天元數學國際交流中心
Tianyuan Mathematics Research Center

通信中的数学问题研讨会

Workshop on Mathematical Issues in Communications

TY-2026-C-077

会议手册

Conference Program

召集人： **Organizers：**

姓名 罗智泉 香港中文大学（深圳）

姓名 邵明杰 中国科学院数学与系统科学研究院

姓名 刘亚锋 北京邮电大学

2026 年 8 月 2 日—8 日

August 2 – 8, 2026

中国 • 昆明

Kunming, China

天元数学国际交流中心简介

天元数学国际交流中心（以下简称“中心”）成立于 2023 年 7 月，由中国科学院、国家自然科学基金委员会、中国数学会、中国科学院数学与系统科学研究院，以及昆明市有关部门共同支持建设的数学与交叉科学交流机构。旨在搭建数学及其跨学科应用领域的学术交流平台，提升我国数学整体研究水平，成为国际一流的数学交流与合作研究中心。

中心位于昆明市宜良县柴石滩水库库区，三面环山、一面临水，环境优美，海拔约 1700 米。距长水国际机场约 90 公里（车程约 1.5 小时），距石林风景区约 30 公里，距九乡风景区约 20 公里。

中心总建筑面积约 6000 平方米，设有大报告厅（可容纳 100 人，配备高清 LED 屏）、中型会议室 1 间、小型会议室 4 间、研讨/工作室 21 间、图书阅览室 1 间、咖啡厅 1 间。专家楼配有 56 间宿舍及自助洗衣房、公共休息区等配套设施。

中心官方网站：http://tianyuan.amss.ac.cn/



Introduction to Tianyuan Mathematics Research Center （TYMRC）

The Tianyuan Mathematics Research Center (established in July 2023) is jointly supported by the Chinese Academy of Sciences, the National Natural Science Foundation of China, the Chinese Mathematical Society, the Academy of Mathematics and Systems Science of the Chinese Academy of Sciences, and relevant departments of Kunming City. It aims to build a platform for academic exchange in mathematics and interdisciplinary applications, enhance China's overall mathematical research level, and become a world-class center for mathematical exchange and collaborative research.

It is located in the national-level public welfare forest in the Chaishitan Reservoir area of Yiliang, Kunming, Yunnan Province, surrounded by mountains on three sides and facing water on one side. The center has a total land area of about 27,000 square meters, with three two-story main buildings, namely the Research Building, the Expert Building and the Logistics Building, which can accommodate nearly 200 people for academic activities, and are equipped with a library and reading room, a restaurant and a certain number of offices and guest rooms.

The center has a total construction area of approximately 6,000 square meters. It features a main lecture hall (capacity: 100 people, equipped with an HD LED screen), one medium-sized seminar room, four small meeting rooms, 21 seminar/workshop rooms, one library and reading room, and one café. The Expert Building is equipped with 56 guest rooms, as well as supporting facilities such as a self-service laundry room and a public lounge.

Official website: http://tianyuan.amss.ac.cn/

会议信息

一、研讨主题、内容及意义：

在无线通信领域，数学是推动技术演进的核心驱动力。无线通信系统设计中的诸多关键问题，其本质均可凝练为数学问题，尤其是优化问题——从信号调制解调的波形设计，到频谱资源的动态分配，从多用户干扰的抑制策略，到网络覆盖与容量的平衡，背后都是对目标函数的求解、约束条件的突破和效率边界的探索。

自香农信息论以数学公式定量揭示 “通信系统极限” 以来，无线通信的每一次跨越式发展都与数学突破紧密相连。从蜂窝网络的拓扑优化依赖图论与随机过程，到 MIMO 技术通过矩阵论实现空间复用增益，再到 5G 中极化码基于信道极化理论攻克信道编码难题，数学始终为技术创新提供严谨的理论框架和可落地的求解路径。

本次研讨会正是基于这一核心逻辑，聚焦新一代通信系统设计中的数学算法创新与复杂问题分析。通过汇聚应用数学、运筹优化、通信工程及机器学习领域的学者，搭建跨学科交流平台：一方面，深入探讨最优化在资源调度中的高效求解、信息论对新型网络架构的理论分析、深度学习与传统通信算法的融合边界等交叉领域的挑战性问题；另一方面，推动理论数学成果向通信技术的转化，同时将工程实践中涌现的新问题反哺给数学研究，形成 “理论突破—问题反哺” 的良性循环，预期促进下一代无线通信技术的数学基础理论突破。

