

Towards Making Your VIS Paper Writing Better”

Presenter: Shaolun RUAN

12/15/23

Towards Making Your VIS Paper Writing Better

Before We Start

Thank Prof. Jiansu PU for inviting me here!



Towards Making Your V
Before We

I spent the unfor



Hi there!

Hi, I'm Shaolun Ruan

I am currently a Ph.D. candidate of Computer Science at [Singapore Management University](#), under the supervision of Professor [Yong WANG](#). Before that, I received my bachelor degree from [University of Electronic Science and Technology of China](#) at School of Computer Science and Engineering in 2019. From 2020 to 2021, I worked as a Research Assistant at Kent State University, U.S.

I develop novel graphical representations that enable a more effective and smoother analysis using machines. My work focuses on handling complex domain problems in *quantum computing*, leveraging the methods from **Data Visualization** and **Human-computer Interaction**.



My Research

- **TVCG 2023** [VIOLET: Visual Analytics for Explainable Quantum Neural Networks](#), Shaolun Ruan, Zhiding Liang, Qiang Guan, Paul Griffin, Xiaolin Wen, Yanna Lin, and Yong Wang *IEEE Transactions on Visualization and Computer Graphics (TVCG 2023)*.
- **TVCG 2023** [QuantumEyes: Towards Better Interpretability of Quantum Circuits](#), Shaolun Ruan, Qiang Guan, Paul Griffin, Ying Mao, and Yong Wang, *IEEE Transactions on Visualization and Computer Graphics (TVCG 2023)*.
- **TVCG 2022** [VACSEN: A Visualization Approach for Noise Awareness in Quantum Computing](#), Shaolun Ruan, Yong Wang, Weiwen Jiang, Ying Mao, Qiang Guan, *IEEE Transactions on Visualization and Computer Graphics (TVCG 2022)*.
- **EuroVis 2023** [VENUS: A Geometrical Representation for Quantum State Visualization](#), Shaolun Ruan, Ribo Yuan, Qiang Guan, Yanna Lin, Ying Mao, Weiwen Jiang, Zhepeng Wang, Wei Xu, Yong Wang, *Computer Graphics Forum (Proceedings of EuroVis 2023)*.
- **VIS 2023** [Intercept Graph: An Interactive Radial Visualization for Comparison of State Changes](#), Shaolun Ruan, Yong Wang, Qiang Guan, *Proceedings of IEEE VIS (VIS 2021)*.
- **DATE 2023** [BatchLens: A Visualization Approach for Analyzing Batch Jobs in Cloud Systems](#), Shaolun Ruan, Yong Wang, Hailong Jiang, Weijia Xu and Qiang Guan, *Proceedings of Design, Automation and Test in Europe Conference (DATE 2022)*.
- **PRDC 2023** [Visilience: An Interactive Visualization Framework for Resilience Analysis using Control-Flow Graph](#), Hailong Jiang*, Shaolun Ruan*, Bo Fang, Yong Wang, and Qiang Guan, *Proceedings of IEEE PRDC 2023*.

Agenda

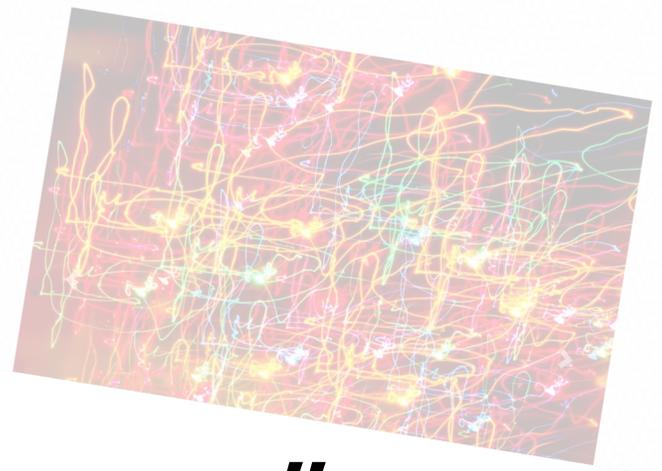
- Think about the “writing space”
- Set the tone making your paper “can be accepted”
- What does a VIS-tier figure look like?
- Do everything before the April 1st

Papers - Call For Participation

In 2021, IEEE VIS transitioned from the three sub-conferences (VAST, InfoVis, and SciVis) to one unified conference. IEEE VIS 2023 solicits novel research contributions and innovative applications in all areas of visualization.



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Area 1: Theoretical & Empirical
This area focuses on theoretical and empirical research topics that aim to establish the foundation of VIS as a scientific subject.

Area 2: Applications
This area encourages research in forms of visualization that have non-formal applications.

Area 3: Systems & Rendering
This area focuses on the themes of building systems, algorithms for rendering, and alternative input and output modalities.

Think about the "writing space"



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Papers
The latest research in theory, methods, and applications of visualization

Posters
Nascent and recent work

Tutorials
Learn new tools and application domains

Workshops
Informal setting to discuss emerging topics

Panels
Discuss important topics



Short Paper Call for Participation

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IEEE VIS 2022 solicits submissions in a short paper format. Short Papers welcome submissions describing original work with focused and concise research contributions, incremental work such as follow-up extensions or evaluations of existing methods, or exploratory work. Short papers also welcome papers describing new systems or tools that offer practical value.

Short Papers often fall into one or more of five main categories: technique or algorithm, system or design study, empirical study, theory, or model. The contributions of a short paper should be of the nature of the paper. Technique or algorithm papers should state the value, and system or tool papers should state the value, and software release).

