How to write a technique essay?
A student version

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Date: May 17, 2012

Why this topic?

- Don't expect others to revise / modify your paper!
  - Everyone has his own writing / thinking style.
  - Revising others' papers is an abominable work: You may want to fight or kill somebody.
- Don't be lofty and don't belittle yourself
  - Local conf. → Intl. conf → Top conf. and Journals
- Assumption:
  - Structure, Description, Content
  - Assume that the content is good / worthy enough

Outline

- Why?

- What is a technical essay?

- Where to learn the skills?

- How to write?

  - ➢ Structure: Just a logical matter, not an English one
  - ➢ Sentence: Write, read, think, delete, write,…
  - ➢ Grammar: The easiest? Or the hardest?

- Conclusion

Why?

- Why you study the MS degree?

- Graduation? Then you need to write.

- Other reasons for writing an essay:

➢ Improve your English skill: Yes! Have you ever written a COHERENT article with more than 1000 words?

➢ Train your logical thinking: Not kidding! Writing a technical essay is just like planning or designing a show to sell your products.

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What is a technical essay?

- Two cases: paper or MS / PHD essay
- A MS essay is longer but usually easier, so we focus on the paper part.
- Any one haven't read a paper?
- Have you ever checked the publication site, the quality, the citation of the paper you're reading?
- Have you ever really gotten the meaning of a paper? Or just treat it like the reading test in high schools?

What is a technical paper?

- Paper structure:
  - ➢ Abstract
  - ➢ Introduction
  - ➢ Previous and related work
  - ➢ Main body
  - ➢ Experiments
  - ➢ Conclusion
  - ➢ Reference
- Paper material:
  - ➢ Text
  - ➢ Illustration
  - ➢ Tables, and figures

Abstract

- Goal:
  - ➤ Give a brief review of the paper
  - ➤ Difficulty: 150 words, how to design the appetizer?

- Example:

Starting:
In this paper, a XXX algorithm based on XXX is proposed.

Main content:
(1) Briefly introduce the work, but how? Too short? Too long?
(2) Focus on the physical meaning, not the detailed techniques.
(3) Fluent concern
Ex: (X) Our algorithm is composed of three steps, ...
    (O) Our algorithm is based on three major concerns,…...

Ending:
According to the experiments, the proposed algorithm …….

Introduction

- Goal:
  - The **most critical part** of the paper, I think.
  - Control the whole structure, the whole current of the paper
- Example:

Work introduction part:
(1) Motivations, findings (fill in some words)
(2) Maybe the hardest part of the paper
(3) Collect some materials and then paraphrase

Main content:
(1) Our idea
(2) Our contribution
(3) Experiments preview

Ending:
This paper is organized as follows:……

Previous and related work

- Goal:
  - Introducing the history of the work
  - Facilitate the main body and experiment part
  - The most flexible part in a paper
  - Remember: "Modesty"

- Ex: A work on face recognition with subspace learning
  - The history and categorization of face recognition
  - The concepts and key algorithms of subspace learning

Main body

- Goal:
  - ➢ The soul of a paper
  - ➢ Describe the flow of the introduction part in more detailed.
  - ➢ Require (1) math writing, (2) skills of telling stories
- Attention:
  - ➢ Fewer we, more conjunction / adv words and phrases.
  - ➢ For every word / claim you made, a corresponding reason, evidence, or proof is required.
  - ➢ (X) To detect XXX, we design an algorithm XXX.

Experiments

- Goal:
  - ➢ Seems easy but actual needs a story or planning
  - ➢ Prove what you claim and assume in the main body
  - ➢ Discussion is required

- Ex:

Experimental settings: (1) Data bases (2) Evaluation criteria
Main body: (1) Toy examples or proving (2) Main comparisons: Figures, plots, accuracy, rate, ……
Discussion:

Final work

- Conclusion:
  - ➢ Just review the core of the paper
  - ➢ The easiest part in a paper

- Reference:
  - ➢ Check the form, and reference to books, journals, conference, or website, but no WIKI or BLOG.
  - ➢ If any statement you made has a corresponding reference, cite it.
  - ➢ Ex: In [], Chao et al. claimed that ...
   The algorithm in [] / proposed by Chao et al. [] takes …

