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主编序语

各位学者：

我们希望通过办《IEEE 信息论学会广州分会季报》(简称《季报》)为大家提供一个稳定高效的知识交流平台。学术文章的撰写追求科学严谨，写稿、审稿、修正并最终发表的周期较长。《季报》则主要刊登介绍性的通讯稿，便于大家更及时地发布科研成果甚至猜想，获得关注与交流，以期与学术文章形成良性互补，进一步推动信息论和编码领域的知识创新与应用。

陈立

From the Editor-in-Chief

Dear Chapter Members,

We hope the *IEEE Information Theory Society Guangzhou Chapter Newsletter* can provide a long-term and effective platform for knowledge exchange. Scientific articles are rigorous, where their publications require a relatively longer period to accommodate the process of writing, reviewing, revising before the final stage. We believe this *Newsletter* can become a complementary channel for our members to announce their results and even conjectures. It might catalyse our endeavour in the areas of information theory and coding, for the better.

Li Chen

来稿请包含中英文题目、联系人、联系方式、拟投稿栏目，正文内容可以是中文或英文，不超过 800 字。

The submission should include the title in both Chinese and English, author contacts, and the column that the article belongs to. Content of the article can be in Chinese or English, and is limited to 800 words.

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Finite-length Code and Application in Network Coding
有限长度编码及在网络编码中的应用

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A binary code of block length n and codebook size 2^k is called an (n,k) code, which is said to be *linear* if it is a subspace of $\{0,1\}^n$. Linear codes have been extensively studied in coding theory. For memoryless binary symmetric channels (BSCs), asymptotically capacity achieving linear codes with low encoding/decoding complexity have been designed. However for fixed n and k, whether linear codes are optimal or not among all (n,k) codes for BSCs in terms of the maximum likelihood (ML) decoding is a long-standing open problem, dated back to Slepian's 1956 paper [1]. Except for codes that are perfect or quasi-perfect, very little is known about optimal codes for BSC. The best linear $(n,2)$ codes have been explicitly characterized for each block length n [2][3], but whether linear $(n,2)$ codes are optimal or not among all $(n,2)$ codes in terms of the ML decoding is unknown in general.

Recently we derived a general approach for comparing the ML decoding performance of two $(n,2)$ codes with certain small difference. Based on this approach, we verify that linear $(n,2)$ codes are optimal for a range of n. In particular, we show that for any block-length n, there exists an optimal $(n,2)$ code that is either linear or in a subset of nonlinear codes, called Class-I codes. Based on the analysis of Class-I codes, we derive sufficient conditions such that linear codes are optimal. For $n \leq 8$, our analytical results show that linear codes are optimal. For n up to 300, numerical evaluations show that linear codes are optimal, where the evaluation complexity is $O(n^7)$. Moreover, most ML decoding comparison results obtained are universal in the sense that they do not depend on the crossover probability of the BSC.

Finite-length codes find applications in network coding. When studying the communication through a line network with buffer size constraints at intermediate nodes, a class of batched codes are used [5][6]. A batched code has an outer code and an inner code. The outer code encodes the information messages into batches, each of which is a sequence of coded symbols, while the inner code performs a general network coding for the symbols belonging to the same batch. The inner code, comprising of recoding at network nodes on each batch separately, should be designed for specific channels.

Batched codes provide a general coding framework for line networks with buffer size constraints at the intermediate nodes. We have the following results about the performance of batched codes [5][6][7]: When buffer size is a constant of the network length L, the maximum achievable rate decreases exponentially with the network length. When the batch size is a constant, using a buffer size of $O(\log\log L)$ can achieve rate $\Omega\left(\frac{1}{\log L}\right)$, and the achievable rate is upper bounded by $O\left(\frac{1}{\log L}\right)$ as long as the buffer size is $O(\log L)$. Moreover, using $O(\log L)$ batch size and $O(\log L)$ buffer size, the maximum achievable rate can be arbitrarily close to the cut-set bound.

Finite-length codes can be used to form the inner code of batched codes. For line networks of packet erasure channels, random linear codes can be used between two adjacent nodes [8]. Here the random linear codes are used as erasure codes, but do not need to be decoded in each hop. For line networks of binary symmetric channels, it has been shown that [5] when using batch size 1, the inner code formed by repetition codes, i.e., the optimal $(n, 1)$ codes, can achieve the rate $\Omega\left(\frac{1}{\log L}\right)$, which is optimal in terms of scalability with L. To achieve higher absolute rates, larger batch sizes should be used (see Fig. 1). Note that for any fixed batch size k and network length L, the best rate in the figure is achieved by the inner code formed by (n, k) codes with $n = O(\log L)$.

