



上海交通大学
SHANGHAI JIAO TONG UNIVERSITY



m . i . n Institute of Media,
Information, and Network

Introduction to Academic Writing

Hongkai Xiong

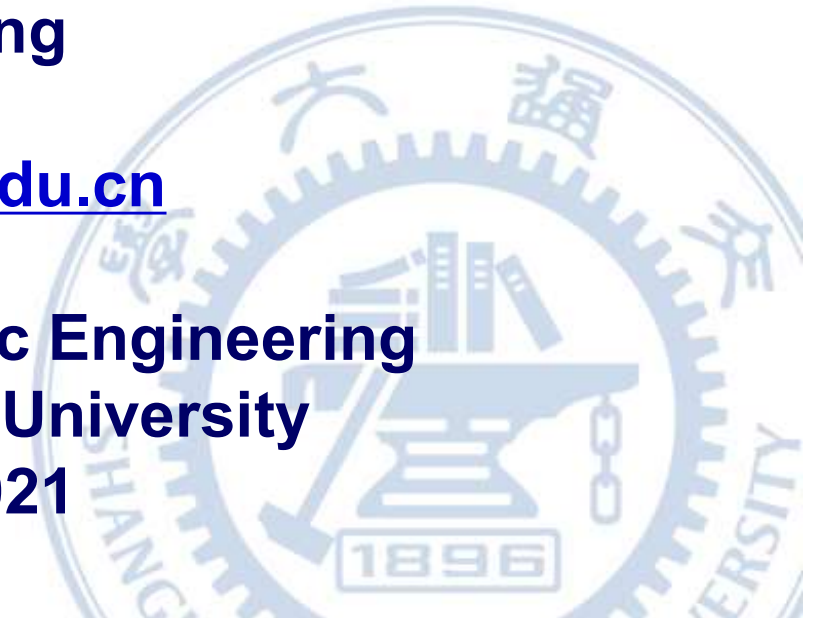
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Outline

1

What is Academic Writing?

2

Academic Writing Structure

3

Methods to Incorporate Evidence

4

Use Concise and Clear Language

5

Build Your Arguments

Outline

1

What is Academic Writing?



2

Academic Writing Structure

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Methods to Incorporate Evidence

4

Use Concise and Clear Language

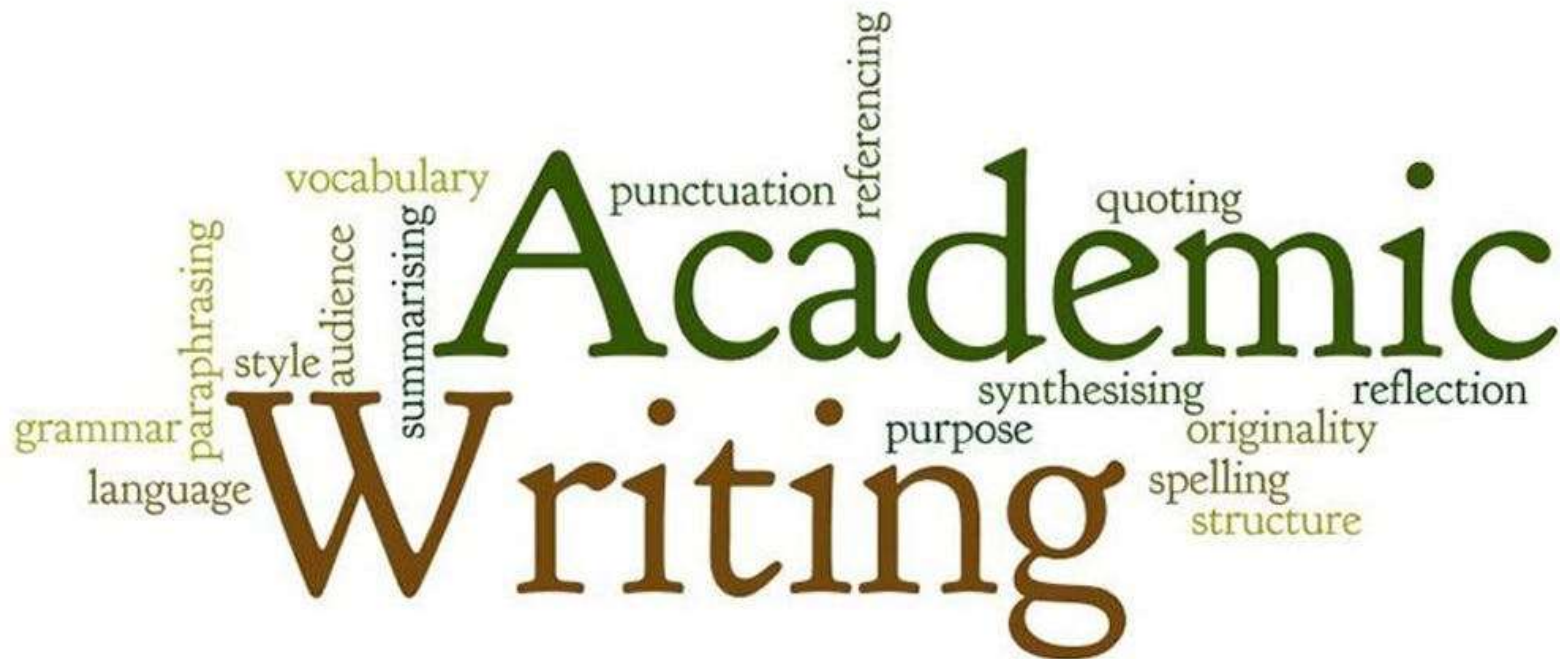
5

Build Your Arguments

What is Academic Writing

“State your facts as simply as possible, even boldly. No one wants owners of eloquence or literary ornaments in a research article.”

