English Practice

Results (Figures and Tables)

and Discussion

conference

Presentation

Writing

Networking

BIG DATA
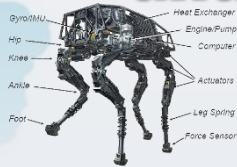
Chapter 4 Results and discussion

- Order your material

- Write a concise and attractive title

- Construct a neat abstract

- Write an effective introduction

- Describe your methods so that other researchers could repeat your study

- **Report your results precisely**

- Make your discussion relevant and interesting

How to demonstrate the results

- ☐ **Design the simulation/experiment setups**
- ☐ **Use appropriate figures and tables to show the results**
- ☐ **Discussions on the results**

Categories of figures

- ❑ **Pictures**：**records of the experiments**
- ❑ **Statistical graphs**：
  - ● **Point chart**：**Quantitative relationship between two variables (trend, continuous change)**
  - ● **Scatter diagram**：**The distribution of two variables**
  - ● **Bar chart**：**The independent variable is classified data**
  - ● **Histogram**：**Statistical distribution of variables**
  - ● **Pie chart**：**Proportional relationship**
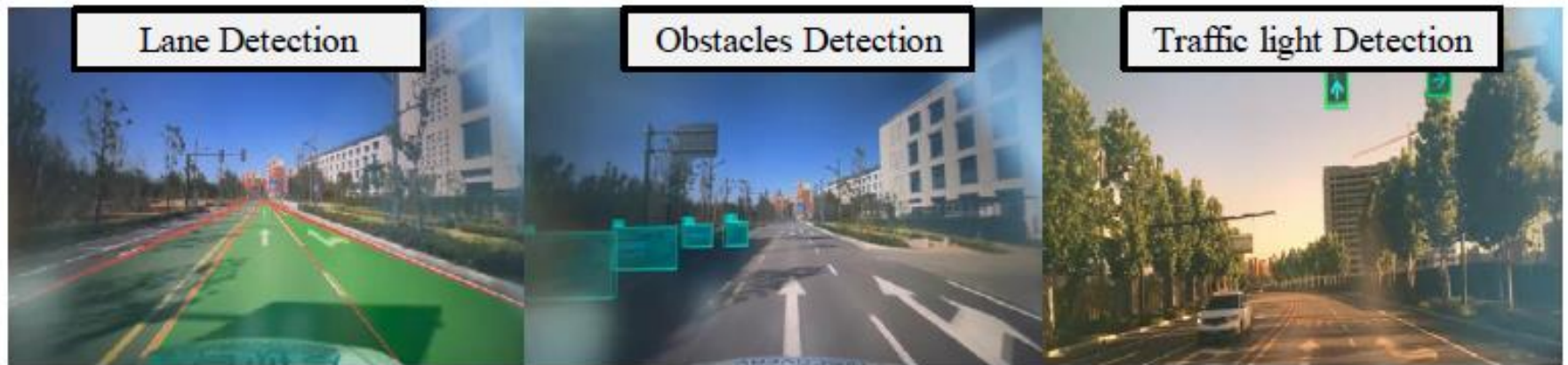- ❑ **Flowchart and schematic diagram**

Pictures : Displaying preliminary products
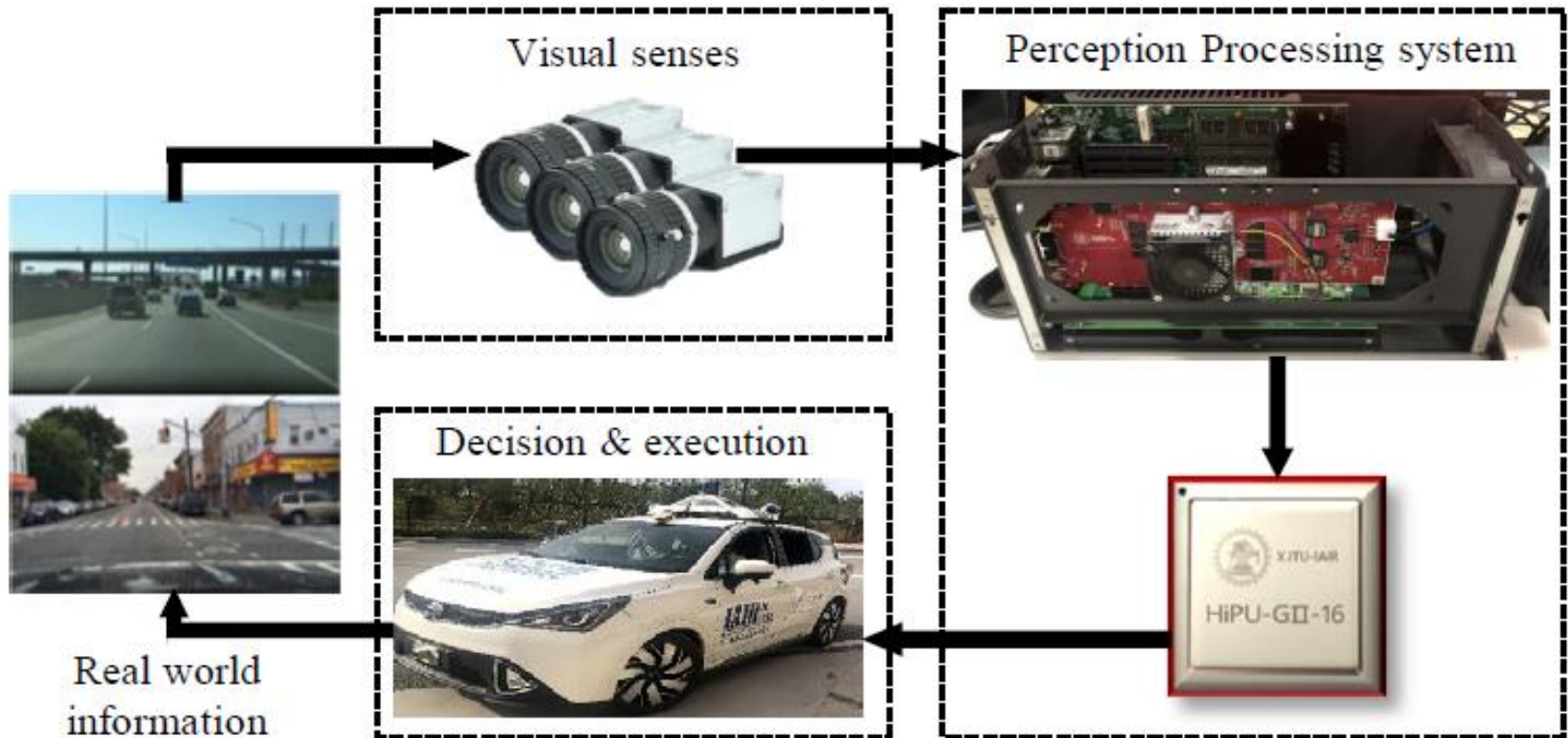
(a) System diagram of autonomous vehicles

Figure 1. The practical evaluation system for autonomous vehicles using HIPU accelerator
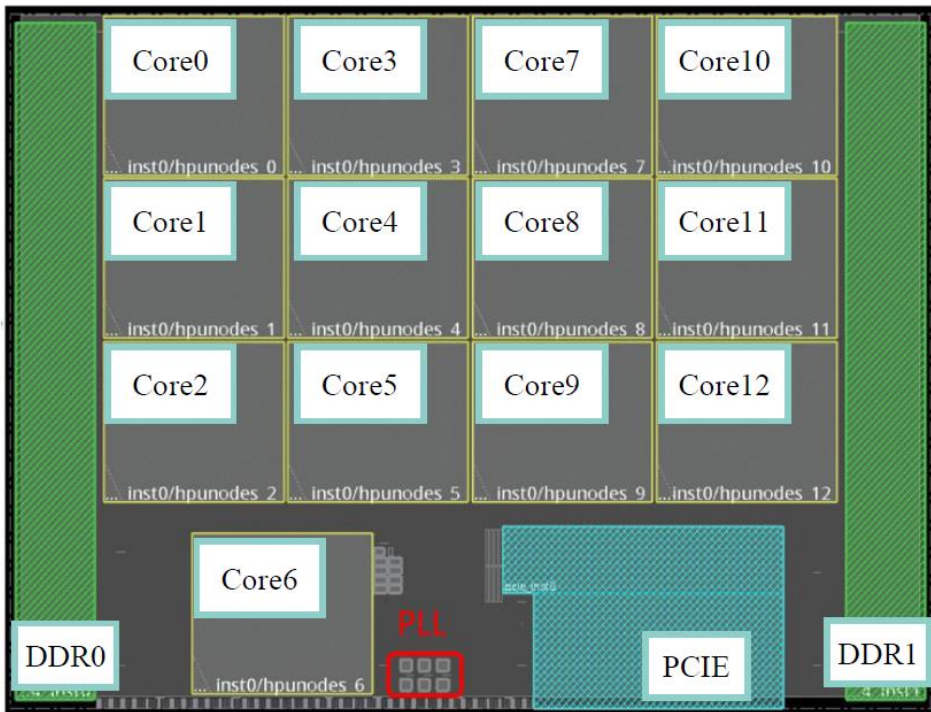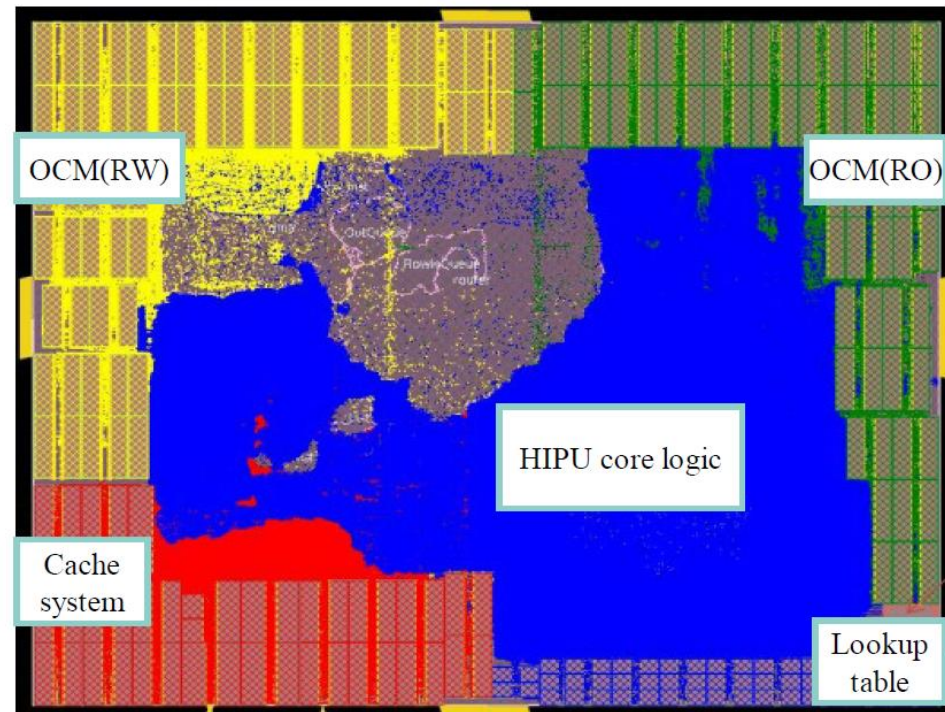
Pictures : Presenting a real scenario

(b) Detection result of 3 perception tasks

Figure 1. The practical evaluation system for autonomous vehicles using HIPU accelerator

Pictures： Proper labeling

(a) Top floor plan of 13-core HIPU

(b) Place and route design of 1 HIPU core

Figure 2. Place and route results of HIPU with 13 cores, 2 DDR controllers, and 1 PCIe DMA.

