

RCR Short Course: “Responsible Use of AI in Neuroscience Research and Education”

Friday, 11/10/23 1-5:30 pm WCC 150

Packet of Course Activities and Resources

Establishing Common Ground

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Term	Definition
AI (Artificial Intelligence)	A branch of computer science that aims to create intelligent machines capable of simulating human-like cognitive functions, such as learning, reasoning, problem-solving, and decision-making.
Responsible AI	The ethical and accountable development, deployment, and use of AI systems, considering the potential impact on society, privacy, fairness, and safety.
Ethical Frameworks	Guiding principles and moral guidelines that help determine the ethical and responsible use of AI in neuroscience research and education.
Bias in AI	Systematic errors or unfairness in AI algorithms, which can result in discriminatory outcomes, especially when using biased training data.
Fairness	Ensuring that AI systems do not discriminate against individuals or groups based on factors such as race, gender, or socioeconomic status.
Explainable AI (XAI)	AI systems that provide transparent and understandable explanations for their decisions and predictions, especially in critical applications like neuroscience.
Privacy and Data Security	Protecting sensitive and personal data used in AI applications to prevent unauthorized access, use, or disclosure.
Data Ethics	Ethical considerations surrounding the collection, use, and sharing of data in neuroscience research and education, including informed consent and data anonymization.
Transparency	The openness and clarity in AI processes, algorithms, and decision-making, enabling stakeholders to understand and scrutinize the technology.
Model Validation	The process of evaluating and verifying the performance and accuracy of AI models, ensuring their reliability in neuroscience applications.
Robustness	The ability of AI models to perform consistently and accurately under various conditions, including unexpected or adversarial inputs.
Human-AI Collaboration	The integration of AI tools with human expertise and judgment in neuroscience research and education to enhance decision-making and problem-solving.

Bias Mitigation	Strategies and techniques to reduce bias in AI models and ensure that they provide more equitable and unbiased results.
Interdisciplinary Collaboration	Encouraging collaboration between experts in neuroscience, AI, ethics, and related fields to ensure responsible and effective use of AI in neuroscience research and education.
Regulatory Compliance	Adherence to legal and ethical regulations and standards governing AI applications in neuroscience, such as data protection and research ethics.
Neuromorphic Computing	AI and computing systems designed to mimic the structure and function of the human brain, potentially enhancing neuroscience research.
Neuroethics	The study of ethical and societal implications associated with advances in neuroscience, including the responsible use of AI.
Human Dignity	The fundamental principle that individuals should be treated with respect and their rights preserved when conducting AI-driven neuroscience research and education.
Neuroinformatics	The field that applies informatics and data science methods to neuroscience research, utilizing AI for data analysis and interpretation.
Meta-Learning	A type of machine learning where a model learns how to learn, adapting its parameters or architecture to perform better on new tasks with minimal training.
Dropout Probability	A hyperparameter in neural networks that represents the probability of randomly dropping (deactivating) a neuron during training to prevent overfitting.
Hyperparameters	Parameters of a neural network that are set before training begins and determine its architecture and behavior, such as learning rate, batch size, and layer size.
Backpropagation (Backprop)	A supervised learning algorithm used to train neural networks, involving the calculation of gradients for model weights and the adjustment of weights to minimize the error.
Gradient Descent	An optimization technique used in training neural networks to update model parameters iteratively by moving in the direction of steepest descent on a loss surface, reducing the model's error.
Credit Assignment	The process of attributing the error or credit for a neural network's prediction to the various weights and neurons in the network, which is essential for learning and optimization.