- R. B. McKerrow



What is Academic Writing

Academic Writing:

*Academic writing is to **convey thoughts** and **share ideas** in an **academic setting**.*

Different from Personal Writing

- ✓ Communicative
- ✓ Fact-based Argument
- ✓ Identify Your Audience
- ✓ Objective Writing
 - Avoid Biased Language and Generalizations
 - Don't Bring in Personal Pre-Conceptions and Opinions



Academic Writing

Characteristics

Planned and Focused

- establish motivation
- answer question
- demonstrates understanding

Structured

- coherent / written in a logical order
- brings together related points and material

*Academic Writing
Structure*

Evidenced

- support opinions and arguments with evidence
- referenced accurately

*Methods to
Incorporate Evidence*

Formal

- use appropriate language and tenses
- clear, concise and balanced

*Use Concise and Clear
Language*

Academic Writing: 3 Cases

- *Literature Review*

L

Dictionaries for Sparse Representation Modeling

Digital sampling can display signals, and it should be possible to expose a large part of the desired signal information with only a limited signal sample.

By RON RUBINSTEIN, *Student Member IEEE*, ALFRED M. BRUCKSTEIN, *Member IEEE*, AND MICHAEL ELAD, *Senior Member IEEE*

Proceedings of the IEEE, 2010

- *Tutorial*

T

An Introduction To Compressive Sampling

[A sensing/sampling paradigm that goes against the common knowledge in data acquisition]

Emmanuel J. Candès and Michael B. Wakin

Conventional approaches to sampling signals or images follow Shannon's celebrated theorem: the sampling rate must be at least twice the maximum frequency present in the signal (the so-called Nyquist rate). In fact, this principle underlies nearly all signal acquisition protocols used in consumer

IEEE Signal Processing Magazine, 2008

- *Regular Paper*

R

IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 14, NO. 12, DECEMBER 2005

The Contourlet Transform: An Efficient Directional Multiresolution Image Representation

Minh N. Do and Martin Vetterli, *Fellow, IEEE*

IEEE Transactions on Image Processing, 2005

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Methods to Incorporate Evidence

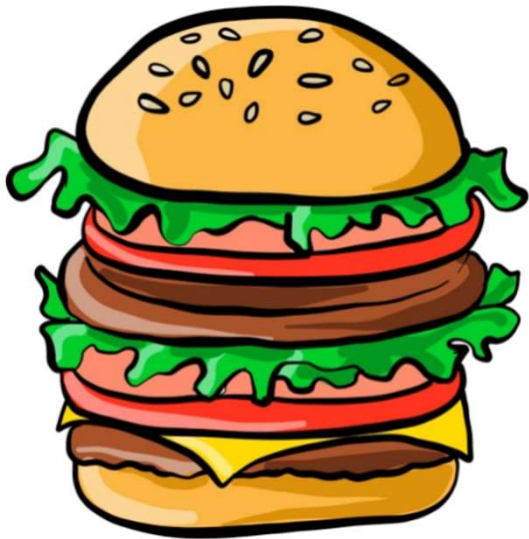
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Use Concise and Clear Language

5

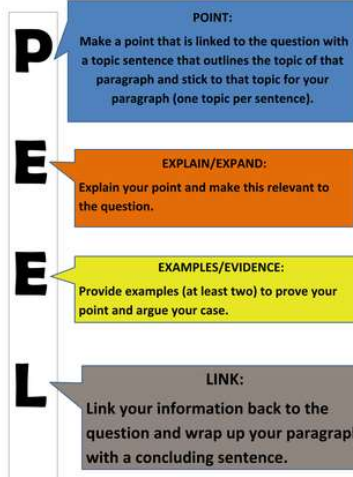
Build Your Arguments

Academic Writing Structure

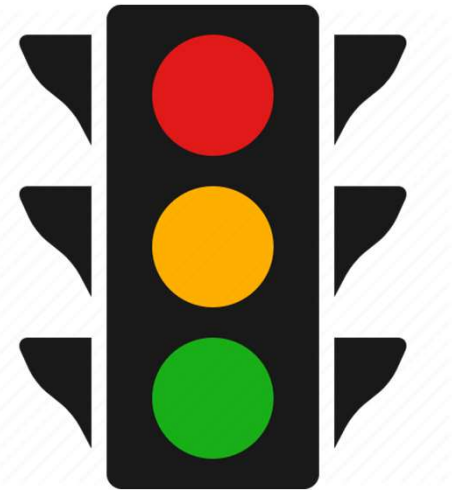


*Hamburger-like
Model of
Academic Papers*

Paragraph Structure:



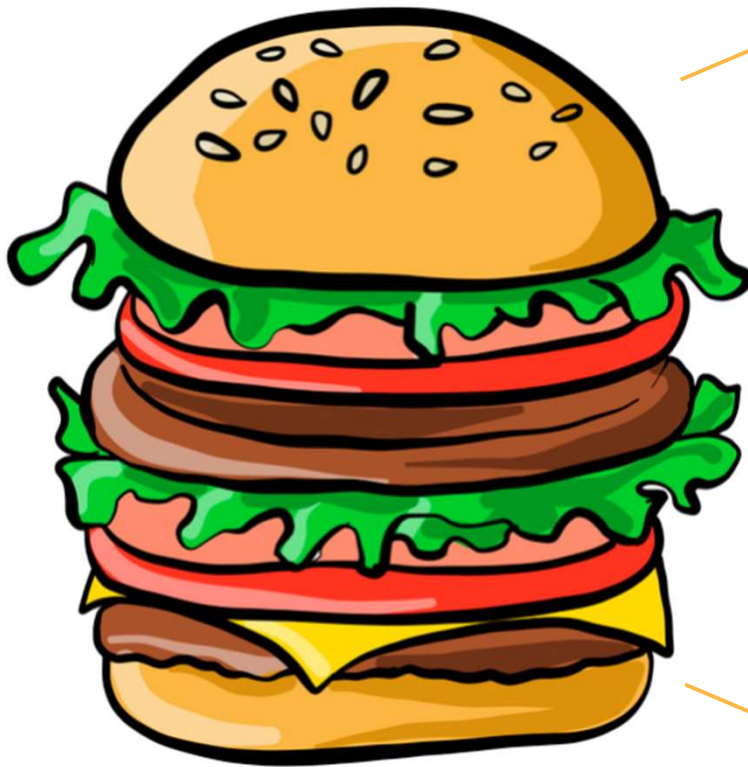
*Structured
Paragraphs*



*Signal
Words*

Structure

A Uniform Model



Top Bun

Introduction

Toppings

Main Body

one possible choice

Lettuce

Related Works

Tomato

Proposed Method

Burger

Experiments

Bottom Bun

Conclusion

Structure

Introduction

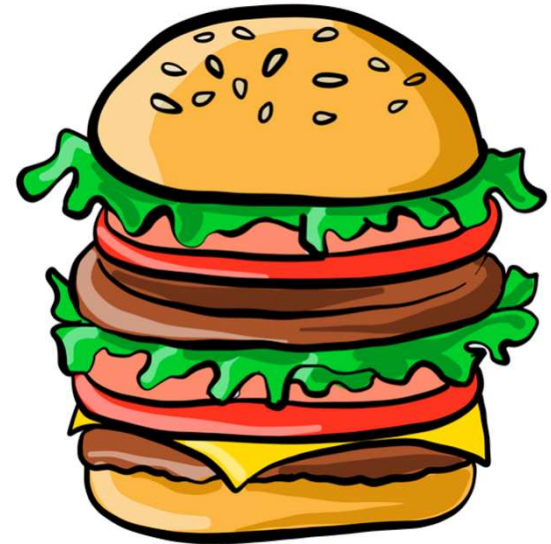
- Background Information and Context
- Problem and Motivation

Main Body

- Method and Experiment
- Demonstration
- Explanation
- Illustration
- In Logical Order

Conclusion

- Highlight Key Message and Argument
- Identify Gaps and Weakness
- Recommend Further Research



Structure

How to design main body?

1. List All Following Things:
 - Main Points
 - Things Readers Need to Know
2. Select Evidences:
 - Support Your Main Points
 - Theoretical Analysis
 - Experimental Results
3. Group Your Points in a Logical Order
4. Put Groups into a Sequence
 - Readers Can Follow
 - Focus on the Topic or Argument

A Typical Case: Regular Paper

R

The Contourlet Transform: An Efficient Directional Multiresolution Image Representation

Abstract

Introduction

Related Works

Background and Related Work

Discrete-Domain Construction Using Filter Banks

Concept

Pyramid Frames

Iterated Directional Filter Banks

Multiscale and Directional Decomposition: The Discrete Contourlet Transform

Methods

Contourlets and Directional Multiresolution Analysis

Multiscale

Multidirection

Multiscale and Multidirection: The Contourlet Expansion

Theoretical Framework

Contourlet Approximation and Compression

Parabolic Scaling

Directional Vanishing Moment

Contourlet Approximation

Contourlet Compression

Experiments

Numerical Experiments

Conclusion

Case Study: Literature Review



Dictionaries for Sparse Representation Modeling

Introduction

A History of Transform Design

- Signal Transforms: The Linear Era*
- Non-Linear Revolution and Elements of Modern Dictionary Design*
- From Transforms to Dictionaries*
- Higher Dimensional Signals*
- Analytic Versus Trained Dictionaries*

Overview

Analytic Dictionaries – State-of-the-Art

- Curvelets*
- Contourlets*
- Bandelets*
- Other Analytic Dictionaries*

Subtopic 1

Dictionary Training – State-of-the-Art

- Method of Optimal Directions*
- Union of Orthobases*
- Generalized PCA*
- The K-SVD Algorithm*
- Parametric Training Methods*

