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President's Column

Wei Yu

Like many of my predecessors, I feel honored and privileged to have the opportunity to serve as the President of the Information Theory Society (ITSoc) this year. I am extremely fortunate to be surrounded by so many dedicated volunteers, who put in countless hours to make ITSoc a vibrant community.

The ITSoc has been the intellectual home for many of us for many years. At the core of the society is the Board of Governors (BoG) and its shift-register model of five elected officers. I am grateful to the service of Elza Erkip, who retired as the Senior Past President, as well as Vincent Poor and Parastoo Sadeghi, who retired from the BoG, at the end of the last year.

I take this opportunity to welcome Natasha Devroye, Massimo Franceschetti, Brian Kurkoski, Anand Sarwate, Vincent Tan, Daniela Tuninetti, and Aaron Wagner, who are elected or re-elected to the BoG this year, and Edmund Yeh, who takes on the position of Treasurer in 2021.

Our volunteer base is, of course, much larger than just the BoG. We have close to one hundred Editors-in-Chief, Executive/Senior Editors, Associate Editors, Industrial Advisors, and Steering Committee Members in our flagship journals *IEEE Transactions on Information Theory*, *IEEE Journal on Selected Areas in Information Theory*, and the soon-to-be launched *IEEE BITS the Information Theory Magazine*. We have numerous volunteers serving on the organizing committees and on the technical program committees for our conferences. Our society is run by many committees, which organize student events, schools of information theory, and nominate and select members for awards at the society level and beyond. We have benefited from grassroots efforts of more than fifty chapters all over the globe, which organize distinguished lecturer visits for our local members. All of these activities are our core mission, which serves you, a strong community of about 3,700 members who are passionate about information theory.



The greatest strength of our discipline is its intellectual beauty and rigor, but also its openness and accessibility. An introductory class in Information Theory typically would attract students from many different backgrounds and interests. Intellectual discoveries made by our members have made impact not only in traditional areas such as communications and statistics, but also in emerging fields, ranging from machine learning to infectious disease detection and modeling. We are blessed by both the elegance and the tremendous utility of our discipline. Such is the *Spirit of Information Theory*, as articulated so well by David Tse in his Shannon Lecture in Aachen, which binds us together as a community.

However, the “new normal” brought by life under Covid also means that our core community building mission is facing new challenges. The *IEEE International Symposium on Information Theory (ISIT)*, which has always been a highlight of the year for me personally, and I am sure for many of us, was moved online last year and will remain virtual this year. I know that I will miss the after-the-talk discussions, the intellectual energy in the hallway, meeting of new colleagues who are tackling the same technical problems, and the catching-up with friends at the social events that come with the in-person event.

But along with the challenges comes opportunities. The organizers of ISIT 2021 in Melbourne have come up with an innovative plan to blend pre-recorded talks with live question-and-answer periods, while overcoming the time zone differences of our global audiences. The virtual ISIT will have the benefit of being more accessible. It will allow a much broader reach, especially for students in developing nations who might not otherwise have the means to travel, or to members previously unable to attend overseas conferences due to visa barriers.

(continued on page 5)

From the Editor

Changho Suh



As a new editor, I am greatly delighted to bring you the first issue of our IT society newsletter this year. I am also thrilled and grateful to be entrusted this beloved publication of our society and committed to continue its success and growth. Salim El Rouayheb, our outgoing editor, has left his mark on the newsletter. I would like to express our sincere gratitude for his tremendous efforts made during the past three years, on behalf of all of us.

We start the first issue with the column of the new president of our society, Wei Yu. We then congratulate all the members of our community who have recently received prestigious awards and honors. We are all honored as a community. Next we have a report on the SYSU International Workshop on Mathematics and Coding. We also have the 2020 Shannon lecture by Charles H. Bennett on Quantum Information Theory. We continue with the BoG minutes from its last meeting in the fall.

With sadness, we conclude with an article celebrating the life and works of Joy Thomas who passed away recently.

As a reminder, announcements, news, and events intended for both the printed newsletter and the website, such as award announcements, calls for nominations, and upcoming conferences, can be submitted at the IT Society website <http://www.itsoc.org>. Articles and columns can be e-mailed to me at chsuh@kaist.ac.kr with a subject line that includes the phrase "IT newsletter."

The next few deadlines are:

April 10, 2021 for the issue of June 2021.