Activation Function	A mathematical function applied to the output of a neuron in a neural network to introduce non-linearity, allowing the network to model complex relationships and learn more effectively.
Loss Function	A mathematical function that quantifies the difference between the predicted values and the actual values in the training data, used to measure the model's performance during training.
Overfitting	A phenomenon in which a neural network learns to perform exceptionally well on the training data but fails to generalize to new, unseen data, typically due to excessive model complexity.
Underfitting	The opposite of overfitting, where a neural network is too simple to capture the underlying patterns in the training data, resulting in poor performance on both training and test data.
Convolutional Neural Network (CNN)	A type of neural network architecture designed for processing grid-like data, such as images, using convolutional layers to detect hierarchical patterns.
Recurrent Neural Network (RNN)	A type of neural network architecture that processes sequential data by using recurrent connections to maintain memory of past inputs.
Long Short-Term Memory (LSTM)	A specific type of RNN designed to capture long-range dependencies in sequential data, making it well-suited for tasks like natural language processing.
Feedforward Neural Network	A type of neural network architecture where information flows in one direction, from input to output, with no feedback loops.
Regularization	Techniques applied during training to prevent overfitting by introducing constraints on the neural network's weights, such as L1 and L2 regularization.
Batch Normalization	A technique that normalizes the inputs of each layer in a neural network to stabilize and accelerate training.
Learning Rate	A hyperparameter that determines the step size in gradient descent during weight updates, influencing the convergence and stability of training.
Weight Initialization	Strategies for setting initial values of neural network weights, affecting the training process's speed and success.

Transfer Learning	A technique where a pre-trained neural network is used as a starting point for a new task, fine-tuning it for improved performance with limited data.
GAN (Generative Adversarial Network)	A type of neural network architecture consisting of a generator and a discriminator, often used for generating synthetic data, such as images.



Mandy Cohen previously served as North Carolina's health secretary.

in its response to the emergency.

One of the priorities for the new director, Varma says, is to restore support for public health among politicians, community groups and citizens. "That means spending a lot of time with elected officials to help them understand how this work, on a day-to-day basis, is benefiting their constituents," says Varma, who worked at the CDC for 20 years. Public-health agencies, he says, "have not communicated strongly enough how they are very similar to fire departments and police departments, in that they keep people safe".

Another priority should be modernizing the CDC's data systems, which still rely on fax machines as the primary mover of information in some communities, says Georges Benjamin, the executive director of the American Public Health Association in Washington DC. "The CDC is always getting data way too late," he says. "And that means we're chasing very dangerous infectious diseases, and we're behind the curve all the time."

Brain drain

Staff shortages could also be a problem for Cohen. Varma notes that several mid-level and senior officials have left the CDC in the past few years because they felt that it didn't provide a supportive work environment. "The new director will face a very big challenge in trying to recruit high-quality people to the CDC and, even more importantly, to retain them in the agency," Varma says.

Public-health experts say that the CDC needs to be more action-oriented and ready to make quick decisions based on the available science.

Over the past several decades, Varma says, the agency has become increasingly technocratic, focusing heavily on scientific and policy issues. "All of those are very important.

But the challenge is that, when you focus on those issues, you lose some of the boots-on-the-ground expertise," he says.

Benjamin notes that Walensky has already started to move the agency in that direction. "That's a cultural change and those are tough to do. But Dr Cohen demonstrated that kind of attitude as a health commissioner in North Carolina, so we would anticipate she'll bring that style to the CDC."

Implementing some of the necessary changes might be difficult with the agency's current budget, however. According to a report published last month by Trust for

America's Health (TFAH), an advocacy group in Washington DC, the CDC's budget rose by just 6%, after adjusting for inflation, over the past decade (see go.nature.com/3k1s0vc). That wasn't enough to keep pace with emerging threats and the country's growing public-health needs, the report said. "Underfunding will continue to limit how modern and effective the CDC can be," says Dara Lieberman, director of government relations at TFAH and one of the authors of the report.

The CDC also needs to have more flexibility in how it manages its resources, Lieberman says. "Congress has placed very strict limits on how things like emergency funding can be spent," she says. When mpox emerged, for example, congressional rules barred health departments from using their COVID-19 response funding for mpox vaccination.

One area that has been especially underfunded, Lieberman adds, is chronic-disease prevention. "We're spending over US\$4 trillion a year on health-care costs, but only about 4–5% of that is spent on preventing disease," she says. "Instead of paying so much to treat conditions once people have them, we could get a major return on investment if we tried to address the root causes of disease."

Joshua Sharfstein, a vice-dean at the Johns Hopkins Bloomberg School of Public Health in Baltimore, Maryland, thinks that the CDC has already entered a rebuilding phase. In August 2022, Walensky launched the Moving Forward initiative, aiming to reorganize the agency. The CDC "is on the right track", Sharfstein says, "and I think Dr Cohen will be a terrific leader to go even further".

