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Peer Review

Review of: "LoRaFlow: High-Quality Signal Reconstruction using Rectified Flow"

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Thank you for sharing your research on LoRaFlow and its application to signal reconstruction in low-SNR environments. This work presents a promising advancement in LoRa signal processing, particularly with the introduction of rectified flow-based methods. Below are my thoughts on its strengths and areas where minor refinements could enhance its clarity and impact.

Strengths

1- Innovative Approach

The authors provide a well-justified and innovative implementation of rectified flow technology for LoRa signal reconstruction work. Such integration ensures a smooth deployment of the method into current LoRa networks.

2- Technical Depth

The paper shows deep mathematical precision through its development of stochastic differential equations and probability flow ODEs. The experimental results receive effective theoretical validation from a solid theoretical basis.

3- Comprehensive Evaluation

Experimental results which compare LoRaFlow against NELoRa indicate its superior capability to state-of-the-art methods. Several performance standards are used to provide an all-inclusive evaluation process.

4- Well-Structured Presentation

A methodical organization between background information and methodology and results and discussion enables researchers from wireless communication and machine learning to understand the text better.

Suggestions for Improvement

1- Experimental Clarifications

The paper states that NELoRa failed to surpass baseline performance, although researchers should specify the causes between experimental conditions, implementation differences, or core NELoRa limitations. The introduction of an explanation would benefit transparency levels within the process.

2- Computational Complexity

Discussion: A summary chart displaying inference operation times along with GPU system requirements would enhance how the paper addresses real-time implementation possibilities in limited IoT deployments.

3- Future Work Expansion

The article minimally addresses difficulties with higher spreading factors, yet omitting potential solutions, including optimized batch sizes and alternative training techniques, together with hybrid architectures, would make valuable suggestions for future study directions.

Reference Comparisons

The paper presents later references in discussion sections to compare with previous research. The authors could achieve a better effect by placing their comparison information directly within the section reviewing previously published work to enhance early-stage understanding.

Overall Recommendation

This paper makes a strong and meaningful contribution to the field of low-SNR LoRa signal recovery. The suggested refinements, particularly in experimental clarifications and computational discussions, will further enhance its clarity and impact. I highly recommend acceptance with minor revisions.

Declarations

Potential competing interests: No potential competing interests to declare.