July 10, 2021 for the issue of September 2021.

October 10, 2021 for the issue of December 2021.

Please submit plain text, LaTeX, or Word source files; do not worry about fonts or layout as this will be taken care of by IEEE layout specialists. Electronic photos and graphics should be in high resolution and sent as separate files.

Changho Suh

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Awards

Congratulations to the members of our community that have recently received prestigious awards and honors and to those that have been recently elevated to the grade of IEEE fellow!

We are all honored as a community!

2021 IEEE Medal of Honor: Jacob Ziv

The IEEE Medal of Honor is awarded for an exceptional contribution or an extraordinary career in IEEE fields of interest, sponsored by the *IEEE Foundation*, to **JACOB ZIV** (LFIEEE). *For fundamental contributions to information theory and data compression technology, and for distinguished research leadership.*

2021 IEEE Richard W. Hamming Medal: Raymond Yeung

The IEEE Richard W. Hamming Medal is awarded for exceptional contributions to information sciences, systems, and technology, sponsored by *Qualcomm, Inc.*, to **RAYMOND YEUNG** (FIEEE)—Professor, Chinese University of Hong Kong, Hong Kong. *For fundamental contributions to information theory and pioneering network coding and its applications.*

2021 IEEE Jack S. Kilby Signal Processing Medal: Emmanuel Candès

The IEEE Jack S. Kilby Signal Processing Medal is awarded for outstanding achievements in signal processing, sponsored by *Texas Instruments, Inc.*, to **EMMANUEL CANDÈS** (FIEEE)—Professor, Stanford University, Stanford, CA, USA. *For groundbreaking contributions to compressed sensing.*

2021 IEEE Leon K. Kirchmayer Graduate Teaching Award: Andrea Goldsmith

The IEEE Leon K. Kirchmayer Graduate Teaching Award that recognizes inspirational teaching of graduate students in the IEEE fields of interest—sponsored by the *Leon K. Kirchmayer Memorial Fund*, is awarded to **ANDREA GOLDSMITH** (FIEEE)—Professor, Stanford University, Stanford, CA, USA. *For educating, developing, guiding, and energizing generations of highly successful students and postdoctoral fellows.*

2021 IEEE Eric E. Sumner Award: En-hui Yang

The IEEE Eric E. Sumner Award that recognizes outstanding contributions to communications technology—sponsored by *Nokia*

Bell Labs is awarded to **EN-HUI YANG** (FIEEE)—Professor, University of Waterloo, Waterloo, ON, Canada. *For contributions to the theory and practice of source coding.*

2021 Newly Elevated IEEE Fellows:

Stephan ten Brink

for contributions to iterative detection and decoding

Chan-Byoung Chae

for contributions to MIMO design and prototypes for emerging communication systems

Dongning Guo

for contributions to multi-user detection and estimation theory

Tara Javidi

for contributions to stochastic resource allocation and active hypothesis testing

Francis Lau

for contributions to analysis of chaotic communications systems and low-density parity-check code design

Sandeep Pradhan

for contributions to coding for distributed compression and structured coding

Hyundong Shin

for contributions to the analysis and design of wireless communication and networking

Erik Strom

for contributions to reliable low latency communications and synchronization of code-division systems

Edward Tiedemann

for innovation and standardization of digital cellular communications

Daniela Tuninetti

for contributions to theory of repetition protocols and wireless interference management

Pascal Vontobel

for contributions to graphical models for channel coding

Birsen Yazici

for contributions to synthetic aperture radar and passive imaging

Board of Governors: New Members

Congratulations to the new members of the IT Society Board of Governors (a full list of members can be found on the ITSoc website).

Natasha Devroye

University of Illinois at Chicago

Massimo Franceschetti

University of California at San Diego

Brian M. Kurkoski

Japan Advanced Institute of Science and Technology

Anand D. Sarwate

Rutgers University

Vincent Y. F. Tan

National University of Singapore

Daniela Tuninetti

University of Illinois at Chicago

Aaron B. Wagner

Cornell University

Edmund Yeh

Northeastern University

SYSU International Workshop on Mathematics and Coding

The Sun Yat-sen University (SYSU) International Workshop on Mathematics and Coding was successfully held on Dec. 2–3, 2020 in the University's Guangzhou South Campus. This workshop was organized by the University and the IEEE Information Theory Society Guangzhou Chapter. More than 80 scholars and industrial partners from mainland China participated the workshop onsite, and more than 50 oversea scholars participated online due to travel restrictions.

