

# Academic Writing 101

Dr. Junchen Feng

January 2025

- ▶ Basics: Structure
- ▶ Advanced: Style
- ▶ How to Use LLM Creatively and Responsibly

# 1 Structure

- ▶ Title
- ▶ Abstract
- ▶ Introduction (Literature Review)
- ▶ Methodology
- ▶ Results/Analysis
- ▶ Discussion



## 1.1 Introduction

- ▶ **Why the reader should care about your research**
  - ▶ introduce your research question,
  - ▶ identify why the question needs to be asked
  - ▶ state the hypothesis you are testing.



## 1.1 What is a research question?

- ▶ **Good, bad, ugly:**
  - ▶ This paper is about handwriting recognition
  - ▶ This paper uses CNN to recognize handwriting
  - ▶ This paper studies whether dropout improves handwriting recognition with Lenet-5



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- ▶ This paper studies whether dropout improves handwriting recognition with Lenet-5

- ▶ **Great:**

*This paper studies whether randomly masking certain coefficients during training (dropout) can prevent Lenet-5 from overfitting, and thus improves handwriting recognition task performance on MNIST dataset.*

## 1.2 Literature Review

### ► The Reverse Triangle

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  - ▶ Identify key debates and research gaps.
  - ▶ How your research contributes to the field by closing the gap



## Example

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- ▶ Handwriting recognition is a longstanding problem in the field of computer vision ...
- ▶ The Lenet-5 model (LeCun et al., 1998) significantly improved the performances by using CNN to automatically learning features from raw images.
- ▶ However, research (So and so, 200x; So and so, 200y) shows that CNN is prone to overfitting. Recently Hinton et al. (2014) proposed a new method called dropout that randomly masks certain coefficients during training.
- ▶ This paper attempts to apply dropout to improve the performance of Lenet-5 model in handwriting recognition



## 1.2 How to find the relevant Paper?

- ▶ Google Scholar / Arxiv.  
The paper cites who? Who cited the paper?
- ▶ Perplexity / Ellicit.  
LLM assisted search.



## 1.3 Methodology: Reproduce My Research for Dummies

- ▶ **Data Source:** Specify how the data were collected and what is in the dataset.
- ▶ **Analysis Protocol:** Detail the research design and every research step





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- ▶ The MNIST dataset is ... The dataset is from ... . Here are a few examples...
- ▶ The Lenet-5 model is specified as ... . The dropout is specified as ... .
- ▶ Both models are trained with ... optimizer, ... loss function, ... config

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## Example B

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- ▶ The volunteers are recruited from ... . The volunteers have  $x$  men and  $y$  women, aging from  $a$  to  $b$  ...
- ▶ The GAD-7 is ..., administered by ...
- ▶ The LLM Diagnosis system is ... . Its key prompt is ... . Its user interface is ... . Here is a screenshot and an excerpt of user conversation.



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- ▶ The obstacle detection use YoloVx to identify xxx, xxx... The model is fine-tuned with ...
- ▶ The chatbot used xxx LLM model for decision making and response generation. The prompt for decision making is ... . The prompt for response generation is ... .



## 1.4 Results/Analysis

- ▶ **Describe the results literally and "figuratively"**
  - ▶ You need to describe the tables and graphs in WORDS.
  - ▶ Callback to your methodology if necessary.



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  - ▶ Callback to your methodology if necessary.
- ▶ **Highlight Your Insight:**
  - ▶ Except for the summary statistics, you need to explicitly state the key findings for each table and graph.
  - ▶ Ideally each paragraph builds or leads to your final Aha moment.

