A Manuscript Microscope 'Sentence Audit' of:

Parallel inference of hierarchical latent dynamics in two-photon calcium imaging of neuronal populations

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.
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Bonus 1: Improved Productivity: Rapidly refine rough drafts to polished papers.
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Manuscript Source: https://www.biorxiv.org/content/10.1101/2021.03.05.434105v1

Manuscript Authors: Luke Y. Prince, Shahab Bakhtiari, Colleen J. Gillon & Blake A. Richards

Audit Date: 29/03/21 **Audit Identifier:** E3EUC9832B6IVF9 **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	15
Section: 2	INTRODUCTION	12
N/A	--- --- --- --- --- --- ---	0
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The Sentence Audit Of The Research Paper

Title **Parallel inference of hierarchical latent dynamics in two-photon calcium imaging of neuronal populations**

S1 [001] Abstract

S1 [002] Dynamic latent variable modelling has provided a powerful tool for understanding how populations of neurons compute.

Dynamic latent variable modelling has provided a powerful tool ...
... for understanding how populations ...
... of neurons compute.

S1 [003] For spiking data, such latent variable modelling can treat the data as a set of point-processes, due to the fact that spiking dynamics occur on a much faster timescale than the computational dynamics being inferred.

For spiking data, ...
... such latent variable modelling can treat the data ...
... as a set ...
... of point-processes, ...
... due to the fact ...
... that spiking dynamics occur ...
... on a much faster timescale ...
... than the computational dynamics being inferred.

S1 [004] In contrast, for other experimental techniques, the slow dynamics governing the observed data are similar in timescale to the computational dynamics that researchers want to infer.

In contrast, ...
... for other experimental techniques, ...
... the slow dynamics governing the observed data are similar ...
... in timescale ...
... to the computational dynamics ...
... that researchers want ...
... to infer.

S1 [005] An example of this is in calcium imaging data, where calcium dynamics can have timescales on the order of hundreds of milliseconds.

An example ...
... of this is ...
... in calcium imaging data, ...
... where calcium dynamics can have timescales ...
... on the order ...
... of hundreds ...
... of milliseconds.

S1 [006] As such, the successful application of dynamic latent variable modelling to modalities like calcium imaging data will rest on the ability to disentangle the deeper- and shallower-level dynamical systems' contributions to the data.

As such, ...
... the successful application ...
... of dynamic latent variable modelling ...
... to modalities like calcium imaging data will rest ...
... on the ability ...
... to disentangle the deeper- ...
... and shallower-level dynamical systems' contributions ...
... to the data.

S1 [007] To-date, no techniques have been developed to directly achieve this.

To-date, ...
... no techniques have been developed ...
... to directly achieve this.

S1 [008] Here we solve this problem by extending recent advances using sequential variational autoencoders for dynamic latent variable modelling of neural data.

Here we solve this problem ...
... by extending recent advances ...
... using sequential variational autoencoders ...
... for dynamic latent variable modelling ...
... of neural data.

S1 [009] Our system VaLPACa (Variational Ladders for Parallel Autoencoding of Calcium imaging data) solves the problem of disentangling deeper- and shallower-level dynamics by incorporating a ladder architecture that can infer a hierarchy of dynamical systems.

Our system VaLPACa ...
... (Variational Ladders ...
... for Parallel Autoencoding ...
... of Calcium imaging data) ...
... solves the problem ...
... of disentangling deeper- ...
... and shallower-level dynamics ...
... by incorporating a ladder architecture ...
... that can infer a hierarchy ...
... of dynamical systems.

S1 [010] Using some built-in inductive biases for calcium dynamics, we show that we can disentangle calcium flux from the underlying dynamics of neural computation.

Using some built-in inductive biases ...
... for calcium dynamics, ...
... we show ...
... that we can disentangle calcium flux ...
... from the underlying dynamics ...
... of neural computation.

S1 [011] First, we demonstrate with synthetic calcium data that we can correctly disentangle an underlying Lorenz attractor from calcium dynamics.

First, ...
... we demonstrate ...
... with synthetic calcium data ...
... that we can correctly disentangle an underlying Lorenz attractor ...
... from calcium dynamics.

S1 [012] Next, we show that we can infer appropriate rotational dynamics in spiking data from macaque motor cortex after it has been converted into calcium fluorescence data via a calcium dynamics model.

Next, ...
... we show ...
... that we can infer appropriate rotational dynamics ...
... in spiking data ...
... from macaque motor cortex ...
... after it has been converted ...
... into calcium fluorescence data ...
... via a calcium dynamics model.

S1 [013] Finally, we show that our method applied to real calcium imaging data from primary visual cortex in mice allows us to infer latent factors that carry salient sensory information about unexpected stimuli.

Finally, ...
... we show ...
... that our method applied ...
... to real calcium imaging data ...
... from primary visual cortex ...
... in mice allows us ...
... to infer latent factors ...
... that carry salient sensory information ...
... about unexpected stimuli.

S1 [014] These results demonstrate that variational ladder autoencoders are a promising approach for inferring hierarchical dynamics in experimental settings where the measured variable has its own slow dynamics, such as calcium imaging data.

These results demonstrate ...
... that variational ladder autoencoders are a promising approach ...
... for inferring hierarchical dynamics ...
... in experimental settings ...
... where the measured variable has its own slow dynamics, ...
... such as calcium imaging data.

S1 [015] Our new, open-source tool thereby provides the neuroscience community with the ability to apply dynamic latent variable modelling to a wider array of data modalities.

Our new, ...
... open-source tool thereby provides the neuroscience community ...
... with the ability ...
... to apply dynamic latent variable modelling ...

... to a wider array ...

... of data modalities.

S2 [016] INTRODUCTION

S2 [017] Dynamic latent variable modelling has been a hugely successful approach to understanding the function of neural circuits.

Dynamic latent variable modelling has been a hugely successful approach ...

... to understanding the function ...

... of neural circuits.

S2 [018] For example, it has been used to uncover previously unknown mechanisms for computation in the motor cortex 1,2, somatosensory cortex 3, and hippocampus 4.

For example, ...

... it has been used ...

... to uncover previously unknown mechanisms ...

... for computation ...

... in the motor cortex 1,2, ...

... somatosensory cortex 3, ...

... and hippocampus 4.

S2 [019] However, the success of this approach is largely limited to datasets where the observed variables have dynamics whose timescales are much faster than the dynamics of the underlying computations.

However, ...

... the success ...

... of this approach is largely limited ...

... to datasets ...

... where the observed variables have dynamics whose timescales are much faster ...

... than the dynamics ...

... of the underlying computations.

S2 [020] This is the case, for example, with spiking data, where the dynamics governing the generation of individual spikes are much faster than the dynamics of computation across the circuit.

This is the case, ...

... for example, ...

... with spiking data, ...

... where the dynamics governing the generation ...

... of individual spikes are much faster ...

... than the dynamics ...

... of computation ...

... across the circuit.

End of Sample Audit

This is a truncated Manuscript Microscope Sample Audit.

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