Information coding is the key for modern communications, and coding is founded on mathematics. For example, classic channel codes were founded on linear algebra, while modern channel codes had been facilitated by probability and graph theories. The understanding of network coding requires both linear algebra and graph theory. This workshop aims to look back at the mathemat-

ics that we have used for designing and practicing codes, so that we can better look forward. It is also hoped that such an event can provide an opportunity for scholars at home and abroad to exchange knowledge and establish collaborations. Pingzhi Fan and Li Chen are the co-chairs of the workshop. The two-day workshop spanned four sessions chaired by Li Chen, Pingzhi Fan, Baoming Bai, and Bazhong Shen, respectively.

The workshop invited fifteen talks. In the morning session of Dec. 2, Alexander Barg of University of Maryland presented his recent results on Stolarsky's invariance principle for the Hamming space and energy maximization. Jun Chen of McMaster University introduced the duality between Slepian-Wolf coding and channel coding. Li Chen of Sun Yat-sen University presented his recent comprehension on the Gröbner bases in decoding of Reed-Solomon codes,





and Paul Siegel of University of California, San Diego, showed the coding technique for efficient DNA synthesis. The afternoon session of the day started with the talk of Erdal Arıkan of Bilkent University, which focused on the polarization adjusted convolutional (PAC) codes. Martin Bossert of Ulm University then presented the information set decoding of BCH codes over binary symmetric channel. The last talk of the day was presented by Bob Li of University of Electronic Science and Technology, China, who gave an intuitive explanation on the commutative algebra in network coding.

In the morning session of Dec. 3, Frank Kschischang of University of Toronto presented the art and some recent results of zipper codes. Dmitry Trukhachev of Dalhousie University introduced braided block codes, and its structural relation to zipper codes. Hamid Ebrahimpour of Huawei later introduced concatenated polar-zipper codes for optical communications. The last talk of the morning session was given by Kai Niu of Beijing University

of Post and Telecommunications, who presented his recent work on characterizing the polar spectrum. The afternoon session of the day started with the talk of Peter Trifonov of Saint Petersburg Polytechnic University, which focused on the trellises, BCH codes, finite fields and successive cancellation decoding. Pingyi Fan of Tsinghua University then presented interpretable generative adversarial networks with exponential function. Fangwei Fu of Nankai University presented optimal cyclic (r, δ) locally repairable codes with unbounded length. The last talk of the workshop was given by Raymond Leung of Huawei, who unwrapped more possibilities by pointing out that coding is not only mathematics.

This has been a successful workshop, especially in face of the pandemic challenge, its hybrid model has tested a new way of conferencing and proliferating research in information theory and coding. The Guangzhou Chapter continues its mission on serving its research community.

President's Column *(continued from page 1)*

Likewise, the Information Theory Workshop (ITW) and most of our Schools of Information Theory postponed from 2020 will now be held in a virtual format in 2021. We are hoping that the online format will attract a larger audience and enable all who are interested in learning the latest developments in information theory to attend.

Most importantly, the online format for conferences will allow the preservation of both plenary and possibly contributed talks for posterity. In this vein, a dedicated committee, aptly named Future of Information Theory Society (FITS), has been initiated by my predecessor, with a core mission to revamp the digital offerings of our society to better support our conferences, workshops, schools, publications, distinguished lecturers, and outreach events. I know that the committee is hard at work, and hope to report back later this year on its progress.

I envision our society to be open and to be diverse and inclusive—intellectually, geographically, as well as in all human dimensions. Our intellectual discipline transcends gender, racial, national and geopolitical boundaries. Many of our broader outreach efforts are aimed at general audience, such as a collection of short technical animation videos to explain information theory concepts, and of course the Shannon documentary, *The Bit Player*, which is now available on Amazon Prime, as well as in French, Chinese, and Arabic online platforms. If you have not seen the movie, I highly recommend it.

I look forward to a day when I can meet many of you in person. In the meanwhile, stay safe and healthy! With the incredible resilience of our community, we will get through this together stronger as a society!

Quantum Information Theory: What Early 20th Century Physics Revealed About the Nature of Information and Computation

Charles H. Bennett

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Abstract—Quantum effects, initially regarded as a nuisance or handicap in information processing, have become the foundation of a more coherent and complete mathematical theory of communication, computation and interaction. Aside from being useful, this theory is so strangely simple that, as with special and general relativity, its gist is worth learning even by non-scientists.