Paper material

- Text:
  - ➢ Let's talk about this later.
- Illustration:
  - ➢ A cutting path to describe your finding/ algorithm.
  - ➢ Require creativities and the sense of beauty
- Tables, and figures:
  - ➢ Summarize the details of the algorithm
  - ➢ Summarize the experimental results
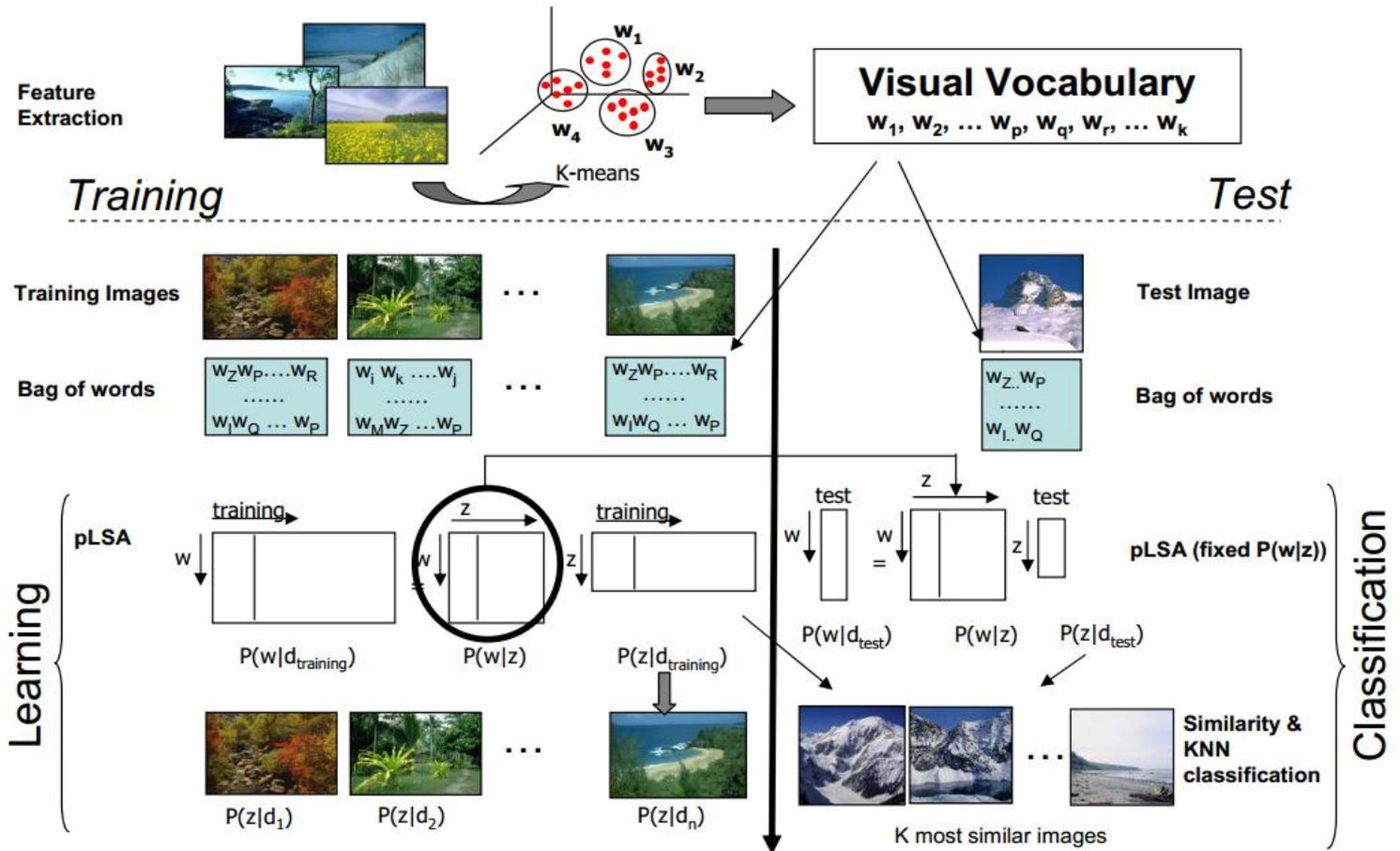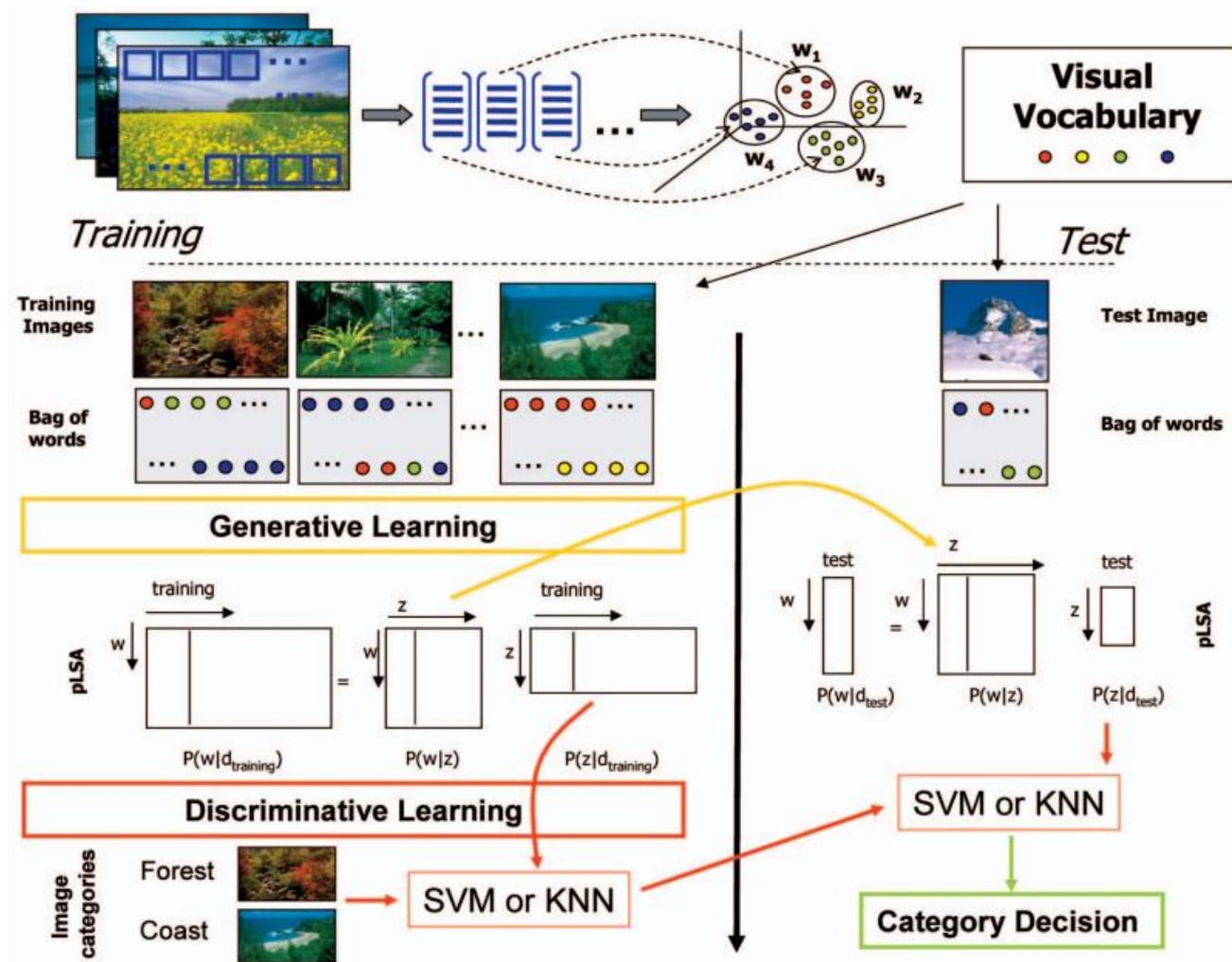 - ➢ Demonstrate the effectiveness of a work