SUBMIT YOUR PAPER

- Papers
- Short Papers
- Posters
- Tutorials
- Workshops
- Panels

Think about the “writing space”

From the viewpoint of reviewers

The idea of the paper (**application** and **contribution** for VAST paper)



The writing of the paper



The figure's authenticics



Minor issues

Think about the “writing space”

The idea of the paper

Application

- Broaden the breadth of your research

Think about the “writing space”

The idea of the paper

Contribution

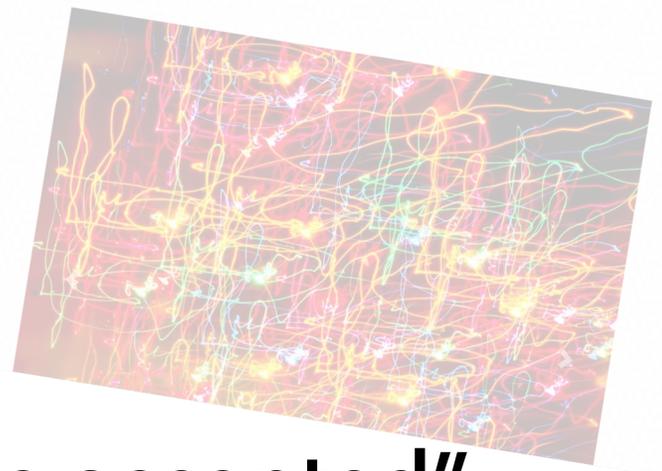
- **General** visualizations or visual design (★ ★ ★ ★)
- New requirements for an **unknown topic** (★ ★ ★)
- Implications that benefits the **vis** community (★ ★)
- A sound workflow to unify different parts (★ ★ ★)

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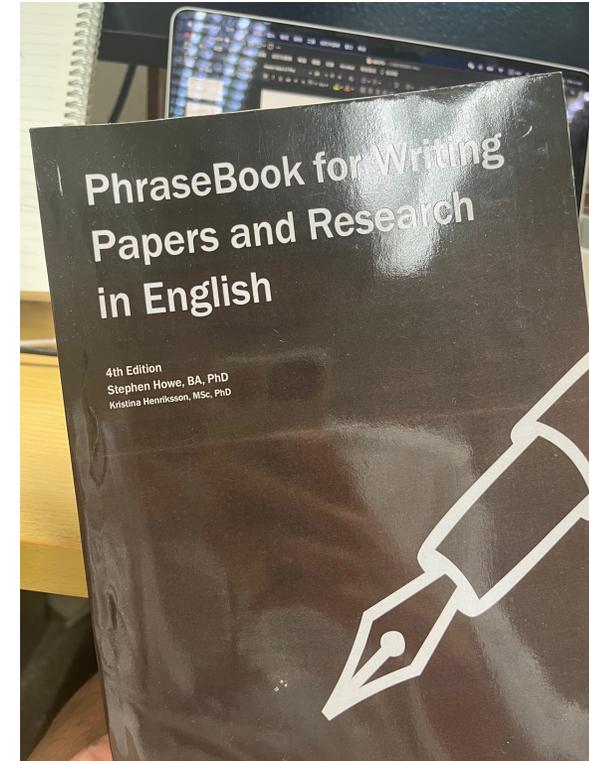
SUBMIT YOUR PAPER

- Papers
- Short Papers
- Posters
- Tutorials
- Workshops
- Panels

Set the tone making your paper "can be accepted"

Ensure your paper is easy-to-follow

- Practice your academic writing
- Don't rely on GPT too much!
- "The palest ink is better than the best memory"



Howe, Stephen, and Kristina Henriksson. *PhraseBook for writing papers and research in English*. The Whole World Company, 2007.

Set the tone making your paper "can be accepted"

Ensure your paper is easy-to-follow



The screenshot displays a LaTeX editor interface. On the left, the 'Code Editor' shows the following LaTeX code:

```
1 %\documentclass[10pt,landscape]{article}
2 %\usepackage{amsymb,amsmath,amsthm,amsfonts}
3 %\usepackage{multicol,multirow}
4 \documentclass[10pt,landscape]{article}
5 \usepackage{amsymb,amsmath,amsthm,amsfonts}
6 \usepackage{multicol,multirow}
7 \usepackage{calc}
8 \usepackage{ifthen}
9 \usepackage[landscape]{geometry}
10 \usepackage[colorlinks=true,citecolor=blue,linkcolor=blue]{hyperref}
11 \usepackage{blindtext}
12 \usepackage{multicol}
13
14
15 \usepackage{xcolor}
16 \newcommand{\shaolun}[1]{\textcolor{blue}{\textit{Shaolun:#1}}}
17
18 % #1
19 \usepackage{tikz}
20 \newcommand{\autour}[1]{\tikz[baseline=(X.base)]\node
21 [draw=gray,fill=gray!40,semithick,rectangle,inner sep=2pt, rounded
22 corners=3pt] (X) {#1};}
23
24 % #2
25 \newcommand*\circled[1]{\tikz[baseline=(char.base)]{
26 \node[shape=circle,draw,inner sep=1pt] (char) {#1};}}
27
28
29 \ifthenelse{\lengthtest { \paperwidth = 11in}}
30 { \geometry{top=.5in,left=.5in,right=.5in,bottom=.5in} }
31 { \ifthenelse { \lengthtest { \paperwidth = 297mm}}
32 { \geometry{top=1cm,left=1cm,right=1cm,bottom=1cm} }
33 { \geometry{top=1cm,left=1cm,right=1cm,bottom=1cm} }
34 }
35 \pagestyle{empty}
36 \makeatletter
37 \renewcommand{\section}{\@startsection{section}{1}{0mm}%
```

On the right, the 'Cookbook of Writing' by Shaolun RUAN is displayed. It contains several sections:

- Who am I?**: A paragraph about the author's research and the manual's purpose.
- Logical Phrases & Academic Terms**: A table of phrases and their uses.
- Cookbook of Writing**: A table of writing tips and phrases.