二、活动日程：

报到：2026 年 8 月 2 日

报告：2026 年 8 月 3 日至 8 月 7 日

离会：2026 年 8 月 8 日

地点：天元数学国际交流中心（云南省昆明市宜良县柴石滩水库）

三、相关事项：

1. 本次研讨会得到天元数学国际交流中心资助，参会人员的住宿及餐饮由中心承担，其余费用（含往返交通费）由参会人员自理。
2. 中心统一安排往返昆明高铁站/长水机场及昆明市区的接送服务。请及时登录项目管理系统（http://tianyuanpm.amss.ac.cn/）登记行程信息。
3. 中心距离医院较远，建议访客适当随时携带一些必备药品。
4. **会议联系人：**

   姓名：邵明杰 电话：18110075677

Conference Information

I. Seminar Theme, Content, and Significance：

In wireless communications, mathematics serves as the core engine driving technological evolution. Many critical problems in wireless system design are essentially optimization problems. From waveform design in modulation and demodulation to dynamic spectrum resource allocation, and from multi-user interference mitigation to the balance between network coverage and capacity, every advance relies on solving target functions, breaking through constraint boundaries, and exploring efficiency limits.

Since Shannon’s information theory quantitatively revealed the ultimate limits of communication systems, every leap forward in wireless communications has been tightly coupled with mathematical breakthroughs. From cellular network topology optimization relying on graph theory and stochastic processes, to MIMO technology achieving spatial multiplexing gains via matrix theory, to 5G polar codes overcoming channel coding challenges based on channel polarization theory, mathematics has consistently provided a rigorous theoretical framework and practical paths for innovation.

Grounded in this core logic, this symposium focuses on mathematical algorithm innovation and complex problem analysis for next-generation communication systems. By bringing together scholars across applied mathematics, operational research and optimization, communication engineering, and machine learning, this cross-disciplinary platform aims to: on one hand, explore challenging cross-domain issues—such as efficient solutions for resource scheduling optimization, theoretical analysis of novel network architectures using information theory, and the integration boundaries between deep learning and traditional communication algorithms; on the other hand, translate theoretical achievements into practical communication technologies, while feeding back engineering challenges to mathematical research. This fosters a virtuous cycle of "theoretical breakthroughs driving technology, and practical challenges refining theory," ultimately accelerating foundational breakthroughs for next-generation wireless communications.

II、Program Schedule：

Check-in: August 2, 2026

Talks: August 3 – August 7, 2026

Departure: August 8, 2026

Venue: Tianyuan Mathematics Research Center (Chishitan Reservoir, Yiliang County, Kunming, Yunnan Province)

III、Practical Information：

1. This seminar is financially supported by the TYMRC. Accommodation and meals for participants will be covered by the Center. All other expenses (including round-trip transportation) shall be borne by the participants themselves.
2. The Center will arrange shuttle services to/from the following locations: Kunming High-Speed Railway Station, Kunming Changshui International Airport, and downtown Kunming. Participants are kindly requested to log in to the project management system (http://tianyuanpm.amss.ac.cn/) in a timely manner to register their travel information.
3. As the Center is located at a considerable distance from the nearest hospital, participants are advised to bring an adequate supply of essential personal medications.
4. Conference Contact:
   Mingjie Shao: 18110075677