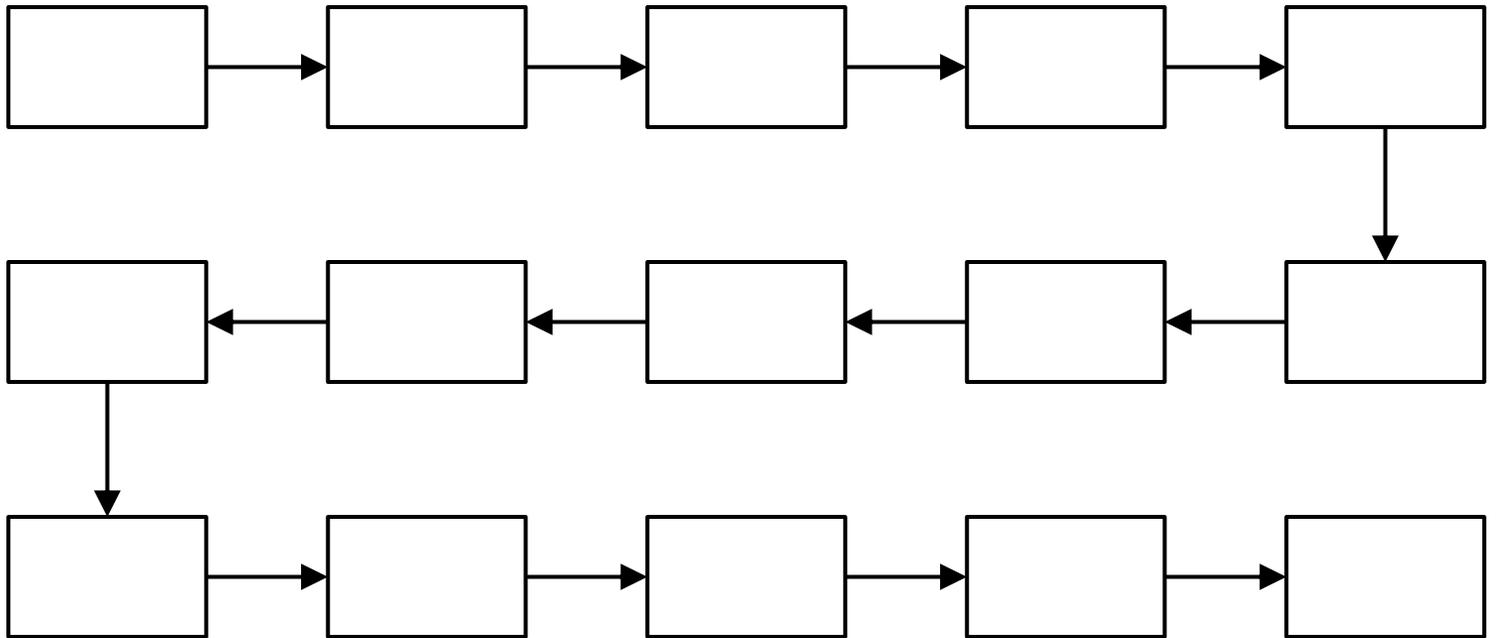# Good illustrations

- Ex:

Good illustrations

- Ex:
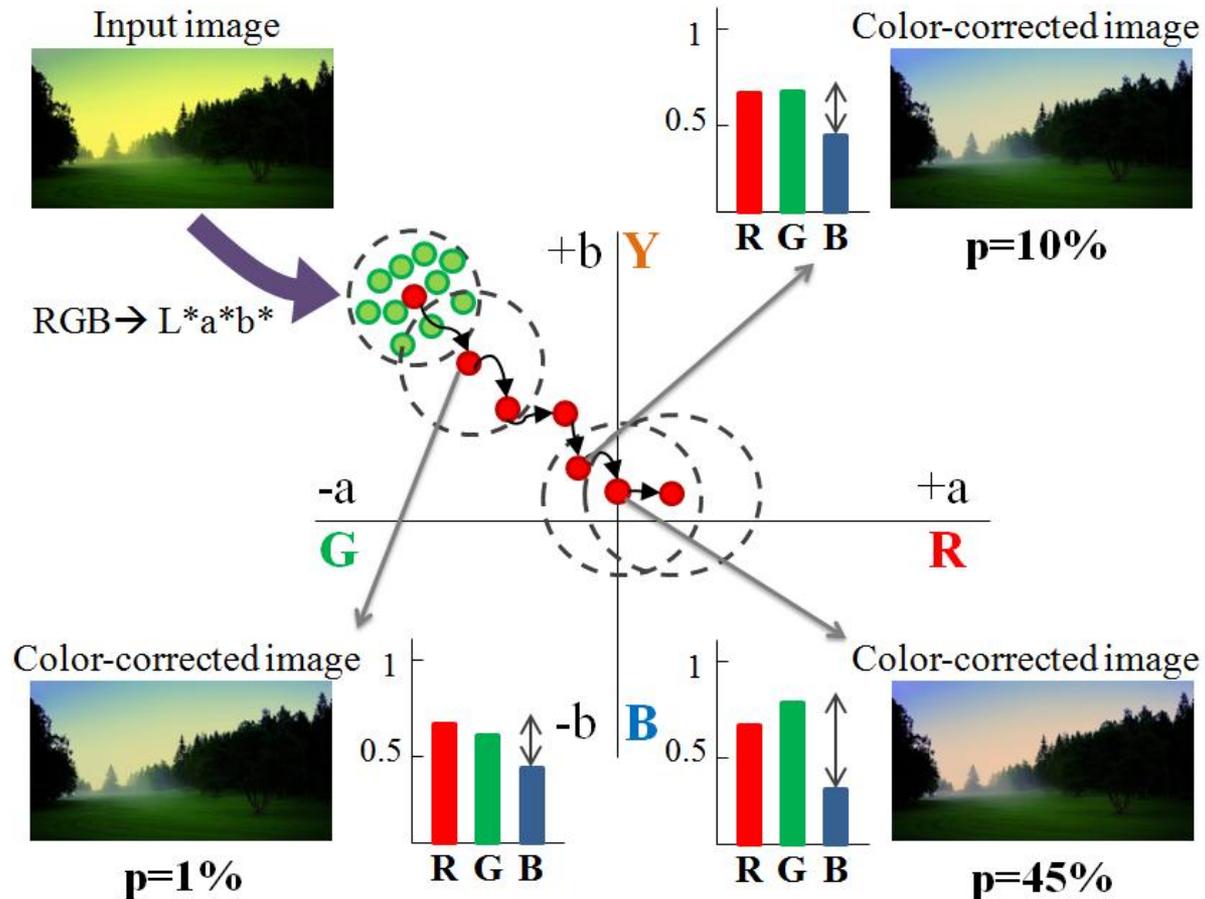
Good illustrations

- Ex:

Poor illustrations

- Ex:

Short summary

- Understand the structure and what to write / not to write.

- Keep the COHERENCE: That is, make sure that you're talking about the same thing in the paper.

- How to evaluate the paper you write: Read some published papers, and then go back to yours. Would you fell the gap and comes out the idea "Come on! Who write this XXX?"

Short summary

- Treat your paper as if you were the **reviewer**:
  - ➢ Does this paper attract you?
  - ➢ Does this paper touch your heart at the first glance?
  - ➢ Does this paper have sufficient creativity, novelty?
  - ➢ Is the claim / algorithm technically solid or correct?
  - ➢ Is the paper written in a native English manner?
  - ➢ What stuffs are missed?
  - ➢ Will you accept this paper?

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Where to learn the skills?

- What to learn?
  - ➢ English writing skills, especially for paper writing
- Where to learn?
  - ➢ Google: ex: How to write a paper?
  - ➢ DISP Lab tutorials
  - ➢ English reading habit
  - ➢ Read more papers (I mean the well-written ones.)

Where to learn the skills?

- Why reading more papers?

  ➤ Gain more background and understanding about the research fields.

  ➤ Knowing that how a work can be published

  ➤ Essay writing has specific writing styles and word usages.

  Ex: (O) We make an assumption that ……
       (X) We guess / surmise that

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How to write?

- Revisit: Structure, Description, Content

- Structure:

  ➢ The logical flow

  ➢ How to allocate the sections mentioned before into a 4-8 pages paper?

- Description: Write your idea out!!

