What Should You Think to Perfectly Present Research Papers?

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Steps for Presentation

1. Motivation of your research problem/topic
2. Problem description
3. State-of-the-art research work
4. Your solution
5. Experiment studies
6. Conclusion and future work

Motivation of Research Problem/Topic

- Always ask some basic questions (may not be related to any technical details).
  1. What are the applications for this problem?
  2. Who are the users?
  3. Have some software packages been developed based on this research problem/topic?
  4. What are the challenges for this problem/topic?
  5. (For old topic) There have been some existing research studies. Why do you need to make another solution? (Is it more accurate? Is it more efficient?)
  6. (For new topic) No one has studied this before. Why do you need to be the first to study this topic? (Solid motivation should be provided.)

- Don’t panic. Try to find out the answers.

- Make sure that laymen (can be your mother or your father) can also understand what you are talking about.

Problem Description

- Describe the problem in detail.
- Use more examples.
- Be careful of your notations.
- Do not expect that your audience can understand everything.
  - Stand on their sides.
  - Assume that your audiences have just finished the undergraduate study in computer science or software engineering.

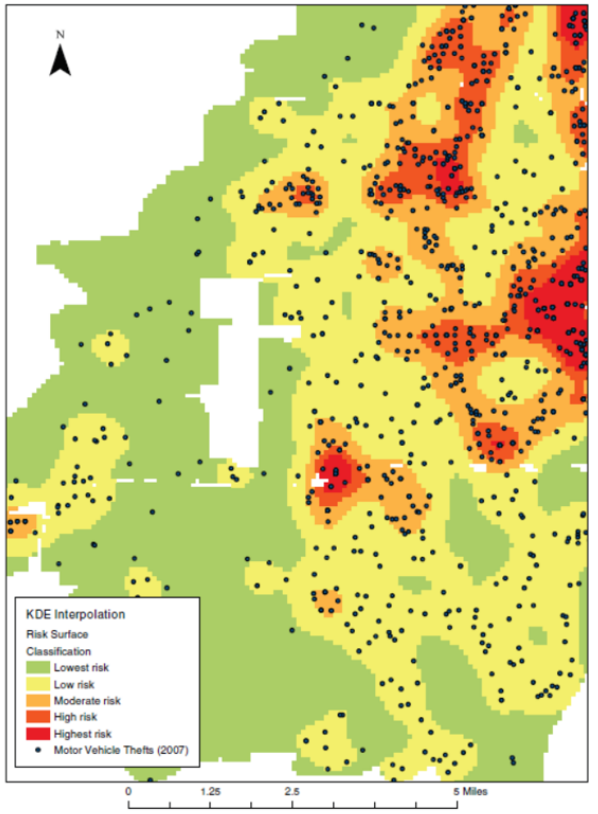
Problem Description (Example)

What is KDV?

- *Application*: crime rate prediction
  - Each **p** (black dot) represents the location of a crime.
    - e.g., robbery,
      commercial burglary,
      motor vehicle theft
  - Predict the crime rate of a given location (**q**)
    by computing the ***kernel density function*** $\mathcal{F}_P(\mathbf{q})$.

$$\mathcal{F}_P(\mathbf{q}) = \sum_{\mathbf{p} \in P} w \cdot \begin{cases} 1 - \frac{1}{b^2} dist(\mathbf{q}, \mathbf{p})^2 & \text{If } dist(\mathbf{q}, \mathbf{p}) \le b \\ 0 & \text{Otherwise} \end{cases}$$

2D pixel; dataset; weighting; Euclidean distance; bandwidth



[1] T. Hart and P. Zandbergen "Kernel density estimation and hotspot mapping Examining the influence of interpolation method, grid cell size, and bandwidth on crime forecasting", International Journal of Police Strategies and Management 2014

State-of-the-art Research Work

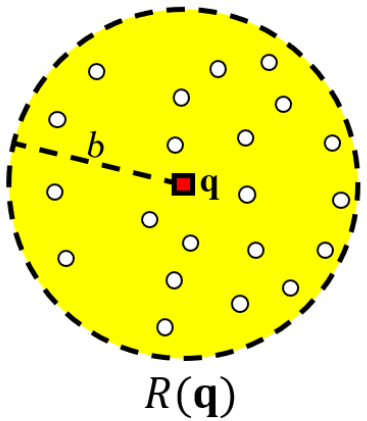
- Discuss the core idea of the state-of-the-art work (opponent).
  - NO NEED to discuss all details.