The mathematical theory of information processing rests on two audacious abstractions from everyday physical experience: Turing’s universal, hardware-independent notion of computation; and Shannon’s universal, hardware-independent, and even meaning-independent, notion of communication.

But in retrospect these abstractions discarded too much. Through most of the 20th century, quantum phenomena were deemed part of physics, and, though practically useful and philosophically intriguing, were regarded mainly as a nuisance for information processing, limiting the precision of measurements and making tiny devices less reliable than their larger cousins. Now it is known that they also have positive consequences, enabling new kinds of information processing such as quantum cryptography and quantum computation.

More importantly, they have provided a simpler and more insightful mathematical basis for the whole theory of communication and computation. This theory has been explained in detail elsewhere; see [21, 22] for instance; here I attempt to make the gist of it accessible even to non-scientists.

Stephen Wiesner’s 1968 manuscript *Conjugate Coding* [1] showed how quantum mechanics can be used to perform two tasks outside the scope of Shannon’s mathematical theory of communication: 1) Multiplexing two messages into a quantum signal from which the receiver can recover either message at will, but not both; and 2) Quantum banknotes that are, even in principle, physically impossible to counterfeit.

Ordinary (what a physicist would call “classical”) information, such as one finds in a book, can be copied at will and is not disturbed by reading it. Quantum information behaves more like the information in a dream in the sense that trying to describe your dream to someone else changes your memory of it, so eventually you forget the dream and remember only what you said about it. But unlike dreams, quantum information obeys well-understood laws.

The central principle of quantum mechanics, called the *Superposition Principle*, concerns the possible states of a physical system, their (in general imperfect) distinguishability, and their time evolution.

- Between any two reliably distinguishable states of a physical system (for example vertically and horizontally polarized

single photons), there are intermediate states (for example diagonal photons) that are not reliably distinguishable from either original state.

- The system’s possible states correspond to directions in space—not ordinary 3-dimensional space, but an n -dimensional space where n , a property intrinsic to the system, is its maximum number of reliably distinguishable states. More precisely, quantum states correspond to rays in an n -dimensional Hilbert space, like Euclidean space but with complex coefficients [32].
- Any direction is a possible state, but two states are reliably distinguishable if and only if their directions (rays) are orthogonal.
- A closed quantum system’s time evolution conserves distinguishability, i.e., it is *unitary*, a rigid rotation in Hilbert space. In open systems, distinguishability may decrease but it can never increase.

The in-principle imperfect distinguishability of distinct states and unpredictable behavior of identically prepared systems under identical conditions, illustrated in Figs. 1 and 2, are hallmarks of quantum mechanics. Bill Wootters likens quantum measurement to the behavior of a shy student (the photon) confronting a stern teacher (the measuring apparatus) in an old-fashioned school

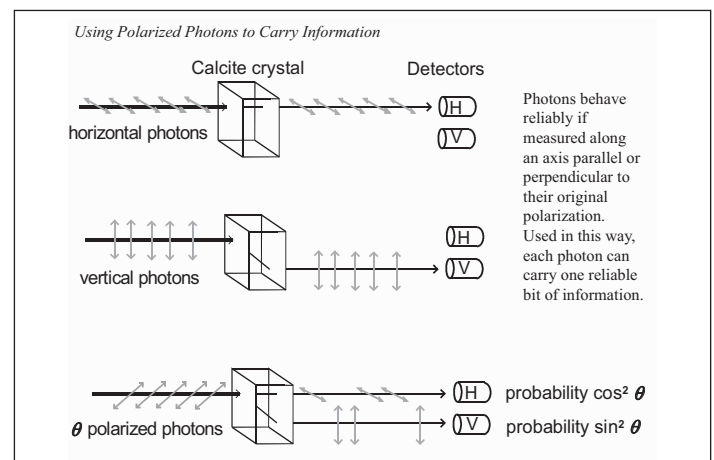


Fig 1: Superposition illustrated by polarized photons. Horizontal and vertical photons can be reliably distinguished, and can be used to carry one bit each, because horizontal photons pass straight through the crystal, but vertical ones are deviated into a shifted beam. But when a diagonal photon is sent into the same apparatus, instead of being shifted by an intermediate amount as one might expect, it sometimes goes into the upper beam and becomes horizontal, and sometimes goes into the lower beam and becomes vertical.