  ➢ Paragraphs, sentences

  ➢ Words, phrases (grammar)
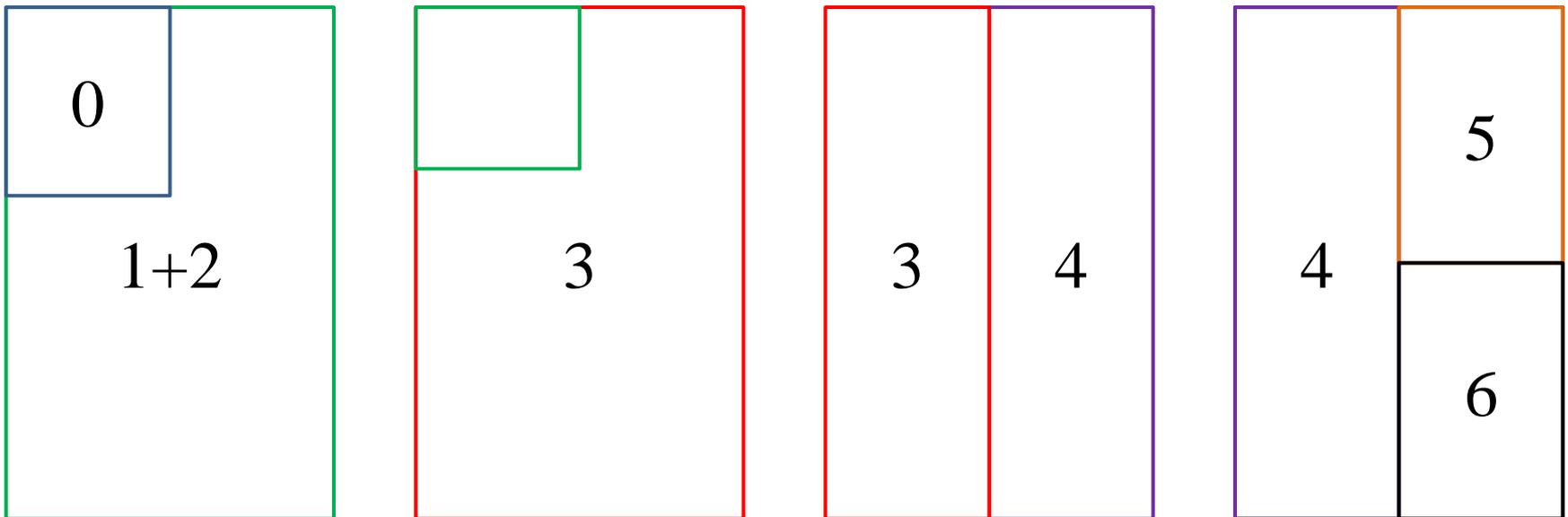
Structure

- Logic flow:

✓Vote me!! Vote me!! Vote me!!
✓I could raise your salary.
✓I could reduce the unemployment rate.
✓I could make you smile.
✓We'd like to start a new XXX plan.

✓The government is suck!
✓The government neglects the problem of unemployment because ……
✓The problem of unemployment can be alleviated by a XXX plan.
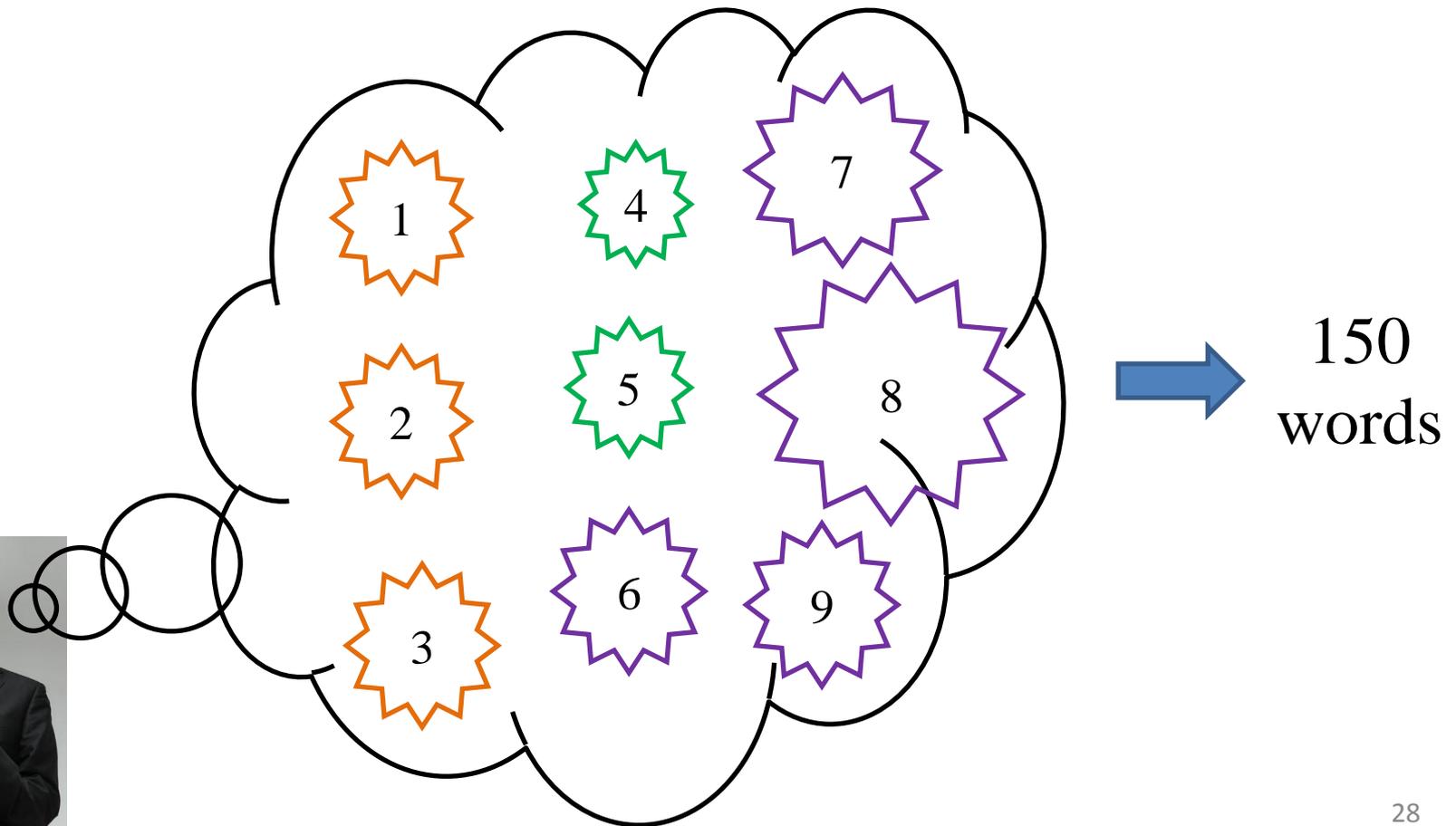✓To implement the plan, please vote me!