Subtopic 2

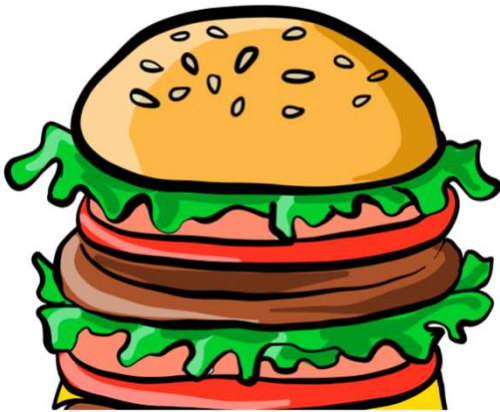
Conclusion

Case Study: Tutorial

A Special Case (without Conclusion)

T

An Introduction To Compressive Sampling



Introduction

Related Theories

The Sensing Problem

Incoherence and the Sensing of Sparse Signals

Robust Compressive Sampling

Random Sensing

What is Compressive Sampling

Application

Summary of Theories

Structured Paragraphs

PEEL Model of Paragraphs

1. Point (P)

- Central Arguments
- First or Second Sentence

2. Evidence (E)

- Support Your Point
- Quote / References / Statistics

3. Explanation (E)

- Explain the Point
- Demonstrate the Relationship between Point and Evidence

4. Link (L)

- Summary this Paragraph
- Bridge to Next Paragraph

Case Study

L

Dictionaries for Sparse Representation Modeling

In practice, the K-SVD is an effective method for representing small signal patches. ① However, the K-SVD, as well as the MOD, suffer from a few common weaknesses. ② The high non-convexity of the problem means that the two methods will get caught in local minima or even saddle points. ③ Also, the result of the training is a non-structured dictionary which is relatively costly to apply, and therefore these methods are suitable for signals of relatively small size. ④ In turn, in recent years several parametric dictionary training methods have begun to appear, and aim to address these issues by importing the strengths of analytic dictionaries to the world of example-based methods.

Point

Examples
Explanation

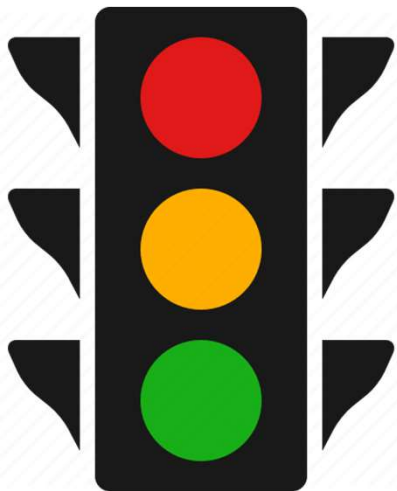
Link

Signal Words

Signal Words:

Signal words give hints about what is about to happen in what you're writing. Using signal words will help the reader to understand the structure of your work.

Examples



Cause-Effect	Compare/Contrast	Time/Sequence
Therefore Because Thus If ... then ... It follows Hence For this reason Since Furthermore	But However On the other hand Yet Either ... or ... While Unless Even if In comparison	Afterwards Previously First Secondly Next Finally In addition Initially Shortly

Case Study

R

The Contourlet Transform: An Efficient Directional Multiresolution Image Representation

Cause-Effect

Let

$$\phi_{j,n} = 2^{-j} \phi \left(\frac{\mathbf{t} - 2^j \mathbf{n}}{2^j} \right), \quad j \in \mathbb{Z}, \quad \mathbf{n} \in \mathbb{Z}^2. \quad (8)$$

Then the family $\{\phi_{j,n}\}_{n \in \mathbb{Z}^2}$ is an orthonormal basis for an approximation subspace V_j at the scale 2^j . Furthermore, $\{V_j\}_{j \in \mathbb{Z}}$ provides a sequence of multiresolution nested subspaces $\dots V_2 \subset V_1 \subset V_0 \subset V_{-1} \subset V_{-2} \dots$, where V_j is associated with a uniform grid of intervals $2^j \times 2^j$ that characterizes image approximation at scale 2^j . The difference images in the LP contain the details necessary to increase the resolution between two consecutive approximation subspaces. Therefore, the difference images live in a subspace W_j that is the orthogonal complement of V_j in V_{j-1} , or

$$V_{j-1} = V_j \oplus W_j. \quad (9)$$

Case Study

T

An Introduction To Compressive Sampling

Although one could develop a CS theory of continuous time/space signals, we restrict our attention to discrete signals $f \in \mathbb{R}^n$. The reason is essentially twofold: first, this is conceptually simpler and second, the available discrete CS theory is far more developed (yet clearly paves the way for a continuous theory—see also “Applications”). Having said this, we are then interested in *undersampled* situations in which the number m of available measurements is much smaller than the dimension n of the signal f . Such problems are extremely common for a variety of reasons. For instance, the number of sensors may be limited. Or the measurements may be extremely expensive as in certain imaging processes via neutron scattering. Or the sensing process may be slow so that one can only measure the object a few times as in MRI. And so on.

