A Manuscript Microscope 'Sentence Audit' of:

Meta-learning local synaptic plasticity for continual familiarity detection

What is the Manuscript Microscope Sentence Audit?

The Manuscript Microscope Sentence Audit is a research paper introspection system that parses the text of your manuscript into minimal sentence components for faster, more accurate, enhanced proofreading.

Why use a Sentence Audit to proofread your manuscript?

- Accelerated Proofreading: Examine long technical texts in a fraction of the usual time.
- Superior Proofreading: Detect subtle errors that are invisible to traditional methods.
- Focused Proofreading: Inspect each individual sentence component in isolation.
- Reliable Proofreading: Ensure every single word of your manuscript is correct.
- Easier Proofreading: Take the hardship out of crafting academic papers.

Bonus 1: Improved Productivity: Rapidly refine rough drafts to polished papers.
Bonus 2: Improved Authorship: Cultivate a clear, concise, consistent, writing style.
Bonus 3: Improved Reputation: Become known for rigorously precise publications.

Manuscript Source: https://www.biorxiv.org/content/10.1101/2021.03.21.436287v1

Manuscript Authors: Danil Tyulmankov, Guangyu Robert Yang & LF Abbott

Audit Date: 31/03/21 **Audit Identifier:** X4AE5I5U8W842G9 **Code Version:** 3.6

Features of the Sentence Audit:

The Sentence Audit combines two complementary proofreading approaches:

1. Each sentence of your text is parsed and displayed in isolation for focused inspection.
2. Each individual sentence is further parsed into Minimal Sentence Components for a deeper review of the clarity, composition and consistency of the language you used.

The Minimal Sentence Components shown are the smallest coherent elements of each sentence of your text as derived from it's conjunctions, prepositions and selected punctuation symbols (i.e. commas, semicolons, round and square brackets).

The combined approaches ensure easier, faster, more effective proofreading.

Comments and Caveats:

• The sentence parsing is achieved using a prototype natural language processing pipeline written in Python and may include occasional errors in sentence segmentation.

• Depending on the source of the input text, the Sentence Audit may contain occasional html artefacts that are parsed as sentences (E.g. "Download figure. Open in new tab").

• Always consult the original research paper as the true reference source for the text.

Contact Information:

To get a Manuscript Microscope Sentence Audit of any other research paper, simply forward any copy of the text to John.James@OxfordResearchServices.com.

All queries, feedback or suggestions are also very welcome.

Research Paper Sections:

The sections of the research paper input text parsed in this audit.

Section No.	Headings	Sentences
Section: 1	Abstract	8
Section: 2	Introduction	19
N/A	--- --- --- --- --- --- ---	0
N/A	--- --- --- --- --- --- ---	0
N/A	--- --- --- --- --- --- ---	0
N/A	--- --- --- --- --- --- ---	0
N/A	--- --- --- --- --- --- ---	0
N/A	--- --- --- --- --- --- ---	0
N/A	--- --- --- --- --- --- ---	0
N/A	--- --- --- --- --- --- ---	0
N/A	--- --- --- --- --- --- ---	0

The Sentence Audit Of The Research Paper

Title

Meta-learning local synaptic plasticity for continual familiarity detection

S1 [001] Abstract

S1 [002] Over the course of a lifetime, a continual stream of information is encoded and retrieved from memory.

Over the course ...
... of a lifetime, ...
... a continual stream ...
... of information is encoded ...
... and retrieved ...
... from memory.

S1 [003] To explore the synaptic mechanisms that enable this ongoing process, we consider a continual familiarity detection task in which a subject must report whether an image has been previously encountered.

To explore the synaptic mechanisms ...
... that enable this ongoing process, ...
... we consider a continual familiarity detection task ...
... in which a subject must report ...
... whether an image has been previously encountered.

S1 [004] We design a class of feedforward neural network models endowed with biologically plausible synaptic plasticity dynamics, the parameters of which are meta-learned to optimize familiarity detection over long delay intervals.

We design a class ...
... of feedforward neural network models endowed ...
... with biologically plausible synaptic plasticity dynamics, ...
... the parameters ...
... of which are meta-learned ...
... to optimize familiarity detection ...
... over long delay intervals.

S1 [005] After training, we find that anti-Hebbian plasticity leads to better performance than Hebbian and replicates experimental results from the inferotemporal cortex, including repetition suppression.

After training, ...
... we find ...
... that anti-Hebbian plasticity leads ...
... to better performance ...
... than Hebbian ...
... and replicates experimental results ...
... from the inferotemporal cortex, ...
... including repetition suppression.

S1 [006] Unlike previous models, this network both operates continuously without requiring any synaptic resets and generalizes to intervals it has not been trained on.

Unlike previous models, ...
... this network both operates continuously ...
... without requiring any synaptic resets ...
... and generalizes ...
... to intervals it has not been trained on.

S1 [007] We demonstrate this not only for uncorrelated random stimuli but also for images of real-world objects.

We demonstrate this not ...
... only ...
... for uncorrelated random stimuli ...
... but also ...
... for images ...
... of real-world objects.

