2
w = +1
w = ...
w = -1
w = -2
Σ
Σ
Σ
Σ
Σ

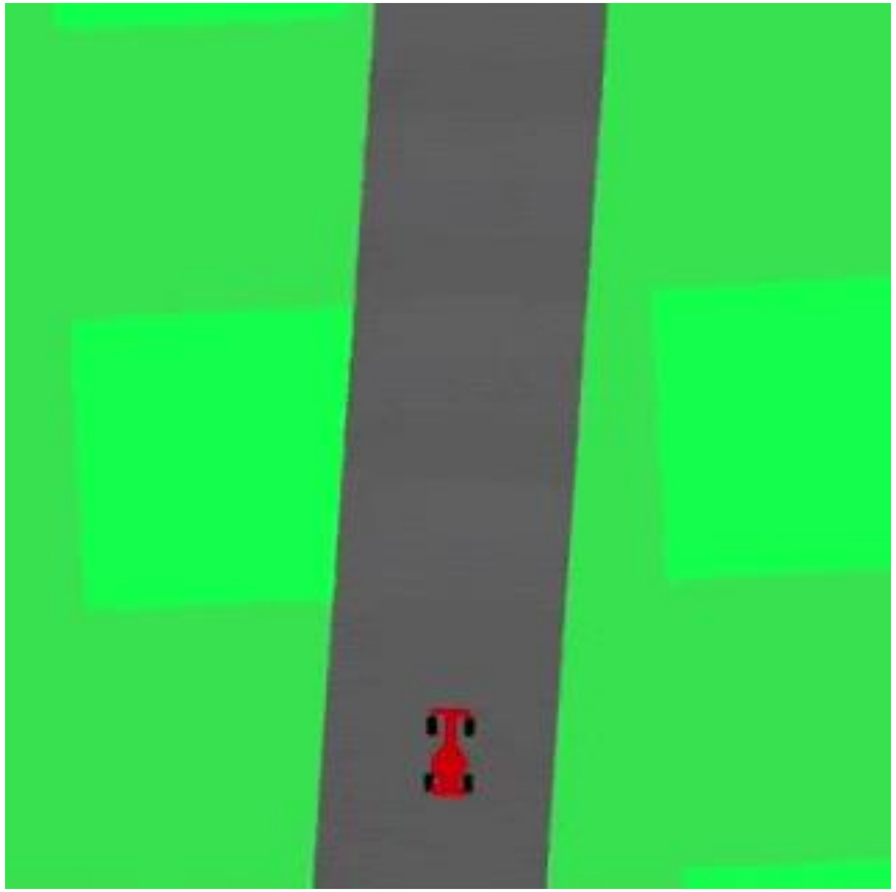
Example: Cartpole Swing-up task





Example 2: Pixel Car Racing





Google AI Blog links

- https://ai.googleblog.com/2019/08/exploring-weight-agnostic-neural.html

- https://weightagnostic.github.io/

- https://github.com/google/brain-tokyo-workshop/blob/master/CONTRIBUTING.md