Structure

- Section allocation:

- My suggestion:
  - ➢ Carefully plan the allocation
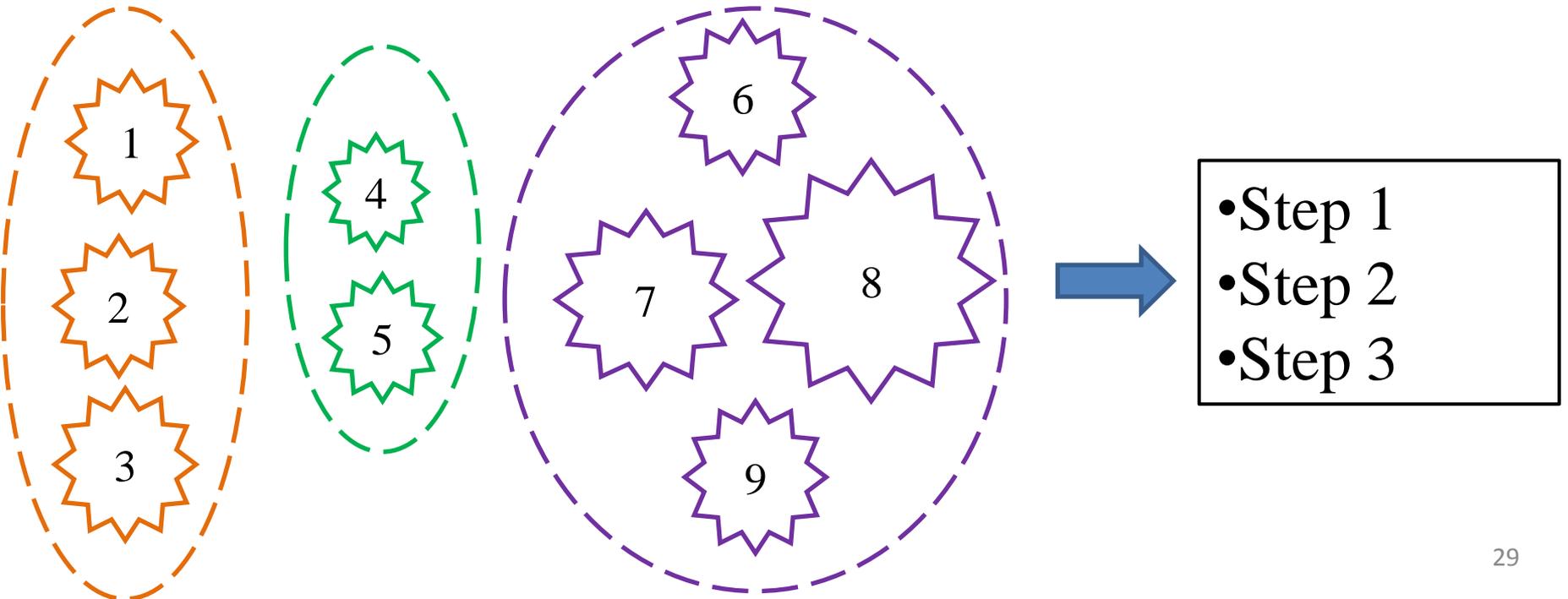 - ➢ Write in sequence from abstract into cnoclusion

Structure

- Why write in sequence: (Abstract & Introduction)

150 words

Structure

- Clustering and planning:
  - ➢ Semantic meaning is important than hard working
  - ➢ A key idea may be implemented simply; a seemingly trivial step may be implemented with hundred lines of programs


- Step 1
- Step 2
- Step 3

Abstract

- Ex:

In this paper, a new article recognition algorithm with three steps is proposed. By considering the fact, a single meaning could be claimed diversely by different people, the raw text is first processed by a *mid-level representation* step, which results in a compact feature vector robust to different writing styles. To further reduce the semantic gap, a *semantic grouping algorithm* is then presented to describe a feature vector sparsely by its corresponding topics. Finally, a *sparse-oriented classifier* is designed for accurately article recognition. The experiments performed on the popular DISP text database with 100000 articles demonstrate the effectiveness of our work.