会议日程一（Schedule I）

8 月 2 日	
周日　Sunday	报到（**Registration**）
8 月 8 日	
周六　Saturday	离会（**Departure**）

8 月 3 日（周一　Monday）			
8:45 - 9:00	开幕式及合影　Opening Ceremony & Group Photo		
时间 Time	报告人 Speaker	题目 Title of talk	主持人 Chair
9:00 - 9:45	光炫	唯一可译的网络函数计算编码	刘亚锋
9:45 - 10:30	杨在	频谱压缩感知与 Carathéodory-Fejér 定理	刘亚锋
10:30 - 11:00	讨论（Discussion over coffee）		
11:00 - 11:45	郭涛	Recent Progress on Multilevel Diversity Coding	黄记祖
11:45 - 14:00	午餐（Lunch Break）		
14:00 - 14:45	刘凡	何种通信波形具有最优测距性能？——大样本条件下的 CRB 分析	邵明杰
14:45 - 15:30	陈伟坤	Distributionally robust probabilistic set covering problems under Wasserstein ambiguity	邵明杰
15:30 - 16:00	讨论（Discussion over coffee）		
16:00 - 16:45	魏志强	6G 高移动调制波形设计：OFDM, OTFS, or DD-a-OFDM?	徐彦卿
16:45	晚餐（Dinner Break）		

会议日程二（Schedule II）

8 月 4 日（周二　Tuesday）			
时间 Time	报告人 Speaker	题目 Title of talk	主持人 Chair
9:00 - 9:45	唐波	面向多目标定位和多用户通信的 MIMO 一体化系统波形设计方法	尹峰
9:45 - 10:30	许威	有限码长信息论基础理论研究	尹峰
10:30 - 11:00	讨论（Discussion over coffee）		
11:00 - 11:45	胡奕聪	Unified framework for outage-constrained rate maximization in secure ISAC	王治国
11:45 - 12:30	宋恩彬	Exactly or Approximately Wasserstein Distributionally Robust Estimation According to Wasserstein Radii Being Small or Large	王治国
12:30 - 14:00	午餐（Lunch Break）		
14:00 - 16:30	FREE DISCUSSION		
16:30	晚餐（Dinner Break）		

会议日程三（Schedule III）

8 月 5 日（周三　Wednesday）			
时间 Time	报告人 Speaker	题目 Title of talk	主持人 Chair
9:00 - 9:45	李庆娜	A Robust EDM Optimization Approach for 3D Single-Source Localization with Angle and Range Measurements	沈超
9:45 - 10:30	黄永伟	Optimal Robust Adaptive Beamforming for a General-Rank Signal Model via Equivalence of Maximin and Minimax SINR Problems	沈超
10:30 - 11:00	讨论（Discussion over coffee）		
11:00 - 11:45	何恒涛	Physics-Guided Foundation Models for Wireless Communications and Sensing	郭涛
11:45 - 14:00	午餐（Lunch Break）		
14:00 - 14:45	黄杰	无线底层算子加速问题	姜波
14:45 - 15:30	陈琪	端侧通信优化 agent 与自进化 harness 系统	姜波
15:30 - 16:00	讨论（Discussion over coffee）		
16:00 - 16:45	沈闿明	Generalized Quadratic Transform and Its Application	向立瑶
16:45	晚餐（Dinner Break）		

会议日程四（Schedule IV）

8 月 6 日（周四　Thursday）			
时间 Time	报告人 Speaker	题目 Title of talk	主持人 Chair
9:00 - 9:45	王治国	Proximal-Based Generative Modeling for Bayesian Inverse Problems	蔡曙
9:45 - 10:30	张雅倩	Reducing The Sub-packetization of Optimal-Access Cooperative MSR Codes With Two Erasures	蔡曙
10:30 - 11:00	讨论（Discussion over coffee）		
11:00 - 11:45	孙浩	Radio map construction for wireless communication and localization	孙文宣
12:30 - 14:00	午餐（Lunch Break）		
14:00 - 16:30	FREE DISCUSSION		
16:30	晚餐（Dinner Break）		

会议日程五（Schedule V）

8 月 7 日（周五　Friday）			
时间 Time	报告人 Speaker	题目 Title of talk	主持人 Chair
9:00 - 11:00	FREE DISCUSSION		
11:00 - 14:00	午餐（Lunch Break）		
14:00 - 16:30	FREE DISCUSSION		
16:30	晚餐（Dinner Break）		

