Instructions For Research Writting

Winston. F. Blake
winston.f.blake@gmail.com

Abstract

Purpose: Summarize the entire paper—motivation, method, results, and significance—in a single paragraph (150–250 words).
Template:

- Motivation: [Why is this problem important?]
- Problem: [What problem do you address?]
- Method: [What approach do you propose?]
- Results: [What are the main findings?]
- Significance: [Why do the results matter?]

Example:
We address the challenge of [problem] in [field]. Existing methods [limitation]. We propose [your method], which [main idea]. Experiments on [datasets] show that our approach outperforms previous methods by [key results]. This demonstrates the effectiveness of [your contribution] for [application].

1 Introduction

Purpose: Introduce the problem, explain its importance, summarize prior work, state your contribution, and outline the paper. Template:

- Background: [Introduce the general area and why it matters.]
- Problem Statement: [Describe the specific problem.]
- Limitations of Existing Work: [Briefly discuss what's missing in current approaches.]
- Your Contribution: [Clearly state what you do differently.]
- Summary of Results: [Highlight your main findings.]
- Paper Organization: [Briefly describe the structure of the paper.]

Example: [Background] has received significant attention due to [reason]. However, [problem] remains unsolved because [limitations]. In this paper, we propose [your method], which [main idea]. Our approach differs from previous work by [key difference]. We evaluate our method on [datasets], achieving [results]. The rest of the paper is organized as follows: Section 2 reviews related work, Section 3 describes our method, Section 4 presents experiments, and Section 5 concludes.

2 Method

Purpose: Describe your approach in detail so others can understand and reproduce it.

Template:

- Overview: [Briefly describe your method.]

Preprint. Under review.

- Details: [Explain each component/step, possibly with equations or diagrams.]
- Algorithm (optional): [Present a pseudocode or flowchart if applicable.]
- Complexity/Analysis (optional): [Discuss computational cost or theoretical properties.]

Example: Our method consists of three main steps: (1) [step 1], (2) [step 2], and (3) [step 3]. First, we [describe step 1]. Next, we [describe step 2]. Finally, we [describe step 3]. The overall procedure is summarized in Algorithm 1.

3 Experiments

Purpose: Show that your method works, compare with baselines, and analyze results. Template:

- Experimental Setup: [Describe datasets, metrics, and implementation details.]
- Baselines: [List methods you compare against.]
- Main Results: [Present tables/figures with quantitative results.]
- Ablation Study (optional): [Analyze the effect of different components.]
- Qualitative Results (optional): [Show examples, visualizations, or case studies.]

Example: We evaluate our method on [datasets] using [metrics]. We compare against [baselines]. Table 1 shows that our method achieves [result], outperforming others by [margin]. Figure 2 illustrates [qualitative result]. An ablation study in Table 2 demonstrates the contribution of each component.

4 Conclusion

Purpose: Summarize your main findings, discuss implications, and suggest future work.

Template:

- Summary: [Restate what you did and found.]
- Significance: [Why does it matter?]
- Future Work: [What could be improved or explored next?]

Example: In this paper, we proposed [method] for [problem]. Our experiments show that [main result]. This work demonstrates the potential of [approach] for [application]. In the future, we plan to [future direction].

Semmuary Table

Section	Key Questions to Answer	Template / Checklist
Abstract	What, why, how, results, significance?	Motivation, Problem, Method, Results, Significance
Introduction	Why is this important? What's the gap? What's new?	Background, Problem, Limitation, Contribution, Results
Method	How does your approach work?	Overview, Details, Algorithm, Analysis
Experiments	Does it work? How does it compare?	Setup, Baselines, Results, Ablation, Qualitative
Conclusion	What did you do? Why does it matter? What's next?	Summary, Significance, Future Work

5 Question

In this section, I try to resolve some confusions that is common for each junior reasearcher.

Q. 1: What problems did junior researchers commonly face?

Junior researchers often encounter a range of challenges that affect the quality of their research output. One of the most common issues is that their papers tend to resemble technical reports rather than scholarly research articles. The following outlines the key problems.

- Superficial Understanding of the Research Process. Junior researchers may focus on executing tasks (e.g., coding, running experiments) without fully understanding the underlying research objectives. This often leads to results-driven work lacking conceptual depth.
- Weak Problem Formulation. Many junior researchers struggle to identify a clear, specific, and non-trivial research question. This results in work that imitates existing literature without articulating a novel gap or motivation.
- Limited Writing and Storytelling Skills. Writing is often overly descriptive, outlining what was done without emphasizing the significance of the work. Key components such as a central hypothesis, logical flow, or take-home message are frequently underdeveloped.
- Insufficient Engagement with the Literature. Literature reviews may be superficial, listing related works without critically analyzing or contextualizing them. This weakens the research framing and diminishes perceived novelty.
- Overemphasis on Implementation and Results. Junior researchers often focus on technical execution—describing models, datasets, and results—while neglecting to explain:
  - Why the results matter.
  - How the work builds upon or diverges from existing methods.
  - What new insights the research contributes.
- Lack of Feedback and Mentorship. Research is frequently developed in isolation, with limited iterative review and feedback. This leads to structural issues and logical gaps in the writing.
- Misunderstanding of Academic Standards. There is often a misconception that novelty alone is sufficient. Junior researchers may underestimate the importance of:
  - Rigorous evaluation.
  - Comparison with baselines.
  - Clear and precise exposition.

