



MODOC: A Modularized Interface for Flexible Interlinking of Text Retrieval and Generation Functions

Demonstration Guideline for ACL 2024 submission

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Richard H.R. Hahnloser¹

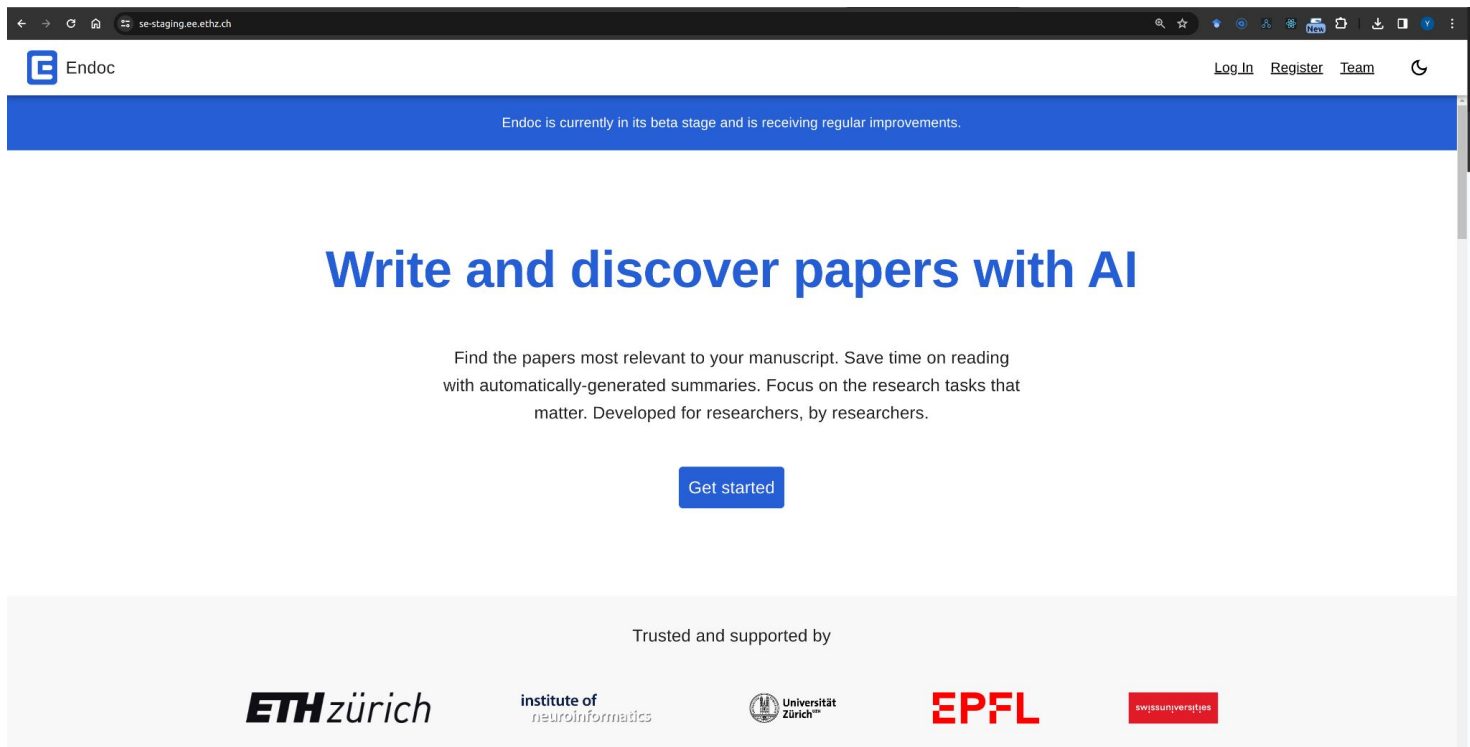
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Log in and Get started

Visit <https://se-staging.ee.ethz.ch/>



The screenshot shows a web browser window with the address bar displaying "se-staging.ee.ethz.ch". The website header features the "Endoc" logo on the left and navigation links "Log In", "Register", and "Team" on the right. A blue banner below the header states: "Endoc is currently in its beta stage and is receiving regular improvements." The main content area has a large blue heading "Write and discover papers with AI". Below this, a paragraph reads: "Find the papers most relevant to your manuscript. Save time on reading with automatically-generated summaries. Focus on the research tasks that matter. Developed for researchers, by researchers." A blue "Get started" button is centered below the text. The footer section, titled "Trusted and supported by", displays logos for "ETH zürich", "institute of neuroinformatics", "Universität Zürich", "EPFL", and "swissuniversities".

Endoc

Log In Register Team

Endoc is currently in its beta stage and is receiving regular improvements.

