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ICASSP 2024: Reflections and Recommendations

I am pleased to provide a summary of my experience attending the 2024 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2024) held in Seoul, Korea, from April 14 to 19, 2024. Organized by the IEEE Signal Processing Society, ICASSP is globally recognized as the premier technical conference focusing on signal processing and its diverse applications. This report outlines my impressions of the conference and my presentation of my work titled "Kalman Filter for Tracking Network Dynamics," as well as reviews some works that align with the center's vision of achieving zero transportation externalities.
Participating in ICASSP 2024 was an enriching experience that provided valuable insights into the latest advancements in signal processing and its diverse applications. Specifically, the conference highlighted new developments in graph signal processing, a field particularly relevant to various smart transportation tasks, as data related to roads can be efficiently represented in a graph format, thereby enhancing the efficiency and effectiveness of transportation systems. The conference program featured a comprehensive lineup of sessions, workshops, and keynote presentations, covering a wide spectrum of topics ranging from fundamental research to practical applications. Engaging with fellow researchers and industry experts facilitated meaningful discussions and knowledge exchange opportunities.
Presenting my work on "Kalman Filter for Tracking Network Dynamics" provided an opportunity to share insights and receive feedback from colleagues. My presentation was part of the special session "Graphical Inference and Modeling in Dynamical Systems," which provided a platform to showcase cutting-edge research in tracking dynamic changes in graph signals and graph topology. The session encouraged interdisciplinary collaboration, further enriching the conference experience.
Based on my participation in ICASSP 2024 and considering the goals of Zero Casualties, Zero Delays, and Zero Environmental Damage, several works appear to be potentially relevant and interesting:

1. "Joint Signal Recovery and Graph Learning from Incomplete Time-Series" [1] - This research aims to simultaneously infer the signal and the graph from incomplete data, offering potential applications in optimizing traffic flow, predicting congestion, and enhancing the efficiency of intelligent transportation systems.
2. "Identifiability Study of Near-Field Automotive SAR" [2] - This work proposes extending radar aperture using synthetic aperture radar (SAR) for automotive applications to cover near-field operation conditions, crucial for autonomous driving and active safety features. It addresses the goal of Zero Casualties by providing high-resolution information on vehicle surroundings, enabling accurate object localization and velocity estimation.
3. "Variational Inference, (Not So) Approximate Bayesian Techniques, and Applications" [3] - This tutorial covers key Bayesian techniques such as Variational Bayes, Expectation Propagation, and Factor Graph models. These

methods offer powerful tools for probabilistic modeling and inference across various applications, including transportation systems. In the context of achieving zero transportation externalities, Bayesian techniques play a crucial role in developing advanced algorithms for real-time monitoring and optimization. For instance, Variational Bayes and Expectation Propagation can model dynamic changes in traffic flow and road conditions, while Factor Graph models can capture complex dependencies in transportation networks, aiding in more accurate predictions and decision-making. Additionally, techniques like Adaptive Kalman filtering enhance the performance of intelligent transportation systems by adapting to environmental changes and uncertainties.

4. "Deep Generative Model for Inference" [4] - This tutorial explores advanced methodologies in data generation and inference, encompassing mathematical models and neural network architectures. It covers topics such as partial and stochastic differential equations. Additionally, it addresses evaluation techniques for generative models. These methodologies hold potential relevance to the center's vision by addressing the complexity of transportation systems. Leveraging these advanced methods could enable the modeling and prediction of intricate phenomena such as traffic flow dynamics, vehicle behavior, and environmental impacts with greater precision. For instance, they could aid in generating realistic traffic patterns or forecasting the consequences of infrastructure changes. Ultimately, the application of these sophisticated techniques has the potential to inform decision-making and design more efficient, safer, and environmentally sustainable transportation systems, aligning with the center's goal of achieving zero transportation externalities.

In conclusion, my participation in ICASSP 2024 was a rewarding experience that deepened my understanding of signal processing and its diverse applications. Presenting my work provided a valuable platform to contribute to the discourse on network dynamics tracking. I look forward to applying the knowledge gained to further the center's mission of creating safer, more efficient, and environmentally sustainable transportation systems.

Sincerely,

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References

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