SCIENTISTS USED CHATGPT TO GENERATE A WHOLE PAPER FROM DATA

An autonomous system prompted ChatGPT to write a paper that was fluent and insightful, but flawed.

By Gemma Conroy

A pair of scientists has produced a research paper in less than an hour with the help of ChatGPT – a tool driven by artificial intelligence (AI) that can understand and generate human-like text. The article was fluent and insightful, but researchers say that there are many hurdles to overcome before the tool can be truly helpful.

The goal was to explore ChatGPT's capabilities as a research 'co-pilot' and discuss its

advantages and pitfalls, says Roy Kishony, a biologist and data scientist at the Technion – Israel Institute of Technology in Haifa.

The researchers designed a software package that automatically fed prompts to ChatGPT and built on its responses to refine the paper over time. This autonomous data-to-paper system led the chatbot through a step-by-step process that mirrors the scientific process, from initial data exploration, through writing data-analysis code and interpreting the results, to writing a polished manuscript.

To put their system to the test, Kishony

and his student Tal Ifargan, a data scientist also based at Technion, downloaded a publicly available data set from the US Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System. The database includes information from more than 250,000 people, who were interviewed by telephone about their diabetes status, fruit and vegetable consumption, and physical activity.

The authors then started their system and went for lunch.

A common problem with generative AI tools is their tendency to fill in the gaps by making things up, a phenomenon known as hallucination. To help address the possibility that it would make up references, the team allowed ChatGPT to access literature search engines so that it could generate correct citations.

By the end of lunch, ChatGPT had generated a clearly written manuscript with solid data analysis. But the paper was not perfect. For instance, it states that the study "addresses a gap in the literature" – a phrase that is common in papers but inaccurate in this case, says Tom Hope, a computer scientist at the Hebrew University of Jerusalem. The finding is "not something that's going to surprise any medical experts", he says. "It's not close to being novel."

Kishony also worries that such tools could make it easier for researchers to engage in dishonest practices such as *P*-hacking, for which scientists test several hypotheses on a data set, but only report those that produce a significant result.

Another concern is that the ease of producing papers with generative AI tools could result in journals being flooded with low-quality papers, he adds. The team's data-to-paper approach is specifically designed to create papers that explain the steps ChatGPT took, meaning that researchers can understand, check and replicate the methods and findings, says Kishony.

Vitimir Kovanović, who develops AI technologies for education at the University of South Australia in Adelaide, says that there needs to be greater visibility of AI tools in research papers. Otherwise, it will be difficult to assess whether a study's findings are correct, he says. "We will likely need to do more in the future if producing fake papers will be so easy."

Generative AI tools have the potential to accelerate the research process by carrying out straightforward but time-consuming tasks – such as writing summaries and producing code – says Shantanu Singh, a computational biologist at the Broad Institute of MIT and Harvard in Cambridge, Massachusetts. They might be used for generating papers from data sets or for developing hypotheses, he says. But because hallucinations and biases are difficult for researchers to detect, Singh says, "I don't think writing entire papers – at least in the foreseeable future – is going to be a particularly good use."



ANNA MONEYMAKER/GETTY

Brad Wenstrup is chair of the Select Subcommittee on the Coronavirus Pandemic.

US HEARING PRODUCES HEAT BUT NO LIGHT ON COVID-ORIGINS DEBATE

Congressional showdown does little to prepare the country for the next pandemic, observers say.

By Max Kozlov

Republicans in the US House of Representatives have accused the authors of a 2020 commentary in a scientific journal of colluding with government officials to stifle conversation about COVID-19 origins. Two of the authors – Kristian Andersen, an evolutionary biologist at Scripps Research in La Jolla, California, and Robert Garry, a virologist at Tulane University in New Orleans, Louisiana – appeared before the Select Subcommittee on the Coronavirus Pandemic on 11 July to categorically deny these allegations.