Pictures： Show the authenticity of the data

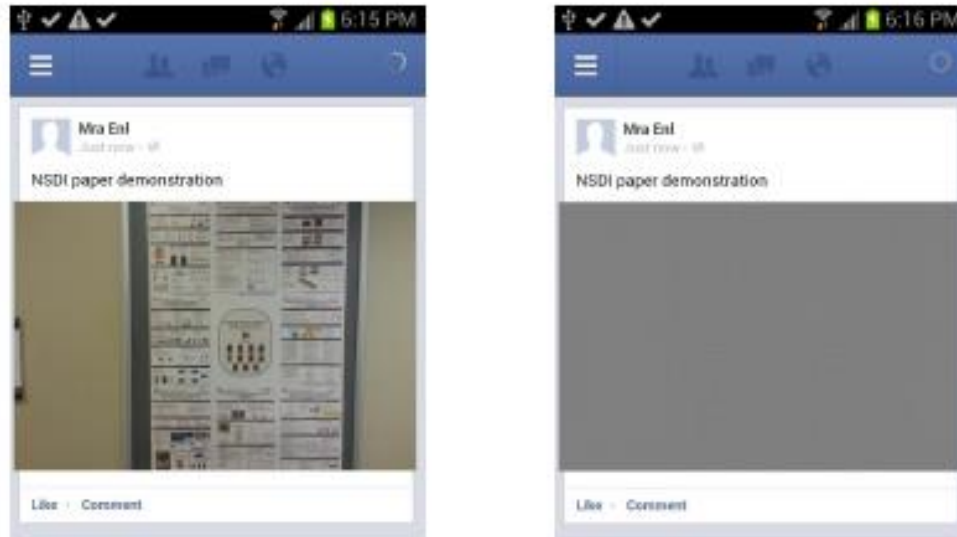□ **Toward Privacy-Preserving Photo Sharing**

Figure 3. Screenshot(Facebook) with/without decryption

Statistical graphs

- **Statistical graphs are widely used to**
  - Show the simulation/experiment results and do **comparisons**
  - **Analyze** the rules inside the data
  - **Insights** to think about the nature of the data
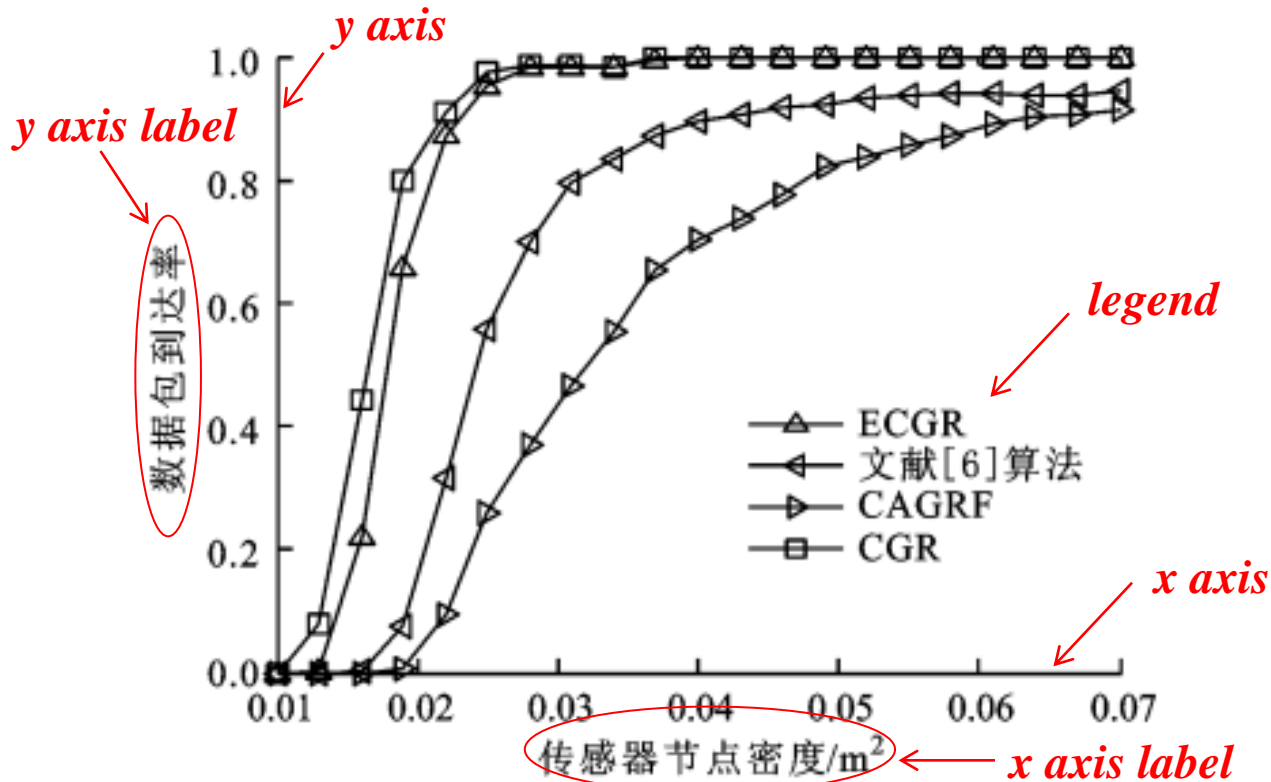
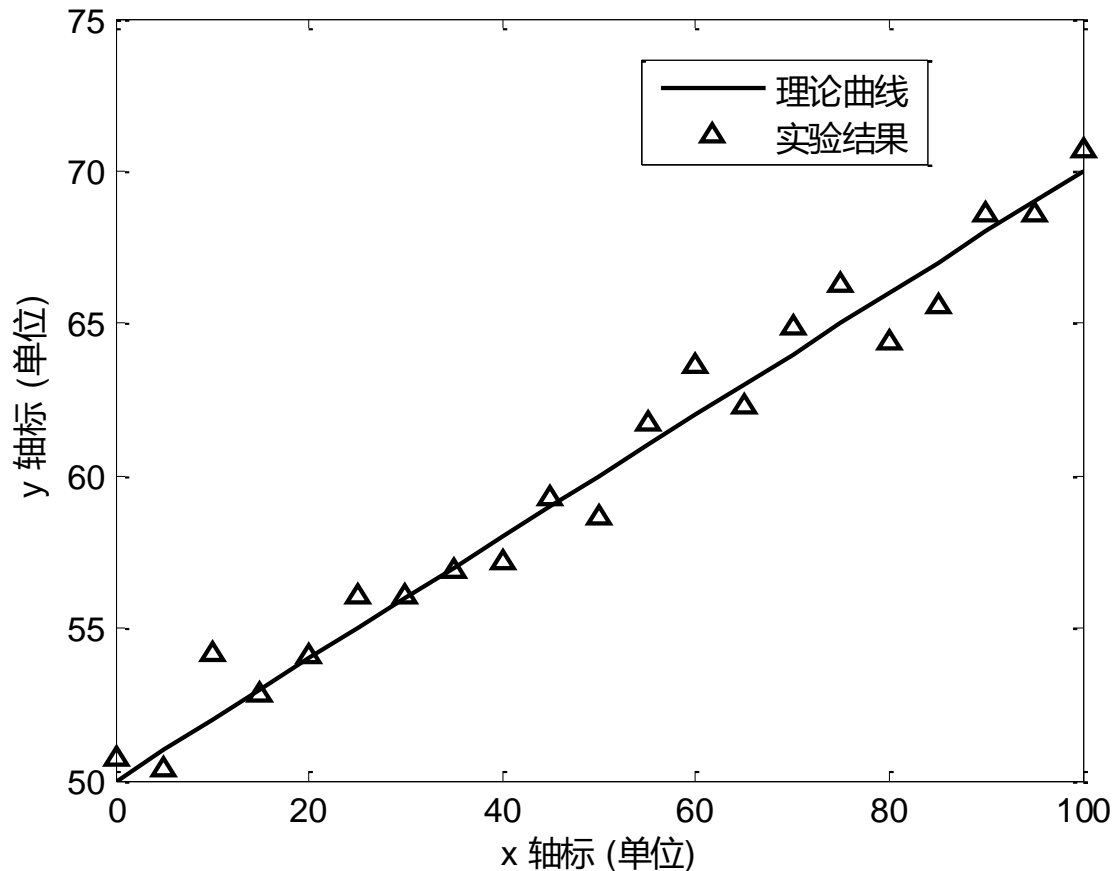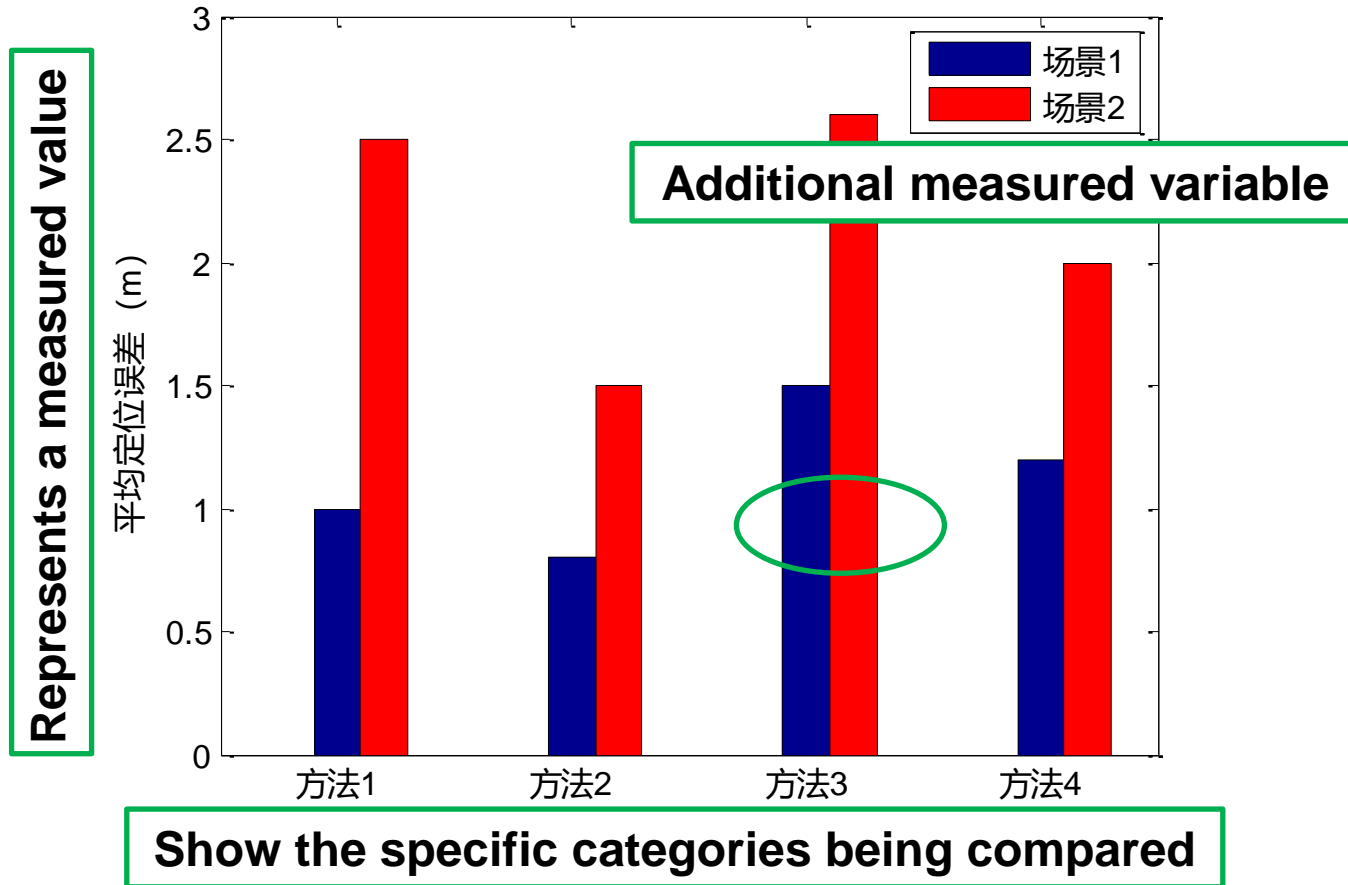# Statistical graphs: Point chart

