*Improve UnitTests for Temporal Memory Algorithm*

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*Abstract*—Temporal memory algorithms have gained popularity as a promising approach for modeling temporal sequences in machine learning. This project aims to improve the unit test for the given temporal memory algorithm, which is based on the principles of the cortical column and the neocortex. The algorithm uses a sparse distributed representation of data and incorporates temporal context to predict future values in a sequence. We implemented improvements to the existing unit test, including the addition of more test cases with varying complexity and the implementation of cross-validation techniques for better evaluation of the algorithm's performance. We also optimized the implementation of the algorithm for improved efficiency and scalability.

Keywords— Temporal memory algorithm, Cortical column, Neocortex, Sparse distributed representation

# Introduction

Temporal memory algorithms have been widely used in machine learning for modeling temporal sequences. These algorithms are inspired by the principles of the cortical column and the neocortex, which are responsible for processing sensory information and storing long-term memories in the brain. The Temporal Memory algorithm is a well-known implementation of these principles, which has been used in various applications such as natural language processing, anomaly detection, and stock price prediction.

However, accurately evaluating the performance of the Temporal Memory algorithm can be challenging, especially when dealing with complex and noisy data. Therefore, improving the unit test for this algorithm is crucial for ensuring its accuracy and reliability. In this project, we propose several improvements to the existing unit test for the Temporal Memory algorithm. These improvements include the creation, removal, and update of synapses in distal segments, growth of new dendrite segments, activation of cells in columns, and detection/handling of duplicate active columns.

We also implemented learning and recalling patterns of sequences with different sparsity rates and the ability to initialize Temporal Memory with custom parameters such as the number of cells per column and number of column dimensions. Additionally, we adapted segments and increased the permanence of active synapses, limited the number of active cells per column, and retrieved winner cells from Temporal Memory Compute. Furthermore, we implemented least used cell selection and correct initialization of Connections object and used different parameters for existing unit tests to reinforce testing.

Overall, our project aims to enhance the reliability and accuracy of the unit test for the Temporal Memory algorithm, enabling more accurate evaluation of its performance. This improvement can help advance the development of more robust and reliable algorithms for modeling temporal sequences, benefiting various domains and applications.

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This Part of the text describes results of your works. There can only be mentioned references, MUST point back to Methods and Intro chapter. No more external references.

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*a**b* 

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| Table Head | Table Column Head | | |
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Figure Example Figure Caption

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Referencing Code in your text should be avoided unless necessary. In such cases it can be inserted as a listing as shown in **Error! Reference source not found.**

Listing Code Reference Example

Console.WriteLine(“Referencing code”, var);

// using tab can be replaced with 4 spaces

Do not pass code as image. When referring to variable in **Error! Reference source not found.**, italics should be used for example *var.* Code flows and logic should be presented better as Graph or Diagram instead of words.

Code Block which is too big to put in the textbox can be reference as Listing 2.

Listing Unit Test [EncodeDateTimeTest](https://github.com/ddobric/neocortexapi/blob/0348ffb99739ddf8c8c3a875f8162a18073938ca/source/UnitTestsProject/EncoderTests/DateTimeEncoderExperimentalTests.cs#L34-L49)

public void EncodeDateTimeTest(int w, double r, …)

{

…

DateTimeEncoderExperimental encoder = new…

var result = encoder.Encode(input);

…

Assert.IsTrue(result.SequenceEqual(expected…

}

##### Acknowledgment *(Heading 5)*

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5. R. Nicole, “Title of paper with only first word capitalized,” J. Name Stand. Abbrev., in press.
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7. M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.

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