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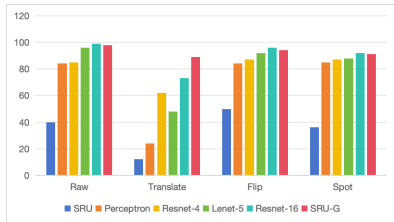
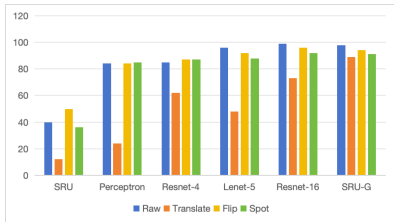
- ▶ Put Key Finding under the Spotlight
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- ▶ Avoid using colors in graphs.



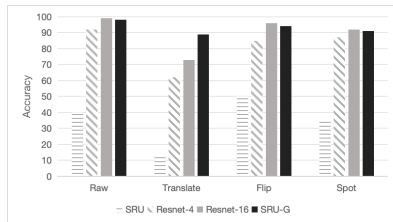
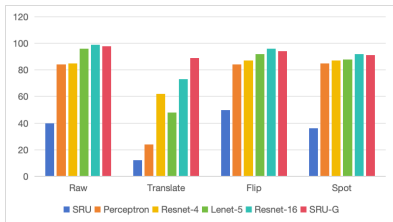
## Dos and Don'ts for Tables and Graphs

- ▶ Put Key Finding under the Spotlight
- ▶ Pay attention to X axis, Y axis, Legend
- ▶ Avoid using colors in graphs.
- ▶ Prefer tables over graphs.

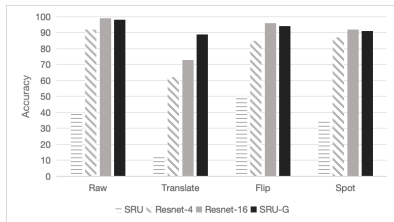
# Story Teller



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## Prefer Table over Graph



	SRU	Resnet-4	Resnet-16	SRU-G
Raw	40	92	<b>99</b>	98
Translate	12	62	73	<b>89</b>
Flip	50	85	<b>96</b>	94
Spot	36	87	<b>92</b>	91

## How to Interpret

Graph X demonstrates that the SRU-G is translate-invariant while has comparable performance to the Resnet-16(SOTA) in other scenarios. The SRU-G achieves 89% accuracy on the translate dataset, outperforming the SOTA Resnet-16 by 16%, while trailing the SOTA model in other scenarios by a narrow margin of 1.5% on average. SRU-G outperforms the baseline models that motivate the research. The baseline SRU model is the weakest model in the raw dataset and is susceptible to noise, especially the translation noise. The Resnet-4 has similar depth as the SRU-G but its accuracy is on average 15% lower than the SRU-G. The experiment data show that the shallow SRU-G is robust to translation and has a competitive overall performance to the SOTA model.

## 1.5 Discussion

- ▶ **What Have You Found:** Summarize your main findings and connect them to the existing body of research.
- ▶ **How it Helps the Community:** Discuss how your results help the community connect the dots and fill gaps.
- ▶ **What the Community Can Do Next:** Suggest areas for future research or practical applications based on your findings.



## 1.6 Abstract: Short But to the Point

- ▶ State the main objectives of the study.
- ▶ Describe the methods used.
- ▶ Summarize key results and conclusions.





## 1.7 Title

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- ▶ **Theory Paper:** A clear description the problem it solved  
"Dropout: A Simple Way to Prevent Neural Networks from Overfitting"
- ▶ **Application Paper:** A dramatic reveal of the research punchline  
"Dancing With Glass Manacles: How Negative Stereotypes Affect Highly-Educated Women in the Chinese Marriage Market"



## 2 Advanced: Writing Style for Academic Writing

*The challenge of academic writing is to convey your complex thinking process to the reader with minimum information loss when the reader cannot engage in dialogue.*

- ▶ Write for the reader's thinking process to facilitate understanding
- ▶ It's good to repeat yourself

## 2.2 Understanding by Design

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- ▶ Like prompting, make the implicit context explicit to the reader
- ▶ You can use jargon and acronyms. Depending on the reader's background, decide if you need to explain them first
- ▶ **Challenge:** Anticipate your reader's questions and answer them "preemptively"