- Clearly point out the weakness of this opponent (any evidence?).
  - Not efficient enough
  - Not accurate enough
  - …

- Further highlight the challenge.

State-of-the-art Research Work (Example)

Range-Query-based Solution



$$\mathcal{F}_P(\mathbf{q}) = \sum_{\mathbf{p} \in P} w \cdot \begin{cases} 1 - \frac{1}{b^2} dist(\mathbf{q}, \mathbf{p})^2 & \text{If } dist(\mathbf{q}, \mathbf{p}) \le b \\ 0 & \text{Otherwise} \end{cases}$$

$$\mathcal{F}_P(\mathbf{q}) = \sum_{\mathbf{p} \in R(\mathbf{q})} w \cdot \left(1 - \frac{1}{b^2} dist(\mathbf{q}, \mathbf{p})^2\right)$$

- Simple ☺
- Many tree structures are available to improve the practical efficiency ☺
- Cannot reduce the worst-case time complexity ($b \to \infty$) ☹

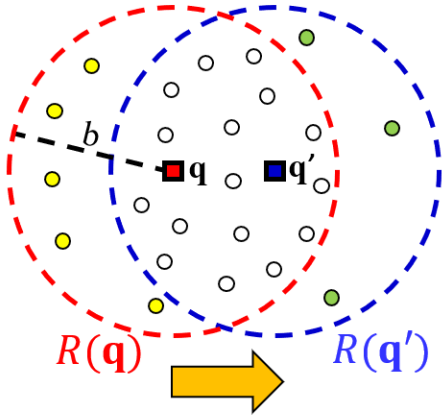
Your Solution

- Present the core ideas.
- From easy to difficult.
- Make a good figure and a good example (or figure example).
- No need to present all details. For example:
  - Pseudocode
  - Proof
  - Complicated equations
  - Everything that looks complicated.
- Goal: Arouse their interest (Not to make them back off).

Your Solution (Example)

Core Ideas of SLAM

- Core idea 1: two consecutive pixels can share many data points (white circles) in the range set.



Can we share computations between two consecutive pixels?

- Core idea 2: $\mathcal{F}_P(\mathbf{q})$ can be decomposed into this expression.

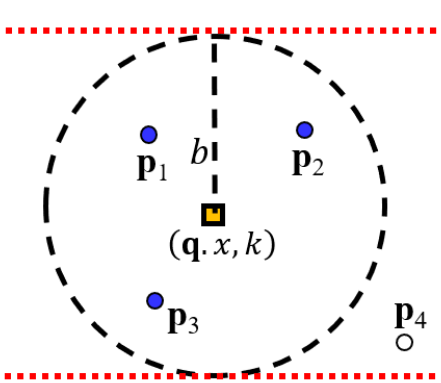
$$\mathcal{F}_P(\mathbf{q}) = \sum_{\mathbf{p}\in R(\mathbf{q})} w \cdot \left(1 - \frac{1}{b^2} dist(\mathbf{q},\mathbf{p})^2\right)$$

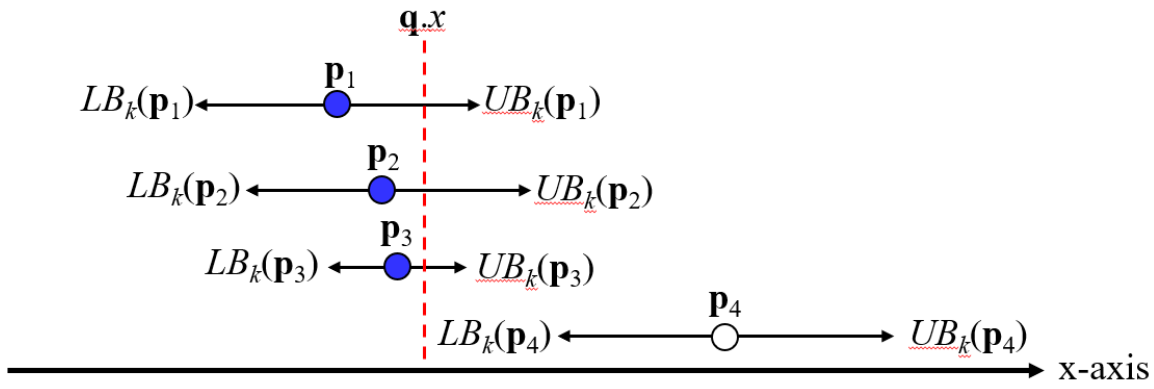
$$= w|R(\mathbf{q})| - \frac{w}{b^2}\left(|R(\mathbf{q})| \times \|\mathbf{q}\|_2^2 - 2\mathbf{q}^T \underbrace{\mathbf{A}_{R_\mathbf{q}}}_{\sum_{\mathbf{p}\in R(\mathbf{q})} \mathbf{p}} + \underbrace{S_{R_\mathbf{q}}}_{\sum_{\mathbf{p}\in R(\mathbf{q})} \|\mathbf{p}\|_2^2}\right)$$

