

Beyond Deep Learning: Synthesizing Navigation Programs using Neural Turing Machines

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Goal

Improve the navigation accuracy of self-driving cars

→ **Problem**

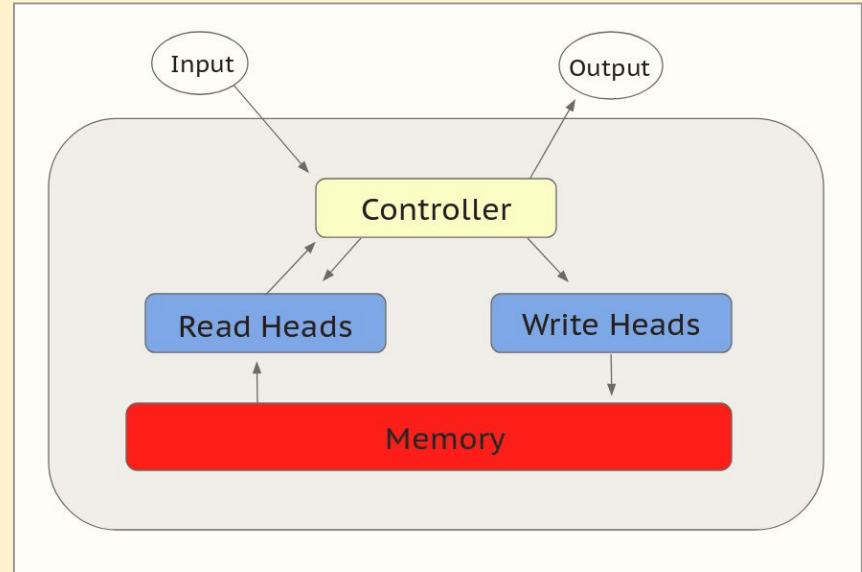
- ◆ Cars currently do not have long-term memory to learn from previous trips

→ **Solution**

- ◆ Enhance the navigation system using a different kind of neural network, Neural Turing Machine, to add memory

What is a Neural Turing Machine?

A Neural Turing Machine (NTM) is a neural network with an external memory structure.

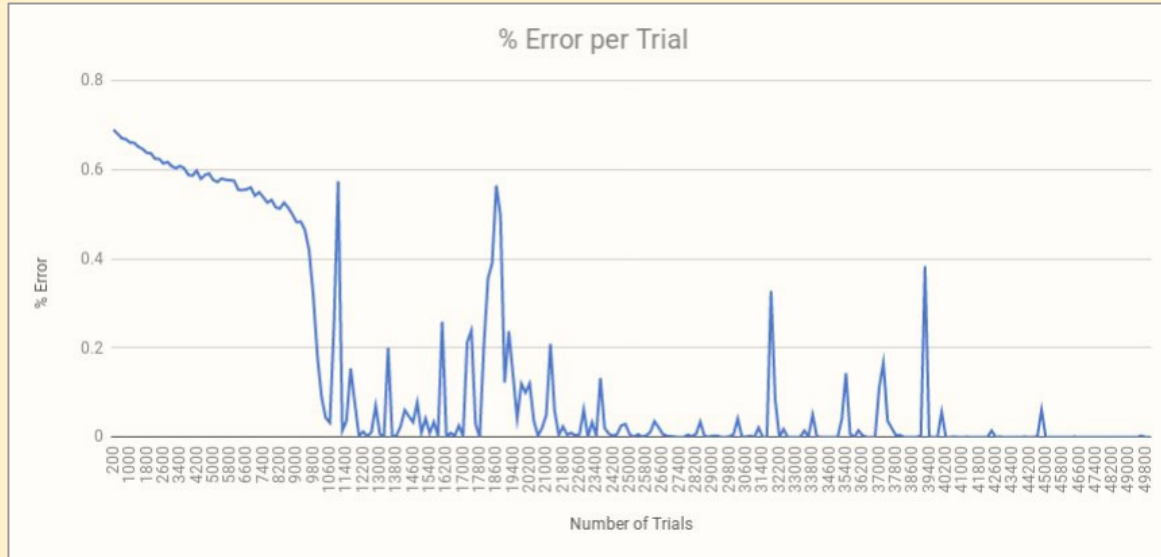


Methods

1. Test if the NTM structure is effective on a simple task
2. Implement a NTM to control a simulated autonomous car

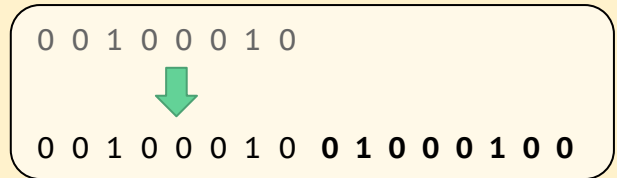
All experiments were written in Python, utilizing machine learning frameworks TensorFlow and PyTorch.

NTM Efficiency for Palindromes



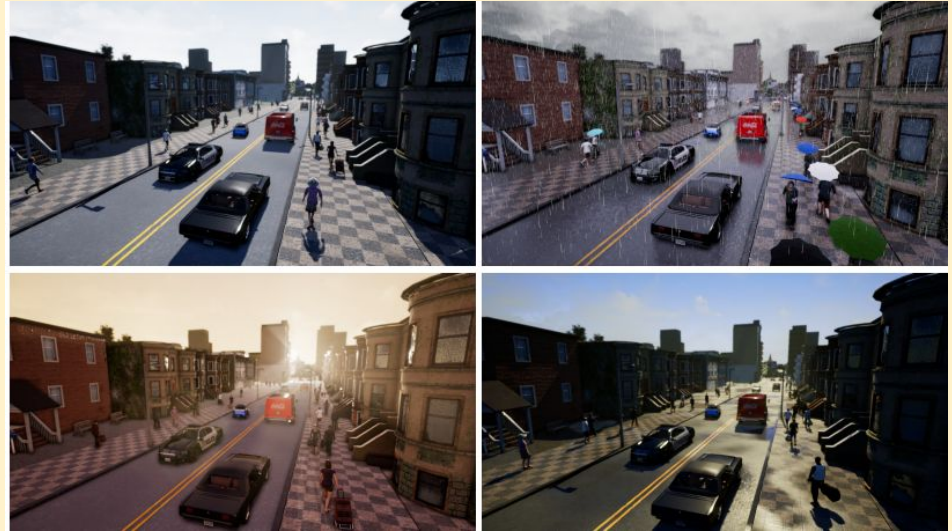
Learning how to make palindromes from bit sequences

- 50,000 trials for training
- 100% accuracy



NTM Efficiency for Car Navigation

Using open-source car simulator CARLA, the car was trained to take a right turn at the first intersection it encountered.



www.carla.org

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Conclusion

The NTM structure was proved useful, as it was able to learn different tasks, sometimes with 100% accuracy.

We hope to apply this to learning more complex tasks, like collision prediction.

Special Thanks To...



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Questions?

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