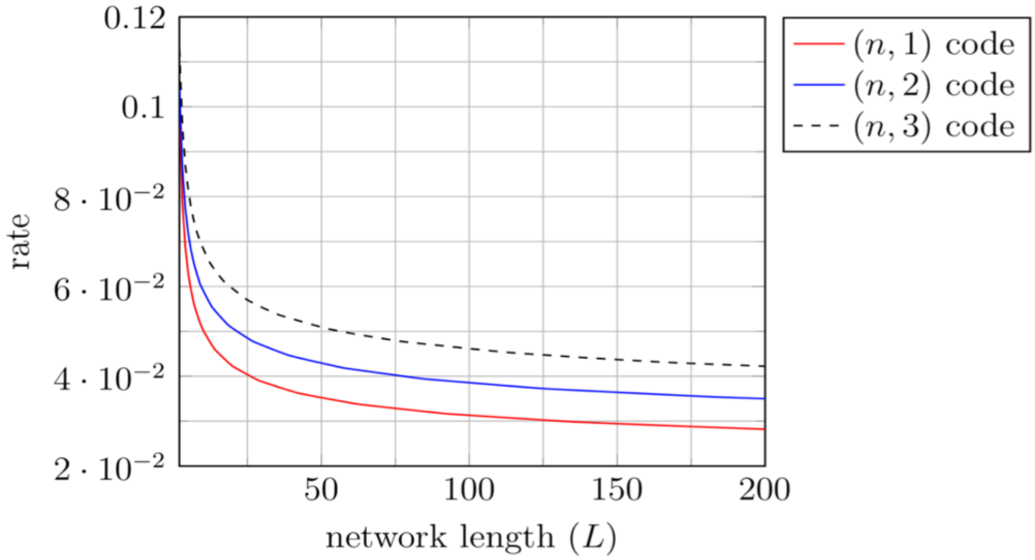

Fig. 1: Achievable rates of batched codes for line networks of binary symmetric channels, where the inner code is formed by binary (n, k) codes, where $k = 1,2,3$.

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最新结果 • RECENT RESULTS •

Progressive Algebraic Soft Decoding of Reed-Solomon Codes Based on Module
基于模的 Reed-Solomon 码渐进代数软译码

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Reed-Solomon (RS) codes are widely applied in communication systems and storage devices. In practice, the Berlekamp-Massey (BM) algorithm is utilized for error-correction, which can correct errors up to half of the code's minimum Hamming distance. The interpolation based Guruswami-Sudan (GS) decoding can correct errors beyond the above distance bound with a polynomial-time complexity. It consists of two steps, interpolation that constructs the minimal polynomial $Q(x, y)$, and root-finding that delivers y-roots of $Q(x, y)$. By transforming received soft information into interpolation multiplicity, algebraic soft decoding (ASD) yields a better performance than the GS decoding. However, their complexity remains high due to the interpolation process, which is usually realized by Kötter's interpolation.

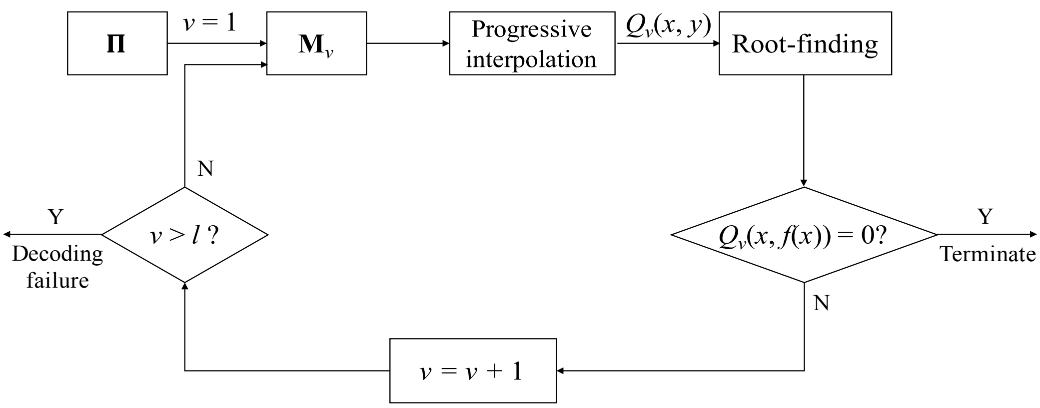

Fig. 1 Diagram of the PASD algorithm.

In order to reduce the average decoding complexity, the progressive ASD (PASD) algorithm [1] was originally proposed by my supervisor, Prof. Li Chen, in 2013. Fig. 1 illustrates the PASD algorithm, where $\mathbf{\Pi}$ denotes the reliability matrix and $\mathbf{M}_v$ ($v = 1, 2, \ldots, l = \deg_y Q$) denotes the intermediate multiplicity matrix. At each iteration v, the PASD algorithm constructs an interpolation polynomial $Q_v(x, y)$ with $\deg_y Q_v = v$, which satisfies the interpolation constraints defined by $\mathbf{M}_v$. As v increases, the error-correction capability improves. Once the transmitted message $f(x)$ is found, the decoding terminates. With such mechanism, the PASD algorithm can adjust its computation to the received information, leveraging the decoding complexity. However, this is realized at the cost of memorizing the intermediate decoding information when Kötter's interpolation is applied.