S1 [008] Our work suggests a biologically plausible mechanism for continual learning, and demonstrates an effective application of machine learning for neuroscience discovery.

Our work suggests a biologically plausible mechanism ...
... for continual learning, ...
... and demonstrates an effective application ...
... of machine learning ...
... for neuroscience discovery.

S2 [009] Introduction

S2 [010] Every day, a continual stream of sensory information and internal cognitive processing causes lasting synaptic changes in our brains that alter our responses to future stimuli.

Every day, ...
... a continual stream ...
... of sensory information ...
... and internal cognitive processing causes lasting synaptic changes ...
... in our brains ...
... that alter our responses ...
... to future stimuli.

S2 [011] It remains a mystery how neural activity and local synaptic updates coordinate to support distributed storage and readout of information and, in particular, how ongoing synaptic changes due to either new memories or homeostatic mechanisms do not interfere with previously stored information.

It remains a mystery how neural activity ...
... and local synaptic updates coordinate ...
... to support distributed storage ...

... and readout ...
... of information and, ...
... in particular, ...
... how ongoing synaptic changes ...
... due to either new memories ...
... or homeostatic mechanisms do not interfere ...
... with previously stored information.

S2 [012] Memory research in theoretical neuroscience and machine learning has addressed these questions through modeling studies, but important features remain to be clarified.

Memory research ...
... in theoretical neuroscience ...
... and machine learning has addressed these questions ...
... through modeling studies, ...
... but important features remain ...
... to be clarified.

S2 [013] First, memories of an individual's history are encoded in a one-shot manner – this is different from typical neural network models which use a prolonged incremental training process to learn a complex task.

First, ...
... memories ...
... of an individual's history are encoded ...
... in a one-shot manner – this is different ...
... from typical neural network models ...
... which use a prolonged incremental training process ...
... to learn a complex task.

S2 [014] Such training algorithms use a global error signal and perform per-synapse credit assignment through knowledge of the entire network (Rumelhart et al., 1986), whereas biological synapses typically only have access to local pre- and postsynaptic activity (Hebb, 1949) and various modulatory signals (Frémaux and Gerstner, 2016; Gerstner et al., 2018).

Such training algorithms use a global error signal ...
... and perform per-synapse credit assignment ...
... through knowledge ...
... of the entire network ...
... (Rumelhart et al., 1986), ...
... whereas biological synapses typically ...
... only have access ...
... to local pre- ...
... and postsynaptic activity ...
... (Hebb, 1949) ...
... and various modulatory signals ...
... (Frémaux ...
... and Gerstner, 2016; ...
... Gerstner et al., 2018).

S2 [015] Second, biological synapses change continually in response to ongoing activity, whereas models commonly assume that synapses are fixed after training ends, such as the classical Hopfield network (Hopfield, 1982) and most deep neural networks (LeCun et al., 2015).

Second, ...

... biological synapses change continually ...

... in response ...

... to ongoing activity, ...

... whereas models commonly assume ...

... that synapses are fixed ...

... after training ends, ...

... such as the classical Hopfield network ...

... (Hopfield, 1982) ...

... and most deep neural networks ...

... (LeCun et al., 2015).

S2 [016] Unregulated continual updating of synapses can cause catastrophic forgetting in which a network either erases previous memories (Kirkpatrick et al., 2017; Zenke et al., 2017) or renders stored information unreadable (Parisi, 1986).

Unregulated continual updating ...

... of synapses can cause catastrophic forgetting ...

... in which a network either erases previous memories ...

... (Kirkpatrick et al., 2017; ...

... Zenke et al., 2017) ...

... or renders stored information unreadable ...

... (Parisi, 1986).

S2 [017] Recurrent neural networks are commonly used to perform tasks that involve memories sustained by neural activity (Elman, 1991; Hochreiter and Schmidhuber, 1997; Mante et al., 2013), however most memories are likely stored through synaptic potentiation and depression (Abbott and Nelson, 2000).

Recurrent neural networks are commonly used ...

... to perform tasks ...

... that involve memories sustained ...

... by neural activity ...

... (Elman, 1991; ...

... Hochreiter ...

... and Schmidhuber, 1997; ...

... Mante et al., 2013), ...

... however most memories are likely stored ...

... through synaptic potentiation ...

... and depression ...

... (Abbott ...

... and Nelson, 2000).

S2 [018] Synaptic memory has sometimes been studied through an ideal observer approach (Benna and Fusi, 2016; Fusi et al., 2005) in which synaptic weights are directly accessible for readout, but biological organisms must read out synaptic storage through neuronal activations.

Synaptic memory has sometimes been studied ...

... through an ideal observer approach ...

... (Benna ...

... and Fusi, 2016; ...

... Fusi et al., 2005) ...

... in which synaptic weights are directly accessible ...

End of Sample Audit

This is a truncated Manuscript Microscope Sample Audit.

To get the full audit of this text (or any other research paper), forward a copy of the research paper to John James at John.James@OxfordResearchServices.com