图 5   PRR 在不同算法中的性能对比曲线

- Show how the **dependent variable** changes with the **variable**.
- **Different groups** of variables are represented by distinguishable **colors/lines/markers**

Statistical graphs: Scatter diagram

- Show the **correlation** and **trend** of **two variables** or events .
- Show the **deviation** between the presented samples and the ideal values.

Statistical graphs: Bar chart

- Show **comparisons** among discrete **categories**.
- Some bar graphs present bars clustered in **groups** of more than one, showing the values of **more than one measured variable**.

Statistical graphs: Histogram
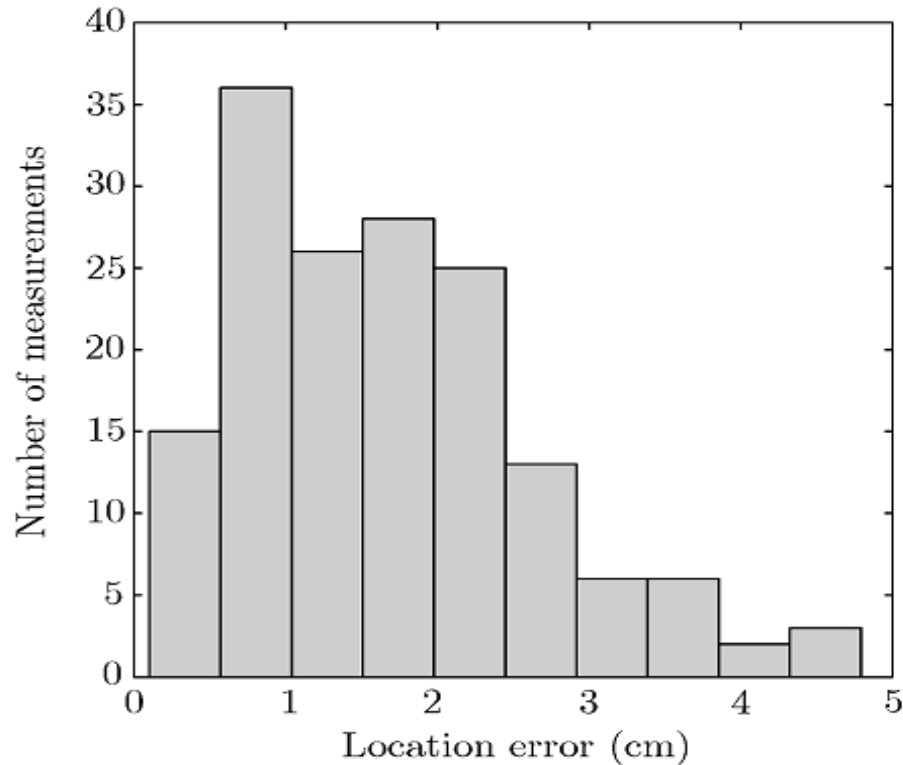
- An estimate of the **probability distribution** of a **continuous variable** (quantitative variable).

- Different from a bar chart, in the sense that a bar graph relates two variables, but a histogram relates **only one variable**, and the **intervals** must be adjacent.
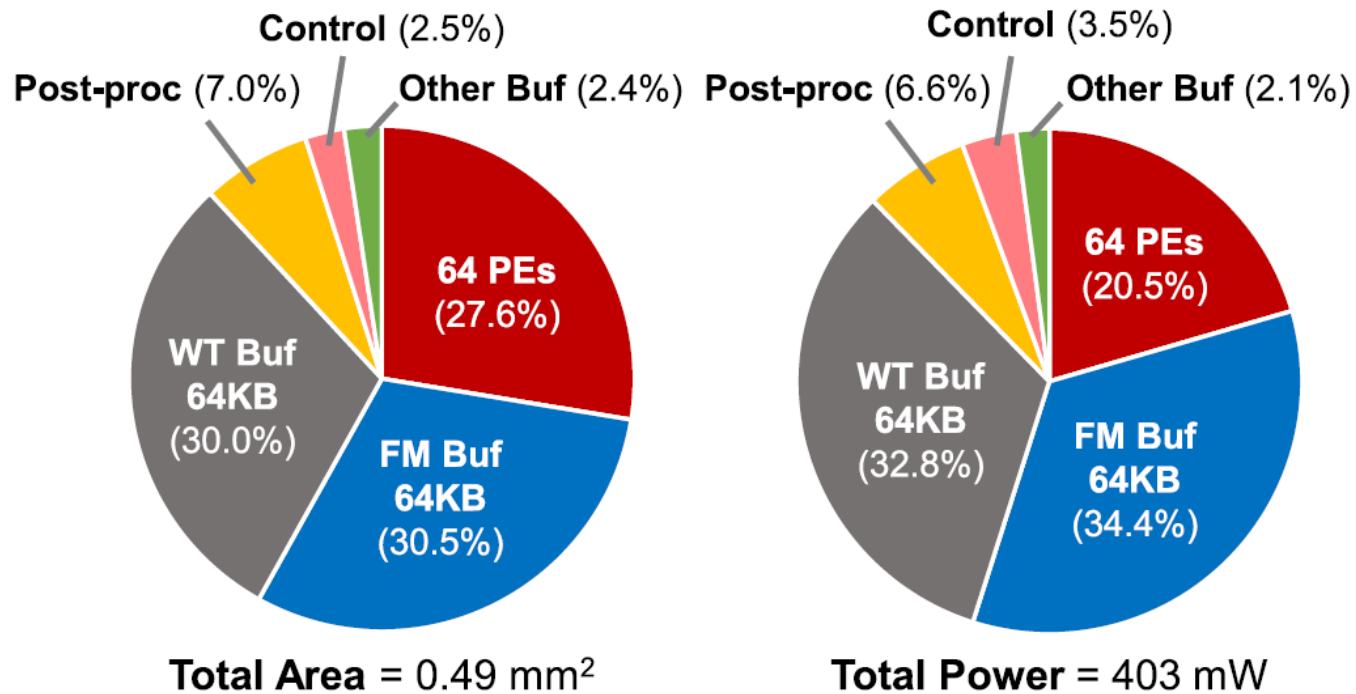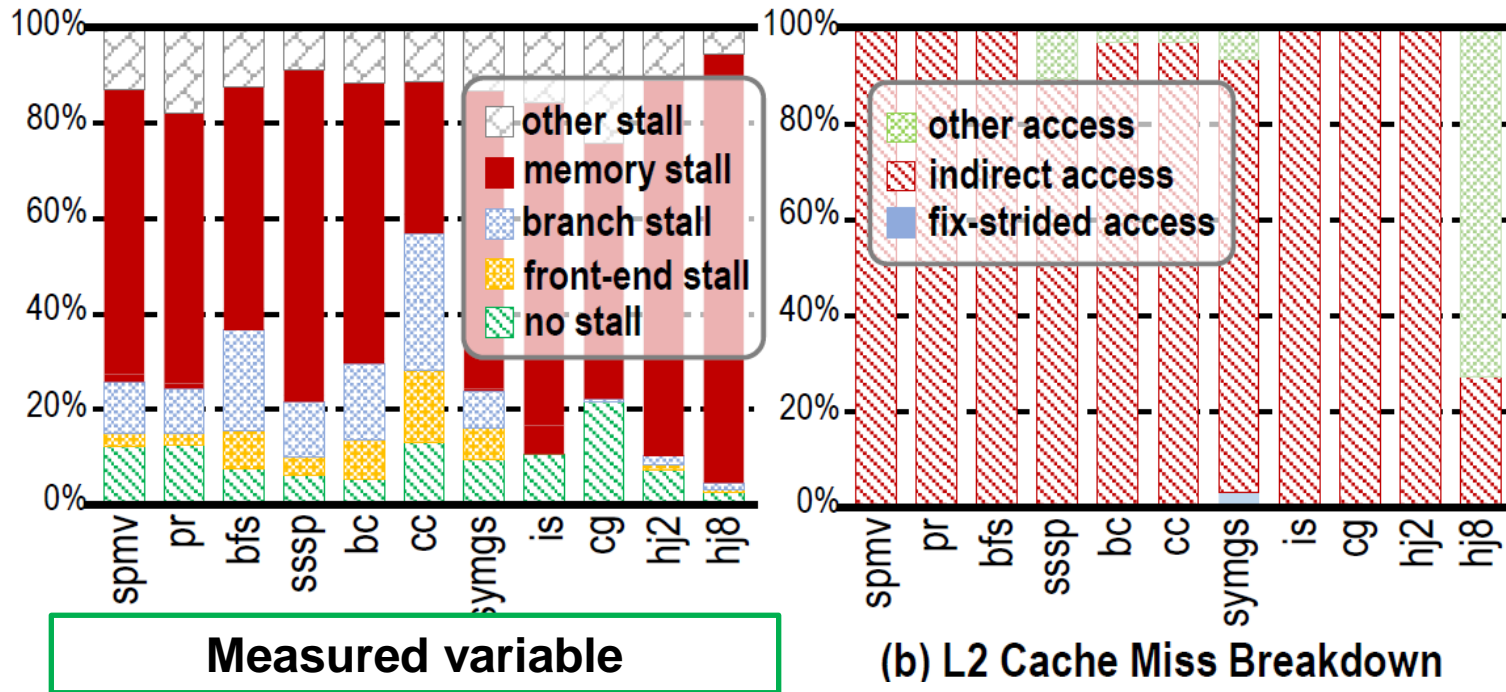
Statistical graphs: Pie chart

Fig. 11. Breakdown of UPoT accelerator's area and power.