Recently, it has been shown that using module basis reduction (BR) technique can yield a lower ASD complexity than using Kötter's interpolation. A module basis is first constructed, which contains bivariate polynomials that satisfy the prescribed interpolation constraints. Presenting it as a matrix over univariate polynomials, row operation further reduces it into a Gröbner basis, where the leading positions of all rows are different. Its minimum candidate is the interpolation polynomial $Q(x, y)$. In this article, we utilize this BR interpolation to realize a new PASD algorithm, namely the PASD-BR algorithm [2]. It can determine polynomial $Q_v(x, y)$ through a progressively enlarged module basis. Let $\mathbf{B}_v$ denote a module basis at iteration v, where its entries have satisfied the interpolation constraints defined by $\mathbf{M}_v$. It will then be reduced into a Gröbner basis $\mathbf{B}'_v$ for retrieving $Q_v(x, y)$. If the intended message cannot be found from $Q_v(x, y)$, basis $\mathbf{B}'_v$ needs to be expanded into $\mathbf{B}_{v+1}$, whose entries will further satisfy the extra interpolation constraints defined by $\mathbf{M}_{v+1} \setminus \mathbf{M}_v$. This expansion can be realized by multiplying $\mathbf{B}'_v$ with a common multiplier $R_{v+1}(x)$, and adds a new polynomial which satisfies the interpolation constraints defined by $\mathbf{M}_{v+1}$. It should be pointed out that the newly added polynomial can be directly generated from the enumerated interpolation points. Consequently, the memory cost of the original progressive decoding can be removed. Moreover, the BR interpolation attributes to a remarkably lower complexity than the original PASD algorithm. Table I shows the average complexity in decoding the (255, 239) RS code, where $n = 255$ and $k = 239$ are the code's length and dimension, respectively. For all algorithms, the decoding parameter is $l = 4$. Note that the ASD and the PASD algorithms employ Kötter's interpolation. It shows that both of the progressive decoding algorithms are less complex than their non-progressive prototypes. Thanks to the BR interpolation, the ASD-BR and the PASD-BR algorithms yield a lower complexity than their counterparts by at least an order of magnitude. Among the four algorithms, the PASD-BR algorithm is the simplest. In [2], complexity of the PASD-BR algorithm has been analyzed, showing its effectiveness for high rate codes. A complexity reducing approach is also introduced.

Table I Average Complexity in Decoding the (255, 239) RS Code ($l = 4$)

SNR (dB)	5.0	5.5	6.0	6.5	7.0	7.5	8.0
ASD	1.08×10^9	1.11×10^9	1.11×10^9	1.08×10^9	1.01×10^9	9.48×10^8	8.89×10^8
PASD	2.39×10^8	1.38×10^8	3.48×10^7	1.13×10^7	1.10×10^7	1.09×10^7	1.09×10^7
ASD-BR	2.92×10^7	3.02×10^7	2.82×10^7	2.69×10^7	2.57×10^7	2.43×10^7	2.31×10^7
PASD-BR	2.05×10^7	1.30×10^7	3.23×10^6	8.29×10^5	6.94×10^5	6.89×10^5	6.87×10^5

This idea was inspired by the earlier work of Prof. Chen. At the beginning, we planned to utilize the BR interpolation to realize the PASD algorithm so as to reduce the decoding complexity. During the explorations and discussions, we found that the BR interpolation not only exhibits a lower complexity, but also removes the memory requirement of the progressive decoding. We first introduced this idea at IEEE ISIT 2018 [3].

References:

[1] L. Chen, S. Tang, and X. Ma, "Progressive algebraic soft-decision decoding of Reed-Solomon Codes," *IEEE Trans. Commun.*, vol. 61, no. 2, pp. 433-442, Feb. 2013.

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A Protograph Based Design for Spatially Coupled LDPC Codes
一种基于原模图的空间耦合 LDPC 码设计

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Spatially coupled (SC) LDPC (SC-LDPC) codes are also known as LDPC-convolutional codes, whose generator and parity-check matrices exhibit a diagonal band of non-zero entries while other positions of the matrices are filled with zeros. The generator matrix of such a structure demonstrates the encoding memory, while the parity-check matrix of such a structure enables certain properties of SC-LDPC codes, which distinguish them from LDPC block codes. Belief propagation (BP) based sliding window decoding (SWD) can be utilized to decode the codes, yielding a low message recovery latency which is important for next generation wireless communication networks. Also, the check node degree irregularity at the beginning and end of the matrix enables the BP decoding thresholds of the SC-LDPC code ensembles to approach the *maximum a posteriori* (MAP) decoding thresholds of the underlying LDPC block code ensembles, thus effectively achieving optimal error-correction performance.

The design of SC-LDPC codes can be categorized by two major approaches. One is through *cut-and-paste* unwrapping of the parity-check matrix of an LDPC block code that results in the parity-check matrix of an SC-LDPC code. The other is through designing an SC *protograph* of a code ensemble, from which the parity-check matrix of an SC-LDPC code can be obtained by lifting the designed SC protograph using permutation matrices. The SC protograph is formed by re-directing edges to connect together a series of block protographs, resulting in a *spatially coupled* protograph that can then be lifted to produce SC-LDPC codes. Our protograph design process results in the girth of the SC parity-check matrix being lowered bounded by that of the SC base matrix (protograph). To produce an easily implementable quasi-cyclic (QC) design, we can use circulant matrices for the graph lifting, and the remaining short cycles in the SC protograph can be removed by carefully designing the shifting factors of the circulant matrices. Our design is inspired by this observation and aims for an SC protograph with girth at least six. Consequently, the designed QC-SC-LDPC codes will have a girth of at least eight, ensuring them of good decoding performance.