Rumours spread in early 2020 that the coronavirus SARS-CoV-2 was a bioweapon created at the Wuhan Institute of Virology in China. So, Andersen, Garry and their co-authors looked at the available genomic data to determine whether the sections that encode the spike protein – which the virus uses to gain entry to cells – showed signs of genetic engineering. The scientists published their findings as a commentary in *Nature Medicine*, in which they concluded that they "do not believe that any type of laboratory-based scenario is plausible" (K. G. Andersen *et al. Nature Med.* 26, 450–452; 2020). (*Nature* is editorially independent of *Nature Medicine*, and *Nature's* news team is

independent of its journal team.)

The US intelligence community is split on the origin of the pandemic. The scientists nevertheless stood by their original assessment at the hearing. They noted that, although there are many possible scenarios for the origin of the pandemic, the available scientific data support a natural origin, in which the virus spread from animals to humans.

Whereas some scientists have said that the authors' emphatic conclusion might have been premature in March 2020 as the pandemic was just beginning, they say that the tone of the hearing served only to further politicize the origins conversation. "This is a very antagonistic set-up which doesn't do anyone any favours," says Filippa Lentzos, a biosecurity researcher at King's College London. With the way that the hearing was framed, she says, "We all lose."

A change of mind

The polarization of US politics was on full display at the hearing. Republican members of the committee hammered Andersen and Garry with allegations of collusion with government scientists, whereas Democratic members praised the scientists' work and accused Republicans of making it more difficult to uncover the true origin of the pandemic.

The Impact of Fruit and Vegetable Consumption and Physical Activity on Diabetes Risk among Adults

Data to Paper

June 23, 2023

Abstract

Diabetes is a global health concern, and identifying modifiable risk factors is essential for prevention. We investigated the association between fruit and vegetable consumption, physical activity, and the risk of diabetes among adults. Using data from the Behavioral Risk Factor Surveillance System (BRFSS) 2015 survey, logistic regression analysis was conducted, controlling for age, sex, BMI, education, and income. Our results show that higher fruit and vegetable consumption is associated with a reduced risk of diabetes. Moreover, engaging in regular physical activity strengthens this association. This study addresses a gap in the literature by providing evidence on the protective effects of fruit and vegetable consumption and physical activity in relation to diabetes risk. However, limitations, such as self-reported data and potential confounders, should be considered. Our findings highlight the importance of promoting healthy lifestyle behaviors and have implications for diabetes prevention interventions among adults.

Introduction

Diabetes is a major global health concern, affecting nearly half a billion people worldwide, with projections estimating an increase of 25% in 2030 and 51% in 2045 [1]. The increasing prevalence of diabetes poses both an economic and a public health burden [2]. Identification of modifiable risk factors, such as dietary habits and physical activity, is crucial for the prevention and management of diabetes [3].

Previous research has demonstrated the beneficial impact of fruit and vegetable consumption and regular physical activity on diabetes risk [4, 5],

focusing primarily on prevalent diabetes risk factors such as insulin resistance, obesity, and cardiovascular health. However, there is limited evidence on the combined effect of both fruit and vegetable consumption and physical activity on diabetes risk.

In this study, we aim to fill this gap in the literature by examining the relationship between fruit and vegetable consumption, physical activity, and diabetes risk among adults using data from the CDC’s Behavioral Risk Factor Surveillance System (BRFSS) 2015 survey [6, 7]. This dataset provides a large and diverse sample of American adults, allowing us to investigate the association of these modifiable lifestyle factors with the risk of developing diabetes.

To assess the impact of fruit and vegetable consumption and physical activity on diabetes risk, we employed logistic regression analysis, controlling for potential confounding factors such as age, sex, BMI, education, and income [8]. In addition to examining the independent effects of fruit and vegetable consumption and physical activity on diabetes risk, we also analyzed the interaction between these lifestyle factors to better understand their potential synergistic effect on diabetes risk reduction.

With this comprehensive analysis of the BRFSS 2015 data, we provide evidence on the protective effects of fruit and vegetable consumption and physical activity on diabetes risk among adults. Our findings contribute to the growing body of literature supporting the importance of promoting healthy lifestyle behaviors for the prevention of diabetes and its complications.