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Find the papers most relevant to your manuscript. Save time on reading with automatically-generated summaries. Focus on the research tasks that matter. Developed for researchers, by researchers.

Get started

Trusted and supported by

ETH zürich

institute of neuroinformatics

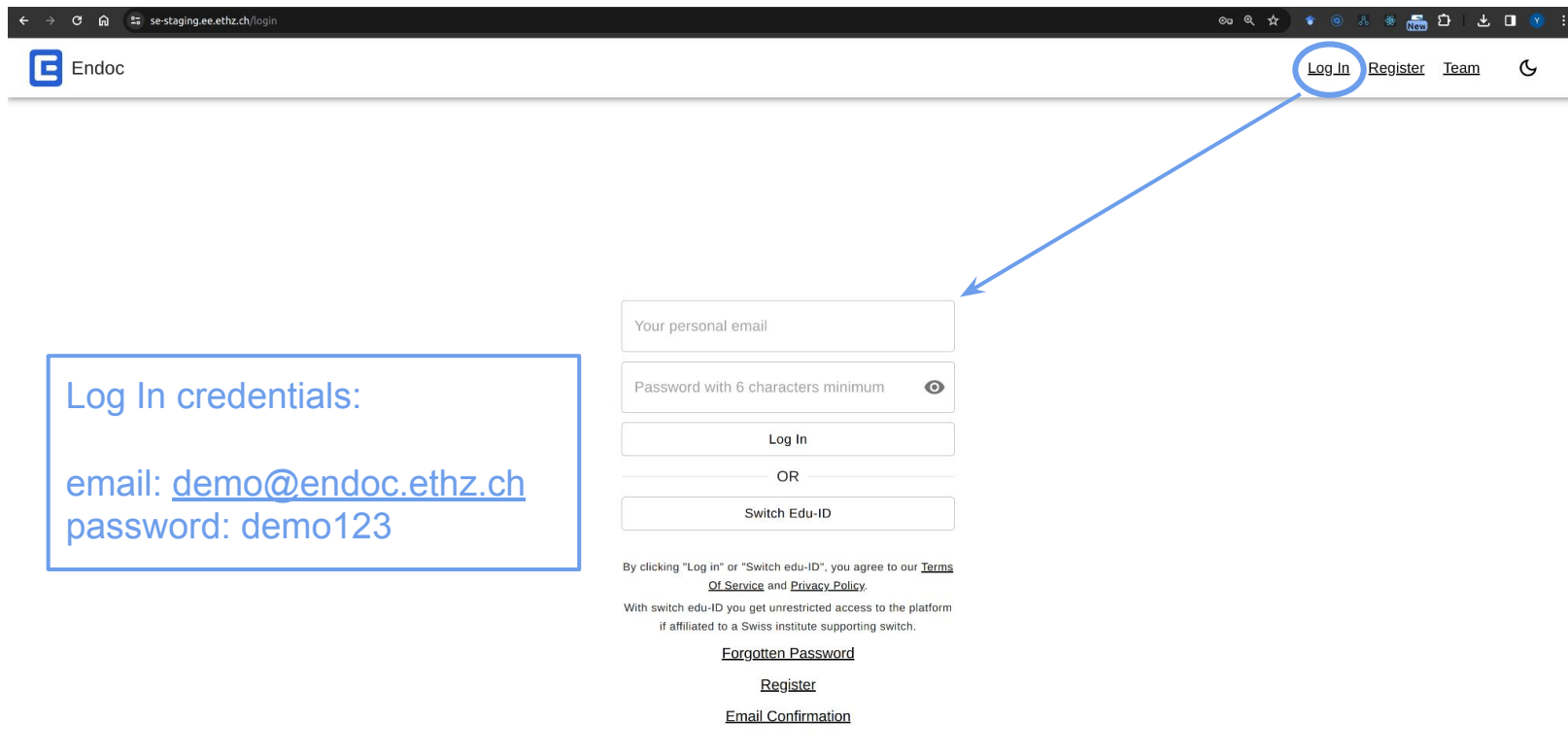
Universität Zürich

EPFL

swissuniversities

Log in and Get started

Use the provided log in credentials



The screenshot shows a web browser at the URL `se-staging.ee.ethz.ch/login`. The page header includes the Endoc logo and navigation links: [Log In](#), [Register](#), and [Team](#). The [Log In](#) link is circled in blue, with a blue arrow pointing from it to the login form. On the left, a blue-bordered box contains the login credentials. The login form consists of two input fields: 'Your personal email' and 'Password with 6 characters minimum' (with a toggle icon). Below these are buttons for 'Log In' and 'Switch Edu-ID', separated by an 'OR' label. At the bottom, there are links for 'Forgotten Password', 'Register', and 'Email Confirmation'.