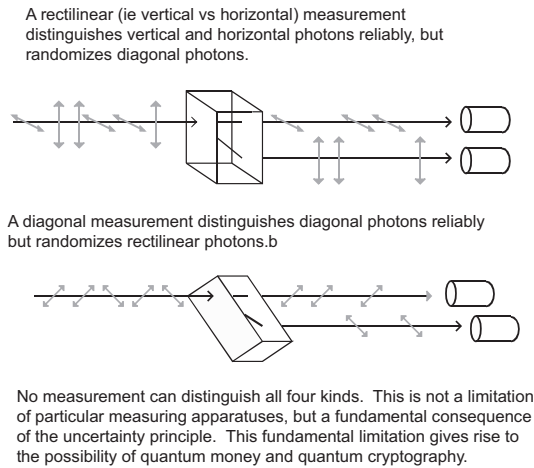


Fig 2: By rotating the measuring apparatus 45 degrees, the two diagonal polarizations 45 and 135 degrees can be reliably distinguished, but the rotated measuring apparatus then randomizes vertical and horizontal photons.

where the students are not supposed to volunteer information or ask questions. See Fig. 3.

There is no way to evade the quantum limitations on measurement. Not only is it impossible to measure a single photon's polarization precisely, but it is also impossible to clone a single photon into many identical copies, whose statistical behavior would then allow us to learn the original polarization more precisely. A laser is indeed a photon-cloning device, which works quite well on a strong input signal. But if the input signal is at the single photon level, the output is polluted by just enough noise, due to spontaneous emission of additional photons, to make it no more useful than the input would have been in estimating the original polarization. See Fig. 4.

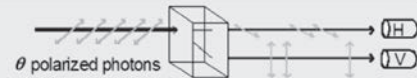
Despite the differences between classical and quantum information, there are important parallels that went unnoticed during the many decades when information and computation theorists neglected quantum mechanics as just another noise source.

- Just as all classical information is reducible to bits, all quantum information is reducible to *qubits*—two-state quantum systems such as polarized photons or spin-1/2 atoms.
- Just as all processing of classical information can be reduced to logic gates acting on bits one and two at a time, all processing of quantum information can be reduced to quantum logic gates acting on qubits one and two at a time.
- Just as classical bits are “fungible”—independent mathematically from their physical embodiment, making possible practical universal computers, Moore's law and the Internet—qubits are fungible among different quantum systems, raising hopes for a similar growth in their feasibility and usefulness. This may take a while, given the primitive state of current quantum computing hardware.

Entanglement

The most remarkable quantum phenomenon, and arguably the most useful for information processing, is entanglement, a non-

Quantum Measurement (Bill Wootters' pedagogic analogy)



Like a pupil confronting a strict teacher, a quantum system being measured is forced to choose among a set of distinguishable states (here two) characteristic of the measuring apparatus.

Teacher: Is your polarization vertical or horizontal?

Pupil: Uh, I am polarized at about a 55 degree angle fr...

Teacher: **I believe I asked you a question.** Are you vertical or horizontal?

Pupil: Horizontal, sir.

Teacher: Have you ever had any other polarization?

Pupil: No, sir. I was always horizontal.

Fig 3: Bill Wootters' pedagogic analogy regarding quantum measurement.