Such a protograph design is realized by decomposing a SC base matrix $\mathbf{B}_{\mathrm{SC}}$ into several substructures, including a representative block $\mathbf{B}_{\mathrm{R}}$ which consists of all the component matrices $\mathbf{B}_i$ that form $\mathbf{B}_{\mathrm{SC}}$. The representative block $\mathbf{B}_{\mathrm{R}}$ can be further decomposed into a constituent block $\mathbf{B}_{\mathrm{C}}$ and several excluded patterns $\mathbf{B}_{\mathrm{E}}$. If 4-cycles can be eliminated in $\mathbf{B}_{\mathrm{R}}$, the SC protograph (base matrix $\mathbf{B}_{\mathrm{SC}}$) will have a girth of at least 6. This 4-cycle elimination is implemented in two stages. Stage I initializes the component matrices $\mathbf{B}_i$ and the excluded patterns $\mathbf{B}_{\mathrm{E}}$ such that they contain no 4-cycles . The initialized component matrices $\mathbf{B}_i$ are then placed into the constituent block $\mathbf{B}_{\mathrm{C}}$ accordingly. Stage II further identifies 4-cycles in $\mathbf{B}_{\mathrm{C}}$ and the non-zero entries that constitute a 4-cycle. It then removes those 4-cycles through an heuristic bit flipping process. As a result, 4-cycles in $\mathbf{B}_{\mathrm{C}}$ can be removed (or minimized). If $\mathbf{B}_{\mathrm{E}}$ and $\mathbf{B}_{\mathrm{C}}$ do not have 4-cycles, neither does $\mathbf{B}_{\mathrm{R}}$. The SC base matrix $\mathbf{B}_{\mathrm{SC}}$ will then have a girth of at least six. A parity-check matrix $\mathbf{H}_{\mathrm{SC}}$ of girth at least eight can then be obtained for the SC-LDPC codes by graph lifting. Details of the two-stage protograph design and graph lifting can be found in our recently published paper [1], in which examples are also provided. Fig. 1 shows the effectiveness of this design. The simulated SC-LDPC codes have a designed rate of 0.5 and a length of 60 000 bits. The designed codes exhibit a girth of six and eight, respectively, while the undesigned code has a girth of four. SWD with different window size W and the flooding schedule (FS) are simulated. It can be seen the designed codes substantially outperform the undesigned one, yielding a lower error floor and a better waterfall. In other words, the codes with larger girth perform better. More insight on the designed ensembles' BP decoding thresholds and the minimum coupling width required to eliminate 4-cycles in $\mathbf{B}_{SC}$ can be found in [1].

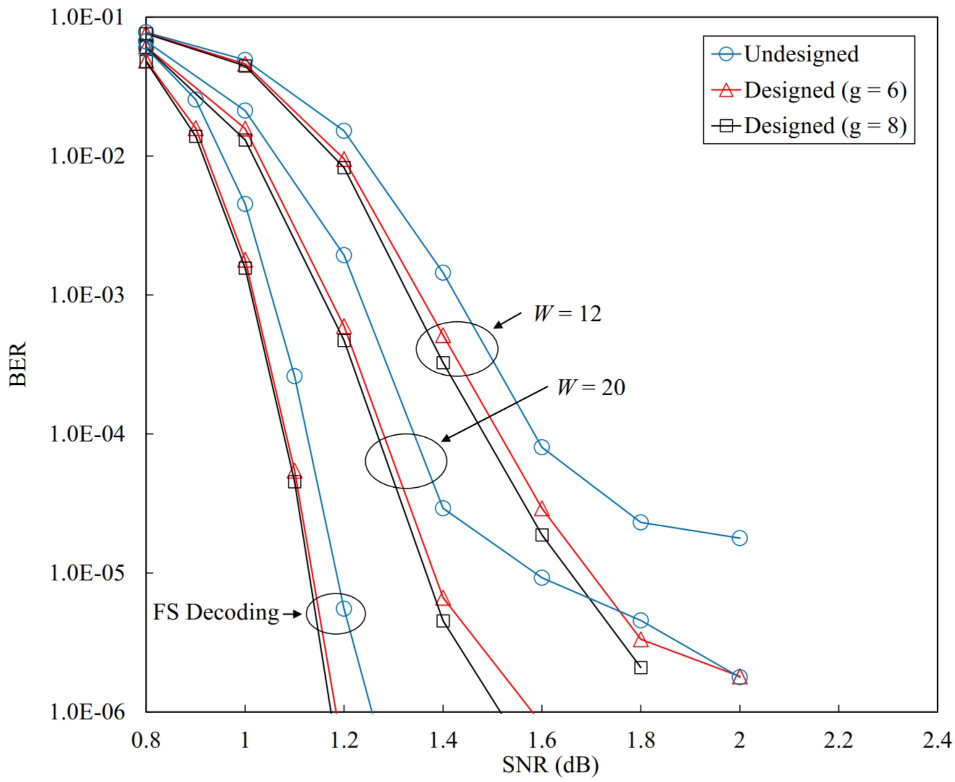

Fig. 1 Performance of the designed SC-LDPC codes [1].