报告摘要（Report Abstracts）

光炫，南开大学，中国

Title: 唯一可译的网络函数计算编码（Uniquely-decodable coding for network function computation）

Abstract: Uniquely-decodable coding for zero-error network function computation will be introduced in this talk, where in a directed acyclic graph, the single sink node is required to compute with zero error a target function multiple times, whose arguments are the information sources generated at source nodes. We are interested in the computing capacity from the information theoretic point of view, which is defined as the infimum of the maximum expected number of bits transmitted on all the edges for computing the target function once on average. We first prove some new results on clique entropy, in particular, the substitution lemma of clique entropy for probabilistic graphs with a certain condition. With them, we prove a lower bound on the computing capacity associated with clique entropies of the induced characteristic graphs, where the obtained lower bound is applicable to arbitrary network topologies, arbitrary information sources, and arbitrary target functions. By refining the probability distribution of information sources, we further strictly improve the obtained lower bound. In addition, we compare uniquely-decodable network function-computing coding and fixed-length network function-computing coding, and show that the former indeed outperforms the latter in terms of the computing capacity.

杨在，西安交通大学，中国

Title: 频谱压缩感知与 Carathéodory-Fejér 定理

Abstract: 频谱压缩感知（或信号频谱分析）旨在从信号的少量时/空域采样中获取其频域信息，是现代信息技术的核心组成。雷达探测和无线通信的快速发展推动了频谱分析从上世纪 60 年代的快速傅里叶变换（FFT）发展到自 70 年代兴起的子空间方法，再到本世纪的稀疏优化与压缩感知方法。在本报告中，我们将重温 1911 年关于 Toeplitz 协方差矩阵分解的 Carathéodory-Fejér 定理，并讨论其在过去半个世纪频谱分析发展中的关键作用。我们将重点介绍 Carathéodory-Fejér 定理从一维到高维的拓展，并展示它如何构成先前（子空间和压缩感知）方法的基础，并启发新的（信号域极大似然和深度学习）频谱分析方法。

郭涛，东南大学，中国

Title: Recent Progress on Multilevel Diversity Coding

Abstract: Multilevel diversity coding is a classical coding model where multiple mutually independent information messages are encoded, such that different reliability requirements can be afforded to different messages. It is well known that superposition coding, namely separately encoding the independent messages, is optimal for symmetric multilevel diversity coding (SMDC). However, the existing characterization of the coding rate region involves uncountably many linear inequalities. In this talk, we obtain in closed form a finite set of linear inequalities for characterizing the coding rate region. We further show by the symmetry of the problem that only a much smaller subset of this finite set of inequalities needs to be verified in determining the achievability of a given rate tuple. The secure settings of SMDC are further considered, and the optimality conditions for superposition coding and its relation with secret sharing are characterized.

刘凡，东南大学，中国

Title: 何种通信波形具有最优测距性能？——大样本条件下的 CRB 分析

Abstract: 通感一体系统利用同一波形同时完成通信信息传输和目标参数感知。然而，通信符号的随机性会引起感知性能的随机波动乃至精度损失，这一机理被称为通信与感知的“确定－随机”折衷。长期以来，通感一体领域的一个开放问题是：何种通信波形具有最优感知性能？围绕这一科学问题，本报告研究正交通信波形对测距克拉美－罗界（CRB）的影响机理。首先，揭示正交通信波形下联合时延－幅度估计的 Fisher 信息矩阵的基本结构。在此基础上，建立随机信号测距 CRB 的普适 Jensen 下界，并证明 CP-OFDM 波形在 PSK 星座下严格达到该下界。进一步地，对于 QAM 及更一般的亚高斯星座，严格证明了如下两点结论：1）当传输符号数 N 充分大时，CP-OFDM 的测距 CRB 低于任意扩频正交波形，如 OTFS 和 AFDM；2）CP-OFDM 在有限 N 下是 CRB 最小化问题的驻点，并在 N 充分大时具有半正定的黎曼 Hessian，从而具有局部最优性。最后，本报告将讨论上述结果的理论与工程意义，并提出 CP-OFDM 在任意有限 N 下实现测距 CRB 全局最优的猜想。

陈伟坤，北京理工大学，中国

Title: Distributionally robust probabilistic set covering problems under Wasserstein ambiguity

Abstract: We consider the distributionally robust probabilistic set covering problem (DR-PSCP) with right-hand-side uncertainty under Wasserstein ambiguity. Standard reformulation techniques yield a mixed-integer linear programming (MILP) formulation that often suffers from a weak linear programming relaxation and a large problem size, particularly when the number of scenarios is large. In this talk, we present a new MILP formulation that offers two key advantages over the standard formulation: (i) a significantly stronger linear programming relaxation and (ii) a substantially more compact representation. Moreover, the proposed formulation is particularly amenable to decomposition, enabling the development of scalable solution methods for large-scale DR-PSCPs. Numerical results demonstrate the computational effectiveness of the proposed formulation.

