***Software Engineering***

***By Damric Dobric/Andreas Pech***

*Migration of video learning project*

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*Abstract*: This paper represents an improving machining learning algorithm Hierarchical Temporal Memory (HTM) which is using Spatial pooler for learning Video data. The SP model shows how neurons learn by feedforward connections and form effective classification of the input frame. It converts binary input pattern into space distributed representation (SDR) by using Cortical Learning rules and homeostatic plasticity control for frame pattern prediction. The result of the learning is tested by giving the trained model an arbitrary image, the model then tries to recreate a video with proceeding frame after the input frame.

Keywords—homeostatic plasticity controller, formatting, division into frames, prediction, training & testing

# **Introduction**

The HTM (Hierarchical Temporal Memory) is based on “Thousand Brains Theory” which explains how an object behaviors and high-level concepts gets tightly replicated across a cortical column but not only on the top layer and gets distributed throughout the neocortex. Here spatial pooler involves different computational principles of the cortex. It depends on competitive Hebbian learning, homeostatic excitability control, topology of connections in sensory cortices and structural plasticity. The HTM Spatial pooler is developed in such a way to achieve a set of computational properties which includes 1. Preserving topology of the input space by mapping similar inputs to similar outputs 2. Continuously adapting to changing statistics of the input stream 3. Forming fixed sparsity representations 4. Being robust to noise and 5. Being fault tolerant that supports computations with SDRs (Sparse Distributed Representations). The output of the SP which is the integral component of HTM can be easily recognized by downstream neurons and contribute to improved performance in the end-to-end HTM system.

This type of works forecasting that Machine Learning (ML) or statistical modelling emphasis here is to enable the reader to understand on some of ML or statistical techniques actively used in past and till the present moment.

# Mthods

## Creating Video Files

There are different ways to create training videos of object recognition but we chose to create our object videos. As we worked on the previous “[**neocortexapi-videolearning**](https://github.com/ddobric/neocortexapi-videolearning)” project we had video data set for recognizing circle, triangle and rectangle. With the help of previous python [codes](https://github.com/ddobric/neocortexapi-videolearning/tree/main/DataGeneration) we created training video-set for a line moving around the 120x120 frame.

## Reading Video

To train a video to a machine learning program one has to divide it into picture frames. As like brain, frames are the point of reference to the recognition program.

# Prepare Your Paper Before Styling

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Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

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may use the solidus ( / ), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

*a**b* 

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## Some Common Mistakes

* The word “data” is plural, not singular.
* The subscript for the permeability of vacuum **0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o”.
* In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
* A graph within a graph is an “inset”, not an “insert”. The word alternatively is preferred to the word “alternately” (unless you really mean something that alternates).
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* Do not confuse “imply” and “infer”.
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* There is no period after the “et” in the Latin abbreviation “et al.”.
* The abbreviation “i.e.” means “that is”, and the abbreviation “e.g.” means “for example”.

An excellent style manual for science writers is [7].

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1. Table Type Styles

| Table Head | Table Column Head | | |
| --- | --- | --- | --- |
| Table column subhead | Subhead | Subhead |
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2. Example of a figure caption. (*figure caption*)

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##### 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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