Results

In this section, we present the results of our analysis on the association between fruit and vegetable consumption, physical activity, and the risk of diabetes among adults using data from the Behavioral Risk Factor Surveillance System (BRFSS) 2015 survey.

Association between Fruit and Vegetable Consumption and Diabetes Risk

To understand the relationship between fruit and vegetable consumption and diabetes risk, we conducted logistic regression analysis while controlling for age, sex, BMI, education, and income (Table 1). Our findings reveal that higher fruit and vegetable consumption is associated with a reduced risk of diabetes (Coefficient = -0.181, p -value $< 10^{-4}$). This suggests that

individuals who consume more fruits and vegetables have a lower probability of developing diabetes.

Table 1: Association between fruit and vegetable consumption and diabetes risk: Logistic regression results

Variable	Coeff.	Std. Err.	p-value
Intercept	-4.861	± 0.050	$< 10^{-4}$
Fruit & Vegetable	-0.181	± 0.012	$< 10^{-4}$
Age (years)	0.211	± 0.002	$< 10^{-4}$
Sex (Male)	0.329	± 0.013	$< 10^{-4}$
BMI	0.085	± 0.001	$< 10^{-4}$
Education	-0.108	± 0.007	$< 10^{-4}$
Income	-0.147	± 0.003	$< 10^{-4}$

Association between Physical Activity, Fruit and Vegetable Consumption, and Diabetes Risk

To further explore the relationship between fruit and vegetable consumption, physical activity, and diabetes risk, we performed a logistic regression analysis controlling for age, sex, BMI, education, income, and physical activity (Table 2). The results demonstrate that physical activity (Coefficient = -0.211, p-value $< 10^{-4}$) and fruit and vegetable consumption (Coefficient = -0.052, p-value = 0.016) are independently associated with a reduced risk of diabetes. Moreover, the interaction term between fruit and vegetable consumption and physical activity is also statistically significant (Coefficient = -0.143, p-value $< 10^{-4}$). This indicates that the combined effect of engaging in physical activity and consuming fruits and vegetables is even more protective against diabetes.

The inclusion of physical activity and the interaction term in the logistic regression model improves its predictive power, as indicated by a higher pseudo R-squared value of 0.1263 compared to 0.1242 in the model without the interaction term. These results provide insights into potential mechanisms by which lifestyle interventions, such as increasing fruit and vegetable consumption and engaging in physical activity, may contribute to reducing the burden of diabetes among adults.

The negative correlation coefficient of -0.181 between fruit and vegetable consumption and diabetes risk suggests that for every unit increase in fruit and vegetable consumption, the odds of developing diabetes decrease by

CHAT-GPT AS REVIEWER

Here we test the ability of Chat-GPT to review an SfN abstract. Using separate sessions of Chat-GPT, the model was given different combinations of prompts and abstracts. We first provide here the different prompts and the different abstracts used. Below you will see the model's response for each combination of prompt and abstract.

Prompt 1: The following is an abstract submitted to the Society for Neuroscience conference. Please provide a detailed scientific review of it and determine if it should be accepted into the conference.

Prompt 2 (intended to elicit a stronger criticism) : The following is an abstract submitted to the Society for Neuroscience conference. Please provide a thorough peer review to determine the quality of the work and decide if it should be accepted into the conference.

Abstract 1 (actual abstract from Kastner lab):

Title: Covert spatial attention enables prioritized processing of stimuli in cued locations.

Abstract: The neural mechanisms that instate the allocation of attention to a specific spot in the visual field following exogenous and endogenous cues are not clearly understood. In this study, we recorded local field potentials and single-unit spiking activity from macaque lateral intraparietal area (LIP) and its projection zone in pulvinar (Pul), a thalamic nucleus implicated in attention function and control, using linear arrays as the animals performed a modified version of the Egly-Driver task. Informative cues were either endogenous (unique color cues at fixation memorized by the animals to correspond to one of four target locations) or exogenous (salient cues presented at a target location), and preceded a low-contrast target after a variable cue-target delay period. Behavioral performance showed that the animals ($n=2$) had equivalent performance for the two types of cues, indicating similar task difficulty. Preliminary spiking analysis showed a distinct difference of visual responsiveness in both LIP and Pul neurons with respect to receptive field (RF) selectivity after cue onset, which is expected given the location difference of cue location. Further, population spiking activity corresponding to exogenous cues showed clear attention-modulated sustained activity in the delay period prior to target onset, which was unobservable for endogenous cues. However, despite the differences between the two cue types in the cue-target delay period, attention modulation was especially similar after target onset in LIP and was similar to a more modest extent in Pul. These results suggest that attention-modulated neurons may not similarly encode the locus of attention following endogenous and exogenous cueing, that covert attention may utilize non-overlapping populations in exogenous and endogenous attention, or that the type of cue may elicit different forms of neural modulation.