魏志强，西安交通大学，中国

Title: 6G 高移动调制波形设计：OFDM, OTFS, or DD-a-OFDM?

Abstract: 本报告围绕 6G 高移动性通信的调制波形设计问题，系统介绍正交频分复用（OFDM）、正交时频空调制（OTFS）以及时延-多普勒域辅助 OFDM（DD-a-OFDM）等典型波形体制的基本概念与信号处理方法。首先，报告回顾调制波形设计的基本概念、核心准则以及 6G 高移动性通信的候选波形分类。随后从 OFDM 在高移动性场景下面临的问题出发，引入时延-多普勒（DD）域通信的基本理论与信号处理方法，包括 DD 域信道估计和 DD 域多天线收发机信号处理。为进一步推动 DD 域调制波形与现有 OFDM 波形体制的兼容融合，课程介绍 DD-a-OFDM 技术，分析其如何在兼容 5G NR OFDM 框架的基础上引入 DD 域信号处理辅助 OFDM 传输设计，在多普勒鲁棒性、系统兼容性和实现复杂度之间取得平衡。报告有望为低空通信、卫星通信以及感通一体化等未来应用场景的技术发展提供波形设计参考。

唐波，国防科技大学，中国

Title: 面向多目标定位和多用户通信的 MIMO 一体化系统波形设计方法

Abstract: 本报告主要讨论多输入多输出（MIMO）系统的发射波束成形设计问题，旨在同时实现多目标定位和多用户通信。为了提升目标定位性能，基于标准线性接收阵列假设，证明了 MIMO 系统的目标角度估计误差渐近 CRB 的上界为目标方向图响应加权调和平均值的倒数。提出了基于最小化渐近 CRB 上界的 MIMO 一体化形设计方法。为了实现多用户通信，施加了通信用户接收端信干噪比约束。提出两种波形设计方法：一是 ADMM 方法；另一种为 MM4MM 方法。研究结果表明，MM4MM 方法能够获得更好的性能，但运行时间更长。与对比算法相比，MM4MM 方法所设计的波形在目标角度能够形成更强的方向图响应，更低的方向图副瓣，以及达到更高的角度估计精度。

许威，东南大学，中国

Title: 有限码长信息论基础理论研究

Abstract: 近年来，超低时延通信已成为 6G 新型应用的重要支撑，有限码长信息论是刻画低时延通信性能极限的核心理论。相较于经典无限码长信息论，有限码长理论仍存在界不够紧、表达形式复杂以及多天线推广困难等开放问题。本报告围绕有限码长信息论基础理论开展研究：在单天线场景下，基于高维填球几何模型提出球内均匀随机码本（VURC），通过随机几何统计分析得到更加紧致的有限码长闭式可达界与 4 阶渐进界；在多用户及多天线场景下，构建统一有限码长分析框架，通过多用户错误事件解耦以及二阶随机占优理论（SOSD），得到业内首个有限码长 MAC/BC 信道闭式可达界，并进一步探讨其向多天线系统的推广路径。所提方法可进一步推广至更多信道模型，为低时延无线通信理论研究提供了新的码本工具和数学基础。

胡奕聪，香港大学，中国

Title: Unified framework for outage-constrained rate maximization in secure ISAC

Abstract: Integrated sensing and communication (ISAC) is poised to redefine the landscape of wireless networks by seamlessly combining data transmission and environmental sensing. However, ISAC systems remain susceptible to eavesdropping, especially under uncertainty in eavesdroppers' channel state information, which can lead to secrecy outages. On the other hand, diverse and complex sensing performance requirements further complicate resource optimization, often requiring custom solutions for each scenario. To this end, this paper introduces a unified optimization framework that holistically addresses both the worst-case user secrecy rate and the sum secrecy rate across multiple users. Besides putting the two commonly used objectives into a single but flexible objective function, the framework accurately controls secrecy outage probabilities while accommodating a broad spectrum of sensing constraints. To solve such a general problem, we integrate the sensing requirements into the objective function through an auxiliary variable. This enables efficient alternating optimization and the proposed approach is theoretically guaranteed to converge to at least a stationary point of the original problem. Extensive simulation results show that the proposed framework consistently achieves higher optimized secrecy rates under various sensing constraints compared to existing methods. These results underscore the proposed unified framework's superiority and versatility in secure ISAC systems.