Cause-Effect

Contrast

Sequence

Example

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Methods to Incorporate Evidence



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Use Concise and Clear Language

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Build Your Arguments

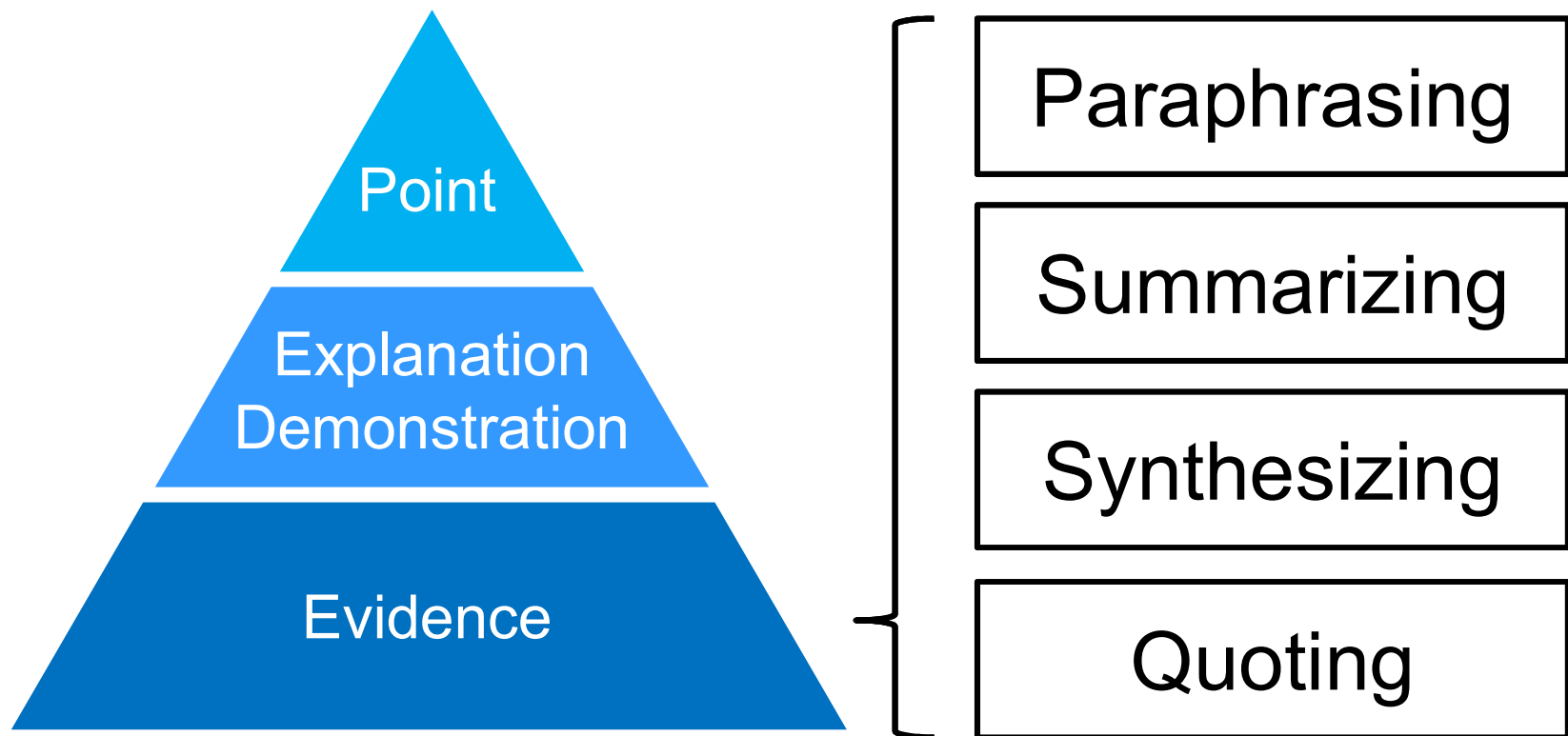
Importance of Evidence

Academic writing must be supported by evidence such as **data, facts, quotations, arguments, statistics, research, and theories**. The evidence will:

- add substance to your own ideas.
- allow the reader to see what has informed your thinking and how your ideas fit in with, and differ from, others' in your field.
- demonstrate your understanding of the general concepts and theories on the topic.
- show you have researched widely, and know about specialist/niche areas of interest.

Incorporate Evidence

Four Methods to Incorporate Evidence



Paraphrasing

Paraphrasing:

Paraphrasing is using *your own words* to express *someone else's ideas*.



Do's

- Write the point in your own words.
- Focus on the meaning of an idea or argument.
- Distinguish between the author's point and your own viewpoint.
- Include a reference to the original author.



Don'ts

- Describe an author's idea/argument without explaining the significance to your own arguments.
- Use too many of the original author's words, including using the same structure.
- Provide too much detail.

Case Study

Paraphrasing:

Paraphrasing is using *your own words* to express *someone else's ideas*.

Paraphrasing ideas to support your argument.

Example 1

... In 1992, [Simoncelli et al. \[36\]](#) published ... The authors concluded that achieving these properties required abandoning orthogonality in favor of overcompleteness, since the critical number of atoms in an orthogonal transform was simply insufficient. ...

L

Example 2

... Interestingly, there are no measurement matrices and no reconstruction algorithm whatsoever which can give the conclusions of Theorem 2 with substantially fewer samples than the left-hand side of (13) [\[2\]](#), [\[3\]](#). ...