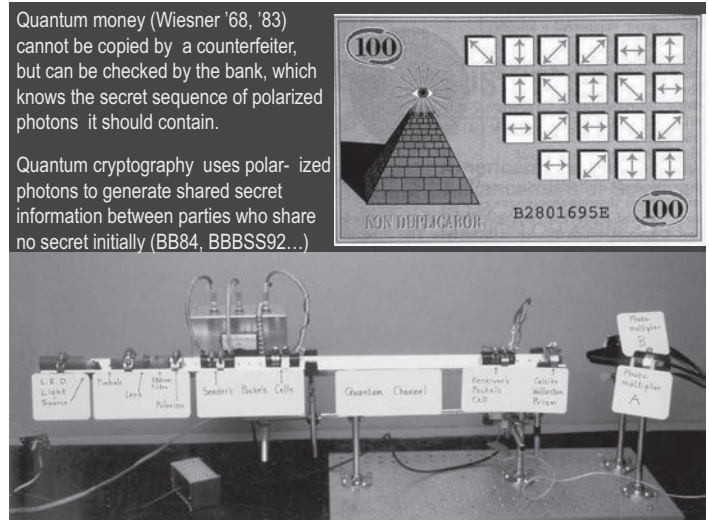


Fig 4: (Above): A hypothetical quantum banknote might contain 20 random photons of the four kinds, in perfectly reflective boxes. The bank uses the serial number, printed in ordinary ink, to look up the expected polarizations, then makes the proper measurements to verify that each photon is as it should be, measuring the first photon diagonally, the second rectilinearly, etc. A would-be counterfeiter, not knowing what sequence to expect, spoils some of the photons by measuring them the wrong way, and unless exceedingly lucky, will produce an inaccurate copy that will fail inspection at the bank. Quantum key distribution (QKD) is a more practical application of the same principle, using the photons to carry, rather than store, quantum states. (Below): The first QKD apparatus, which was used to share secret keys over a distance of about 30 centimeters in 1989. Three decades later fiberoptic QKD can operate at hundreds and space-based QKD at thousands of kilometers.

classical relation between parts of a quantum system. It arises naturally during almost any interaction, by virtue of the superposition principle, as shown in Fig. 5, where a simple quantum gate, acting on a pair of initially unentangled qubits, produces an entangled output.

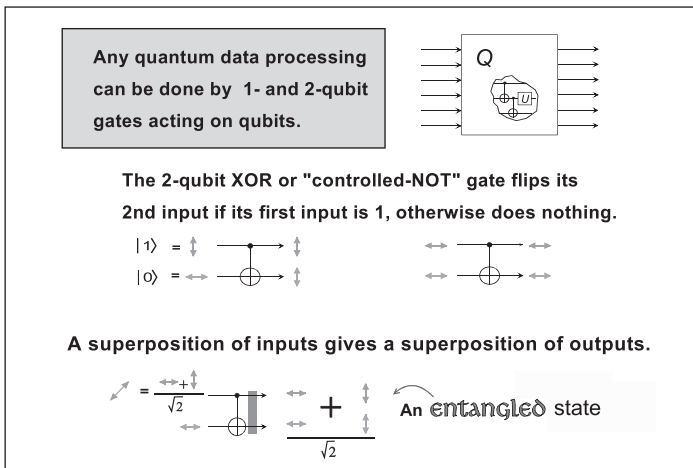


Fig 5: As noted earlier, any quantum data processing can be accomplished by one- and two-qubit gates. If we use vertical and horizontal polarizations to represent the Boolean values 1 and 0 respectively (the half angle-bracket notation, due to Dirac, signifies a quantum state), the quantum generalization of an XOR gate flips its "target" qubit if and only if its "control" qubit is $|1\rangle$. But given a superposition of inputs the gate must yield a corresponding superposition of outputs, as shown at the bottom. The blue bar across the two output lines signifies that the state of the two output qubits is entangled.

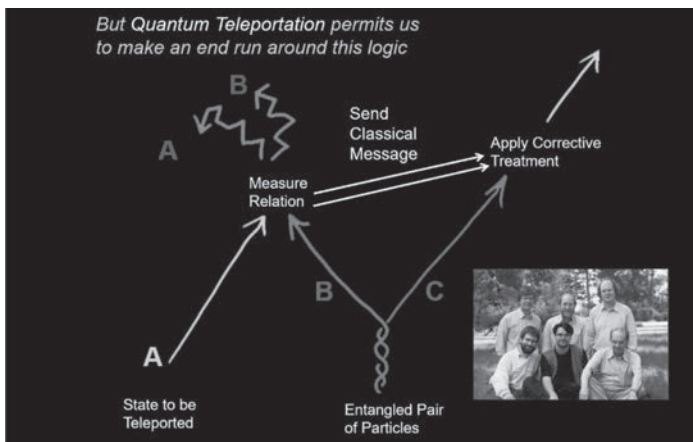


Fig 6: Quantum teleportation.