- ❑ Effective to emphasize the **proportion** of **components** within the whole. Widely used for **breakdown analysis** for area, power and performance.
- ❑ Not used widely for **comparison**, since it is difficult to compare different data across different pie charts.

Statistical graphs: Stack-up Bar Chart

Measured variable

(b) L2 Cache Miss Breakdown

- A **variation** of pie chart.
- It **compares** the breakdown proportions when the **measured variable** is different

What is a good Statistical graph?

- Choose a right **graph**
- Choose a right **size**
- Choose a right **scale**
- Choose a right **font**
- Self-explanatoriness
- Legend
- Be Concise and clear
- Use auxiliary markers appropriately

Choose a right graph

Histogram is suitable when the X-axis is the **independent classification** variable
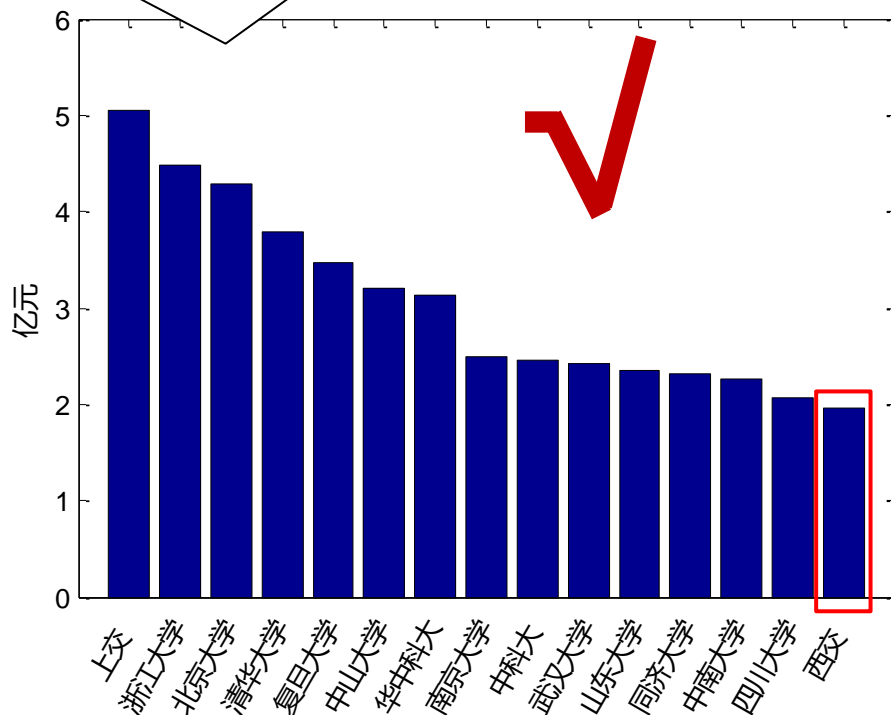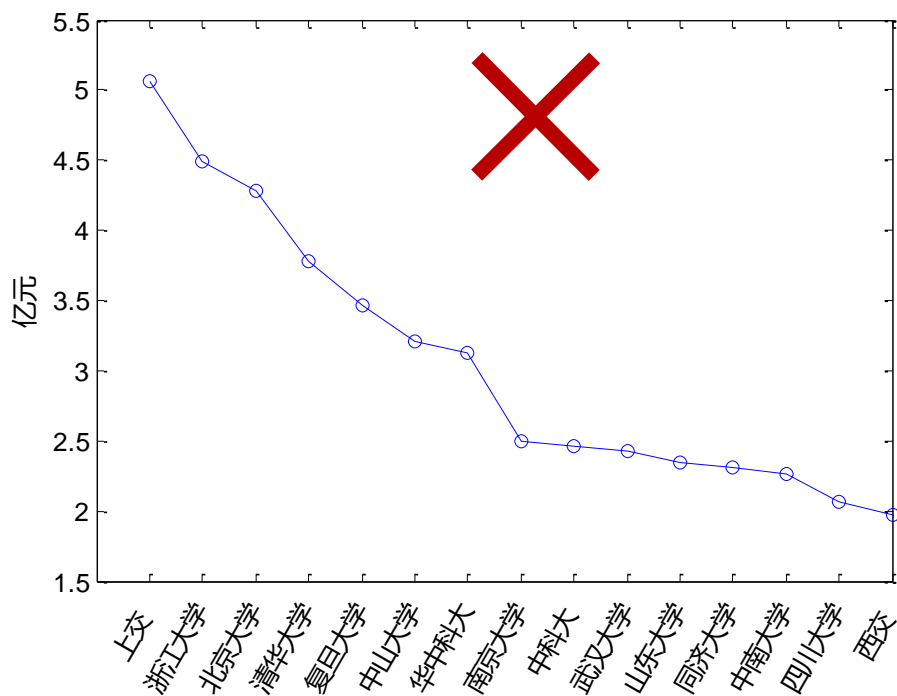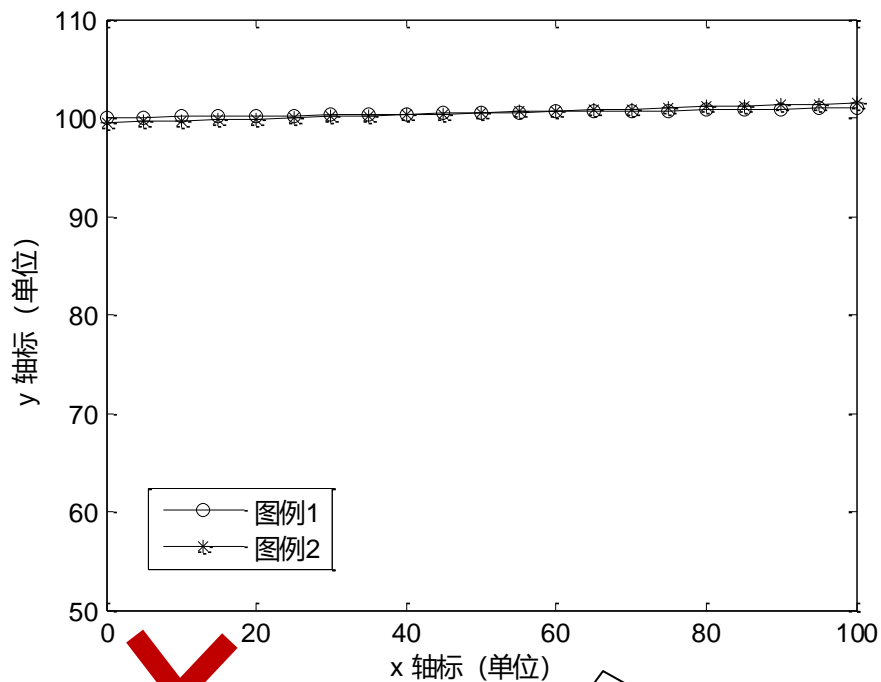
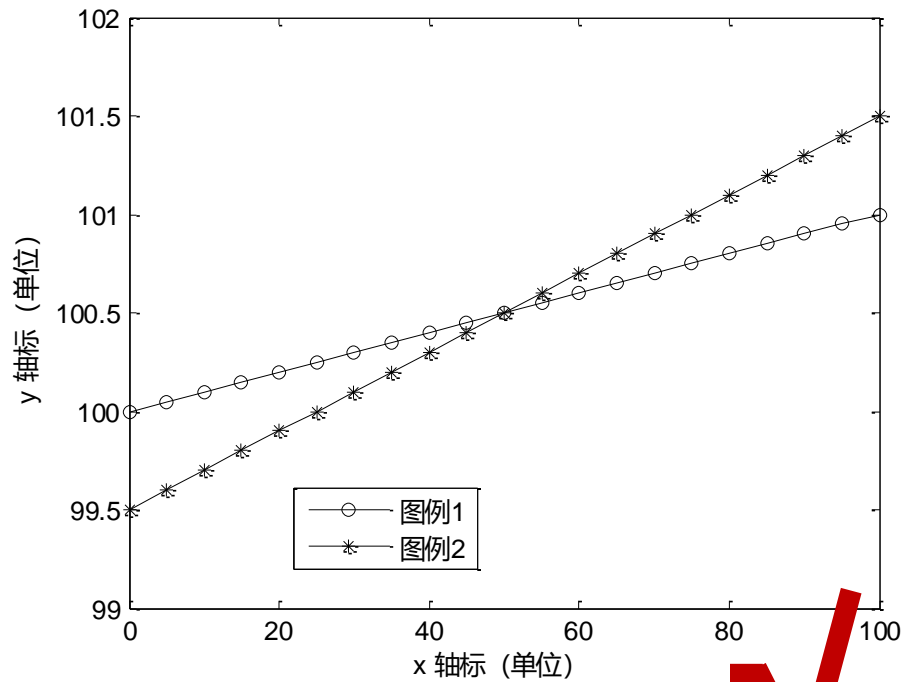National natural science foundation of China in 2013

