Where to Score?

TU Delft

1 Background

RoboCup - 1997
World Cup Football for Robots

AI World Cup Football - 2017
Simulated World Cup Football for Robots

TU Delft Framework - 2021
TU Delft created a framework for building teams

2 Research Question

What are the best scoring regions of the goal given the position of the goalkeeper?

1. What is the chance of scoring a goal when aiming at the best scoring region according to the deep learning network compared to simple heuristics?
2. What is the impact of changing subdivisions of the goal (i.e. altering the grid of regions to aim at)?
3. How much will the chance of scoring a goal increase by training against a better goalkeeper?

3 Method

Targeting

Heuristics

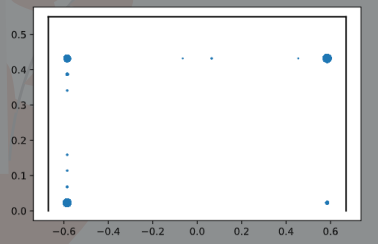
Deep Learning

Evaluation

4 Results

	arc goalkeeper			line goalkeeper		
subdivisions | *attacker*	**random**	**heuristic**	**neural net**	**random**	**heuristic**	**neural net**
12	38%	61%	45%	39%	44%	45%
25	45%	79%	54%	33%	66%	50%
56	35%	77%	58%	37%	74%	40%
100	37%	71%	58%	29%	71%	50%
mean	38.8%	72.0%	53.8%	34.5%	63.8%	46.3%

Percentage of goals scored



Heatmap of targets by NN

5 Conclusion

1. Heuristic attacker outperforms neural network by 17 percentage points.
2. Impact of subdivisions is significant. Up to 30 percentage points for heuristic attacker and 13 for neural network attacker. More is not necessarily better.
3. Performs 'more better' playing against a weaker goalkeeper than the random shooter: 7.5 percentage points compared to 4.3 percentage points.

Marius J.H. Birkhoff
m.j.h.birkhoff@student.tudelft.nl

CSE 3000
Research Project

Professor: **R. Bidarra**
Supervisor: **K. Prakash**