Phrases	Academic Terms	Cookbook of Writing
... is increasingly exerting ...	legacy	at the top right corner
... requirements on ...	need	temporal evolution process
... gain wide popularity in ...	enhance the ability of...	explicitly
... play a key role in ...	human knowledge	specialised research area
... have attracted considerable public attention	human analysts	multidisciplinary research area
... is becoming increasingly pervasive	ensure ... mitigation	we produce leading-edge research
... the last decade has seen an explosive growth of	increase the possibility of	top-tier journals and conferences
... is of great significance and value	uncovering hidden patterns in...	bring about impactful changes
... is extensively adopted in a variety of areas,	generate beneficial knowledge of...	in their respective fields
... such as ...	is used as ... serve as ...	lay the ground in preparation for ...
... can be attributed to ...	leads to	solve ... tasks
... with regard to ...	we adopt perform promisingly
... in terms of ...	we utilize ...	issues with transparency limit their adoption in ...
... Apart from ...	Besides can be challenging
... Incorporate ... into ...	combine ... with ... because ...	literature surveys
... with an attempt to ...	so as to ...	seamlessly incorporates ML into ...
... ultimately ...	to ...	integrate ... into ...
... facilitate the ... to support ...	at the expense of ...	enriched interactions
... Given a are divided into 12 intervals	... can ...
... in a format of "year-month-day"	There appears to be mentioned above
... no optimal method for all graph tasks	... received little attention beyond literature surveys
... are equally complex	We accomplish this via store an individual's profile
... frequently	f... Additionally fFurthermore, Moreover,	Nevertheless, ...
... Finally,	fTherefore,	... have already proven powerful
... different=various=diverse	Specifically == In particular,	intrinsically
... sufficient	a feasible solution	tailored design
... system architecture	system architecture	run into problems in ...
		... remains an open question
		one that is underexplored
		The aforementioned challenges
		Despite efforts by ... yo ... remains
		risk-averse domain
		By ...
		... is exacerbated by the fact that...
		as-is
		f due to ...
		limit the adoption in ... practice
		apply==adopt==use
		identify challenges
		contextual information
		a visual analytics tool == system
		facilitate...with...==+<=>
		...that seamlessly incorporates...into...
		...can be useful for...
		Despite efforts by ... to..., +<=>
		challenges remain - including many associated with...
		At the same time,
		... continue to be developed
		... built upon ...
		literature survey
		the reasons are twofold
		engage with ...
		... are often presumed to...+<=>
		In reality,

Set the tone making your paper "can be accepted"

Logic flow of VAST papers matters!

Why need your research? - **Motivation**



What's your solution? - **Contribution**



What's new? - **Novelty & Related work**



The need from the domain to fill the gap? - **Design requirements**



Your solution to meet the need? - **Approach**

Set the tone making your paper "can be accepted"

Logic flow of VAST papers matters!



How will you convince me your approach is sound? - **Evaluation**



You think your approach is the perfect one? - **Limitations**



Any other useful things for the follow-up researchers?
Lessons learned & Implications



Now give me some take-away - **Conclusion**

Set the tone making your paper “can be accepted”

Try to make the evaluation convincing

Case study

- Tell a “multi-faceted” story.

6 CASE STUDY

In this section, we conducted two case studies on both small-scale and large-scale quantum circuits to demonstrate the effectiveness of *VACSEN*. The users involved in the case studies are two quantum computing experts (U1 and U6) who also attended the user interviews in Section 7. IBM Quantum platform was used to compile and execute the quantum circuits on March 5, 2022⁵.

6.1 Case Study I - Two-qubit Circuit

U1 employed *VACSEN* to explore the noise of different quantum computers and select an appropriate compiled circuit for the two-qubit circuit introduced by Ash-Saki *et al.* [6]. This circuit is often used for demonstrating the different probabilities of correct results.

Striking a trade-off between quantum computer noise and queuing time. Both quantum computer noise assessment and queuing number awareness are crucial for quantum computer selection, which

6.2 Case Study II - Shor’s Algorithm

U6 used *VACSEN* to assess the quantum noise when trying to execute a large-scale quantum circuit, *i.e.*, *Shor’s algorithm*. Shor’s algorithm [49] is a famous and widely-used quantum algorithm for integer factorization. Meanwhile, it is usually used for the evaluation of noise optimization algorithms [14, 43]. The experiment was conducted on the IBM Quantum platform on March 5, 2022.

Balancing different noises of a quantum computer. Since the Shor’s algorithm requires seven qubits, the potential quantum computers are those with no less than seven qubits, *i.e.*, *ibm_lagos*, *ibm_perth* and *ibmq_jakarta*. U6 changed the *time range* and *interval* to 30 and 7 respectively in the control panel, to explore their status in the past month.

6.1 Case Study I - Forward Exploration

We worked with E12, who is a Ph.D. student with 3.5 years of experience in quantum neural networks, to explore the model’s prediction process. As suggested by E12, we reproduced the standard 2-dimensional datasets introduced by Zhou *et al.* [86] in advance. We then implemented the 3-qubit encoding and ansatz layer following the tutorial by Paddle Quantum [53]. He was asked to conduct the analysis task of forward exploration.

6.2 Case Study II - Backward Exploration

We worked with E2, who has 8 years of working experience in quantum computing, to investigate the 4-qubit variational circuits with the dataset generated by the *make_circles* function from the *scikit-learn* library. The architecture of the circuit remains the same as in the previous case. He was asked to use *VIOLET* to conduct the backward exploration for diagnosing quantum neural networks.

Identify the incorrectly-classified data points. E2 started by observing the augmented heatmap to identify the target data point. E2 first glanced at the line charts (Figure 6(C)) and easily found that the accuracy started to increase in Epoch 1 and converged around Epoch 50. So he selected Epochs 1, 25, and 50 to analyze further. As shown in Figure 6(A1), the variational parameters were just initialized and the features learned by the model were randomly distributed, as indicated by the background augmented heatmap. After 25 iterations of training, the uncertainty of the model is high, where the confidence of predictions for Class A and B are relatively close (Figure 6(A2)). “I think the prediction will be totally random because the model seems to be uncertain for any input attributes.” Then, in Epoch 50, the background is divided into three layers, while the middle layers in blue

Set the tone making your paper "can be accepted"

Try to make the evaluation convincing



Case study

- Do not involve "Strawman"
- Is it the same as the "usage scenario"?
- Split it into several "sub-stories"

Set the tone making your paper "can be accepted"

Try to make the evaluation convincing

A. Case Study I - Grover's Algorithm

Grover's algorithm [60] is a quantum computing algorithm for searching an unsorted database, which is shown to be more efficient than classical algorithms. It works by repeatedly applying a process called amplitude amplification, which increases the probability of selecting the correct item(s) and decreases the probability of other items. We worked with E12, whose research interest includes applying Grover's Algorithm to speed up the unstructured searching problems. To find more insights behind the quantum circuit used in his research, E12 leveraged *QuantumEyes* to interactively explore Grover's Algorithm. Following the example [62], we implemented a 2-qubit Grover's Algorithm for the study.