How to efficiently maintain $|R(\mathbf{q})|$, $\mathbf{A}_{R_\mathbf{q}}$, and $S_{R_\mathbf{q}}$?

Your Solution (Example)

Range Search Problem = Interval Stabbing Problem





LEMMA 2. *Given the lower and upper bound values, i.e.,* $LB_k(\mathbf{p})$ *and* $UB_k(\mathbf{p})$*, respectively, for each data point* $\mathbf{p}$ *in the envelope point set* $E(k)$*, this data point* $\mathbf{p}$ *is in the range query solution set* $R(\mathbf{q})$ *if* $\mathbf{q}.x$ *is within the bound interval* $[LB_k(\mathbf{p}), UB_k(\mathbf{p})]$.

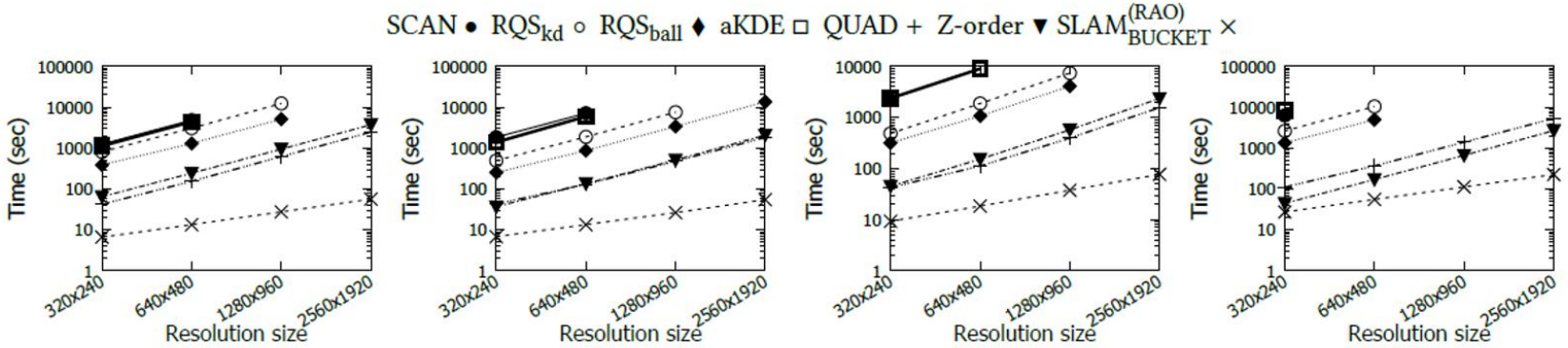
Experiment Studies

- Clearly describe your datasets.
- Think deeply about which experiments you should show.
- Only show a few important experiments (Do not put every experiment in the slides).

Experiment Studies (Example)

Our Experiment

Dataset name	Dataset size n	Category	Bandwidth b (meters)
Seattle [5]	862873	Crime events	671.39
Los Angeles [2]	1255668	Crime events	1588.47
New York [3]	1499928	Traffic accidents	1062.53
San Francisco [4]	4333098	311 calls	279.27