Abstract 2 (modified to lower the quality):

Title: Spatial attention enables prioritized processing of stimuli.

Abstract: The neural mechanisms that instate the allocation of attention to a specific spot in the visual field following cues have not been experimentally studied. In this study, we recorded local field potentials from macaque hippocampus and its projection zone in pulvinar (Pul), a thalamic nucleus implicated in working memory, using linear arrays as the animals performed a modified version of the Adam-Egger task. Informative cues were either endogenous (salient cues presented at a target location) or exogenous (unique color cues at fixation memorized by the animals to correspond to one of four target locations), and preceded a low-contrast target after a variable cue-target delay period. Behavioral performance showed that the animals ($n=0$) had equivalent performance for the two types of cues, indicating differential task difficulty. Preliminary spiking analysis showed a distinct difference of visual responsiveness in both hippocampus and Pul neurons with respect to receptive field (RF) selectivity after cue onset, which is expected given the location difference of cue location. Further, population spiking activity corresponding to exogenous cues showed clear caffeine-modulated sustained activity in

the delay period prior to target onset, which was unobservable for exogenous cues. However, despite the differences between the two cue types in the cue-target delay period, attention modulation was especially different after target onset in LIP and was similar to a more modest extent in Pul. These results suggest that attention-modulated neurons may not similarly encode memory following endogenous and exogenous cueing, that covert attention may utilize overlapping populations in exogenous and endogenous attention, or that the type of cue may elicit similar forms of neural modulation.

ChatGPT session A – response to Prompt 1 paired with Abstract 1:

Title: **Covert Spatial Attention Enables Prioritized Processing of Stimuli in Cued Locations**

Abstract Review:

1. Clarity and Background: The abstract presents a clear research question: understanding the neural mechanisms involved in the allocation of attention in response to different cues. It provides adequate context about the study's focus on the macaque lateral intraparietal area (LIP) and the pulvinar (Pul) thalamic nucleus, which are known to be involved in attention. The mention of the Egly-Driver task gives a familiar context for readers, making the study's design easily comprehensible.

2. Methods and Experimental Design: The methods are well-described, stating the use of local field potentials and single-unit spiking activity recordings from the LIP and Pul areas in macaques. The utilization of both endogenous and exogenous cues in a modified Egly-Driver task adds depth to the study's design. It's also positive that the authors acknowledge the similar task difficulty between the two cue types, ensuring a fair comparison.

3. Results: The abstract provides a concise summary of the key findings, focusing on differences in visual responsiveness based on receptive field selectivity after cue onset. The distinction between endogenous and exogenous cue effects during the cue-target delay period and the attention-modulated sustained activity in response to exogenous cues are interesting observations. The comparison of attention modulation after target onset in LIP and Pul is particularly noteworthy.

4. Implications and Interpretation: The abstract raises intriguing questions about the encoding of attentional focus following different cue types. The discussion of potential interpretations, such as non-overlapping populations for exogenous and endogenous attention or different forms of neural modulation, indicates a thoughtful consideration of the results.

5. Conclusion and Significance: The abstract concludes by highlighting the potential differences in neural encoding of attention based on cue types. This leaves room for future studies to explore these mechanisms in greater detail. The findings contribute to our understanding of covert spatial attention and its underlying neural processes, making it of interest to the neuroscience community.

Overall Assessment: The abstract is well-written, presenting a clear research question, methodology, results, and their implications. The study's design is robust, and the results are intriguing, suggesting potentially novel insights into the neural mechanisms of attention. Therefore, this abstract should be accepted for presentation at the Society for Neuroscience conference.