What kind of state is this? This positive linear combination of both photons being horizontal and both being vertical is not the same as their both being diagonal, but it is the same as a positive linear combination of both being left diagonal and both being right diagonal. One might say that the two photons are in a state of sameness of linear polarization even though neither has a polarization of its own. That sounds like a fuzzy new-age idea. When I was in San Francisco in the summer of 1967, referred to at the time as the Summer of Love, it was easy to find people who thought there were in perfect harmony with one another even though they had no firm opinions about anything. Some believed that with enough LSD, everyone could be in perfect harmony with everyone else, but now that we understand the mathematics of entanglement we know that entanglement is "monogamous"—if two systems are perfectly entangled with each other they cannot be entangled with anything else. Attempting to share the entanglement with a third particle degrades the two-party states to mere correlated classical randomness, while leaving the whole tripartite system in a complicated ménage-à-trois pure state [18].

Aside from being intriguing, entanglement is useful. It would seem that the impossibility of cloning and the randomness of quantum measurement would prevent complete information about a particle's state from being extracted from that particle and transferred to another particle, which has never been anywhere near the first particle.

Quantum teleportation [6] (see Fig. 6), evades this dilemma by not even trying to measure the original particle A alone. Instead, one prepares a pair of entangled particles B and C and measures the relation between A and B, forcing them to choose among four (if A, B, and C are all qubits) orthogonal entangled states. This random result is then used to apply one of four corrective treatments (single qubit rotations) to particle C, leaving it in the same state as particle A was in originally.

The role of entanglement in teleportation is reminiscent of that of the secret key in one-time-pad encryption. Further development of quantum information theory has revealed profound connections between entanglement, privacy, and randomness, as well as yielding elegant generalizations of source and channel coding, wiretap channels, and rate-distortion theory.

In some ways quantum Shannon theory is more complicated than its classical forebear, for example in place of a classical discrete memoryless channel's single capacity, quantum DMCs have several distinct capacities (e.g. for transmitting classical, secret, or quantum information), most of which lack tractable single-letter formulas. But in other ways it is surprisingly simple. For example a quantum DMC's entanglement-assisted classical capacity is given by the same single-letter formula as classical DMC's ordinary Shannon capacity. For more details see [21], [22], the bibliography, and a longer version of this article to be posted in 2021 on the Cornell Archive.

Conclusion

Quantum information provides a coherent basis for the theory of communication, computing, and interaction between systems, within which classical communication and computation emerge as a useful special case. A classical communication channel is a quantum channel with an eavesdropper (maybe only the environment). A classical computer is a quantum computer handicapped by having eavesdroppers on all its wires. Fascinating and unexpected properties of information, owing to its fundamentally quantum nature, are still being discovered. Like the roundness of the earth, or the fact that matter is made of atoms, the quantum nature of information is a fundamental but non-obvious aspect of our universe that everyone should know about. Properly explained, it can be made comprehensible and fascinating.

References

- [1] Wiesner S (1983), "Conjugate coding." Manuscript written while participating in the Columbia University student protests of April 1968 and eventually published in ACM SIGACT News 15(1): 78–88.
- [2] Holevo A (1973), "Bounds for the quantity of information transmitted by a quantum communication channel." Problems of Information Transmission. 9(3): 177–183.