Choose a right size

- **Commonly used size of statistical graphs**
  - **Width > height, the ratio of width over height:1.2~1.5**
  - **Single column: width around 120 mm**
  - **Double column：width around 90 mm**
- **Figures in the same paper must be of the same size!**
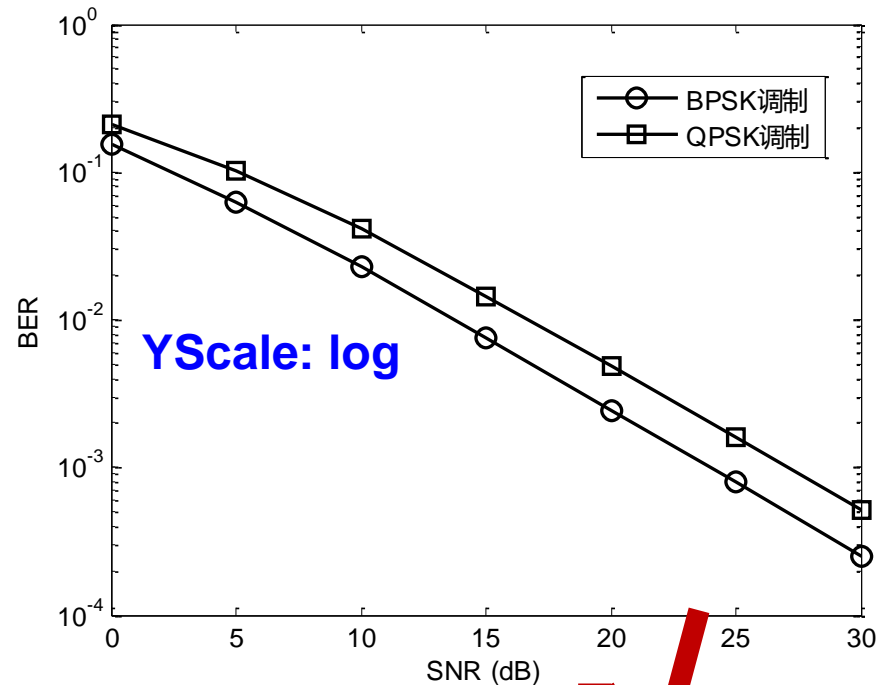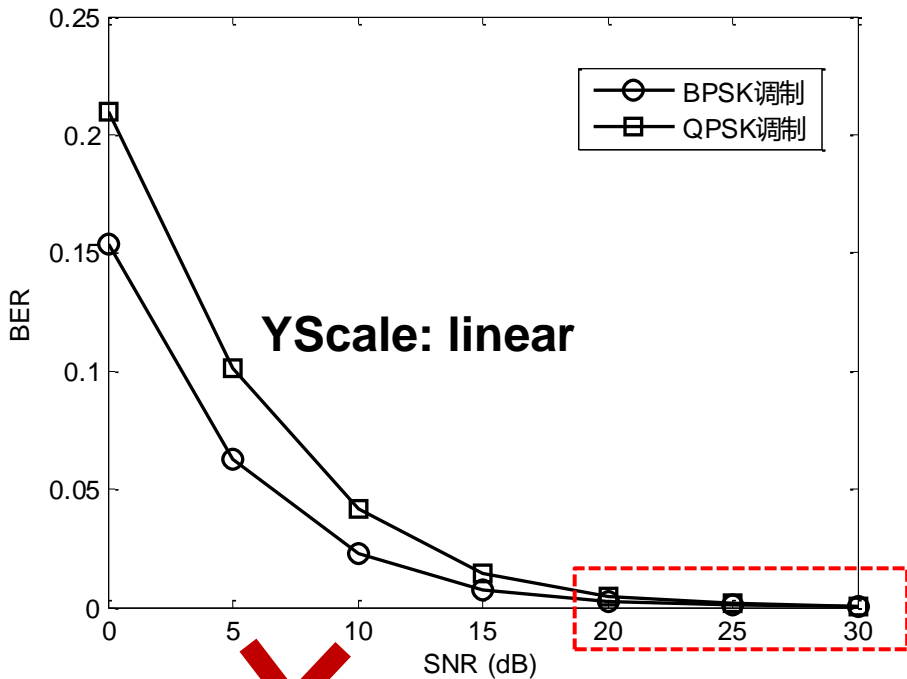
Choose a right scale

What can you conclude from this graph?

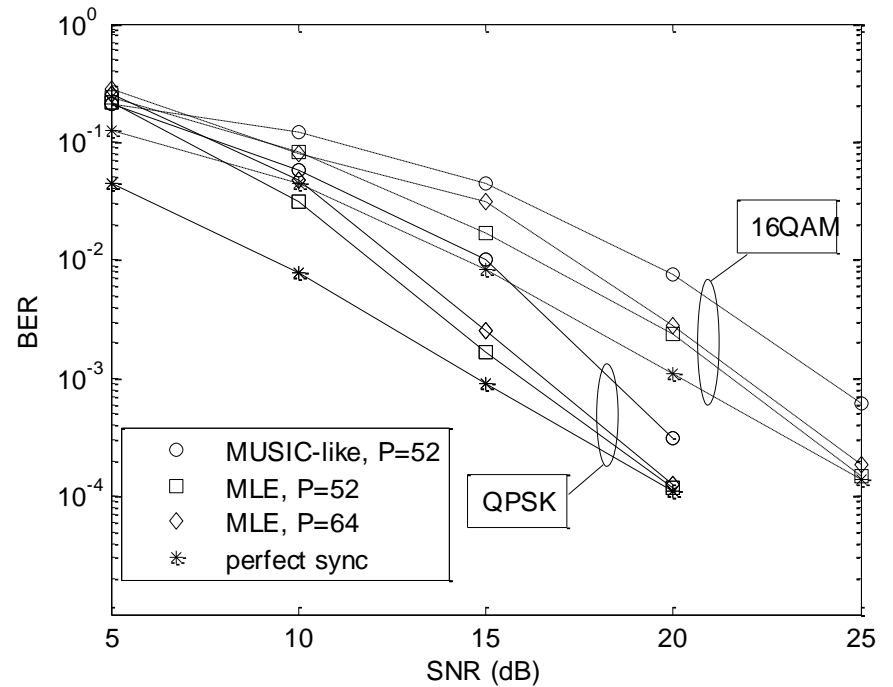Adjust the range of Y axis

Choose a right scale

BER performance of BPSK and QPSK modulation in Rayleigh fading channel

Choose a right font

Font too small
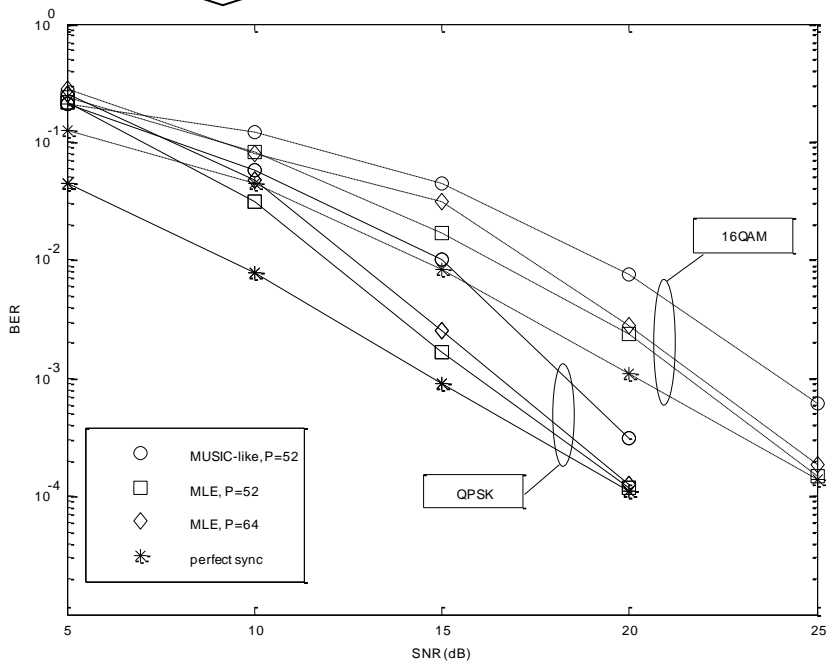
Self-explanatoriness

□ **Stand-alone.** By only looking at the **picture**, **legend** and **title**, you can understand:

- the **meaning** of the picture
- the reflected information or **pattern**
- how the **experiment** is carried out

□ **Self-explanatory.**

- **Key parameters** of the experiment are set in the figure
- **Supplementary description** of the results in the figure, such as experimental conditions.
- Using the **result expectation** in the figure to express the key information

Self-explanatoriness
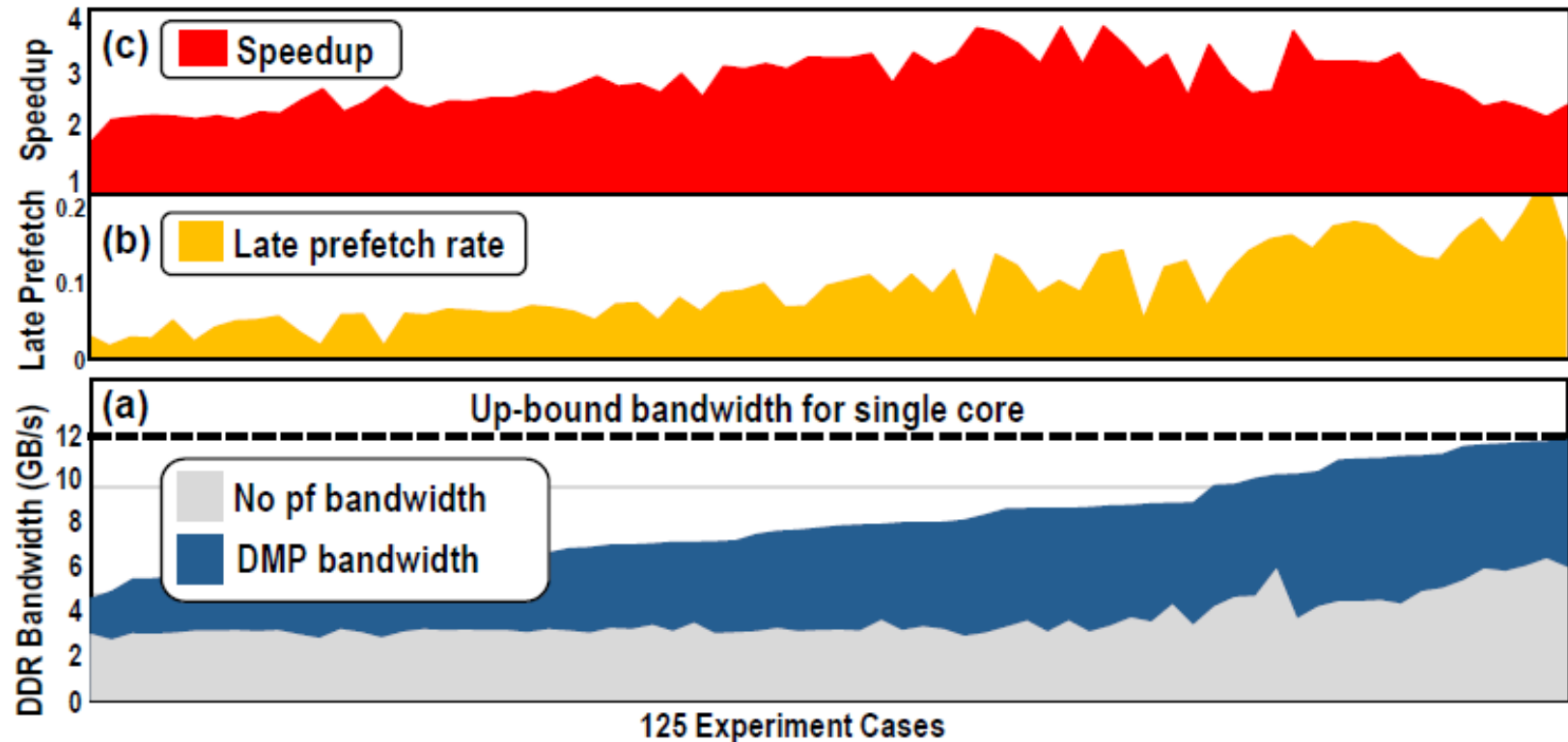
Fig. 9. The bandwidth utilization of DMP in comparison with no-prefetching on all the tested benchmarks. The proportion of late prefetch and the speedup on these benchmarks are also listed.