宋恩彬，四川大学，中国

Title: Exactly or Approximately Wasserstein Distributionally Robust Estimation According to Wasserstein Radii Being Small or Large

Abstract: This talk primarily considers the robust estimation problem under Wasserstein distance constraints on the parameter and noise distributions in the linear measurement model with additive noise, which can be formulated as an infinite-dimensional nonconvex minimax problem. We prove that the existence of a saddle point for this problem is equivalent to that for a finite-dimensional minimax problem, and give a counterexample demonstrating that the saddle point may not exist. Motivated by this observation, we present a verifiable necessary and sufficient condition whose parameters can be derived from a convex problem and its dual. Additionally, we also introduce a simplified sufficient condition, which intuitively indicates that when the Wasserstein radii are small enough, the saddle point always exists. In the absence of the saddle point, we solve a finite-dimensional nonconvex minimax problem, obtained by restricting the estimator to be linear. Its optimal value establishes an upper bound on the robust estimation problem, while its optimal solution yields a robust linear estimator. Numerical experiments are also provided to validate our theoretical results.

李庆娜，北京理工大学，中国

Title: A Robust EDM Optimization Approach for 3D Single-Source Localization with Angle and Range Measurements

Abstract: Accurate source localization in Multi-Platform Radar Networks (MPRNs) benefits from exploiting both range and angle measurements under robust estimation. In this paper, we propose a robust Euclidean distance matrix (EDM) optimization model that simultaneously integrates range measurements, angle information, and the least absolute deviation (ℓ1-norm) criterion for the case of 3D single-source localization (3DSSL). A key theoretical contribution of this work is the rigorous reformulation of existing 3D angle measurements into simple box constraints on the Euclidean distances. Unlike previous approximations, we achieve this by reducing each of the 3D angle measurements to a two-dimensional nonlinear optimization problem, whose global minimum and maximum solutions can be characterized and utilized to get the lower and upper bounds of the distances from the unknown source to the sensors. To solve the resulting rank-constrained EDM problem, we develop an efficient algorithm based on the majorization penalty method. Extensive numerical experiments confirm that the new EDM model significantly outperforms leading solvers in terms of localization accuracy and computational efficiency, particularly in low Signal-to-Noise Ratio (SNR) scenarios.

黄永伟，广东技术师范大学，中国

Title: Optimal Robust Adaptive Beamforming for a General-Rank Signal Model via Equivalence of Maximin and Minimax SINR Problems

Abstract: The globally optimal robust adaptive beamforming (RAB) solution is studied for worst-case signal-to-interference-plus-noise ratio (SINR) maximization (the maximin SINR problem) under convex and closed uncertainty sets for the desired signal covariance and interference plus-noise covariance (INC) matrices, considering a general-rank signal model. First, the corresponding minimax SINR problem is reformulated as a convex optimization problem. In particular, this problem becomes a semidefinite programming (SDP) problem when the uncertainty sets can be represented by finitely many linear matrix inequality constraints. It is then shown that, for a general-rank signal model, the maximin and minimax SINR problems are equivalent when the uncertainty sets are convex and closed, in the sense that they share the same optimal value and the same set of optimal solutions. The requirement of closedness is weaker than the compactness assumption previously used to establish the equivalence between minimax and maximin SINR problems for the rank-one signal model, a state-of-the-art result reported approximately two decades ago. Consequently, an optimal solution to the minimax SINR problem is also globally optimal for the maximin SINR problem, and this solution can be obtained by solving the equivalent SDP of the minimax problem in a single step. In contrast, existing iterative approximation algorithms for the maximin SINR problem yield only locally optimal solutions. Simulation results validate the theoretical results proposed.