Introduction

- ## Structure: face recognition as an example

History / Motivation

↓

Problems

↓

Proposed method

↓

Contribution

↓

Organization

⟹
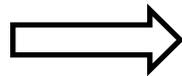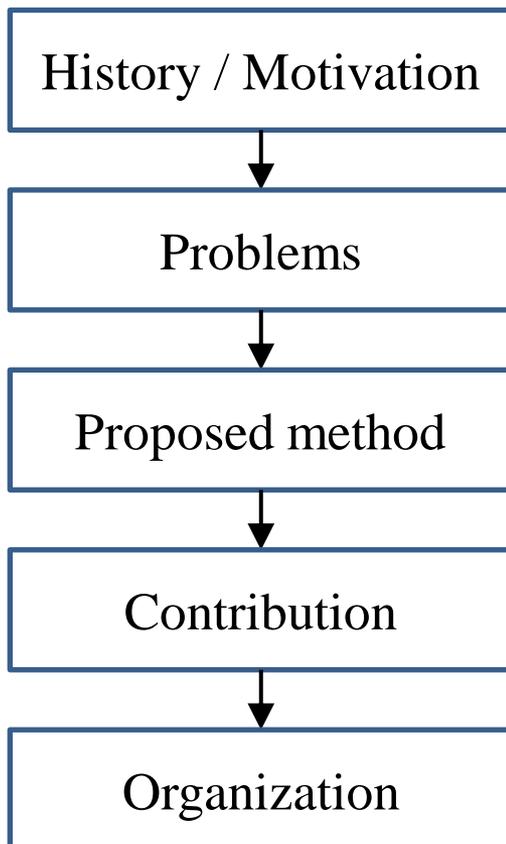
Face recognition has attracted significant attention and been widely researched in the past two decades. Among all the face recognition algorithms, the subspace learning based methods, started from the eigenface algorithm proposed by Land et al. [], are probably the most popular category, not only because of their efficiency but also because of their capability of analyzing the characteristics of human faces: high intra-class variation and low inter-class variation. ……

A paragraph

- ## Structure 1:
  - ➢ Time flow

- ## Structure 2: ⇒

  Analyzing the acoustics signal is a tedious work because of the amount of data: simply over ten thousands of samples per second. To deal with this problem, a dimensionality reduction step is often required to achieve a more compact representation. Inspired by the fact — a clean acoustic signal is usually composed of only a few frequency components — we proposed to first transform the signal into the frequency domain via the Fourier transform, and then detect the key frequency components for compact representation. ……