Legend are consistent with the curves
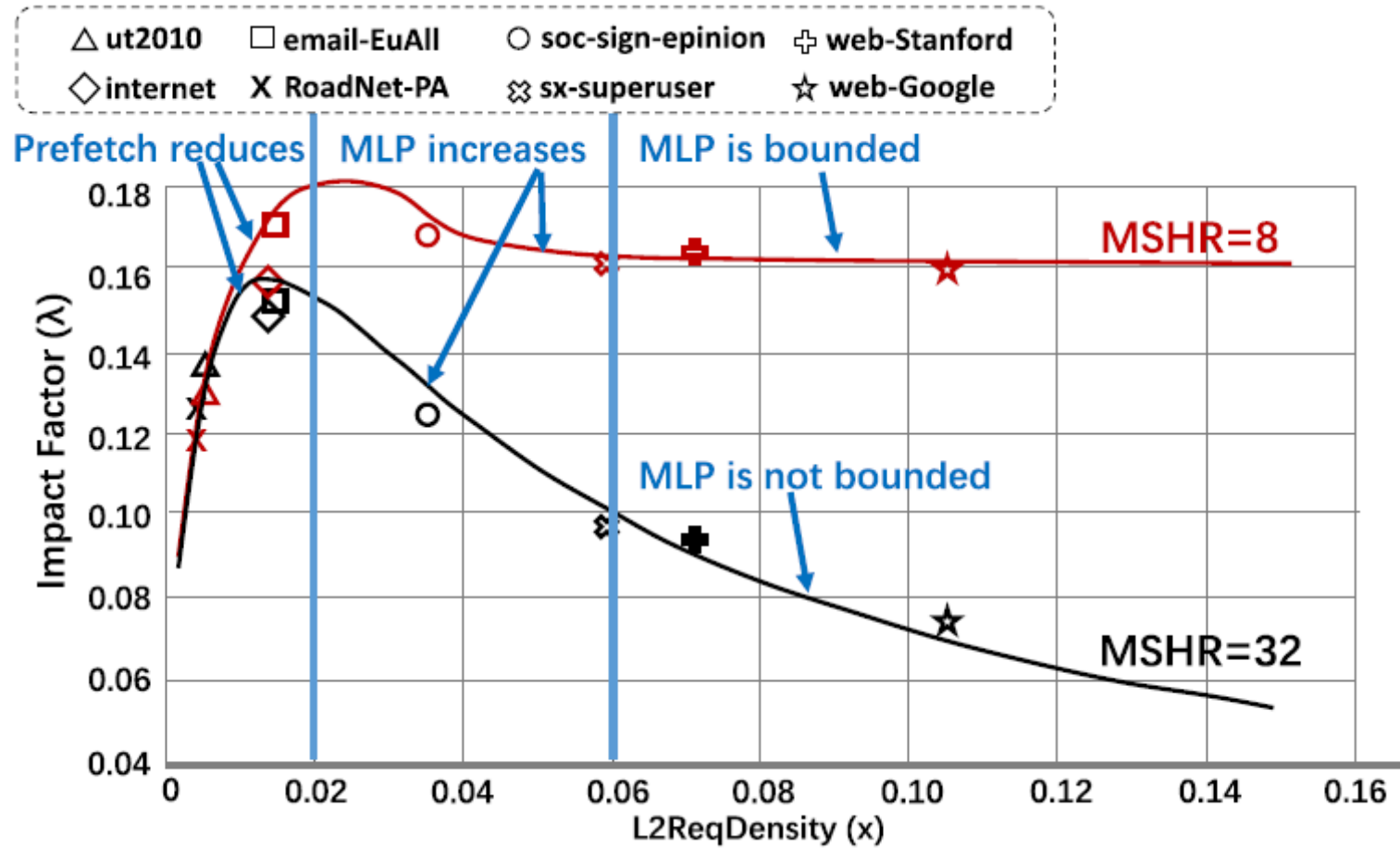
Concise and clear

Patterns are not easily distinguishable
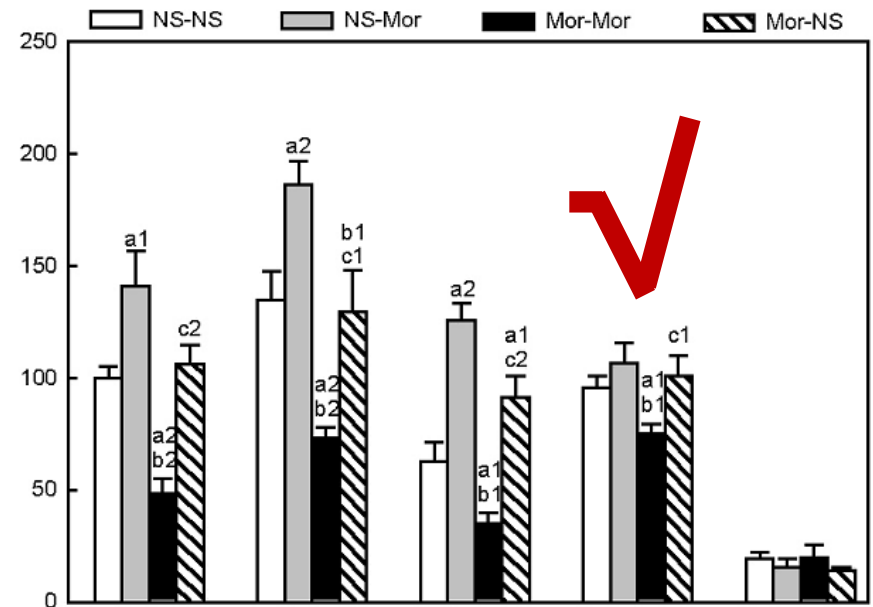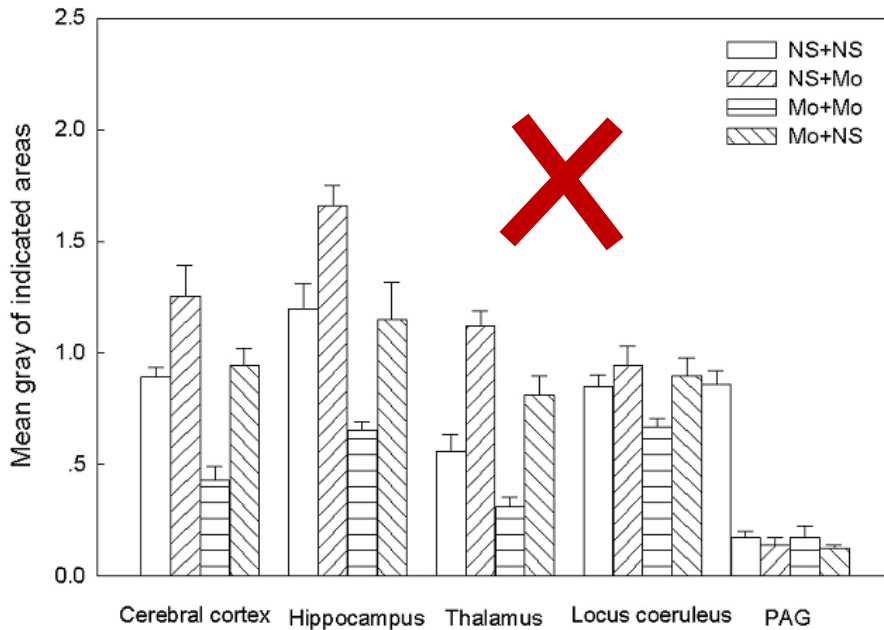
Concise and clear

Can you distinguish these curves?