(a) Seattle (b) Los Angeles (c) New York (d) San Francisco

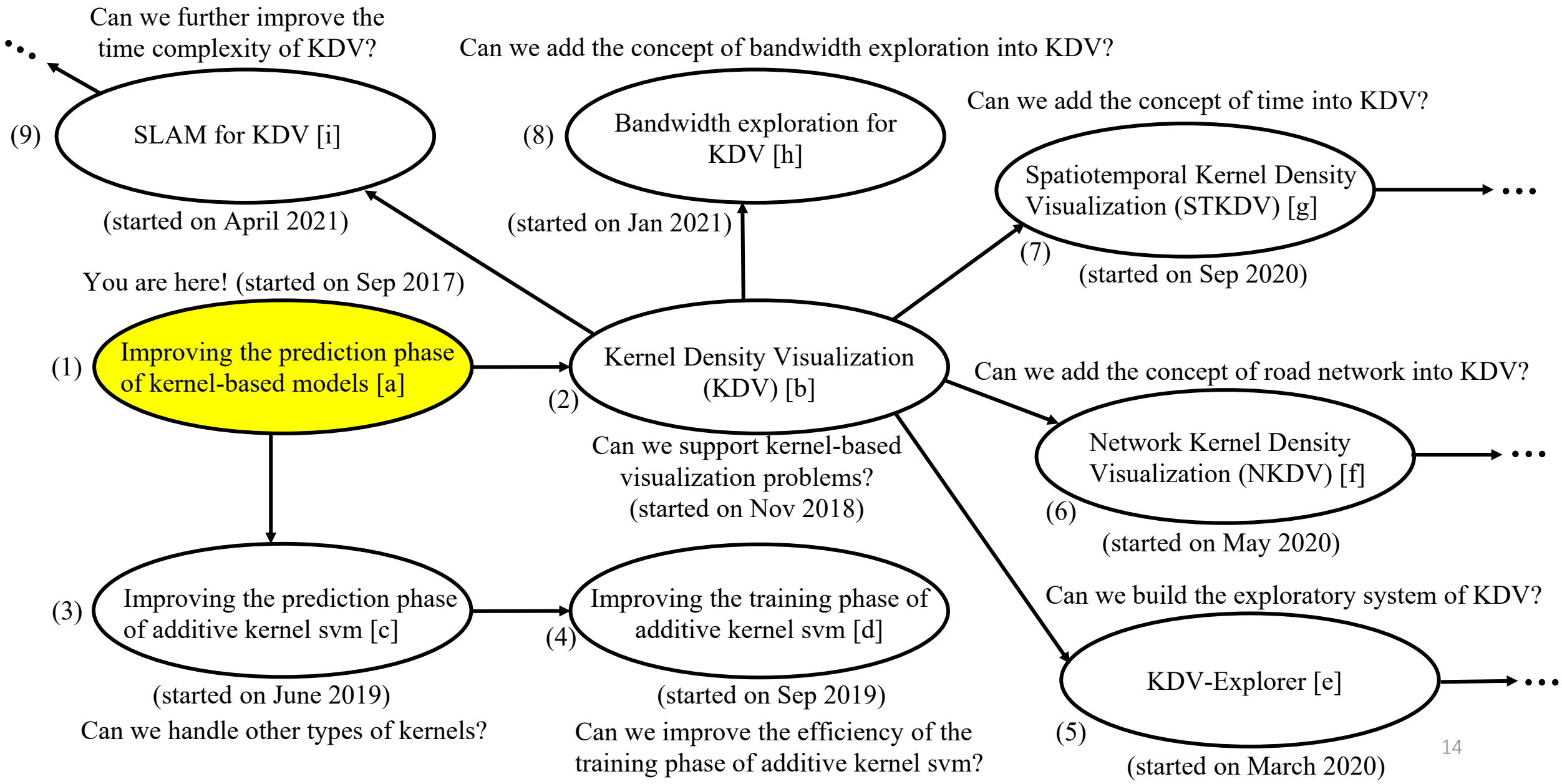
Conclusion and Future Work

- Pretty standard. If step 1 to step 5 are perfectly done, this part can also be done perfectly.

- Highlight your contribution.

- State what you will do next. Think of your next work when you write your slides (or papers). (KEEP ASKING QUESTIONS)

Future Work with Good Quality



Future Work with Good Quality

[a] **Tsz Nam Chan**, Man Lung Yiu, Leong Hou U: "KARL: Fast Kernel Aggregation Queries" **ICDE 2019**, pages 542-553.

[b] **Tsz Nam Chan**, Reynold Cheng, Man Lung Yiu: "QUAD: Quadratic-Bound-Based Kernel Density Visualization" **SIGMOD 2020**, pages 35-50.

[c] **Tsz Nam Chan**, Leong Hou U, Reynold Cheng, Man Lung Yiu, Shivansh Mittal: "Efficient Algorithms for Kernel Aggregation Queries" **IEEE TKDE 2022** (vol 34), pages 2726-2739.

[d] **Tsz Nam Chan**, Zhe Li, Leong Hou U, Reynold Cheng: "PLAME: Piecewise-Linear Approximate Measure for Additive Kernel SVM" **IEEE TKDE 2023** (vol. 35), pages 9985-9997.