Log In credentials:

email: demo@endoc.ethz.ch
password: demo123

Your personal email

Password with 6 characters minimum

Log In

OR

Switch Edu-ID

By clicking "Log in" or "Switch edu-ID", you agree to our [Terms Of Service](#) and [Privacy Policy](#).

With switch edu-ID you get unrestricted access to the platform if affiliated to a Swiss institute supporting switch.

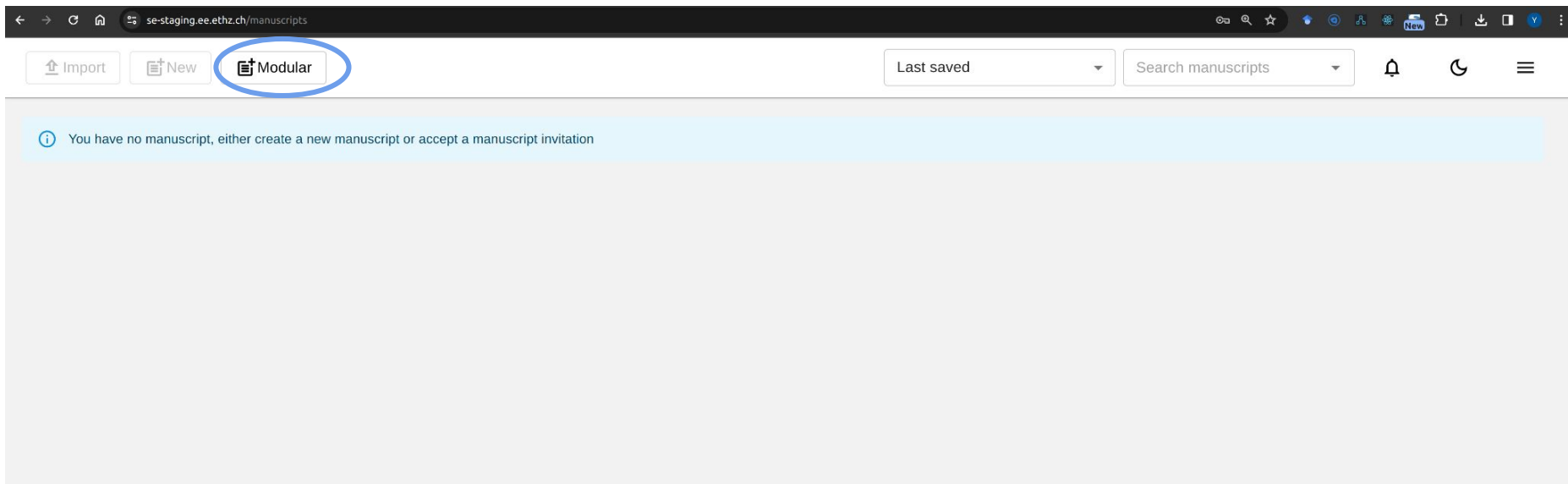
[Forgotten Password](#)

[Register](#)

[Email Confirmation](#)

Log in and Get started

Click on Modular



Construct Manuscript

Click on Write module and construct the manuscript

Zai et al. 2022 bioRxiv

The screenshot shows a web application interface for constructing a manuscript. The top navigation bar includes a 'Write' module icon, which is circled in blue. A 'Write' modal window is open, displaying a text area with the text 'Untitled' and a 'Save' button. Blue arrows point from the 'Write' icon and the text area to explanatory text boxes.

Goal-directed vocal planning in a songbird

Speech planning is an important part of human communication and the inability to plan speech is manifest in disorders such as apraxia. But to what extent is targeted vocal planning an entirely human ability? Many animals are capable of volitional control of vocalizations (), but are they also capable of planning to selectively adapt their vocalizations towards a target, such as when striving to reduce the pitch mismatch of a note in a song?

Function: Keyword-based Literature Discovery

Keywords

2. Click "Fire" button

Keywords

Title:songbirds × |Type a keyword (e.g. vocal learning) and press Enter... × ^

search in Title NOT ☐ Year Range

1. Input keywords and press Enter

Task: find papers using keywords

4. Click "Fire" button again

3. Add suggested keyword to refine the literature discovery results

Keywords

Keywords

Title:songbirds × Semantic:regulator × |Type a keyword (e.g. vocal learning) and press Enter... × ^

search in Title NOT ☐ Year Range


✓ Suggested keywords from the retrieved papers (click to add): ×

unlikely frontier acoustic spatial structure konik horse

click to add



Function: Keyword-based Literature Discovery

6. Retrieved papers are listed in the Discovery module

 **Discovery**

Source
Anywhere

5. Click “Fire” button in Discovery module

 Successfully retrieved the most relevant papers out of 26 papers in just 734 ms! 