ChatGPT session B – response to Prompt 2 paired with Abstract 1:

Title: Covert Spatial Attention Enables Prioritized Processing of Stimuli in Cued Locations

Abstract Review:

This abstract presents a study investigating the neural mechanisms underlying the allocation of attention in response to exogenous and endogenous cues in macaque lateral intraparietal area (LIP) and its projection zone in pulvinar (Pul). The study utilizes informative cues and records local field potentials and single-unit spiking activity during a modified Egly-Driver task. The abstract provides a concise overview of the research objectives, methods, and preliminary findings. Below is a thorough peer review of the abstract:

1. **Clarity and Structure:** The abstract is well-structured, providing a clear overview of the research question, methods, and initial results. The language used is precise and technical, ensuring clarity for readers familiar with the field.
2. **Research Gap and Importance:** The abstract highlights the existing gap in understanding the neural mechanisms governing attention allocation in response to different types of cues. The study's focus on both exogenous and endogenous cues adds depth to the research and addresses an important question in the field of attention research.
3. **Methodology:** The abstract provides a brief description of the methodology, including the use of informative cues, recording techniques, and the behavioral task. However, it lacks specific details about the experimental setup, which could be essential for the conference audience to evaluate the study's rigor and reproducibility.
4. **Results and Implications:** The abstract outlines the behavioral results indicating equivalent performance for both cue types and preliminary spiking analysis results. The mention of distinct differences in visual responsiveness and attention modulation in LIP and Pul neurons is intriguing. However, the abstract lacks specific quantitative results, such as effect sizes or statistical significance, which are crucial for evaluating the strength of the findings.
5. **Conclusion and Future Directions:** The abstract suggests potential interpretations of the results, such as differences in neural modulation based on cue types. However, it does not discuss the implications of these findings in depth. Additionally, insights into future directions or how these findings contribute to the broader understanding of attention mechanisms would enhance the abstract's quality.
6. **Overall Impression:** The abstract presents an interesting study investigating the neural correlates of attention allocation in response to different cues. While the research question is important and the preliminary findings are promising, the abstract would benefit from more specific details about the methodology and quantitative results. Additionally, a deeper

discussion of the implications and potential future directions would strengthen the abstract's overall quality.

Recommendation: The abstract shows potential, but revisions are needed to provide more specific methodological details, quantitative results, and a more in-depth discussion of the findings' implications. With these improvements, the abstract could make a valuable contribution to the conference and the field of neuroscience.

ChatGPT session C – response to Prompt 1 paired with Abstract 2:

Title: Spatial attention enables prioritized processing of stimuli.

Abstract Review:

The abstract describes a study investigating the neural mechanisms underlying the allocation of attention in the visual field following different types of cues. The study employed macaque monkeys performing a modified version of the Adam-Egger task, during which local field potentials were recorded from the hippocampus and the pulvinar (Pul), a thalamic nucleus associated with working memory. The cues used were either endogenous (salient cues presented at a specific location) or exogenous (unique color cues at fixation corresponding to one of four target locations). The study explored the behavioral performance, spiking activity, and attention modulation in response to these cues.

1. Clarity and Purpose: The abstract is generally clear in its description of the study design, cues used, and areas of the brain studied (hippocampus and Pul). The purpose of the study, which is to understand the neural mechanisms involved in attention allocation following different cues, is well-defined.

2. Methodology: The abstract provides details about the experimental setup, including the types of cues, the animals used (macaque monkeys), and the recording methods (local field potentials from linear arrays). The use of both endogenous and exogenous cues in a modified Adam-Egger task adds complexity and depth to the study design, allowing for a comprehensive investigation of attentional processes.

3. Findings and Interpretation: The abstract reports intriguing findings regarding the differential task difficulty for endogenous and exogenous cues, suggesting potential differences in neural processing. The preliminary spiking analysis indicates differences in visual responsiveness and attention modulation between the cue types. Notably, the mention of caffeine-modulated sustained activity in response to exogenous cues during the delay period adds a unique pharmacological perspective to the study.