Identifying the functionality block from the visualization. E12 began by examining the Probability Summary View and quickly noticed that the probability of State $|00\rangle$ was the largest at the beginning of the circuit. However, this dominance gradually diminished and was replaced by

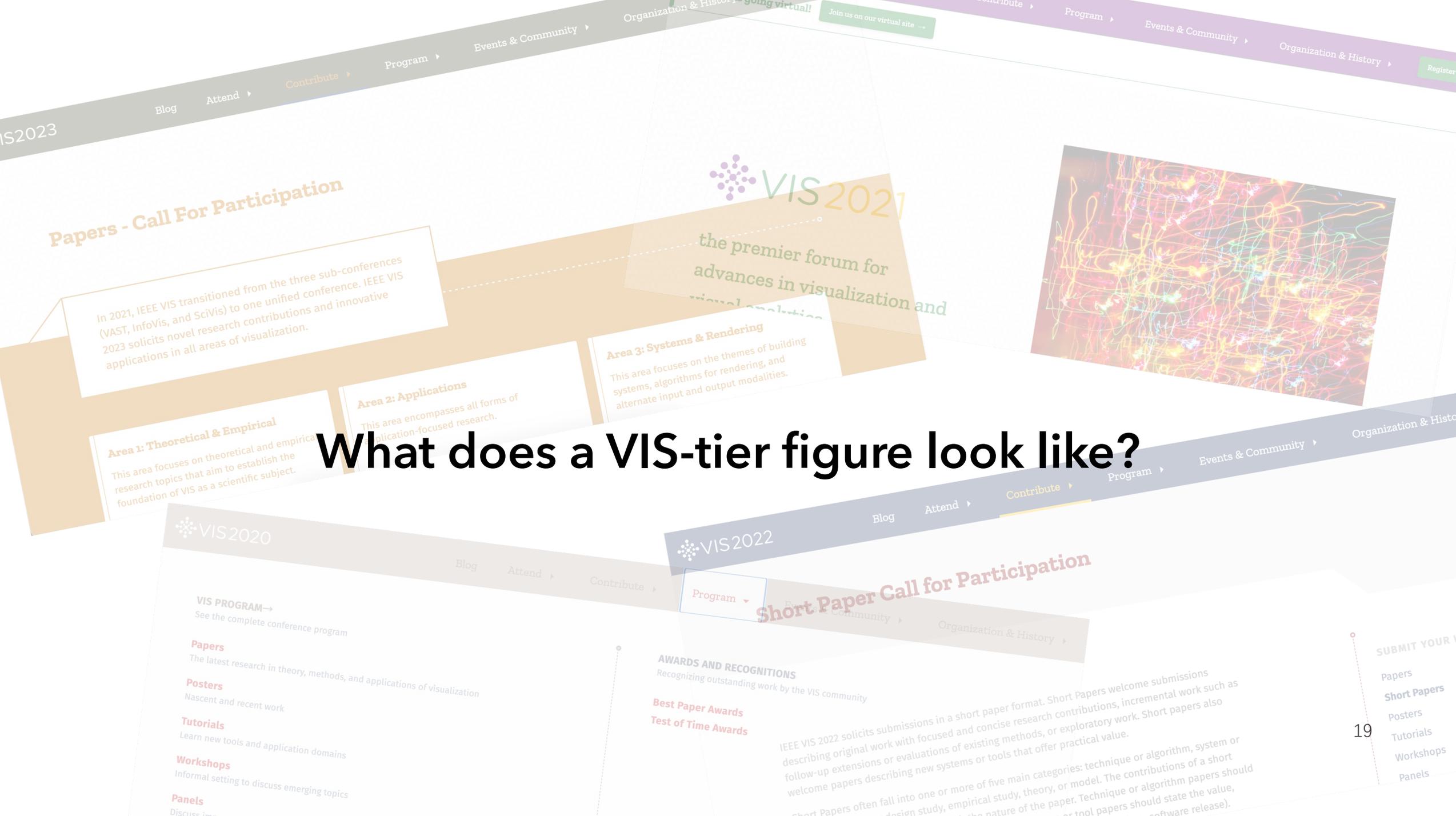
Uncovering the facts of the initialization and oracle.

After the identification, E12 started to perform an in-depth analysis of each functionality block. By brushing the steps of initialization and the oracle from the stacked area chart, the State Evolution View was displayed as shown in Fig. §B₁. To delve further into the quantum gate's effect from a high-level perspective (R2), E12 clicked the "h" symbols of the Hadamard gate and displayed the visual explanations of the Hadamard gates (Fig. §C₁). Taking a close look at the

Exploring the hidden insights of the amplification. E12 proceeded to analyze the functionality block of amplification, which is employed to amplify the probability of the flipped target state. By brushing the corresponding steps in the stacked area chart, E12 got a quick intuition of the operations of the CNOT gate (Fig. §C₃ and C₄) and the NOT gate (Fig. §C₅). To determine the reason for the sudden increase in the probability

of State $|11\rangle$ (R2), E12 took noticed that the Hadamard gate (i.e., $|0\rangle$ and $|1\rangle$) and genera

Understanding the architecture of QFT algorithm. The expert E3 started by brushing the whole quantum circuit from the probability overview because he thought the QFT algorithm is an entity that cannot be split into different functionality blocks. Indicated by the first two X gates with probabilities of 1.0, E3 commented, "These two X gates are for the state preparation because the lengths of the line segments remain the same during Block 1." Meanwhile, he speculated the number to be mapped is 5 due to the decimal of State $|101\rangle$. After identifying the number to be mapped, E3 started to investigate the quantum circuit architecture of the QFT algorithm (R2). By exploring the State Evolution View along



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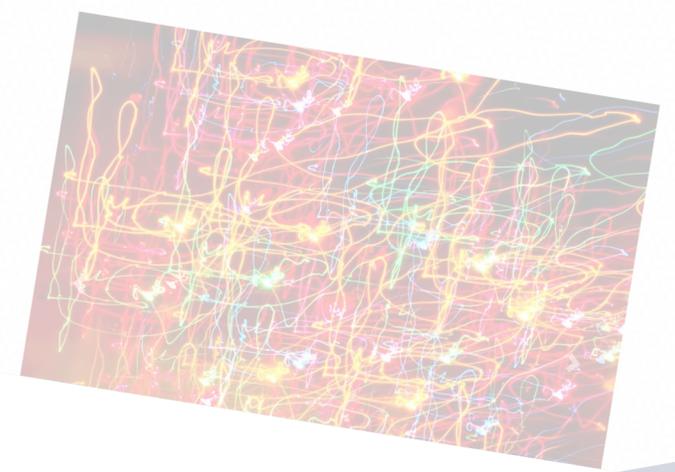
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What does a VIS-tier figure look like?



