Paper Title (use style: *paper title*)

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*Abstract*— Serialization is the act of transforming an object or data structure into a format that is simple to store, send, or exchange with other systems or applications. A text-based format, a binary stream, or a structured file format like JSON or XML can all be used for the serialized representation. This paper focuses on the implementation of serialization in Hierarchical Temporal Memory (HTM) classifier and demonstrates how the parameters of HTM classifier can be serialized. A machine learning method called the HTM classifier learns and anticipates patterns in time-series data using the neocortex's structural layout. In this project, Neocortex API focuses implementation of serialization Hierarchical Temporal Memory Classifier in C#/.NET Core. Serialization in the HTM classifier enables the classifier to preserve its state and structure as a file, enabling it to maintain its state over different runs or transfer its state to a different machine. It is helpful for picking up where training stopped off and incorporating the classifier into different programs or frameworks. We have carried out several tests by comparing the serialization and deserialization results in order to get the required outcome.

Keywords—: Classifier, Hierarchical Temporal Memory, Sparse Distributed Representation, neocortex.

# Introduction

A new paradigm in the study of artificial intelligence has emerged as a result of the idea of Hierarchical Temporal Memory (HTM) and Cortical Learning Algorithms (CLA) recently developing. A biomimetic model called HTM-CLA is based on Jeff Hawkins' memory-prediction hypothesis of brain activity. It is a technique for identifying and extrapolating the root causes of observable input patterns and sequences in order to construct an ever-more sophisticated model of the real world. The structure and operation of the human neocortex are the foundation of HTM-CLA. It lays the foundation for creating robots that do numerous cognitive activities at levels close to or higher than those of humans. It is utilized by the NuPIC, a Numenta-led open-source project. Fundamentally, HTM-CLA is a memory-based prediction system. The networks hold a substantial number of patterns and sequences and are trained on time-varying input. It is intrinsically time based and organized hierarchically. HTM-CLA acquires and saves the hierarchy of regions' structure and sequences of data in a special representation known as Sparse Distributed Representation (SDR).

This paper focuses on the application of serialization in an HTM classifier with the goal of outlining the procedure in great detail and emphasizing the advantages of this method. The purpose of serialization is to enable the trained model to be stored to a file or database for subsequent use in an HTM (Hierarchical Temporal Memory) classifier. A stream of bytes that may be saved on storage or sent over a network is created by serializing an object that is now in memory. Deserialization is the process of building an object from stored bytes in the opposite direction. When an HTM classifier has been trained using a set of data, its state may be saved by serializing the classifier. As a result, we can reuse the model instead of always having to train it from scratch. This is especially helpful in situations when the training procedure is computationally expensive or the training data is huge. Moreover, serialization makes it possible to share the model across many contexts or apps. For usage in production settings, a trained HTM classifier, for instance, might be serialized and disseminated to other systems. Overall, trained models become more portable and effective because to serialization, which offers a mechanism to preserve and reuse them.

# Methods

This section should describe your work in details. Here you can use references to your work and external sources.

# Results

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Code examples must be provided to demonstrate how to use the algorithm/module. Provide a reference to more unit tests, which show the same in more detail. Also provide all diagrams with comments and reference to unit tests, which generate diagrams.

# Discussion

Conclusion of your work should be precise and concise. How was the project, what is done, what is the result... There can be discussion on further work and direction.

# Ease of Use

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*a**b* 

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* The subscript for the permeability of vacuum **0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o”.
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## Figures and Tables

For adding object other than text (tables, equations, graphs, figures, code…), **there must be at least one cross reference** to it. Figure 1 is an example

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1. Table Type Styles

| Table Head | Table Column Head | | |
| --- | --- | --- | --- |
| Table column subhead | Subhead | Subhead |
| copy | More table copya |  |  |

1. Sample of a Table footnote. (*Table footnote*)



Figure 1 Example Figure Caption

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization”, or “Magnetization, M”, not just “M”. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization {A[m(1)]}”, not just “A/m”. Do not label axes with a ratio of quantities and units. For example, write “Temperature (K)”, not “Temperature/K”.

## Code References:

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 1 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 2 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)*

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

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1. G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. *(references)*
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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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