4. Implications and Conclusions: The abstract hints at possible interpretations, such as differences in neural modulation following endogenous and exogenous cues, or the potential overlap in attention-modulated neural populations. However, it does not explicitly state the implications of these findings or the broader significance of the study. More clarity on the conclusions and potential implications for the field would strengthen the abstract.

5. Sample Size: The abstract mentions "n=0," which seems to be a typographical error. The sample size needs to be accurately stated for a comprehensive evaluation of the study's robustness and statistical power.

Overall Recommendation: The abstract presents an interesting and well-designed study investigating the neural mechanisms of attention allocation following different cues. To enhance its quality and suitability for presentation at the Society for Neuroscience conference, the authors should provide a more explicit discussion of the implications of their findings and address the typographical error regarding the sample size. If these aspects are clarified and elaborated upon, the abstract has the potential to make a valuable contribution to the conference, offering insights into the intricate processes of spatial attention and neural modulation in response to various cues.

ChatGPT session D – response to Prompt 2 paired with Abstract 2:

Title: Spatial Attention Enables Prioritized Processing of Stimuli

Abstract Review:

The submitted abstract discusses an experimental study investigating the neural mechanisms underlying the allocation of attention in response to cues in the visual field. The study records local field potentials from the macaque hippocampus and the pulvinar nucleus while animals perform a modified version of the Adam-Egger task. The cues used in the task are either endogenous (salient cues presented at a target location) or exogenous (unique color cues at fixation memorized to correspond to specific target locations). The abstract aims to compare the neural responses and attention modulation between these two types of cues.

1. **Clarity and Coherence:** The abstract is generally clear in its description of the experimental setup and methodology. The distinction between endogenous and exogenous cues, as well as their respective effects on neural responses, is well-defined. The abstract effectively communicates the main objective and findings of the study.
2. **Experimental Design and Methodology:** The abstract provides a concise overview of the experimental design, including the tasks performed by the animals and the types of cues used. However, critical details, such as the duration of the cue-target delay period and the specific nature of the caffeine modulation, are lacking. These details are essential for understanding the experimental setup and should be included.
3. **Results and Interpretation:** The abstract briefly outlines the behavioral results, indicating equivalent performance for both cue types. It also mentions differences in visual responsiveness and attention modulation between endogenous and exogenous cues. However, the abstract lacks specific quantitative results, such as effect sizes or statistical significance, which are necessary for a comprehensive evaluation of the findings.
4. **Discussion and Implications:** The abstract raises interesting questions about the neural encoding of attention following different types of cues. It suggests possible explanations for the observed differences in attention modulation but does not delve into a detailed discussion of

these potential interpretations. Additionally, the implications of these findings for the field of neuroscience and potential applications are not explored.

5. **Conclusion:** While the abstract presents a promising study on the neural mechanisms of attention modulation, it lacks essential details about the experimental setup, quantitative results, and in-depth discussion of the findings. Addressing these shortcomings by providing more specific information about the methods, results, and their implications would significantly enhance the quality of the abstract.

Based on the current content, this abstract requires revisions and additional information before it can be considered for acceptance into the Society for Neuroscience conference.

Discuss Chat-GPT's reviewing behavior

Particularly, think about:

What is the quality of these reviews?

How much did the prompt matter?

Did it catch issues you would have raised?

Would you find this a useful tool for crafting a review?

How would you feel if a review of your paper was crafted with the aid of an LLM?

Readings of Interest

- [The Current and Future State of AI Interpretation of Medical Images - PubMed \(nih.gov\)](#)
- [Artificial Intelligence and Acute Stroke Imaging - PubMed \(nih.gov\)](#)
- [Ideal Foundational Requirements for Stroke Program Development and Growth: A Scientific Statement From the American Heart Association - PubMed \(nih.gov\)](#)
- [Improved Stroke Care in a Primary Stroke Centre Using AI-Decision Support - PubMed \(nih.gov\)](#)
- [Noncontrast Computed Tomography e-Stroke Infarct Volume Is Similar to RAPID Computed Tomography Perfusion in Estimating Postreperfusion Infarct Volumes - PubMed \(nih.gov\)](#)
- [Automated estimation of ischemic core volume on noncontrast-enhanced CT via machine learning - PubMed \(nih.gov\)](#)