[e] **Tsz Nam Chan**, Pak Lon Ip, Leong Hou U, Weng Hou Tong, Shivansh Mittal, Ye Li, Reynold Cheng: "KDV-Explorer: A Near Real-Time Kernel Density Visualization System for Spatial Analysis" **PVLDB 2021** (vol 14), pages 2655-2658 (Demo track).

[f] **Tsz Nam Chan**, Zhe Li, Leong Hou U, Jianliang Xu, Reynold Cheng: "Fast Augmentation Algorithms for Network Kernel Density Visualization" **PVLDB 2021** (vol 14), pages 1503-1516.

[g] **Tsz Nam Chan**, Pak Lon Ip, Leong Hou U, Byron Choi, Jianliang Xu: "SWS: A Complexity-Optimized Solution for Spatial-Temporal Kernel Density Visualization" **PVLDB 2022** (vol 15), pages 814-827.

[h] **Tsz Nam Chan**, Pak Lon Ip, Leong Hou U, Byron Choi, Jianliang Xu: "SAFE: A Share-and-Aggregate Bandwidth Exploration Framework for Kernel Density Visualization" **PVLDB 2022** (vol 15), pages 513-526.

[i] **Tsz Nam Chan**, Leong Hou U, Byron Choi, Jianliang Xu: "SLAM: Efficient Sweep Line Algorithms for Kernel Density Visualization" **SIGMOD 2022**, pages 2120-2134.

⋮

Somethings that You Should Do

- Ask some basic questions and answer them for a research topic/problem.
- Assume that your audience has limited background (e.g., a student who has just finished the bachelor degree).
- Present the core ideas and the weakness of the state-of-the-art solutions.
- Present the core ideas of your solution and the goodness of your solution.
- Draw more figures and examples (or figure examples) to explain.

Somethings that You Should Not Do

- Overcomplicate somethings.
- Assume the audience can understand what you are talking about.
- Present somethings that you do not fully understand.
- Avoid using examples and figures.
- Put everything into the slides.

Some Quotes

- “Most people are not as knowledgeable as you think they are.”
- “A presentation is like a class – if the audience does not understand it is your fault, not theirs.”
- “Present only things that you understand clearly – if something still looks complex, skip it.”
- “Spend a lot of time on good examples”
- “Presentation is as important (if not more) than the actual work. Presentation is easier to improve.”
- By Dimitris Papadias (a full professor in HKUST) https://www.cse.ust.hk/~dimitris/Instructions%20for%20PhD%20Students.pdf (Strongly suggest you to read the slides.)

More Suggestions: Topic-finding

- Topic-finding may not be job-oriented.
- Topic-finding may not be trendy.
- Find the topic that you must really enjoy for.
  - You need to handle this topic for the future four years.
  - Keep asking whether you enjoy that topic.

More Suggestions: Writing Attitude

- Write every day no matter what you feel.

- Write the draft even though you have no idea.
  - Write introduction
  - Write related work
  - Writing helps you for concentration (for thinking ideas).

- Love and believe your work.
  - Do not give up your idea early. (Writing can help!)
  - Find ways to save your ideas.

More Suggestions: Braveness

- Be brave.
  - Academic freedom protects you. ☺
    - No one will laugh at you.
    - No one will blame you even if you are wrong.
    - If they laugh at you or blame you, you can simply say this is academic freedom (I can say whatever I say as long as they are ethical, or they do not break the law.).
  - Don’t be afraid if it is wrong.
    - “Everything you say” is only based on the best of your knowledge at that time.
    - You only need to say “I am sorry.” or “I learn it.” when it turns out to be wrong.

More Suggestions: Submission

- Research papers should be expected to be rejected when we submit them each time.
  - The acceptance rate of every top-tier conference is smaller than 50%.

- Research papers can always be accepted ultimately.
  - If the probability of acceptance p is not zero, the probability of acceptance is:

$$p + (1-p)p + (1-p)^2 p + \cdots = \frac{1}{1-(1-p)} p = 1$$

- Keep submitting papers to top venues.
  - Those comments from top venues can help you increase p.

- Avoid submitting papers to bad venues. (AIM HIGH)

How to be Productive?

Submissions | Search help articles | Help Center | Select Your Role : Author | PVLDBv17_2024 | Tsz Nam Chan

Author Console

Please click here to view Welcome Message & Instructions.