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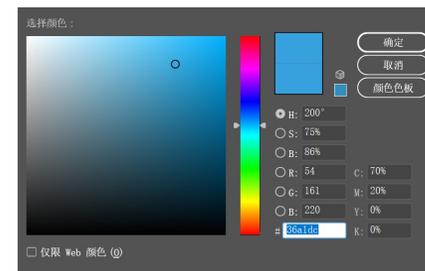
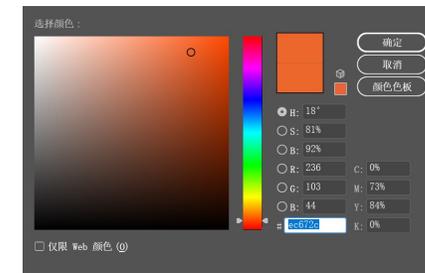
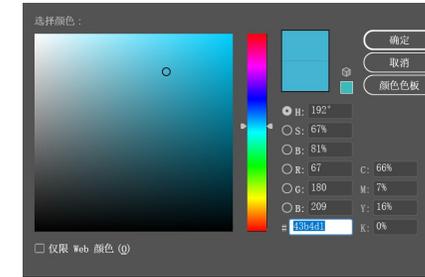
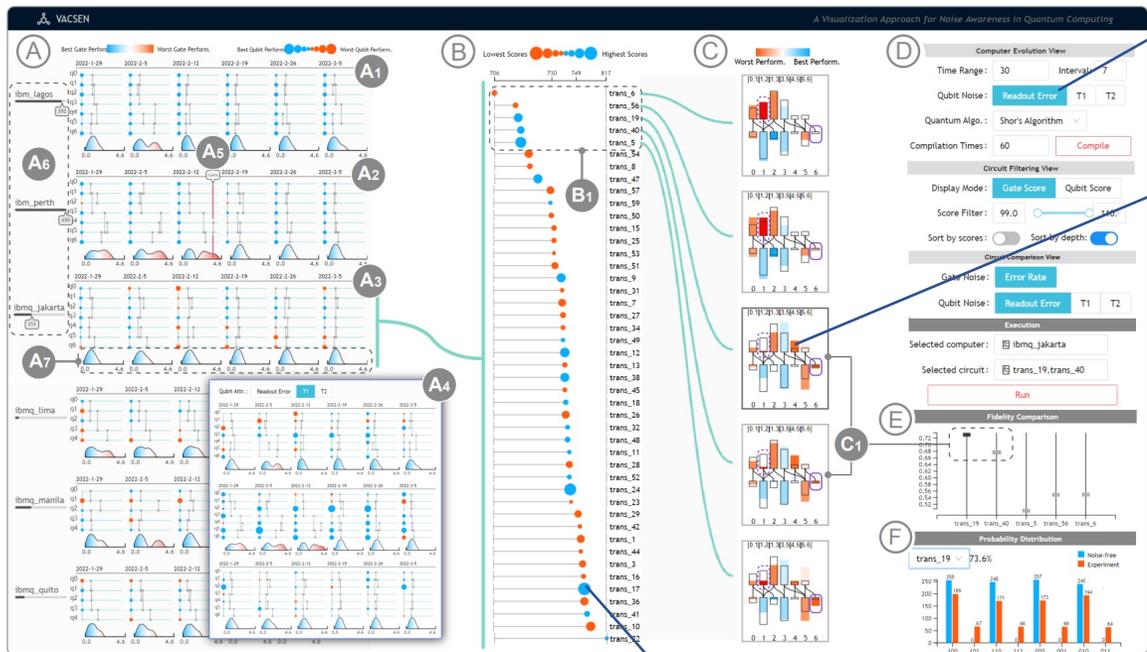
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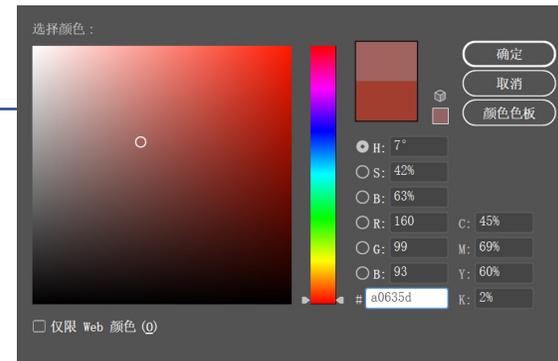
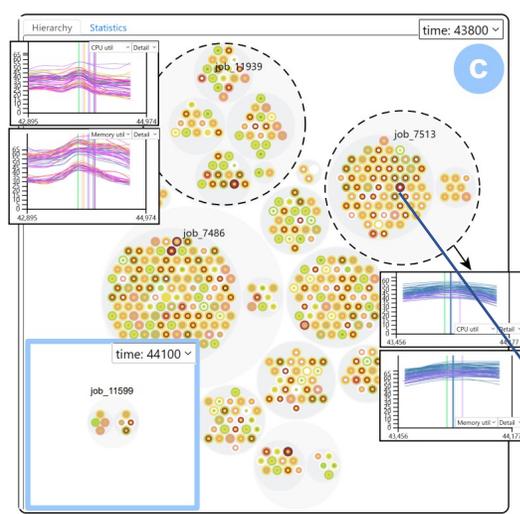
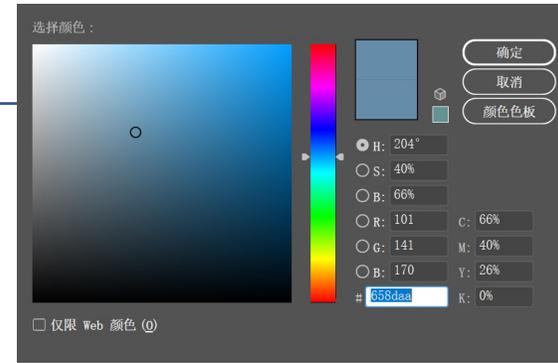
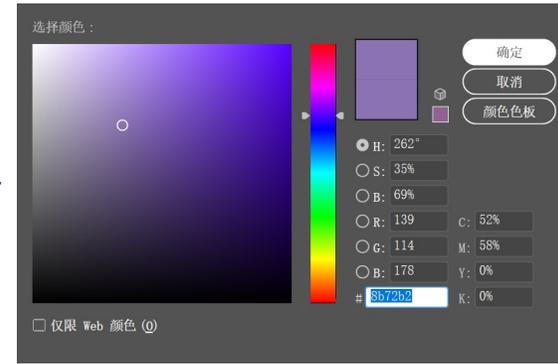
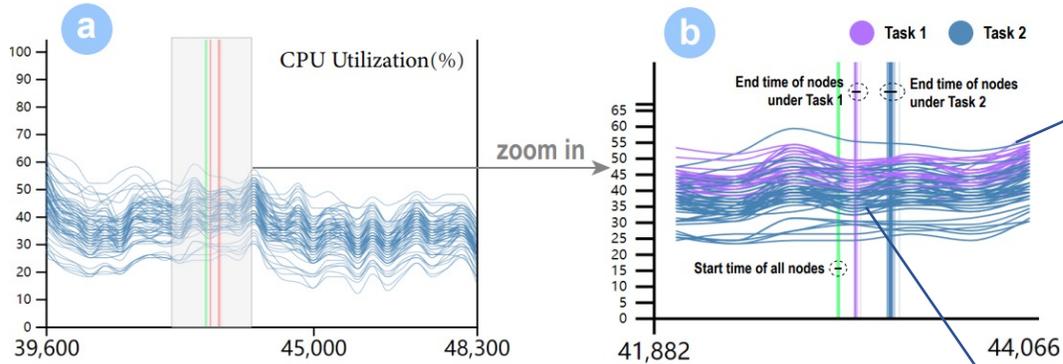
What does a VIS-tier figure look like?