This idea originated from my sabbatical leave at the University of Notre Dame from Oct. 2015 to Jun. 2016. It was hosted by Daniel Costello, to whom I am grateful. The design methodology was further cemented by weekly discussions with David Mitchell and Roxana Smarandache. After I returned to Sun Yat-sen University, I spent significant time trying to characterize the minimum coupling width required to eliminate 4-cycles in $\mathbf{B}_{SC}$. Although empirical results were obtained, an analytical solution is still outstanding. My master's student Shiyuan Mo helped implement this design and conducted the BP decoding threshold analysis and simulations. After Shiyuan Mo graduated in 2018, another master's student Jie Qiu helped finalize this work. We first introduced this design at ISIT 2017, see [2].

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交流活动 • RESEARCH ACTIVITIES •

“编码与信息论中大广深论坛”成功举办
SYSU held 2020 GuangShen Workshop on Coding and Information Theory

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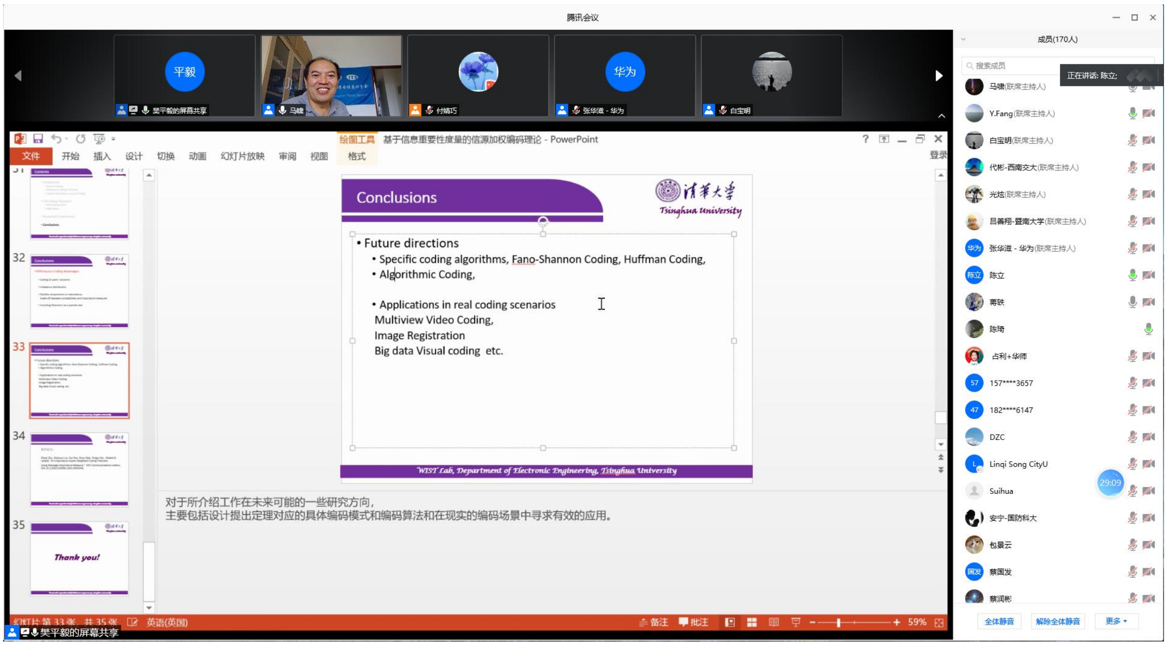
2020 年 6 月 20-21 日，中山大学数据科学与计算机学院主办，中国电子学会信息论分会、IEEE 信息论学会广州分会协办的“编码与信息论中大广深论坛”通过线上会议成功举办，190 余位专家学者在“云端”共享这场学术盛宴。



本次论坛由中山大学马啸教授主持，中国电子学会信息论分会主任委员白宝明教授为大会致辞，介绍了信息论分会学术年会的安排情况，希望大家踊跃参与。

清华大学樊平毅教授、南开大学光炫教授、西南交通大学代彬教授、华为技术有限公司张华滋博士、清华大学殷柳国教授、暨南大学吕善翔博士、长安大学方勇教授分别从经典通信到量子通信，从理论研究到工程应用，从信源编码到信道编码等多方面分享了最新研究成果。专家们精彩纷呈的演讲，得到与会专家的共鸣，纷纷表示本次论坛有深度、有广度。

最后，马啸教授分享麻省理工学院 Robert G. Gallager 教授的“Claude Shannon's Creative Thinking”，希望以此启发广大青年专家学者，扎实研究、创新思维，推动国内相关研究的发展。他提倡今后多举办一些线上论坛，便于更多专家学者（特别是学生）参与，活跃学术研究氛围，促进青年人才成长。