[A supergene underlies linked variation in color and morphology in a Holarctic songbird](#)
Funk, Erik R. Mason, Nicholas A. Pálsson, Snæbjörn.... - Nature Communications - 2021

[Genetics and evidence for balancing selection of a sex-linked colour polymorphism in a songbird](#)
Kim, Kang-Wook. Jackson, Benjamin C. Zhang, Hanyuan.... - Nature Communications - 2019

[Short-term mercury exposure disrupts muscular and hepatic lipid metabolism in a migrant songbird](#)
Seewagen, Chad L. Elowe, Cory R. Gerson, Alexander R.... - Scientific Reports - 2022

[The neurogenomic transition from territory establishment to parenting in a territorial female songbird](#)
Bentz, Alexandra B. Bentz, Alexandra B. Rusch, Douglas B.... - BMC Genomics - 2019

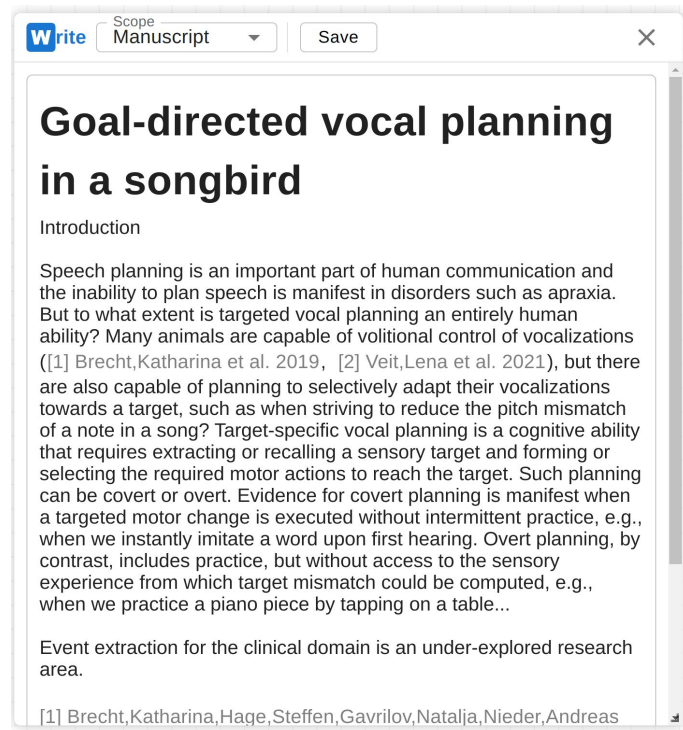
   

[Molecular specializations of deep cortical layer analogs in songbirds](#)

Function: Semantic-based Literature Discovery

1. Set scope in Write module as “Manuscript”



Write Scope: Manuscript Save

Goal-directed vocal planning in a songbird

Introduction

Speech planning is an important part of human communication and the inability to plan speech is manifest in disorders such as apraxia. But to what extent is targeted vocal planning an entirely human ability? Many animals are capable of volitional control of vocalizations ([1] Brecht, Katharina et al. 2019, [2] Veit, Lena et al. 2021), but there are also capable of planning to selectively adapt their vocalizations towards a target, such as when striving to reduce the pitch mismatch of a note in a song? Target-specific vocal planning is a cognitive ability that requires extracting or recalling a sensory target and forming or selecting the required motor actions to reach the target. Such planning can be covert or overt. Evidence for covert planning is manifest when a targeted motor change is executed without intermittent practice, e.g., when we instantly imitate a word upon first hearing. Overt planning, by contrast, includes practice, but without access to the sensory experience from which target mismatch could be computed, e.g., when we practice a piano piece by tapping on a table...

Event extraction for the clinical domain is an under-explored research area.