  - ➢ Main purpose
  - ➢ The thinking flow
  - ➢ The final solution

- ## Structure 3:
  - ➢ Traditional idea
  - ➢ However + Problems
  - ➢ Our idea

Main body

- Paper structure:

```
┌─────────────────────────────────────────┐
│           1 (History and Problem)        │
└─────────────────────────────────────────┘
                    ↓
┌─────────────────────────────────────────┐
│           2 (An initial solution)        │
└─────────────────────────────────────────┘
                    ↓
┌─────────────────────────────────────────┐
│     3 (The problems of the initial solutions)│
└─────────────────────────────────────────┘
                    ↓
┌─────────────────────────────────────────┐
│  4 (Sub factors for solving the problems above)│
└─────────────────────────────────────────┘
                    ↓
┌─────────────────────────────────────────┐
│        5 (Re-state the whole algorithm)  │
└─────────────────────────────────────────┘
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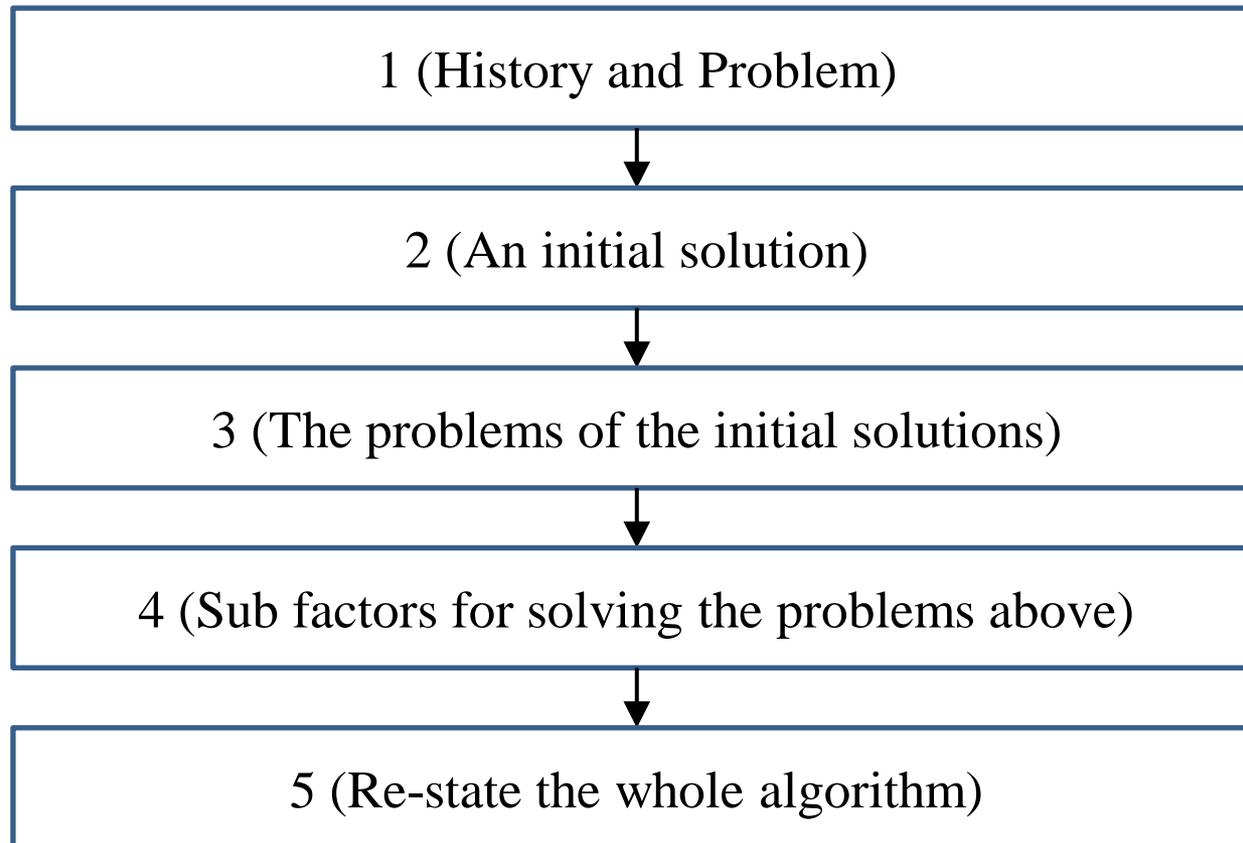
Small notes

- Writing a paper is just like telling a story or planning the show; That is, the main purpose of a paper is to present the core ideas and semantic meanings, not to make a harangue about how you designing each step and how much time you have spent.

- Sometimes, the way you find or discover your algorithm and solution should be decorated: I'm not encourage you to lie, but encourage you to change your seemingly ad-hoc or heuristic flow of thinking into a more formal statement.

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Sentence and Grammar

- ## What's the problem?
  - ➤ Too short
  - ➤ Don't know how to connect two sentences
  - ➤ Don't exactly know how to express what you think

- ## Four warming-up questions
  - ➤ Because he came to the station late, so he could not get on the train.
  - ➤ He usually does great on exams, however, he got only C in the mid-term last week.
  - ➤ Tom, the best shooter in the summer league, scoring 40 points yesterday.
  - ➤ According to the fact that over 1000 technical companies have closed during the last ten years, the development of technology is suffering from a undoubted stagnation.

Sentence and Grammar

- A sentence always contains a verb.

- A "sentence" without a verb is called a fragment.

- Combining two sentences requires a conjunction.

- Conjunction:

  ➤ and, or, but, so, yet, for, because, although, as, if, since, ……

  ➤ He came to the station late, so he could not get on the train.

- Adv:

  ➤ however, nevertheless, that is, namely……

  ➤ He usually does great on exams. However / , but however, he got only C in the mid-term last week.

Sentence and Grammar

- Preposition: combining two parts of a sentence

  ➢ according to, from, on, in, ……

- Punctuation:

  ➢ :   ;   —

  ➢ He derives a new formula: A formula that can ……

  ➢ He derives a new formula: (,) (—) a formula for making ……

  ➢ He usually does great on exams; however, he got only C in the mid-term last week. (; = , + conjunction)

  ➢ His family — which contains a father, a mother, a sister, and a brother — is awarded the best family of the year.

Sentence and Grammar

- Skill 1: Combine two short sentences by a conjunction
- Skill 2: Embed an explanation in you sentence
  - PCA is a dimensionality reduction algorithm. In our framework, we adopt PCA as the preprocessing step.
  - In our framework, we adopt PCA, (which is) a dimensionality reduction algorithm, as the preprocessing step.
- Skill 3: Reduce a sentence into a fragment
  - The algorithm is only designed for small-scale data, so it can not be used on the Internet.
  - Only designed for small-scaled data, the algorithm can not be used on the Internet.

Sentence and Grammar

- Skill 4: Change the order in a sentence

  ➢ The unavoidable image noise is really a problem in object recognition. We design a noise-filtering algorithm that averagely reduces 10dB of noise to alleviate the image noise.

  ➢ The unavoidable image noise is really a problem in object recognition. To alleviate this problem, we design a noise-filtering algorithm that averagely reduces 10dB of noise.

- Skill 5: Try the punctuations

- Skill 6: Frequently re-reading the paragraph you're writing, and see if some skills can make the paragraph more fluent.

Other important notes

- Coherence:
  - It only costs you 40 dollars to learn some skills for protecting yourself from a good coach.
  - He kick the dog with anger.

- Other grammar concerns:
  - The and singular / complex
  - We

Real cases

- Fourier transform is possibly the most important tool in recent signal processing. Fourier transform can transform a time-domain signal into the frequency domain. Fourier transform has great mathematical properties, but Fourier transform is a continuous transform. It can not directly be performed on the discrete signal. Besides, in real implementation, a computer program can not handle a continuous process. How to make Fourier transform usable on the discrete signals and be implemented by a computer program is a crucial issue.

- In recent signal processing, the Fourier transform, which can transform a time-domain signal into the frequency domain, is possibly the most important tool. From the mathematical view, the Fourier transform has several key properties; however, it cannot be directly implemented by a computer program: A computer program is unable to handle a continuous process. Furthermore, the Fourier transform is originally a continuous transform, so it can not be performed on the discrete signal. By considering these drawbacks, how to make the Fourier transform available on discrete signals and be implemented by a computer program becomes a crucial issue.

Conclusion

- When to practice?

  - ➢ Writing the homework in English; more specifically, writing the homework in formal English, not just with several English fragments.

  - ➢ How about the final report?