以“云”为帆，逐梦前行。本次论坛聚焦编码与信息论前沿研究，为广大专家学者提供了良好的交流平台。

交流活动 • RESEARCH ACTIVITIES •

中山大学信息编码与智能传输实验室 ISIT 2020 学习研讨班
ISIT 2020 Seminar of the Information Coding and Intelligent Transmission (ICIT) Laboratory at Sun Yat-sen University

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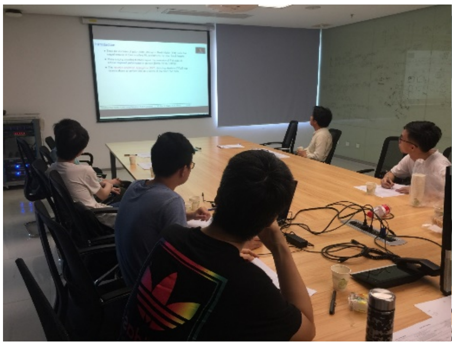
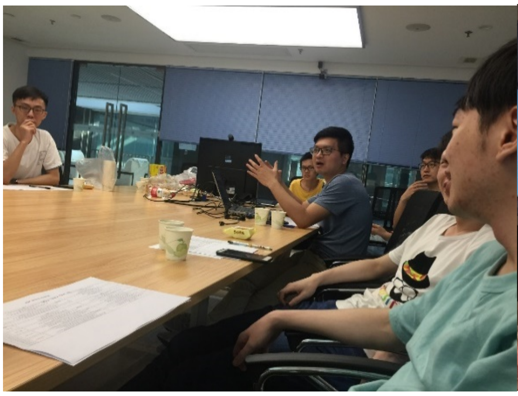
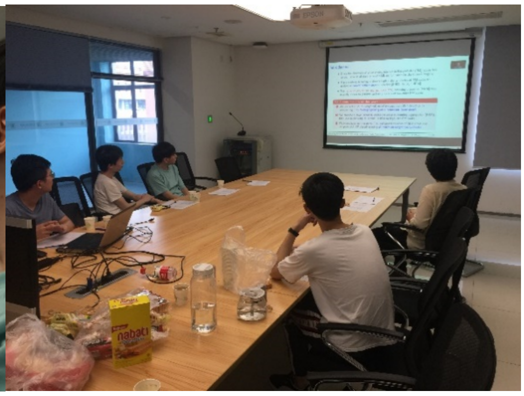
从 6 月 22 日开始，由陈立教授带领的中山大学信息编码与智能传输实验室，就今年的 ISIT 会议开展了为期两天的线下学习研讨班，收获颇丰。ISIT 是信息论领域研究者的一场盛会，今年的 ISIT 受疫情影响改为线上的形式，由演讲者上传提前录制的视频供与会者观看。本次研讨班征集了大家的意见，挑出大家最感兴趣的、与我们研究内容密切相关的会议论文来进行研讨，并且我们将会议内容划分为几大板块来学习以保证主题内容的连贯性。



本次研讨班的形式，是团队成员共同听报告后，开展约 5 分钟的讨论来各自提出自己的想法和问题。第一天，我们主要观摩了两个板块的演讲：一部分是关于线性码的性能分析和译码；另一部分则是与 Reed-Muller 码相关的译码方案。Polar 码的相关内容是研讨班第二日的重头戏，我们关注了多方面的研究，例如 Arıkan 去年提出的性能优越的 PAC 码、添加 CRC 的置信传播列表（BP-list）译码算法等等。除此之外，我们团队还关注了一部分 LDPC 码和其它编码理论的研究。

整个研讨班进行下来，氛围总体是活跃和轻松的。除了集体学习之外我们还安排了茶歇的时间，为成员们提供自由交流的空间。总结起来，为期两天的学习研讨班是十分有意义的，它不仅促进了我们团队成员之间的意见交流，集思广益、打开思路，同时也能够让我们关注到信息论与编码领域内最新的研究进展，熟悉研究现状。其中不乏颇有启发性的文章，为我们团队的研究工作提供了许多新的灵感和思路。

机会信息 • OPPORTUNITIES •

AP/Postdoc Positions Opening
副教授/助理教授/博士后招聘

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The Information Coding and Intelligent Transmission (ICIT) Laboratory of the School of Electronics and Information Engineering, Sun Yat-sen University is openly recruiting associate professors/assistant professors/postdoc at home and abroad, and sincerely invites academic talents from all walks of life to join. Prof. Li Chen is the director of the lab.