[1] Brecht, Katharina, Hage, Steffen, Gavrilov, Natalja, Nieder, Andreas

Task: find papers using entire manuscript

2. Set scope in Discovery module as “Manuscript”



Discovery Source: Manuscript

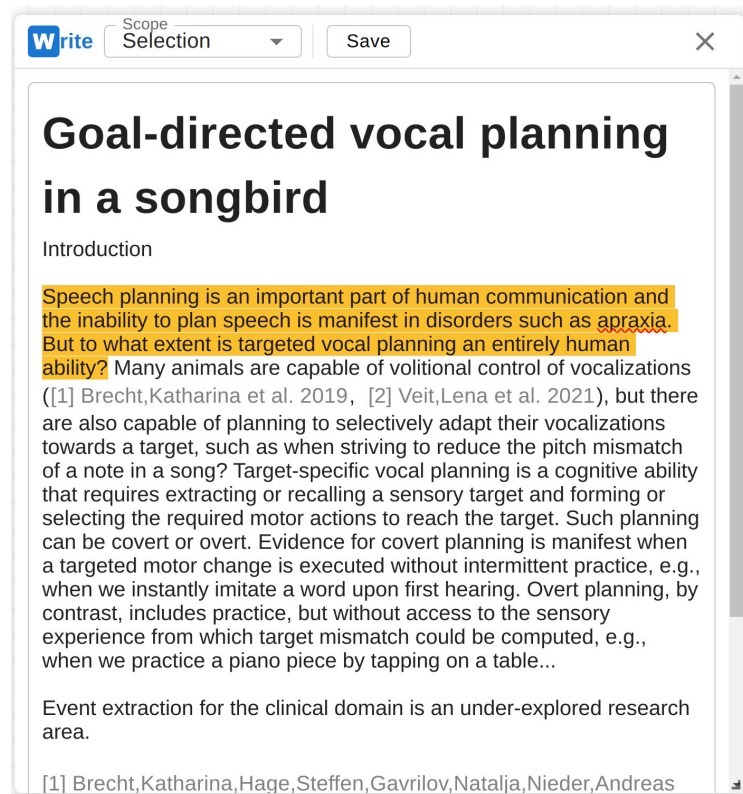
3. Click “Fire” button

✓ Successfully retrieved the most relevant papers out of 5909192 papers in just 1866 ms!

Sequence and hierarchy in vocal rhythms and phonology Fitch, W. Tecumseh. - Annals of the New York Academy of Sciences - 2019	🔍 + 📄 ⬇️
Vocal effort modulates the motor planning of short speech structures Taitz, Alan. Shalom, Diego. Trevisan, Marcos. - 2018	🔍 + 📄 ⬇️
Abnormal laughter-like vocalisations replacing speech in primary progressive aphasia - Journal of the Neurological Sciences - 2009	🔍 + 📄 ⬇️
SARA speech —Feasibility of automated assessment of ataxic speech disturbance Grobe-Einsler, M. Grobe-Einsler, M. Faber, J.... - NPJ Digital Medicine - 2023	🔍 + 📄 ⬇️
Cortical Thickness in Children Receiving Intensive Therapy for Idiopathic Apraxia of Speech	🔍 + 📄 ⬇️

Function: Semantic-based Literature Discovery

1. Set scope in Write module as “Selection”



Write Scope Selection Save

Goal-directed vocal planning in a songbird

Introduction

Speech planning is an important part of human communication and the inability to plan speech is manifest in disorders such as apraxia. But to what extent is targeted vocal planning an entirely human ability? Many animals are capable of volitional control of vocalizations ([1] Brecht, Katharina et al. 2019, [2] Veit, Lena et al. 2021), but there are also capable of planning to selectively adapt their vocalizations towards a target, such as when striving to reduce the pitch mismatch of a note in a song? Target-specific vocal planning is a cognitive ability that requires extracting or recalling a sensory target and forming or selecting the required motor actions to reach the target. Such planning can be covert or overt. Evidence for covert planning is manifest when a targeted motor change is executed without intermittent practice, e.g., when we instantly imitate a word upon first hearing. Overt planning, by contrast, includes practice, but without access to the sensory experience from which target mismatch could be computed, e.g., when we practice a piano piece by tapping on a table...

Event extraction for the clinical domain is an under-explored research area.

[1] Brecht, Katharina, Hage, Steffen, Gavrilov, Natalja, Nieder, Andreas

Task: find papers using selected content in manuscript

2. Set scope in Discovery module as “Manuscript”



Discovery Source Manuscript

3. Click “Fire” button

Successfully retrieved the most relevant papers out of 5909192 papers in just 1580 ms!

Pantomime of tool use: looking beyond apraxia
Osiurak, François. Osiurak, François. Reynaud, Emanuele.... - Brain Communications - 2021

Vocal effort modulates the motor planning of short speech structures
Taitz, Alan. Shalom, Diego. Trevisan, Marcos.- 2018