Q. 2: There are many parts that are used to summarize the whose method: Abstract, the last part of Introduction, the caption of pipepline figure, the first paragraph of the Method, and the Conclusion. What are their differences?

I will give some examples to illustrate the problem in detail.

3DGS [2] is taken as the first example.

Dreamfusion [3] is taken as the second example.

Tetsphere Splatting [1] is taken as another example. And we could make

VolRecon [4], as another example, which describes the method in the Abstract like this:

> *We introduce VolRecon, a novel generalizable implicit reconstruction method with Signed Ray Distance Function (SRDF). To reconstruct the scene with fine details and little noise, VolRecon combines projection features aggregated from multi-view features, and volume features interpolated from a coarse global feature volume. Using a ray transformer, we compute SRDF values of sampled points on a ray and then render color and depth. On DTU dataset, VolRecon outperforms SparseNeuS by about 30% in sparse view reconstruction and achieves comparable accuracy as MVSNet in full view reconstruction*

In the end of the Introduction, the method is described like this:

> *In this paper, we propose VolRecon, a novel framework for generalizable neural implicit reconstruction using the Signed Ray Distance Function (SRDF). Unlike SDF,*

which defines the distance to the nearest surface along any directions, SRDF defines the distance to the nearest surface along a given ray. We utilize a projection-based approach to gather local information about surface location. We first project each point on the ray into the feature map of each source view to interpolate multi-view features. Then, we aggregate the multi-view features to projection features using a view transformer. However, when faced with challenging situations such as occlusions and textureless surfaces, determining the surface location along the ray with only local information is difficult. To address this, we construct a coarse global feature volume that encodes global shape priors like SparseNeuS. We use the interpolated features from the global feature volume, volume features, and projection features of all the sampled points along the ray to compute their SRDF values, with a ray transformer. Similar to NeuS, we model the density function with SRDF and then estimate the image and depth map with volume rendering.

In the conclusion, the method is described like this:

> *Our method incorporates a view transformer for aggregating multi-view features and a ray transformer for computing SRDF values of all the points along a ray to find the surface location. By utilizing both projection features and volume features, our approach is able to combine local information and global shape prior, and thus produce reconstructions with fine details and of high quality. Our method outperforms the state-of-the-art generalizable neural implicit reconstruction methods on DTU by a large margin. Furthermore, experiments on ETH3D without any fine-tuning demonstrate good generalization ability on largescale scenes.*

Q. 3: How can I make it read more like a paper and less like a technical report?"

Great question. The distinction between a **paper-style** write-up and a **technical report** often comes down to tone, structure, and narrative strategy. To "make it like a paper," especially in computer vision or graphics fields like VolRecon, here are some **key transformations** you can apply:

Practical Guidelines to "Paperize" Your Text

Aspect	**Technical Report**	**Academic Paper**
Tone	Descriptive, instruction-oriented	Argumentative, insight-oriented
Focus	What was done	Why it matters + How it compares
Narrative	Step-by-step, method-heavy	Motivation $\rightarrow$ Challenge $\rightarrow$ Innovation $\rightarrow$ Validation
Style	Functional, sometimes list-like	Flowing, cohesive, rhetorically persuasive
Use of Literature	Sparse, mostly background	Rich integration, positioning with prior work
Contribution Framing	"We designed this system with X and Y"	"We address a limitation in Z by proposing..."

Table 1: Guidelines to "paperize" your text.

- Introduce a Motivated Problem
  - **Paper Style:** *Despite the success of SDF-based reconstruction methods, their reliance on surface-normal assumptions often leads to inaccuracies in sparse-view scenarios. We propose VolRecon to overcome this limitation by introducing a novel Signed Ray Distance Function (SRDF) that models surface proximity along viewing rays rather than in Euclidean space.*
  - **Technical Report Style:** *We design a method using SRDF to compute distances on sampled points and render depth/color.*
- Emphasize Insight, Not Just Components
  - **Paper Style:** *To integrate both local surface cues and global scene context, we fuse projection features with a coarse volumetric representation. This dual-stream strategy addresses occlusion and textureless ambiguity.*

- **Technical Report Style:** *We first extract projection features, then interpolate volume features, and combine them to predict SRDF.*
- Use Comparative Framing
  - **Paper Style:** *While SparseNeuS models global priors effectively, it struggles with fine-grained geometry. By contrast, VolRecon leverages projection-aware features to preserve local detail, yielding a 30% accuracy improvement on DTU.*
  - **Technical Report Style:** *We combine projection and volume features. Compared with SparseNeuS, our method performs better.*
- Style and Syntax Tweaks
  - Use transitional phrases like *"In contrast"*, *"To this end"*, *"Crucially"*, and *"Our insight is that..."*
  - Consider using passive voice selectively: "A ray transformer is employed to..." vs. "We use a ray transformer to..."
  - Vary sentence structure: alternate short emphasis with complex explanation.
- Frame the Contributions Properly End the introduction or abstract with a contribution list in a formal tone:
  - We introduce SRDF, a novel representation tailored for view-aligned implicit surface modeling.
  - We design VolRecon, a dual-branch architecture that fuses local projection features with global volumetric priors.
  - We demonstrate strong generalization across datasets, significantly outperforming prior methods in sparse-view setups.