Color harmony



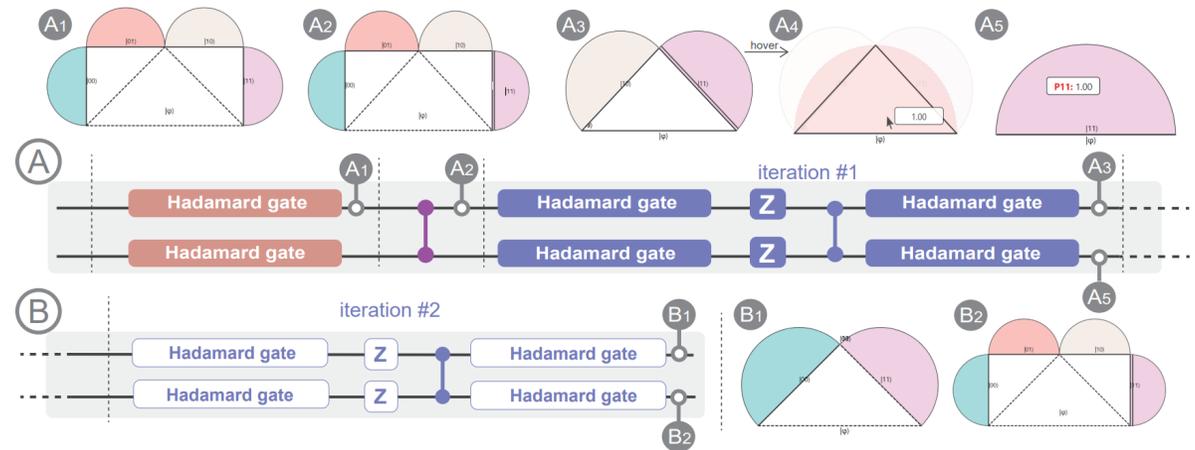
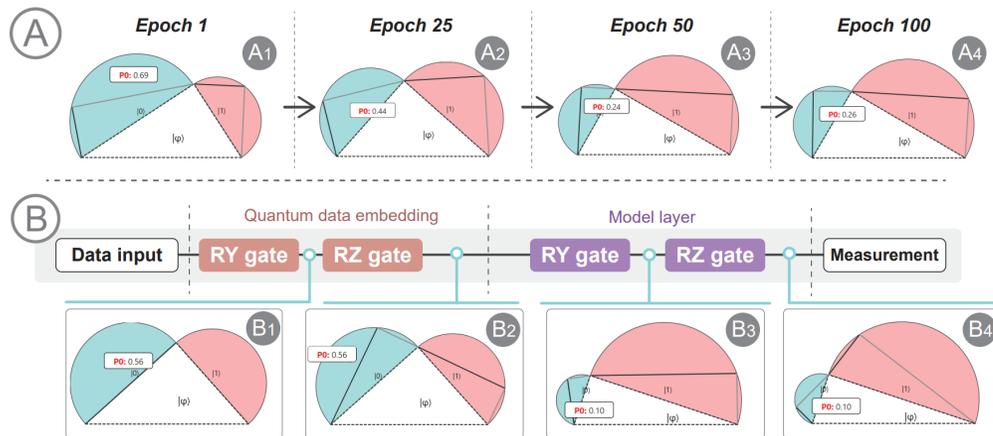
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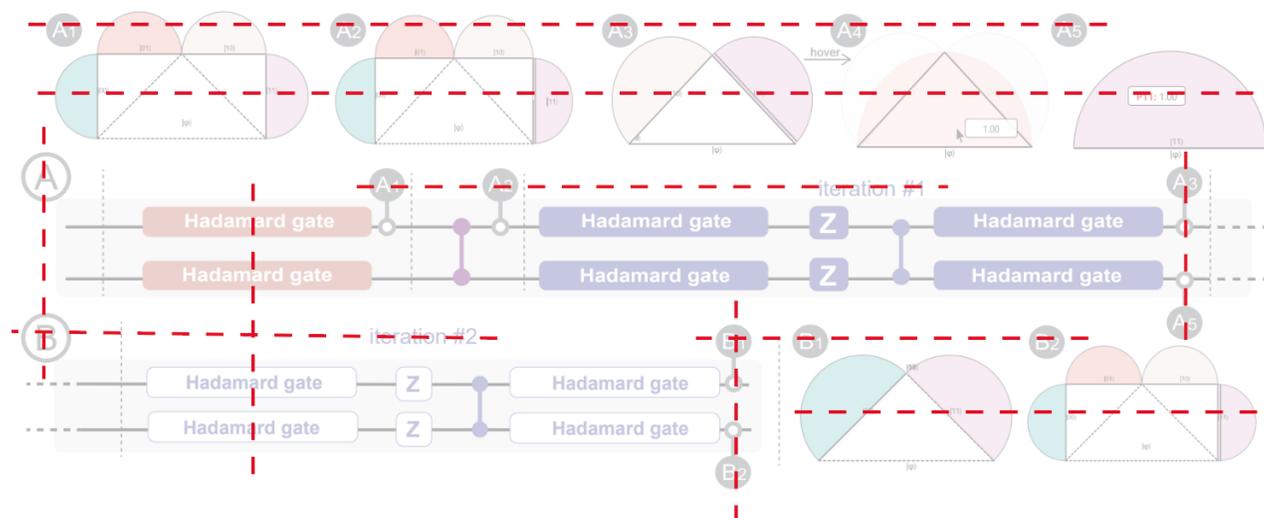
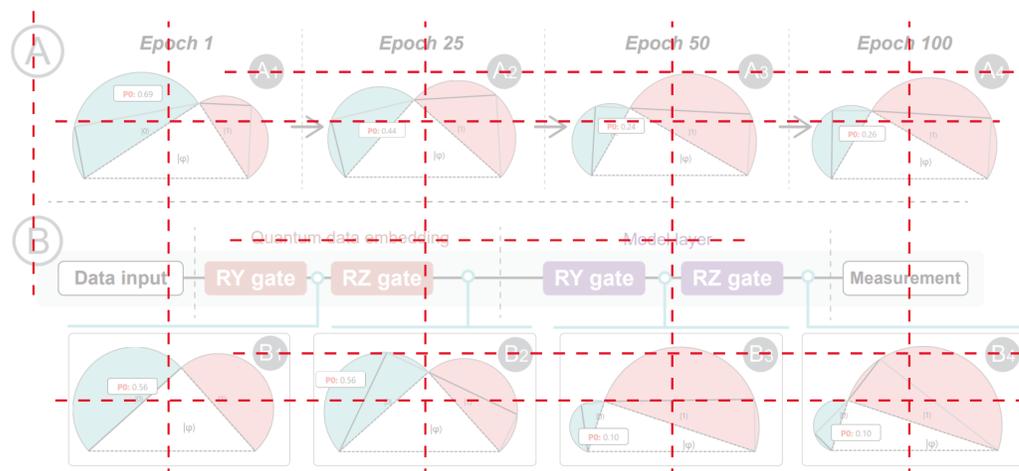
What does a VIS-tier figure look like?