## 2.2 Introduce Jargon

Graph X demonstrates that the SRU-G is translate-invariant while has comparable performance to **the Resnet-16(SOTA)** in other scenarios. The SRU-G achieves 89% accuracy on the translate dataset, outperforming **the SOTA Resnet-16** by 16%, while trailing **the SOTA model** in other scenarios by a narrow margin of 1.5% on average. SRU-G outperforms the baseline models that motivate the research. The baseline SRU model is the weakest model in the raw dataset and is susceptible to noise, especially the translation noise. The Resnet-4 has similar depth as the SRU-G but its accuracy is on average 15% lower than the SRU-G. The experiment data show that the shallow SRU-G is robust to translation and has a competitive overall performance to **the SOTA model**.



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- ▶ The easiest way to make audience remember is to repeat it again and again, even unconsciously.
- ▶ Intentional repetition leaves a trail for your reader to follow.
- ▶ Repeat ideas, not expressions.

## 2.2 Keep Subject Consistent Within a Paragraph

Graph X demonstrates that the **SRU-G** is translate-invariant while has comparable performance to the Resnet-16(SOTA) in other scenarios. The **SRU-G** achieves 89% accuracy on the translate dataset, outperforming the SOTA Resnet-16 by 16%, while trailing the SOTA model in other scenarios by a narrow margin of 1.5% on average. **SRU-G** outperforms the baseline models that motivate the research. The baseline SRU model is the weakest model in the raw dataset and is susceptible to noise, especially the translation noise. The Resnet-4 has similar depth as the SRU-G but its accuracy is on average 15% lower than the SRU-G. The experiment data show that **the shallow SRU-G** is robust to translation and has a competitive overall performance to the SOTA model.



## 2.2 Repeat Your Ideas, Don't Repeat Yourself

Graph X demonstrates that the SRU-G is **translate-invariant** while has comparable performance to the Resnet-16(SOTA) in other scenarios. The SRU-G achieves 89% accuracy on **the translate dataset**, outperforming the SOTA Resnet-16 by 16%, while trailing the SOTA model in other scenarios by a narrow margin of 1.5% on average. SRU-G outperforms the baseline models that motivate the research. The baseline SRU model is the weakest model in the raw dataset and is susceptible to noise, **especially the translation noise**. The Resnet-4 has similar depth as the SRU-G but its accuracy is on average 15% lower than the SRU-G. The experiment data show that the shallow SRU-G is **robust to translation** and has a competitive overall performance to the SOTA model.



## 3 Three Ways LLM Can Help

- ▶ The Editor
- ▶ The Reader
- ▶ The Copilot

## 3.1 The Editor

- ▶ All previous discussions are essential ingredients for prompt engineering, both for content and for style.
- ▶ Ask GPT to give you editing suggestions for your draft. Get feedback often and early.

*You are the editor of the academic journal "Nature". Your goal is to give editorial suggestions for the following draft.*

*# draft*

*<here is your writing>*

*# Style*

- 1. xxxx (e.g. repeat the key ideas while avoid repeating the same words)*
- 2. xxxx (e.g. main consistent subject within a paragraph if possible)*

*# Logic*

- 1. xxx (e.g. The literature review shall contain a critique of the existing research)*



## 3.2 The Reader

- ▶ Ask GPT to "impersonate" your reader and ask clarification questions.

*You are a <university computer science professor>. You are reading student's paper.*

*Please ask at least 5 clarification questions to help students think more clearly and communicate more effectively.*

*# draft*

*<here is the writing>*





## 3.3 The Copilot

- ▶ Ask LLM to brainstorm with you. e.g. propose 10 titles
- ▶ Ask LLM to play the devil's advocate and give you critique.  
e.g. propose 5 challenges to the result section