INCM Project Proposal

Project Proposal: Ablation Studies on Flip-Flop Neurons and Comparison with Traditional as well as novel ML Models

Team Members — *Flippers*

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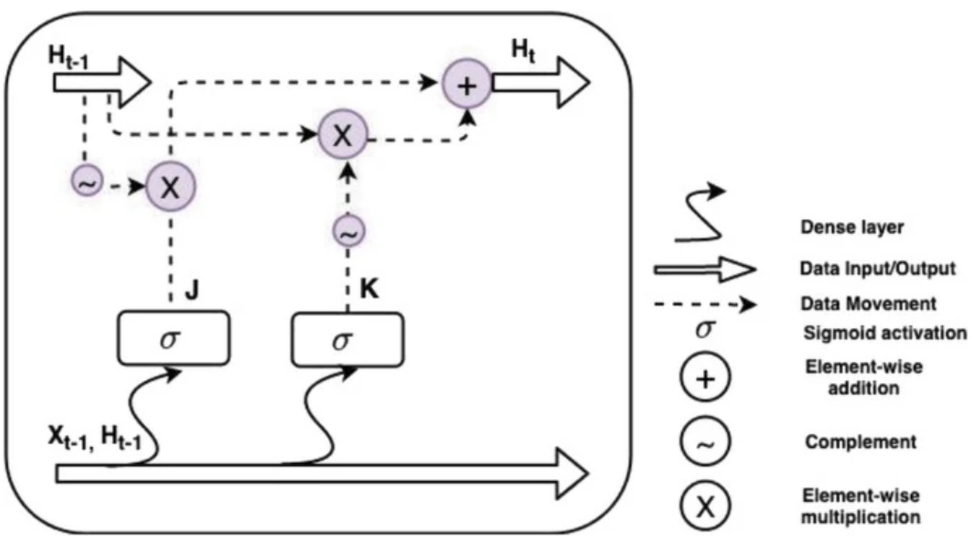
Introduction

We aim to do a comprehensive analysis of the flip-flop neuron model. The proposed model from the paper is based on the JK Flip Flop model from electronics. It can store information over time and tackles issues such as gradient explosion and vanishing. Unlike conventional machine learning models, the flip-flop neuron requires significantly fewer parameters and less memory, making it a compelling alternative for sequence processing tasks. Our objective is to explore the capabilities of this model further and find techniques to enhance it.



The Flip Flop Neuron

Expected Outcomes

We would like to make the following contributions as part of our project:

1. **Comprehensive Literature Review**: A detailed literature review of conventional ML models being used in neural modelling, highlighting their strengths and

weaknesses in comparison to the flip-flop neuron model.

2. **Ablation Study Results**: Abalations over the various parameters of the Flip Flop model and seeing the results, providing insights into which configurations yield optimal results.
3. **Integration of Conventional Techniques**: Addition of techniques from conventional ML into the model such as dropout, skip connections wherever missing and observing the output. We expect to observe how these additions affect model robustness and performance.
4. **Benchmarking Performance**: Benchmarking over different tasks introduced in the paper such as signal generation, sentiment analysis, and action recognition, etc., demonstrating the efficacy of the flip-flop neuron model against established benchmarks.
5. **Comparative Analysis with Novel ML Methods**: A performance comparison between the flip-flop neuron model and other innovative machine learning approaches, such as transformers. This will indicate whether the flip-flop neurons can match or exceed the capabilities of these cutting-edge models and possible open new research directions.

Conclusion

We aim to provide a comprehensive analysis of the model proposed in the paper by examining its performance against traditional machine learning models and adding advanced techniques from ML. Further, we aim to do systematic abaltion studies and benchmarking over various tasks wherein we seek to identify salient parameters and explore potential improvements to the Flip Flop architecture. Ultimately, we hope to gain a deeper understanding of processing in neural systems and possibly explore novel directions in the field.

Thank You.