Final Tip Read top-tier papers (e.g., CVPR, ICCV, NeurIPS) with similar structures and emulate their tone, narrative logic, and especially their introduction and related work sections. *VolRecon* is already a good example, but papers like *NeuS*, *IDR*, and *MVSNet* offer excellent references for high-quality academic writing.

Q. 4: In the manuscript, how can we effectively demonstrate or substantiate that our proposed method is both reasonable and capable of addressing the identified problem, while also illustrating why it represents the optimal choice, thereby persuading readers of the paper's overall merit?

Section-Level Strategy

Section	Goal	How to Convince the Reader
Introduction	Identify a real pain point or limitation	Argue that current solutions are insufficient; hint at your insight
Method	Show your design is a natural solution to the problem	Use intuition + architectural rationale
Experiments	Prove it works better	Highlight improvements in the setting where others fail
Ablation/Analysis	Show it's not just luck	Prove each part is necessary or effective

Table 2: section level strategy

Tactics to Prove Your Method is Reasonable and Effective:

- Design Motivated by Limitations in Prior Work

  While prior methods such as SparseNeuS rely heavily on global priors, they tend to hallucinate geometry in occluded or textureless regions. Our insight is that local multi-view consistency remains reliable in such cases. Thus, we introduce a projection-based aggregation strategy to complement global shape priors.
- "If-Then" Reasoning: Logical Causality

  If only local projection features are used, the method struggles with ambiguous regions due to limited context. Conversely, if only global volumetric priors are used, fine details are often oversmoothed. By combining both via a dual-branch design, we resolve this trade-off.

- Connect Design Choices to Geometric Intuition

  SRDF models the signed distance along a ray, naturally aligning with the rendering process in a volumetric scene. This alignment makes SRDF more suitable for sparse-view reconstruction than traditional SDF, which encodes surface distance in all directions equally.
- Use Comparative Framing

  Unlike MVSNet, which requires dense view input and fails in generalizable settings, VolRecon operates effectively in both sparse and full-view regimes, thanks to its learned shape priors and ray-based formulation.
- Ablation-Driven Justification

  Removing the projection features causes a 12.3% drop in reconstruction accuracy on DTU, confirming that local cues are critical for detail preservation. Similarly, omitting the ray transformer reduces performance, showing its importance in modeling surface alignment along rays.

Useful Language Templates

- Phrases for Motivation
  - Existing methods struggle when …
  - This limitation motivates us to …
  - To address this challenge, we propose …
  - Our key observation is that …
  - Inspired by this, we design …
- Phrases for Justification
  - This design choice is grounded in …
  - This formulation naturally aligns with …
  - We hypothesize that …and confirm this through …
  - By doing so, we are able to …
  - This component is crucial because …
- Phrases for Claiming Superiority (with care)
  - Our approach not only resolves the aforementioned issues, but also achieves …
  - Compared to existing approaches, our method provides a more robust solution for …
  - Empirical results show consistent and significant improvements over …
  - We demonstrate that even without fine-tuning, our method generalizes well to …

A compelling paper does not merely describe what was done—it guides the reader to conclude that:

- The problem is real and important,
- The method is a natural and well-motivated solution,
- The design reflects insight, not arbitrary decisions,
- The experiments confirm the method's strength and necessity.

For optimal results, read high-impact papers from CVPR, ICCV, or NeurIPS, and observe how they construct this rhetorical structure.

References

[1] Minghao Guo, Bohan Wang, Kaiming He, and Wojciech Matusik. Tetsphere splatting: Representing high-quality geometry with lagrangian volumetric meshes. *arXiv preprint arXiv:2405.20283*, 2024.

[2] Bernhard Kerbl, Georgios Kopanas, Thomas Leimkühler, and George Drettakis. 3d gaussian splatting for real-time radiance field rendering. *ACM Trans. Graph.*, 42(4):139–1, 2023.

[3] Ben Poole, Ajay Jain, Jonathan T Barron, and Ben Mildenhall. Dreamfusion: Text-to-3d using 2d diffusion. *arXiv preprint arXiv:2209.14988*, 2022.

[4] Yufan Ren, Fangjinhua Wang, Tong Zhang, Marc Pollefeys, and Sabine Süsstrunk. Volrecon: Volume rendering of signed ray distance functions for generalizable multi-view reconstruction. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pages 16685–16695, 2023.

Appendix

A Technical Appendices and Supplementary Material

Technical appendices with additional results, figures, graphs and proofs may be submitted with the paper submission before the full submission deadline (see above), or as a separate PDF in the ZIP file below before the supplementary material deadline. There is no page limit for the technical appendices.