Clear, concise, easy to read
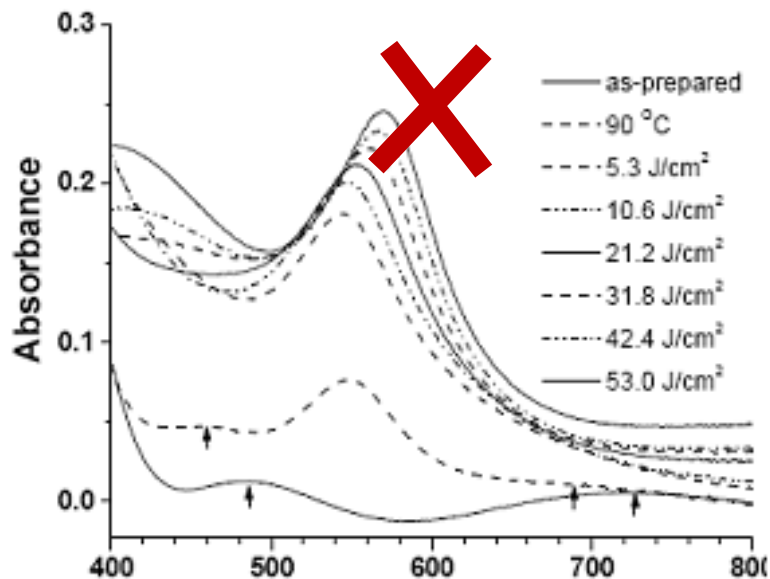
Figure 3 Optical absorption spectral evolutions of in-situ generated Au nai inside the hybrid (SiO₂-TiO₂–PEO) film matrix with respect to the thermal treatment energies.
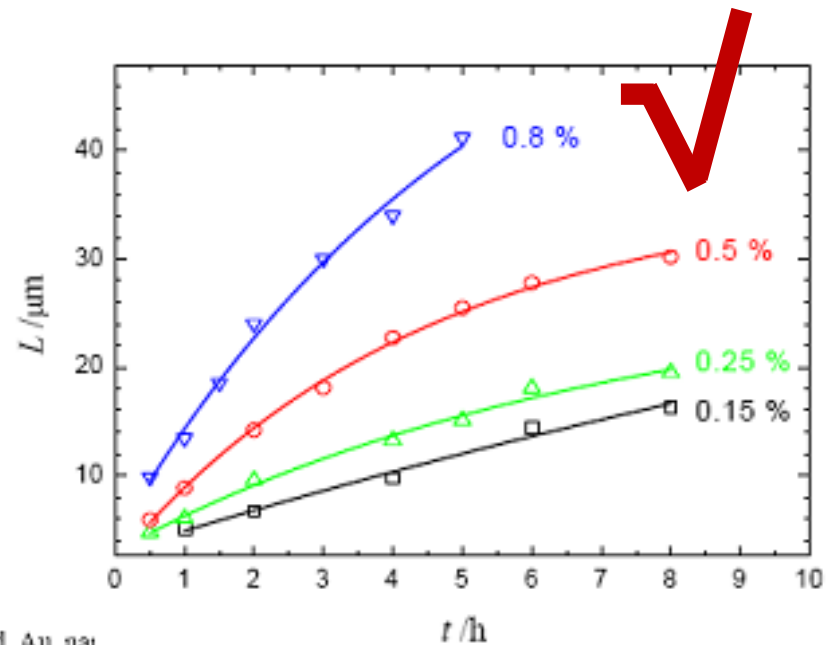
Use auxiliary markers
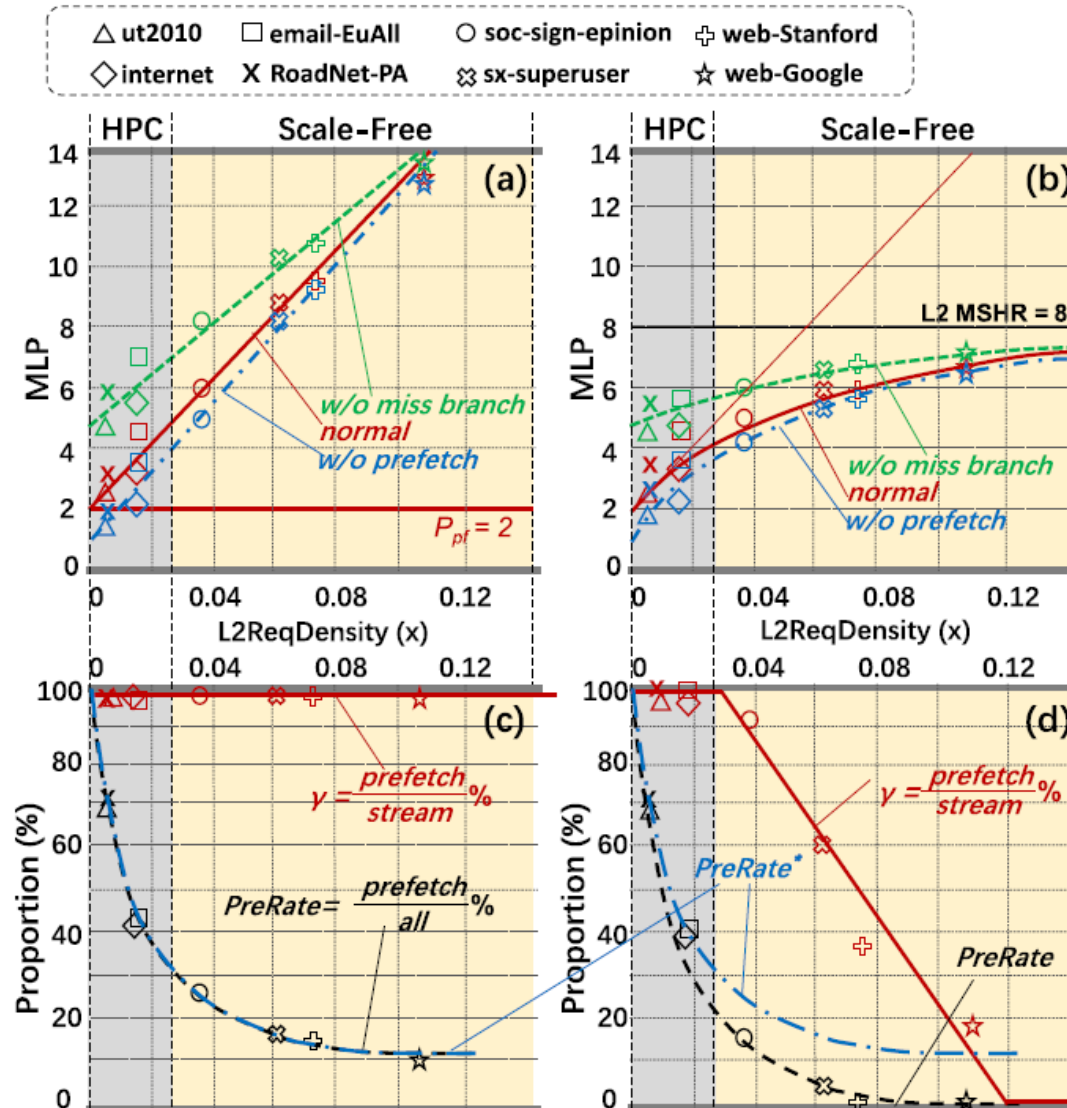
Table

□ **Three-line table is commonly used in research papers.**

table serial number and title   **crest line**

Item ⇨

| ××× | ××× | ××× | ××× |

Table body ⇨

×××	–	–	–	–
×××	–	–	–	–
×××	–	–	–	–

Column line

Table note：

Bottom line

Variations of three-line tables

	longitudinal items		longitudinal items	
	subtopic	subtopic	subtopic	subtopic
⦙	× × ×	× × ×	× × ×	× × ×
	× × ×	× × ×	× × ×	× × ×
⦙	⦙	⦙	⦙	⦙
⦙	⦙	⦙	⦙	⦙
total	× × ×	× × ×	× × ×	× × ×

Table note：

Variations of three-line tables

TABLE V

RESNET18 PERFORMANCE (TOP-1 ACCURACY) ON IMAGENET DATASET USING MULTIPLE QUANTIZATION METHODS. EACH METHOD IS COMPARED WHEN WEIGHT/ACTIVATION VALUES (W/A) ARE IN 4/3/2-BITWIDTH. FOR EACH SETTING, THE ACCURACY CHANGE AGAINST BASELINE (+/−) AND MODEL SIZE (MB) ARE LISTED. SPECIAL PRECISION SETTING REQUIRED IN EACH METHOD IS ALSO LISTED. THE (−) MARK DENOTES THE ABSENCE OF DATA IN ORIGINAL PAPERS

Method	Type	Special Precision	Baseline(%)	W/A=4-bit		W/A=3-bit		W/A=2-bit	
				Top-1(%)	Size	Top-1(%)	Size	Top-1(%)	Size
UPoT	*Logarithmic*	8-bit	70.2	**71.2 (+1.0)**	**5.9**MB	**70.2 (+0.0)**	**4.6**MB	**67.5 (-2.7)**	**3.2**MB
APOT [8]		INT8	70.2	70.7 (+0.5)	5.9MB	69.9 (-0.3)	4.6MB	67.3 (-2.9)	3.2MB
MSQ [22]		INT8	69.8	70.3 (+0.5)	5.9MB	-	-	-	-
LSQ [2]	*Uniform*	INT8	70.1	70.7 (+0.6)	5.9MB	69.4 (-0.7)	4.6MB	66.7 (-3.4)	3.2MB
LSQ+ [19]		INT8	70.1	70.8 (+0.7)	5.9MB	69.3 (-0.8)	4.6MB	66.8 (-3.3)	3.2MB
EWGS [21]		FP32	69.9	70.6 (+0.7)	7.6MB	69.7 (-0.2)	6.3MB	67.0 (-2.9)	4.9MB
DAQ [20]		FP32	69.9	70.5 (+0.6)	7.6MB	69.6 (-0.3)	6.3MB	66.9 (-3.0)	4.9MB
QIL [10]	*Non-Uniform*	FP32	70.2	70.1 (-0.1)	7.6MB	69.2 (-1.0)	6.3MB	65.7 (-4.5)	4.9MB
LQ-Net [25]		FP32	70.3	69.3 (-1.0)	7.6MB	68.2 (-2.1)	6.3MB	64.9 (-5.4)	4.9MB
DDQ [9]		Mixed	70.5	71.2 (+0.7)	5.8MB	-	-	-	-
DMBQ [24]		FP32+Mixed	70.3	-	-	70.0 (-0.3)	6.3MB	-	-

Tips :
- The **caption** is important to clarify the **setting and scope** of the provided experiments
- Data of the **same attribute** should be in the **same dimension** and compared
- Data of the **same attribute** should be **aligned** and have the **same accuracy**.

Examples of tables used in research papers

算法 3–4 用于牛顿迭代的步长搜索算法[57]

1: **procedure** LINESEARCH$(\theta, \triangle \boldsymbol{p}, \alpha, \beta)$ ▷ $\alpha \in (0, 0$
2:       $\zeta \leftarrow 1$;
3:       **while** $\theta(\boldsymbol{p} + \zeta \triangle \boldsymbol{p}) > \theta(\boldsymbol{p}) + \alpha \zeta \nabla \theta(\boldsymbol{p})^{\mathrm{T}} \triangle \boldsymbol{p}$ **do**
4:             $\zeta \leftarrow \beta \zeta$;
5:       **end while**
6:       **return** ζ;
7: **end procedure**

Description of algorithm

TABLE II
SIMULATION PARAMETERS

Channel Bandwidth (BW)	$10 \ MHz$
Number of Subcarriers (N)	1024
Number of Occupied Subcarriers (K)	720
Subcarrier Spacing	$15 \ KHz$
Sampling Frequency (f_s)	$15.36 \ MHz$
Carrier Frequency (f_c)	$2.5 \ GHz$
Resource Block Length (M)	2 (WiMAX) , 7 (LTE)
Number of Multipaths (L)	3
Number of SAGE-MAP iterations (i_{max})	3×Number of Multipath
Modulation Formats	BPSK, QPSK, 16-QAM, 64-QAM

Listing of parameters

表 5-2 计算复杂度比较

| 算法	信道和噪声方差信息	初始计算复杂度	估计复杂度
LS方法	不需要	——	$K_p L$
LMMSE方法	需要	$\mathcal{O}(K_p^3)$	$K_P^2 + K_p L$
SVD方法	需要	$\mathcal{O}(K_p p^2)$	$2p K_p + K_p L$
本文方法	不需要	——	$3K_p + K_p L$

Comparison of algorithms

Discussion on the results

Only when the discussion is sufficient, you can **objectively** demonstrate the **scientific significance** of your work.