1 - 8 of 8 « 1 » Show: 25 50 100 All Clear All Filters

[redacted]		Research -> May 2023	Submission files: main.pdf	Reject Reviews Meta-Reviews
468	LION: Fast and High-Resolution Network Kernel Density Visualization Show abstract	Research -> August 2023	Submission files: main.pdf	Revision Reviews Meta-Reviews
[redacted]		Research -> August 2023	Submission files: [redacted]	Reject Reviews Meta-Reviews
966	Top-k st-Block Mining in Spatio-Temporal Tensors Show abstract	Research -> November 2023	Submission files: 966.pdf	Reject Reviews Meta-Reviews
1055	Effective Clustering on Large Attributed Bipartite Graphs Show abstract	Research -> December 2023	Submission files: Submission-1055.pdf	Reject Reviews Meta-Reviews
1175 (Revision of 468)	LION: Fast and High-Resolution Network Kernel Density Visualization (Revision Submission) Show abstract	Research Revision -> December 2023	Submission files: main_revision.pdf Camera Ready Submission files: p1175-chan.pdf	Accept Reviews Meta-Reviews
1541	LARGE: A Length-Aggregation-based Grid Structure for Line Density Visualization Show abstract	Research -> March 2024	Submission files: main.pdf	Revision Reviews Meta-Reviews

Accepted in SIGKDD 2025

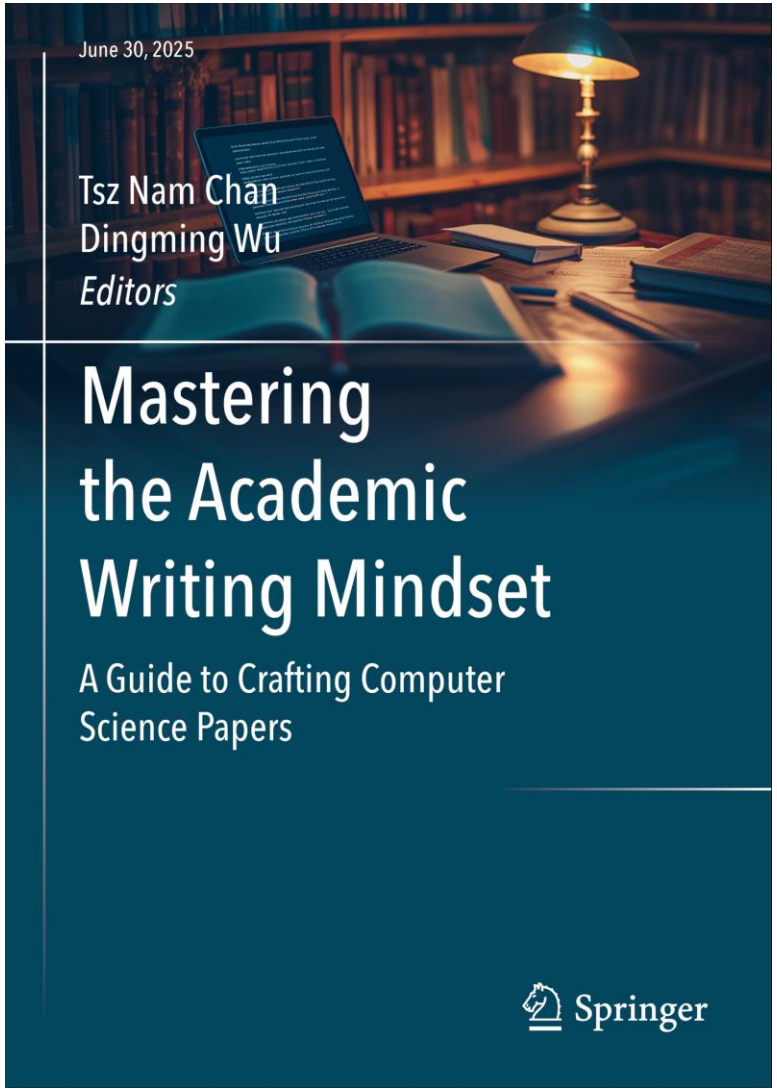
Accepted in SIGKDD 2024

Accepted later

How to be Productive?

Accepted in ICDM 2024

Our Book



Tsz Nam Chan, Dingming Wu

Mastering the Academic Writing Mindset

A Guide to Crafting Computer Science Papers

September 12, 2025

Springer Nature