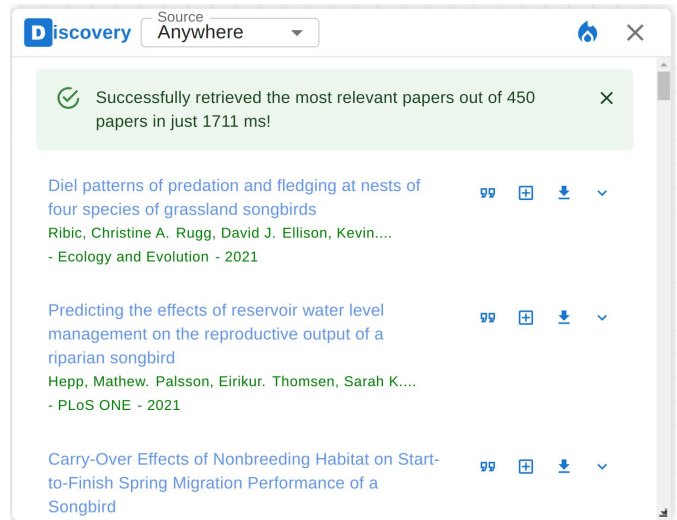
Behavioral, computational, and neuroimaging studies of acquired apraxia of speech
Ballard, Kirrie J. Tourville, Jason A. Tourville, Jason A.... - Frontiers in Human Neuroscience - 2014

Language Impairments in Individuals With Coffin-Siris Syndrome
Vasko, Ashley. Schrier Vergano, Samantha A. Schrier Vergano, Samantha A.- Frontiers in Neuroscience - 2022

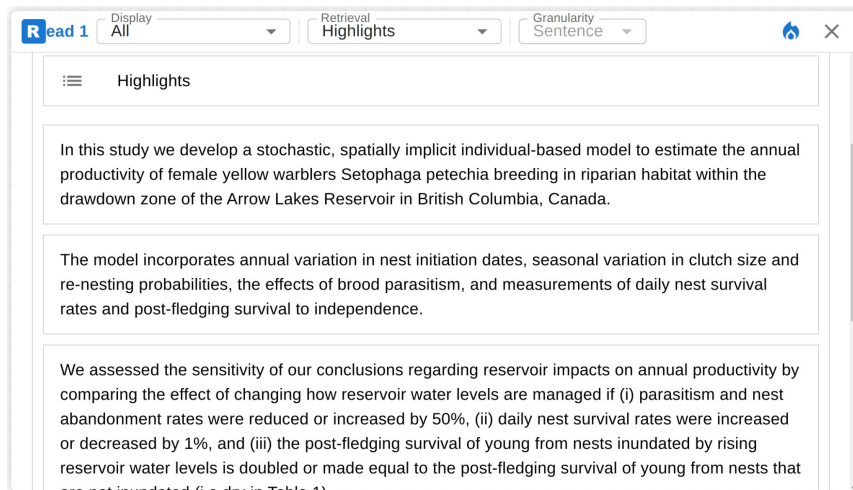
Abnormal laughter-like vocalizations replacing speech in primary progressive aphasia

Function: Paper Summarization

1. Click on paper title to open it in a Read module



2. Set "Retrieval" to "Highlights"



Task: get summary for the reading paper

3. Get summary in listed view



Function: Text Alignment

1. Set “Retrieval” as “none” for the source paper

3. Set “Retrieval” as “Align Read 1” for the target paper

Read 1 Display All Retrieval none Granularity Sentence

Daou, Arij. Daou, Arij. Margoliash, Daniel.

DOI Link

Abstract

Neurons regulate their intrinsic physiological properties, which could influence network properties and contribute to behavioral plasticity. Recording from adult zebra finch brain slices we show that within each bird basal ganglia Area X-projecting (HVC X) neurons share similar spike waveform morphology and timing of spike trains, with modeling indicating similar magnitudes of five principal ion currents. These properties vary among birds in lawful relation to acoustic similarity of the birds' songs, with adult sibling pairs (same songs) sharing similar waveforms and spiking characteristics. The properties are maintained dynamically: HVC X within juveniles learning to sing show variable properties, whereas the uniformity rapidly degrades within hours in adults singing while exposed to abnormal (delayed) auditory feedback. Thus, within individual birds the population of current magnitudes covary over the arc of development, while rapidly responding to changes in feedback (in adults). This identifies network interactions with intrinsic properties that affect information storage and processing of learned vocalizations. The regulation of cellular neuronal properties distinct from synaptic plasticity has been proposed as a mechanism of functional network organization. Here, the authors show that the magnitude of five ion currents in basal ganglia projection song system forebrain neurons covary across life, rapidly and dynamically relating to learned features of individual zebra finches' songs.

Read 2 Display All Retrieval Align Read 1 Granularity Sentence

Source:

Neurons regulate their intrinsic physiological properties, which could influence network properties and contribute to behavioral plasticity. Recording from adult zebra finch brain slices we show that within each bird basal ganglia Area X-projecting (HVC X) neurons share similar spike waveform morphology and timing of spike trains, with modeling indicating similar magnitudes of five principal ion currents.