T

Case Study

Paraphrasing:

Paraphrasing is using *your own words* to express *someone else's ideas*.

Paraphrasing ideas to develop disagreement.

Example 3

Shwartz-Ziv & Tishby (2017) distinguish two phases of SGD optimization: in the first “drift” phase, the mean of the gradients over training samples is large relative to the standard deviation of the gradients; in the second “diffusion” phase, the mean becomes smaller than the standard deviation of the gradients. ... **However, this explanation does not hold up to either theoretical or empirical investigation.** Let us assume that the diffusion phase does drive the distribution of weights to a maximum entropy distribution subject to a training error constraint. ...

A. M. Saxe, et al. "On the information bottleneck theory of deep learning." *Journal of Statistical Mechanics: Theory and Experiment* 2019.12 (2019): 124020.

Summarizing

Summarizing:

Summarizing is providing a *condensed version* of someone else's key points.



Do's

- Write a shortened version, in your own words, to show your understanding.
- Include an in-text citation and reference to the original author.



Don'ts

- Describe an author's idea/argument without explaining the significance to your own argument.
- Provide unnecessary background information.

Case Study

Summarizing:

Summarizing is providing a *condensed version* of someone else's key points.

Example 1 *one work*

Geometric Invariance and Overcompleteness: In 1992, [Simoncelli et al. \[36\]](#) published a thorough work advocating a dictionary property they termed shiftability, which describes the invariance of the dictionary under certain geometric deformations, e.g., translation, rotation or scaling.

L

Example 2 *several works, one aspect*

In the second half of the 1980's, though, the signal processing community was particularly excited about the development of a new very powerful tool, known as wavelet analysis [\[5\]](#), [\[25\]](#), [\[26\]](#).

L

Case Study

Summarizing:

Summarizing is providing a *condensed version* of someone else's key points.

Example 3 *several works, two aspects*

The focus was on a set of statistical tools developed during the first half of the century, known as the Karhunen-Loève Transform (KLT) [4], [5], or Principal Component Analysis (PCA) [6]. The KLT is a linear transform which can be adapted to represent signals coming from a certain known distribution.

L

Synthesizing

Synthesizing:

Synthesizing involves *combining different information and ideas* to develop your own argument.



Do's

- Group sources into relevant categories.
- Write about these in your own words.
- Include references to all the original authors



Don'ts

- Discuss each author separately.
- Give too much details about different perspectives.

Case Study

Synthesizing:

Synthesizing involves combining different information and ideas to develop your own argument.

Example 1

Synthesizing ideas to show difference.

Apart from curvelets and contourlets, there have recently been several approaches in developing efficient representations of geometrical regularity. Notable examples are [bandelets \[10\]](#), [the edge-adapted multiscale transform \[11\]](#), [wedgelets \[12\], \[13\]](#) and [quadtree coding \[14\]](#). These approaches typically require an edge-detection stage, followed by an adaptive representation. **By contrast, curvelet and contourlet representations are fixed transforms.** This feature allows them to be easily applied in a wide range of image processing tasks, similar to wavelets. ...

R

Case Study

Synthesizing:

*Synthesizing involves **combining different information and ideas** to develop your own argument.*

Example 2

Synthesizing ideas to show difference.

Several other well-known systems that provide multiscale and directional image representations include: 2-D Gabor wavelets [15], the cortex transform [16], the steerable pyramid [17], 2-D directional wavelets [18], brushlets [19], and complex wavelets [20]. The **main differences** between these systems and our contourlet construction is that the previous methods do not allow for a different number of directions at each scale while achieving nearly critical sampling. **In addition**, our construction employs iterated filter banks, which makes it computationally efficient, and there is a precise connection with continuous-domain expansions.

R

Quoting

Quoting:

Quoting is where you *copy an author's text word for word*, place *quotation marks* around the words and *add a citation* at the end of the quote.



Do's

- Copy the quote exactly from the original.
- Include quotation marks.
- Include an in-text citation and reference to the original author.



Don'ts

- Use too many quotes throughout your work.

Quoting

Quoting:

Quoting is where you *copy an author's text word for word*, place *quotation marks* around the words and *add a citation* at the end of the quote.

A Special Example

I. INTRODUCTION

All this time the guard was looking at her, first through a telescope, then through a microscope, and then through an opera glass.

Lewis Carroll, *Through the Looking Glass*

THE analysis of nonstationary signals often involves a compromise between how well transitions or discontinuities can be located, and how finely long-term behavior can be identified. A typical example is the choice of window length in the short-time Fourier transform. In wavelet analysis one looks at the signal at different “scales” or “resolutions”: a rough approximation of the signal might look stationary, while at a detailed level

Rarely adopted in academic writing for engineering.

M. Vetterli and C. Herley, "Wavelets and filter banks: theory and design," in *IEEE Transactions on Signal Processing*, vol. 40, no. 9, pp. 2207-2232, Sept. 1992, doi: 10.1109/78.157221.

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Build Your Arguments

Be Concise

Concise Writing:

Writing concisely helps your reader to understand the points you are making.

Tips for Concise Writing:

- Only include one main idea per sentence.
- Keep your sentences to a reasonable length (generally ≤ 25 words).
- Avoid repetition.