何恒涛，东南大学，中国

Title: Physics-Guided Foundation Models for Wireless Communications and Sensing

Abstract: Deep learning (DL) has been widely used in future physical layer communications and sensing, but task-specific DL models are difficult to generalize across different physical layer tasks. Recently emerging wireless foundation models demonstrate strong generalization capability. However, existing methods mainly adapt pretrained language/vision models or rely on CSI reconstruction objectives for pretraining, with limited use of channel knowledge, and thus have limited performance. To address this limitation, we propose several physics-guided foundation models for wireless communications and sensing by exploiting the domain knowledge. Experiments on several wireless and sensing tasks show that the proposed physics-guided wireless foundation models outperform state-of-the art CSI foundation models with smaller number of parameters.

黄杰，华为技术有限公司，中国
Title: 无线底层算子加速问题
Abstract:

陈琪，华为技术有限公司，中国
Title: 端侧通信优化 agent 与自进化 harness 系统
Abstract: 面向现有的终端通信场景感知能力弱，个性化模式等问题，希望未来可探究如何使用 agent 实现多维感知、分层记忆、自动规划决策的端侧通信优化 agent。并结合自进化 harness 系统保证模型的精度。

沈闓明，香港中文大学（深圳），中国
Title: Generalized Quadratic Transform and Its Application
Abstract:

王治国，四川大学，中国
Title: Proximal-Based Generative Modeling for Bayesian Inverse Problems
Abstract: Score-based diffusion models demonstrate superior performance in generative tasks but encounter fundamental bottlenecks in inverse problems due to the analytical intractability of the time-dependent likelihood score. To bridge this gap, we propose a novel proximal-based generative modeling (PGM) framework that rigorously circumvents explicit likelihood evaluation. Our framework is built upon a theoretical equivalence between Gaussian convolution in diffusion processes and Moreau-Yosida regularization in nonsmooth optimization. This enables a new sampling mechanism driven by the proposed Moreau score, which admits a closed-form expression via proximal operators. Moreover, we introduce Moreau score matching to learn the proximal operators that rely solely on samples drawn from the prior distribution. Theoretically, PGM eliminates the early-stopping bias inherent in the score-based diffusion model and achieves non-asymptotic convergence. Experiments demonstrate that PGM significantly surpasses state-of-the-art methods in reconstruction quality and sampling time.

张雅倩，北京邮电大学，中国

Title: Reducing The Sub-packetization of Optimal-Access Cooperative MSR Codes With Two Erasures

Abstract: Cooperative MSR codes are a kind of storage codes which enable optimal-bandwidth repair of any h node erasures in a cooperative way, while retaining the minimum storage as an [n,k] MDS code. In particular, a cooperative MSR code is said to have optimal-access property, if during node repair, the amount of data accessed at each helper node meets a theoretical lower bound. Each code coordinate (node) is assumed to store an array of l symbols, where l is termed as sub-packetization. Large sub-packetization tends to induce high complexity, large input/output (I/O) in practice. In this talk, we focus on reducing the sub-packetization of optimal-access cooperative MSR codes repairing two erasures. At first, we design two crucial MDS array codes for cooperatively repairing a specific repair pattern of two erasures with optimal access. Then, using the two codes as building blocks and by stacking up of the two codes for several times, we obtain an optimal-access cooperative MSR code with two erasures. The derived code has much smaller sub-packetization than the state of the art.

孙浩，香港城市大学，中国

Title: Radio map construction for wireless communication and localization

Abstract: Radio maps have emerged as a critical enabler for next-generation wireless communication and localization systems. By characterizing the spatial variation of received signal strength, radio maps support a wide range of functions, including beamforming, resource allocation, UAV trajectory design, and source localization. However, constructing accurate radio maps in practice remains challenging due to the sparse, irregular, and noise-contaminated nature of real-world measurements. This talk will present several recent advances in radio-map reconstruction that integrate physical modeling with data-driven learning. The discussion will cover interpolation-assisted matrix completion for exploiting spatial smoothness, and tensor-based reconstruction frameworks that incorporate geometric interpolation together with structural priors. A plug-and-play framework with a flow-matching prior is also introduced to enable accurate reconstruction and uncertainty-driven active learning. Collectively, these approaches provide a principled and scalable methodology for recovering high-resolution radio maps under limited sensing budgets.