“Hidden Reference Line” – the secret of looking neat



What does a VIS-tier figure look like?

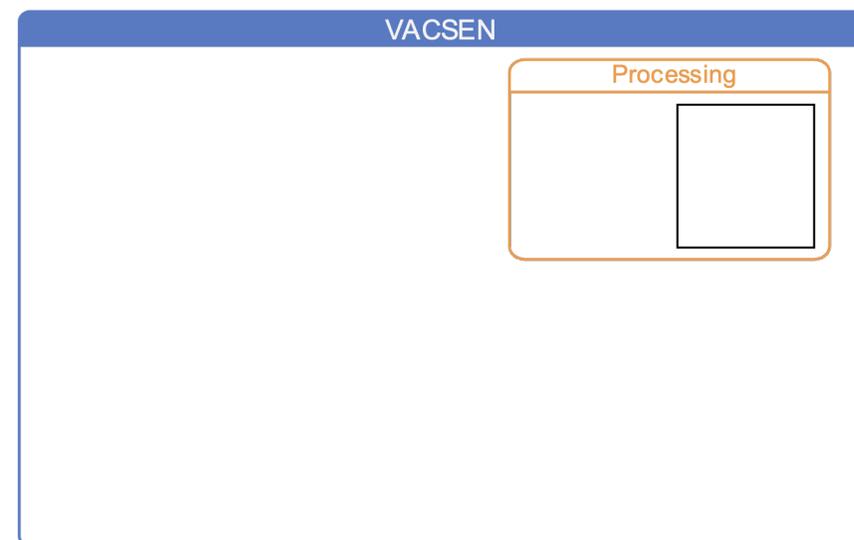
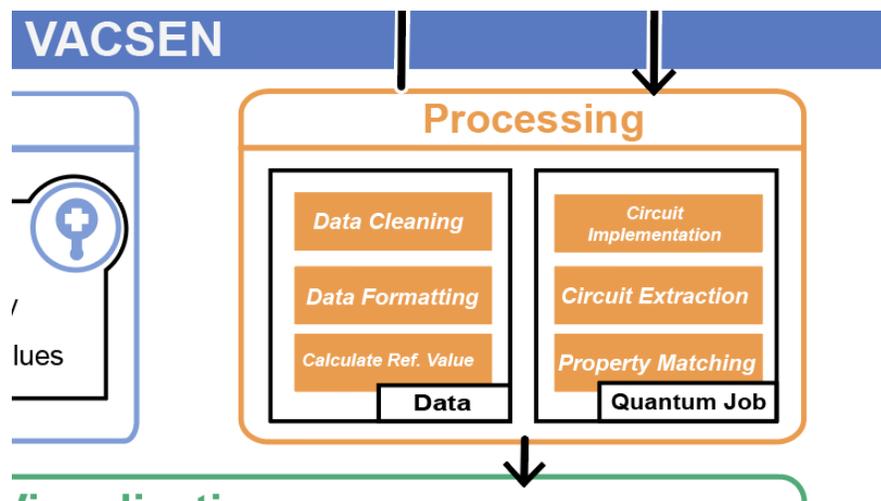
“Hidden Reference Line” – the secret of looking neat



What does a VIS-tier figure look like?