Examples:

- due to the fact that → because
- alternative choices → alternatives
- basic fundamentals → fundamentals
- in as few words as possible → concisely

Formal Language

Tips for Using Formal Language:

- Avoid using colloquialisms or slang terms.
- Write words out in full rather than shortening them.
- The use of *clichés* is not appropriate in academic writing.

Examples

Informal	Formal
go up	increase
go down	decrease
set up	establish
look at	examine
blow up	explode
find out	discover
bring about	cause
put off	postpone

Informal	Formal
need to	required
think about	consider
get	obtain
put up	tolerate
deal with	handle
seem	appear
show	illustrate
start	commence

Formal Language: Cases

L

Dictionaries for Sparse Representation Modeling

- ...this option significantly **increases** redundancy and complexity...
- ...which **established** the wavelet decomposition as a multi-resolution expansion and put forth efficient algorithms for computing it.
- ...who **discovered** oriented Gabor-like patterns in simple-cell receptive fields in the visual cortex.
- **Increasing** sparsity **required** departure from the linear model... We **consider** the dictionary...
- ...and therefore the dictionary transpose can be used to **obtain** a representation over the dictionary.
- Research on general overcomplete dictionaries mostly **commenced** over the past decade...

Formal Language: Cases

R

The Contourlet Transform: An Efficient Directional Multiresolution Image Representation

- Both painters apply a refinement technique to **increase** resolution from coarse to fine.
- We **establish** a precise link between the developed filter bank and the associated continuous-domain contourlet expansion via a directional multiresolution analysis framework.
- ...but **causes** the implementation for discrete images...correspond to a 2-D frequency partition based on the polar coordinate.
- ...we will only **consider** the case with orthogonal filters...
- ...the low frequency content is poorly **handled**.
- Multiscale and multidirection subspaces generated by the contourlet transform which is **illustrated** on a 2-D spectrum decomposition.

Formal Language: Cases

T

An Introduction To Compressive Sampling

- One can also **establish** the RIP for pairs of orthobases as in “Incoherence and the Sensing of Sparse Signals”.
- ...but first we **examine** the robustness of CS vis a vis data corruption.
- ...small perturbations in the data should **cause** small perturbations in the reconstruction.
- ...**obtain** super-resolved signals from just a few sensors.
- Thus, we only have to **tolerate** a probability of failure that is extremely small.
- ...and it **handles** noise gracefully.
- ...at a low rate and later uses computational power for reconstruction from what **appears** to be an incomplete set of measurements.

Active and Passive Voice

Active Voice

- Direct and Easy to Read
- Comparatively Informal

Passive Voice

- Impersonal and Objective
- Comparatively Formal



Examples

- A: *I conducted a study of elementary school teachers.*
- P: *A study was conducted of elementary school teachers.*

- A: *The researchers will publish their results in the next issue of the journal.*
- P: *Results will be published in the next issue of the journal.*

Active and Passive Voice

Tips

- Avoid Unnecessary Shift in Voice

Unnecessary shift in voice

Many customers in the restaurant *found* **the coffee** too bitter to drink, but **it** *was* still *ordered* frequently.

He *tried* to act cool when he slipped in the puddle, but **he** *was* still *laughed at* by **the other students**.

Revised

Many customers in the restaurant *found* **the coffee** too bitter to drink, but **they** still *ordered* **it** frequently.

He *tried* to act cool when he slipped in the puddle, but **the other students** still *laughed at* **him**.

Active and Passive Voice

Tips

- Avoid Dangling Modifiers. (A dangling modifier is a word or phrase that modifies a word not clearly stated in the sentence.)

Dangling modifier with passive voice

To save time, **the paper** *was written* on a computer.

(Who was saving time? The paper?)

Seeking to lay off workers without taking the blame, **consultants** *were hired* to break the bad news.

(Who was seeking to lay off workers? The consultants?)

Revised

To save time, **Kristin** *wrote* **the paper** on a computer.

Seeking to lay off workers without taking the blame, **the CEO** *hired* **consultants** to break the bad news.

Other Tricks

Hedges:

Hedging is the use of linguistic devices to express *hesitation* or *uncertainty* as well as to demonstrate *politeness* and *indirectness*. Hedging is also a skill to distinguish between *facts* and *claims*.

Examples

Reporting Verbs:

seem, tend, look like, appear to be, think, believe, doubt, be sure, indicate, suggest, ...

Modal Adverbs:

possibly, perhaps, conceivably, ...

语气副词

Some Clauses: 从句

It could be the case that ...

It might be suggested that ...

There is every hope that ...

Hedges: Cases

1. While the results of this method **seem** slightly constrained by the small number of elementary functions trained...
2. ...these models **tend** to be over-simplistic compared to the complexity of natural phenomena.

L

Both Reporting Verbs

1. Experiments with real images **indicate** the potential of contourlets in several image processing applications.
2. ...this result **suggests** that for a computational image representation to be efficient...
3. Here, we **assume** all filters are implemented nonseparably.
4. **Perhaps** equally important, the curvelet construction demonstrates that...