Text Aligned successfully! Click the buttons on the right to navigate! Previous Next Overview

mechanisms need not be mutually exclusive and they would air be interrupted by deatening. Their action could give rise to the behavior that Marler et al. [9] referred to as "improvisation". But even with these caveats, the fact remains that hearing dependent "improvisation" is known to occur only in bird species that show vocal imitation, suggesting that these two behaviors share underlying mechanisms.

Here we study the early development of vocal learning and its circuitry in a songbird, the chipping sparrow, by examining major characteristic of vocal learning: its dependence on auditory feedback, a protracted vocal ontogeny [16], [20], and its association with a specialized forebrain song system [21]; these features are absent in vocal non-learners [5]-[7], [22]-[24]. Our results reveal that the first vocalizations of male chipping sparrows, the food begging calls, show features that are associated with the production of learned sounds.

5. The most relevant contents are highlighted in the paper (brightness scales to relevance)

Task: given a text in source paper, find its most relevant content in target paper

Function: Text Generation

Task: generate a citation sentence for the reading paper

1. Set the API as “Citation Generation”

2. Select the paper to generate citation sentence



3. Select the citation intent, e.g. as “background”

Generation 1

Select API
Citation Genera... ▼


Paper to cite
Diel patterns o... ▼

Citation intent
background ▼

4. Click “Fire” button

In #REFR, the authors present a model for songbirds that learns to predict the next syllable in a bird's song. |

Insert 

generated citation sentence

Example Workflow: Retrieve and Cite

Task: find papers to cite for the text “Many animals are capable of volitional control of vocalizations ()”

Zai et al. 2022 bioRxiv

The screenshot shows the Endoc web interface with the following components and workflow steps:

- Title Bar:** Displays the title "Goal-directed vocal planning in a songbird" and a search bar.
- Document Selection Panel (Left):**
 - 1. Select scope "selection":** The "Scope" dropdown is set to "Selection".
 - 2. Select text in the manuscript with the mouse:** The text "Many animals are capable of volitional control of vocalizations ()" is highlighted in the manuscript snippet.
- Keyword Input Panel (Middle):**
 - 3. Input keyword "songbirds" and press Enter:** The keyword "songbirds" is entered in the "Keywords" field.
 - 5. Click "Fire" button:** A blue arrow points to the "Fire" button (a flame icon) in the bottom right corner of the panel.
- Discovery Panel (Bottom):**
 - 4. Select scope "Manuscript":** The "Source" dropdown is set to "Manuscript".
 - Successfully retrieved the most relevant papers out of 1 papers in just 202 ms!** A green notification bar indicates the search results.
 - Retrieved Paper:** "Volitional control of vocalizations in corvid songbirds" by Brecht, Katharina F. Hage, Steffen R. Gavrilov, Natalja,.... - PLoS Biology - 2019.

Example Workflow: Retrieve and Cite

Task: find papers to cite for the text “Many animals are capable of volitional control of vocalizations ()”

Zai et al. 2022 bioRxiv

The screenshot shows a web application interface with a top navigation bar and several floating panels. The top bar includes a browser address bar with the URL 'se-staging.ee.ethz.ch/modular/55f020a2774cbe001a936705', a search icon, and various utility icons. Below the bar, there's a 'Title' field containing 'Goal-directed vocal planning in a songbird' and an 'Endoc' button. To the right of the title field are social media sharing icons (G, D, W, K, L, R) and a home icon. The interface is divided into three main panels:

- Write Selection Panel (Left):** Contains the title 'Goal-directed vocal planning in a songbird' and a paragraph of text: 'Speech planning is an important part of human communication and the inability to plan speech is manifest in disorders such as apraxia. But to what extent is targeted vocal planning an entirely human ability? Many animals are capable of volitional control of vocalizations ([1] K. F. Brecht et al., [2019]), but are they also capable of planning to selectively adapt their vocalizations towards a target, such as when striving to reduce the pitch mismatch of a note in a song?'. Below the text is a citation: '[1] K. F. Brecht, S. R. Hage, N. Gavrilov, A. Nieder, "Volitional control of vocalizations in corvid songbirds", PLoS Biology, [2019].'. A blue arrow labeled '7. Cite the correct paper in the cursor position' points to the citation.
- Keywords Panel (Top Right):** Has a 'Keywords' input field with the text 'Title:songbirds'. Below it is a section 'Suggested keywords from the retrieved papers (click to add):' with buttons for 'addition', 'nogo', and 'onset'. A blue arrow labeled '5. Read the abstract' points to this panel.
- Discovery Panel (Bottom Right):** Has a 'Source' dropdown menu set to 'Manuscript'. It displays a search result for 'Volitional control of vocalizations in corvid songbirds' by 'Brecht, Katharina F. Hage, Steffen R. Gavrilov, Natalja...' from 'PLoS Biology - 2019'. Below the title is an 'Abstract' section with the text: 'Songbirds are renowned for their acoustically elaborate songs. However, it is unclear whether songbirds can cognitively control their vocal output. Here, we show that crows, songbirds of the corvid family, can be trained to exert control over their vocalizations. In a detection task, three male carrion crows rapidly learned to emit vocalizations in response to a visual cue with no inherent meaning (go trials) and to withhold vocalizations in response to another cue (catch trials). Two of these crows were then trained on a go/nogo task, with the cue colors reversed, in addition to being rewarded for withholding vocalizations to yet another cue (nogo trials). Vocalizations in response to the detection of the go cue were temporally precise and highly reliable in all three crows. Crows also quickly learned to withhold vocal output in nogo trials, showing that vocalizations were not produced by an anticipation of a food reward in correct trials. The results demonstrate that corvids can volitionally control the release and onset of their vocalizations, suggesting that songbird vocalizations are under cognitive control and can be decoupled from affective states. Songbirds are renowned for their acoustically elaborate songs, but it is unclear whether they have cognitive control over their vocal output. Using operant conditioning, this study shows that carrion crows, songbirds of the corvid family, can exert control over their vocalizations.' A blue arrow labeled '6. Cite the paper' points to the title of the paper.

Example Workflow: Generate and Check

Task: Generate a citation sentence for a paper and check against the paper

1. Select relevant sentences in a paper

Read 1 | Display: All | Retrieval: none | Granularity: Sentence

Vocal learning promotes patterned inhibitory connectivity
2017
Nature Communications
Miller, Mark N. Cheung, Chung Yan J. Brainard, Michael S.

[DOI Link](#)

Abstract

Skill learning is instantiated by changes to functional connectivity within premotor circuits, but whether the specificity of learning depends on structured changes to inhibitory circuitry remains unclear. We used slice electrophysiology to measure connectivity changes associated with song learning in the avian analog of primary motor cortex (robust nucleus of the arcopallium, RA) in Bengalese Finches. Before song learning, fast-spiking interneurons (FSIs) densely innervated glutamatergic projection neurons (PNs) with apparently random connectivity. After learning, there was a profound reduction in the overall strength and number of inhibitory connections, but this was accompanied by a more than two-fold enrichment in reciprocal FSI-PN connections. Moreover, in singing birds, we found that pharmacological manipulations of RA's inhibitory circuitry drove large shifts in learned vocal features, such as pitch and amplitude, without grossly disrupting the song. Our results indicate that skill learning establishes nonrandom inhibitory connectivity, and implicates this patterning in encoding specific features of learned movements. Complex motor behaviors such as birdsong are learned through practice and are thought to depend on specific excitatory connectivity in premotor circuits.

5. Check the generated citation sentences against the aligned text in the paper for factuality and faithfulness

2. Generate the citation sentence for the paper

Generation 1 | Select API: Citation Genera... | Paper to cite: Vocal learning ... | Citation intent: background

The vocal learning hypothesis #REFR proposes that the evolution of language was driven by the need to communicate about the environment.

[Insert](#)

4. Click "Fire" button

Read 1 | Display: All | Retrieval: Align Generation 1 | Granularity: Sentence

Source: 3. In the paper, set "Retrieval" to "Align Generation 1"

The vocal learning hypothesis #REFR proposes that the evolution of language was driven by the need to communicate about the environment.

✓ Text Aligned successfully! Click the buttons on the right to navigate! [Previous](#) [Next](#) [Overview](#)

generating appropriate behavior. Nonrandom patterns of connectivity among excitatory neurons are a feature of many systems, and plasticity of specific excitatory connections is considered central to the capacity of networks to produce appropriate output 5–8. However, whether learning shapes inhibitory connectivity to achieve comparable specificity 9,10 or instead promotes diffuse, nonspecific inhibition 11 is unclear. The development of temporally precise activation of a diffuse inhibitory network may be sufficient to structure premotor activity during vocal learning 12, yet formation of specific inhibitory connectivity in simulated networks is also sufficient to stably encode complex activity patterns 13. This motivated us to ask how learning shapes inhibitory connectivity in songbirds, where robust vocal learning is subserved by a well-characterized premotor network.

We used a slice preparation of the avian vocal premotor nucleus RA (Fig. 1a) to examine changes to motor circuitry over the course of vocal learning. Glutamatergic RA projection neurons (PNs) that innervate vocal and respiratory motoneurons 14 produce highly structured activity