- **Ablation** study
- **Sensitivity** study
- Deep **insights** derived from the phenomena
- Explanation of **unnatural** or unexpected experimental results
- **Limitation** of the proposed research work or methodology
- Other significant discussions derived from the results.
- Make reader believe the discussions advance the frontier of research
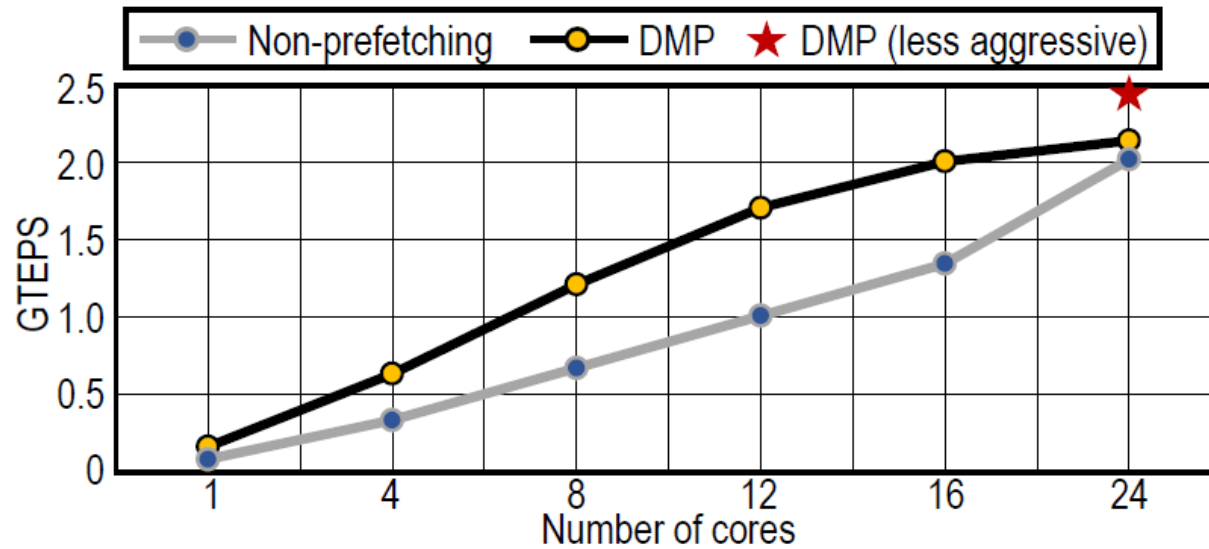
Example of the discussion part
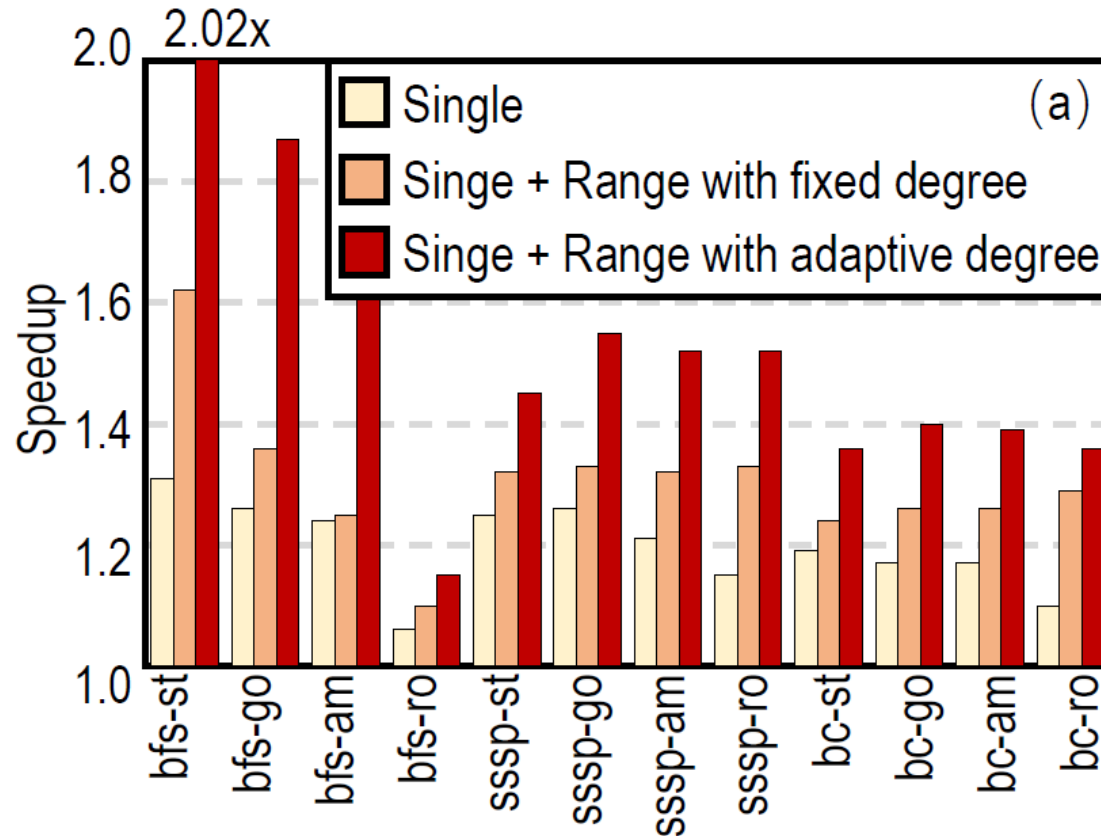
Ablation study on the multiple components of proposed methodology
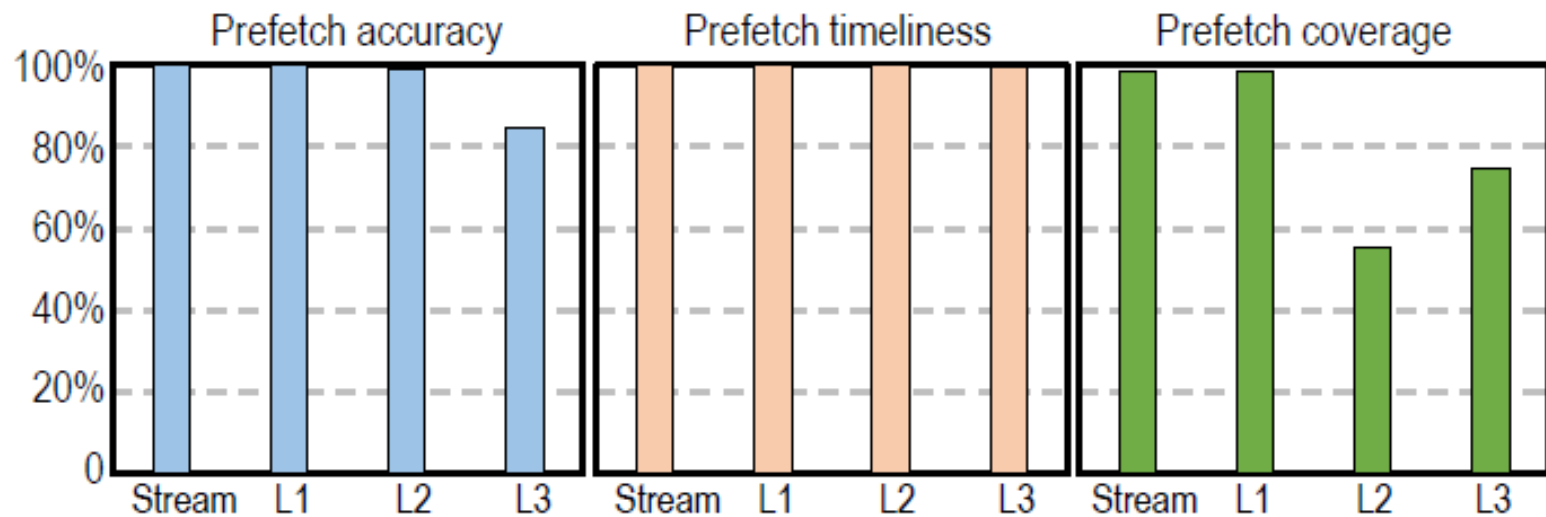
Example of the discussion part
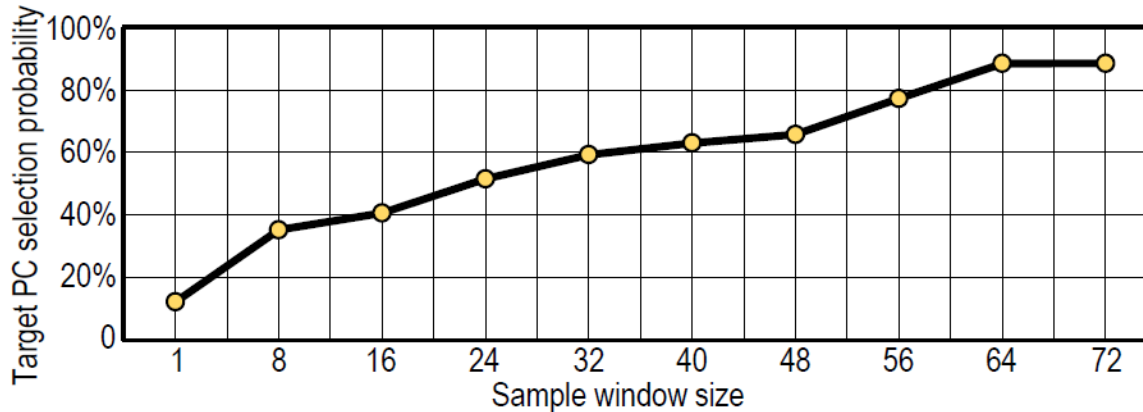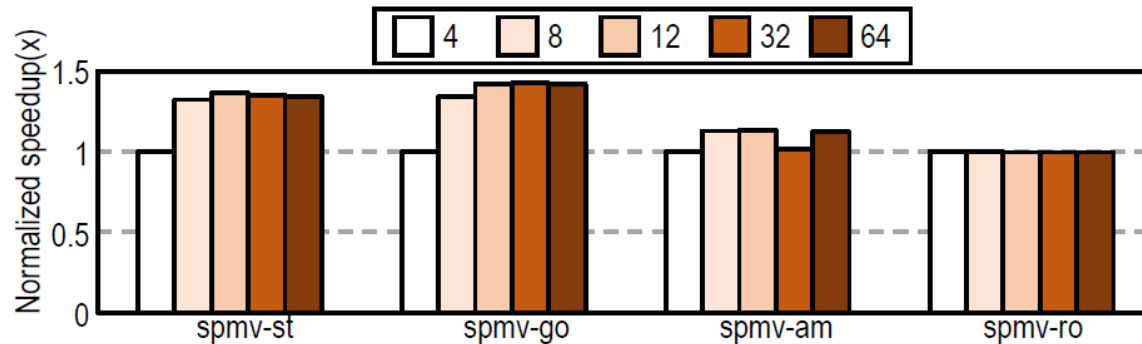
Sensitivity study on the parameters of proposed methodology

Example of the discussion part

Deep insights derived from the phenomena

Example of the discussion part

Limitation of the proposed research work or methodology

Thank you!