1. Recruitment field
Information theory and coding, computation for information theory, intelligent information transmission

2. Recruitment position
(1) Associate professor: The applicant should match the School's development roadmap, have a clear research direction, strong independent research capabilities and high academic attainments. He/she should demonstrate his/her great development potential. The applicant should have work experience in high-level Universities (research Institutes) at home and abroad, and have a good academic training and research background. In general, the age should not exceed 40 years old.
(2) Assistant professors: The applicant should match of the School's roadmap, have important academic achievements and good development potential. The applicant should have study or work experience in high-level Universities (research Institutes) at home and abroad, and have a certain amount of scientific research accumulation. In general, the age should not exceed 35 years old.
(3) Postdoc: The applicant should have a certain amount of scientific research accumulation, and have obtained a doctorate degree in well-known Universities and research Institutes at home and abroad for less than 3 years. The age is not more than 35 years old.

3. recruitment process
(1) Applicants submit personal academic resume (including personal identification information such as birth date, undergraduate and later education, work history, engaged scientific research projects, published papers, award-winning results, etc.) to the contact email. Please note the subject of the email should specify the type of job position.
(2) After the School's preliminary review and confirmation of the relevant conditions, fill in the corresponding post application form, and provide supplementary materials such as peer experts' recommendation letters and related supporting materials.
(3) Colleges and schools conduct reviews according to relevant procedures for talent introduction and notify the results of the review.

中山大学电子与信息工程学院信息编码与智能传输实验室（ICIT）面向海内外公开招聘副教授/助理教授/博士后，诚邀各界学术英才加盟。陈立教授为实验室主任。

一、招聘领域

信息论与编码、信息论计算、智能信息传输。

二、招聘岗位

（1）副教授：符合学校学科发展的需求，研究方向明确，具有较强的独立科研工作能力和较高学术造诣，发展潜力大。具有海内外高水平大学（研究机构）工作经历，具有良好的学术训练和研究背景。年龄一般不超过 40 周岁。

（2）助理教授：符合学校学科发展的需求，具有重要学术成就和较好发展潜力，所从事的研究应为学校拟重点建设或新增建设学科的主要研究方向。具有海内外高水平大学（研究机构）学习或工作经历，有一定的科研积累。年龄一般不超过 35 周岁。

（3）博士后：有一定科研积累，在海内外知名高校、研究机构获得博士学位不超过 3 年。年龄不超过 35 周岁。

三、招聘流程

1. 应聘者提交个人学术简历（包括出生年月等个人身份信息，本科及以后的教育、工作履历，承担的科研项目、发表的论文、获奖成果等）至联系人邮箱，邮件主题请注明应聘岗位类别。

2. 经学院初审并确认相关情况后，填写相应岗位申请表格，并提供同行专家推荐信等补充材料及相关佐证材料。

3. 学院、学校根据人才引进相关程序进行评审，并通知审议结果。

新锐风采 • NEW TALENTS •

Ling Liu（刘凌） was born in Jiangxi, China, in 1988. He received the B.S. degree from Nanjing University in 2008, and the M.S. degree from Peking University in 2012, both in electronic engineering. He received the Ph.D. degree in communication and signal processing from the Imperial College London, UK, in 2016.

He is currently an assistant professor in the Department of Computer Science and Software Engineering at Shenzhen University, Guangdong, China. His research interests are in coding theory, physical layer security, lattice codes and information theory. Before joining Shenzhen University, he had been a research assistant in the CSP group at Imperial College London, and a senior researcher in the Department of Communication Technology Research, Huawei Technologies, Shenzhen, China.

His most recent research focuses on the construction of explicit lattices with good properties from polar codes. The new class of lattices is called polar lattices, which can be proved to be AWGN-good for the AWGN channel and secrecy-good for the Gaussian wiretap channel. They can also be used for source quantization, especially for continuous sources like the Gaussian source. Please check the following references for further interests.

[1] L. Liu, and C. Ling, "Polar Lattices for Lossy Compression," submitted. Available: https://arxiv.org/abs/1501.05683

[2] L. Liu, Y. Yan , C. Ling, and X. Wu, "Construction of Capacity-Achieving Lattice Codes: Polar lattices," *IEEE Trans. Commun*., vol. 67, no. 2, pp. 915-928, Feb. 2019.

[3] L. Liu, Y. Yan, and C. Ling, "Achieving Secrecy Capacity of the Gaussian Wiretap Channel with Polar Lattices," *IEEE Trans. Inform. Theory,* vol. 64, no. 3, pp. 1647-1665, March 2018.

[4] L. Liu, and C. Ling, "Polar Codes and Polar Lattices for Independent Fading Channels," *IEEE Trans. Commun*., vol. 64, no. 12, pp. 4923-4935, Dec. 2016.