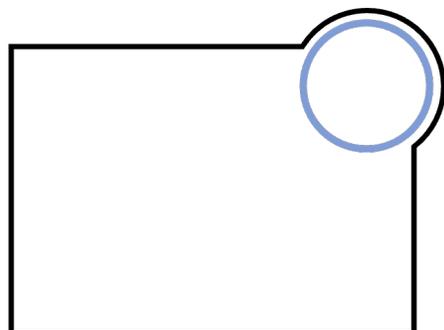
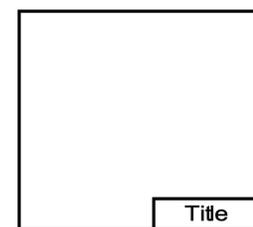
Determine border type based on the hierarchy

- Determine border type based on the **hierarchy**
 - Outer: **solid border**
 - Middle: **hollow border**
 - Inner: **simple shape**



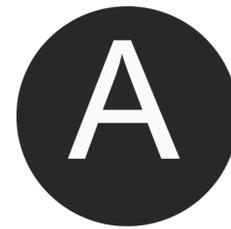
What does a VIS-tier figure look like?

Annotations



What does a VIS-tier figure look like?

Annotations



by Ruan S.

by Wu A.

by Zeng H.

Learning documents

Source

- 《提升设计审美从多看开始》
 - https://www.bilibili.com/video/BV1im4y1Z7WN/?share_source=copy_web&vd_source=7cbca323e3701c23778ec202b2bce3b8



- 《AI教程AI2019教程(illustrator2019版 零基础入门50集)从入门到入土》
 - https://www.bilibili.com/video/BV1ox411f7tA/?share_source=copy_web&vd_source=7cbca323e3701c23778ec202b2bce3b8

Take away for figure making

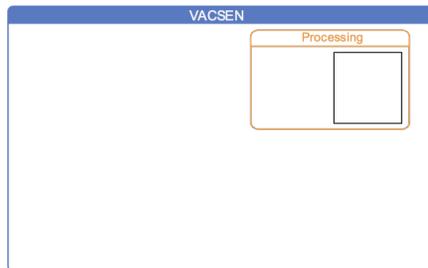
- **COLOR**

- Same "position" in chromatogram
- At the top left of the chromatogram, no "bottom right"
- Color number as few as possible

- **LAYOUT**

- "reference line" in your heart!

- **SHAPE**



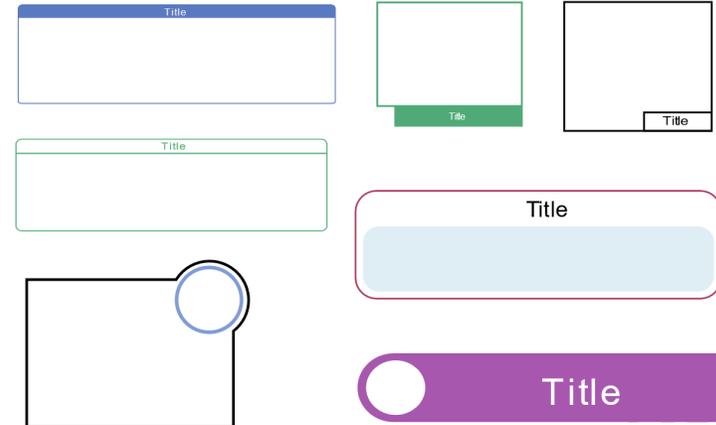
- **ICON**

- Chinese: <https://www.iconfont.cn/>
- English: <https://www.flaticon.com>



- **ANNOTATION**

- As simple as possible
- Border - FYI



Papers - Call For Participation

In 2021, IEEE VIS transitioned from the three sub-conferences (VAST, InfoVis, and SciVis) to one unified conference. IEEE VIS 2023 solicits novel research contributions and innovative applications in all areas of visualization.



the premier forum for advances in visualization and visualization



Area 3: Systems & Rendering

This area focuses on the themes of building systems, algorithms for rendering, and alternate input and output modalities.

Do everything before the April 1st

Area 1: Theoretical & Empirical

This area focuses on theoretical and empirical research topics that aim to establish the foundation of VIS as a scientific subject.

Area 2: Applications

This area encompasses all forms of visualization applications.



VIS PROGRAM

See the complete conference program

Papers

The latest research in theory, methods, and applications of visualization

Posters

Nascent and recent work

Tutorials

Learn new tools and application domains

Workshops

Informal setting to discuss emerging topics

Panels

Discuss important



Short Paper Call for Participation

AWARDS AND RECOGNITIONS

Recognizing outstanding work by the VIS community

Best Paper Awards

Test of Time Awards

IEEE VIS 2022 solicits submissions in a short paper format. Short Papers welcome submissions describing original work with focused and concise research contributions, incremental work such as follow-up extensions or evaluations of existing methods, or exploratory work. Short papers also welcome papers describing new systems or tools that offer practical value.

Short Papers often fall into one or more of five main categories: technique or algorithm, system or design study, empirical study, theory, or model. The contributions of a short paper should be clearly defined by the nature of the paper. Technique or algorithm papers should describe the contribution of the paper. System or tool papers should state the value, impact, and availability of the tool (e.g., software release).

SUBMIT YOUR PAPER

Papers

Short Papers

Posters

Tutorials

Workshops

Panels

Do everything before the April 1st

A few tips

- Finish your draft 2 weeks ahead the deadline
- Video and appendix make your research more solid to reviewers
- Open-source your tool and demo
- Treat your paper like an "art piece" 
- Your draft needs proofreading!
- Don't miss a single deadline

Thank you for your attention!



Call for collaboration

I am looking for chance working with enthusiastic students!



It's you!