R

Reporting Verbs: 1,2,3

Modal Adverbs: 4

Hedges: Cases

- which we should **think** of as comparably small...
- ...one may be led to **believe** that all n time samples are needed.
- ...which we **assume** are all completely unknown a priori.
- Finally, in some important situations the full collection of n discrete-time samples of an analog signal may be difficult to obtain (and **possibly** difficult to subsequently compress).
- Here, **it could be helpful** to design physical sampling devices that directly record discrete...

T

Reporting Verbs: 1,2,3

Modal Adverbs: 4

Clauses: 5

Other Tricks

Boosters:

*Boosters are used to express a **measure** of **certainty** or **conviction**.*

Examples

Actually, always, believe, believed, believes, beyond doubt, certain, certainly, clear, clearly, conclusively, decidedly, definite, definitely, demonstrate, demonstrated, demonstrates, doubtless, establish, established, evident, evidently, find, finds, found, in fact, incontestable, incontrovertible, incontrovertibly, indeed, indisputable, indisputably, know, known, must, never, no doubt, obvious, obviously, of course, prove, proved, proves, realize, realized, realizes, really, show, showed, shown, shows, sure, surely, think, thinks, thought, truly, true, undeniable, undeniably, undisputedly, undoubtedly, without doubt ...

Boosters: Cases

- ...as it **demonstrated** that the single assumption of sparsity could account for a fundamental biological visual behavior.
- ...and **in fact** discretization is the main source for limiting the size of this set.
- Identifying such relations could thus **prove** valuable in enabling a merge between the two forces.
- **Indeed**, further work is required to design more general dictionary models which will **truly** capture the benefits of both analytic and example-based worlds.

L

- As the resolution becomes finer, we can **clearly** see the limitation of the wavelet-style painter who needs to use many fine “dots” to capture the contour.
- This is **obvious** as the discrete contourlet transform is a composition of perfect-reconstruction blocks.

R

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Build Your Arguments



Build Your Arguments

Make an Argument

- Express your viewpoint
- Answer the question you have been set

Structure Your Argument

- Guide the reader in a logical way
- Link all elements
- Answer the possible questions

Develop Your Argument

- Collect evidence for your points
- Group all related opinions
- Make clear what your viewpoint is



Build Your Arguments

Convey Your Own Voice

Your voice will emerge through your discussion, interpretation, and evaluation of the sources.

Some Ways to Establish Your Voice:

1. Unattributed (not referenced) **assertion** at the start of paragraphs followed by **evidence**

Example: “To date there is no well-established tool to measure divided attention in children. Current methods used to assess divided attention usually involve a variation of the CPT with an additional task included e.g. counting or listening to auditory stimuli (Salthouse, 2003).”

2. Explicitly tell your reader what the connections are **between sources**.

Example:

“Smith (2009), however takes a different approach...”

Build Your Arguments

Some Ways to Establish Your Voice:

3. Explicitly tell your reader what the **connections** are between those **sources** and your main **assertion**.

Example:

*“Netzer's argument **challenges** the term 'renaissance', as it displays repeatedly the use of classical imagery during the medieval period ...”*

4. Use language to show your strong **agreement/disagreement/cautious agreement** with sources.

Example:

*“Smith's (2009) findings show a **clear...A serious weakness** with this argument is...The research suggests...”*

Build Your Arguments

Some Ways to Establish Your Voice:

5. Include “so what” **summary sentences** (evaluative sentences) at the end of paragraphs.

Example:

“This shows that it is detrimental to strictly categorize chronological periods with artistic genres, as many art historians suggest different movements were taking place in separate geographical locations at the same time.”

Build Your Arguments: Cases

*An assignment: Please classify the following cases into previous 5 categories.
(Part of Quiz 2 on Canvas)*

Case 1: This structure gained substantial support from the work of Daugman [20], [21], who discovered oriented Gabor-like patterns in simple-cell receptive fields in the visual cortex. These results motivated the deployment of the transform to image processing tasks, led by works such as Daugman [22] and Porat and Zeevi [23].

L

Case 2: For one-dimensional (1-D) piecewise smooth signals, like scan-lines of an image, wavelets have been established as the right tool, because they provide an optimal representation for these signals in a certain sense [1], [2].

R

Build Your Arguments: Cases

Case 3: Several other well-known systems that provide multiscale and directional image representations include: 2-D Gabor wavelets [15], the cortex transform [16], the steerable pyramid [17], 2-D directional wavelets [18], brushlets [19], and complex wavelets [20]. The main differences between these systems and our contourlet construction is that the previous methods do not allow for a different number of directions at each scale while achieving nearly critical sampling.

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Case 4: Non-linear approximation in the wavelet basis was shown to be optimal for piecewise-smooth 1-D signals with a finite number of discontinuities, see e.g., [32].

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Case 5: The point here is that even though the amount of data is ridiculously small, one has nevertheless captured most of the information contained in the signal. This, in a nutshell, is why CS holds such great promise.

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Summary

- ✓ How to conduct research
- ✓ What is academic writing
- ✓ Academic writing structure
 - Hamburger-like model, structured paragraph, signal words
- ✓ Methods to incorporate evidence
 - Paraphrasing, summarizing, synthesizing, quoting
- ✓ Concise and clear language
 - Be concise, formal language, active and passive voice, hedges and boosters
- ✓ Build your arguments
 - How to establish arguments



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Q & A



Many Thanks