新锐风采 • NEW TALENTS •

李聪端，男，汉族，1986 年 7 月生。2018 年 9 月入职中山大学电子与通信工程学院，为“百人计划”副教授。研究方向包括通信网络、信息论、信息安全、车联网等。2015 年博士毕业于美国德雷塞尔大学。在海外的教学科研工作经历包括在德雷塞尔大学担任讲师（2015.6-2015.9）；在香港中文大学网络编码研究所担任博士后研究员（2015.10-2016.12），合作者为网络编码领域开创者和奠基者，信息论和通信领域顶级专家杨伟豪（Raymond Yeung，IEEE Fellow）教授；在香港城市大学计算机科学系任博士后研究员（2016.12-2018.9），合作者为通信和计算机领域的知名学者陈志为（Chee Wei Tan）教授。

目前已发表国际学术论文 40 余篇，参与编著学术专著一项，其中近三年以第一作者或唯一通信作者发表 SCI 期刊论文 8 篇，包括 IEEE Journal of Selected Areas in Communications (JSAC), IEEE Transactions on Information Theory 等领域内顶级期刊。曾获得 2017 年中国电子学会信息论分会年会最佳论文奖。主持国家自然科学基金项目 1 项，广东省基础研究重点项目 1 项，深圳市面上项目 1 项，参与国家和省市项目多项。担任国际期刊 IEEE Access（JCR 一区）的副主编、IEEE VTC、WiOpt 等多个国际学术会议的 TPC，以及众多国际顶级期刊/会议的审稿人。担任 IEEE 信息论学会广州分会秘书。担任国家自然科学基金委网评专家、广东省基础与应用基础研究评审专家、广东省工业与信息化厅入库专家、广东省高级职称评审专家等。

代表性论文论著：

[1] Congduan Li, Xuan Guang, Chee Wei Tan, Raymond Yeung, “Fundamental Limits On a Class of Secure Asymmetric Multilevel Diversity Coding Systems”, *IEEE J. on Sel. Areas of Commun.*, vol. 36, no. 4, pp. 737-747, Apr. 2018

[2] Congduan Li, Steven Weber, and John M. Walsh, “On multi-source networks: enumeration, rate region computation, & hierarchy”, *IEEE Trans. Inform. Theory*, vol. 63, no. 11, pp. 7283-7303, Nov. 2017.

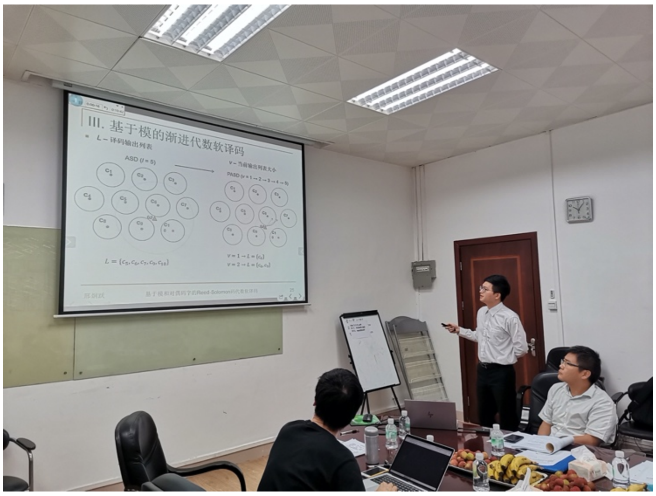
[3] Congduan Li, Steven Weber, and John M. Walsh, “Multilevel diversity coding systems: rate regions, codes, computation, & forbidden minors”, *IEEE Trans. Inform. Theory*, vol. 63, no. 1, pp. 230-251, Jan. 2017.

[4] Congduan Li, Xuan Guang, “Asymmetric multilevel diversity coding systems with perfect secrecy”, *IEEE Trans. on Veh. Technol.*, vol. 66, no. 9, pp. 8558-8562, Mar. 2017.

新锐风采 • NEW TALENTS •

Jiongyue Xing (邢炯跃) received the B.Sc. degree in Communication Engineering from Sun Yat-sen University, China, in 2015. From 2015 to 2020, he pursued the Ph.D. degree in Information and Communication Engineering from Sun Yat-sen University, under the supervision of Prof. Li Chen. From Dec. 2018 to Dec. 2019, he visited Prof. Martin Bossert at the Institute of Communication Engineering, Ulm University, Germany.

He is a newly graduated Ph.D. in the area of channel coding. He took the Ph.D. Defence on June 7th, 2020 at Room 210 of Mathematica Building, Sun Yat-sen University. The Defence Committee includes Prof. Xiaohu Tang, Prof. Jin Li, Prof. Hao Chen, Prof. Xianhua Dai and Prof. Fangguo Zhang.



His thesis is entitled "Algebraic Soft Decoding of Reed-Solomon Codes Based on Module and Dual Codewords (基于模和对偶码字的 Reed-Solomon 码代数软译码)", which focuses on low-complexity soft decoding of Reed-Solomon (RS) codes using module basis reduction (BR) technique and minimum-weight dual codewords. Based on the BR interpolation, the thesis utilizes re-encoding transform, progressive decoding and Chase decoding to propose several low-complexity and high-performance RS decoding algorithms, hoping to facilitate the industrial applications of the algebraic soft decoding. The thesis also introduces a novel shift-sum decoding scheme for the iterative decoding, which was grown during his visit of Prof. Bossert. This concept may bring some research topics on the soft decoding of RS codes. He has published two journal papers and five conference papers, including IEEE Transactions on Communications, IET Communications, IEEE International Symposium on Information Theory and IEEE International Conference on Communications. He also serves as the reviewer of several journals and conferences.

He will work as a coding theory researcher at Theory Lab, Huawei Technologies Co., Ltd. He likes playing Ping-Pong and running.