- [3] Bennett CH, Bessette F, Brassard G, Salvail L, Smolin J (1992), "Experimental quantum cryptography." *J Cryptol* 5(1): 3–28.
- [4] Bennett CH, Brassard G (1984), "Quantum cryptography: public-key distribution and coin tossing." In: Proceedings of international conference on computers, systems and signal processing, Bangalore, pp 175–179.
- [5] Bennett C H and Wiesner, S J (1992), "Communication via one- and two-particle operators on Einstein-Podolsky-Rosen states," *Phys. Rev. Lett.*, **69**, pp. 2881–2884.
- [6] C. H. Bennett, G. Brassard, C. Crépeau, R. Jozsa, A. Peres, and W. K. Wootters (1993), "Teleporting an unknown quantum state via dual classical and Einstein-Podolsky-Rosen channels," *Phys. Rev. Lett.*, **70**, pp. 1895–1899.
- [7] Schumacher, B (1995). "Quantum coding," *Physical Review A*. 51 (4): 2738–2747. doi:10.1103/physreva.51.2738. ISSN 1050-2947.
- [8] Schumacher, B and Westmoreland M D (1997), "Sending classical information via noisy quantum channels," *Phys. Rev. A* 56, 131.
- [9] Holevo, A (1998), "The capacity of the quantum channel with general signal states," *IEEE Trans. Inf. Theory*.
- [10] Cerf N J, Adami C (1997), "Negative Entropy and Information in Quantum Mechanics," *Phys. Rev. Lett.* 79, 51–94.
- [11] C. H. Bennett, P. W. Shor, J. A. Smolin, and A. V. Thapliyal (1999), "Entanglement-assisted capacity of noisy quantum channels," *Phys. Rev. Lett.*, **83**, pp. 3081–3084, arXiv eprint quant-ph/9904023.
- [12] C. H. Bennett, P.W. Shor, J.A. Smolin, and A.V. Thapliyal (2002), "Entanglement assisted capacity of a quantum channel and the reverse Shannon theorem," *IEEE Trans. Inf. Theory*, **48**, pp. 2637–2655. arXiv eprint quant-ph/0106052.
- [13] A. Holevo (2001), "On entanglement-assisted classical capacity," arXiv eprint quant-ph/0106075.
- [14] Hastings, M B (2009), "Superadditivity of communication capacity using entangled inputs," *Nature Physics* 5, 255.
- [15] Barenco A, Bennett CH, Cleve R, DiVincenzo DP, Margolus N, Shor P, Sleator T, Smolin J, Weinfurter H (1995), "Elementary gates for quantum computation," *Phys. Rev. A* 52, 3457
- [16] Lloyd S (1996), "Capacity of a noiseless quantum channel," *Phys. Rev. A* 55, 1613, 1996.
- [17] Shor P W (2002), "The quantum channel capacity and coherent information," lecture notes, MSRI Workshop on Quantum Computation, 2002.
- [18] Colette (1929) *The Other One* ISBN 014003465X (ISBN13: 9780140034653) Original French "La Seconde" ISBN 2010192095 (ISBN13: 9782010192098)
- [19] Devetak I (2005), "The private classical capacity and quantum capacity of a quantum channel," in *IEEE Transactions on Information Theory*, vol. 51, no. 1, pp. 44–55, Jan. 2005, doi: 10.1109/TIT.2004.839515.
- [20] Gottesman D (2009), "An introduction to quantum error correction and fault-tolerant quantum computation," arxiv:0904.2557.
- [21] Wilde M (2019), "Quantum Information Theory," second edition, Cambridge University Press ISBN 978010197017616-4, pre-publication draft at arxiv:1106.1445.
- [22] A. S. Holevo (1998), "Coding theorems for quantum channels," *Russian Math Surveys* **53**, pp. 1295–1331, arXiv e-print quant-ph/9809023.
- [23] Brandao F, Horodecki M (2010), "On Hastings' counterexamples to the minimum output entropy additivity conjecture," *Open Syst. Inf. Dyn.* 17, 31, arxiv:0907.3210.
- [24] Smith G, Yard J (2008), "Quantum communication with zero-capacity channels," *Science* 321 1812–1815.
- [25] Bennett CH, Devetak I, Harrow A, Shor P, Winter A (2014), "Quantum Reverse Shannon Theorem," *IEEE Trans. Inf. Theory* 60:5 2926–2959, DOI 10.1109/TIT.2014.2309968, arXiv:0912.5537v5.
- [26] Berta M, Christandl M, Renner R (2011), "A conceptually simple proof of the quantum reverse Shannon theorem," *Comm. Math. Phys.* 306(3), 579–615. arXiv:0912.3805.
- [27] Rabin M O (1981) "How to exchange secrets by oblivious transfer," TR-81 Aiken Computation Lab. Harvard University <https://eprint.iacr.org/2005/187.pdf>.
- [28] Damgaard I, Fehr S, Salvail L, Schaffner C (2005), "Cryptography in the bounded quantum storage model," *IEEE Symp. on Found. of Computer Science (FOCS)* 449–458, arxiv:quant-ph/0508222v2.
- [29] Shamir A (1992), "IP=PSPACE," *Journal of the ACM* 39:4, 869–877.
- [30] Jain R, Ji JF, Upadhyay S, Watrous J (2011), "QIP=PSPACE," *Journal of the ACM* 58:6, article 30.
- [31] Ji JF, Natarajan, A, Vidick T, Wright J, Yuen H (2020), "MIP*=RE," arxiv:2001.04383v2.
- [32] Quantum theory also treats infinite-dimensional Hilbert spaces, but any system bounded in spatial extent and energy is described by a finite-dimensional Hilbert space. Quantum information theory on finite dimensional Hilbert spaces is the natural generalization of the classical theory of discrete sources and channels.

IEEE Information Theory Society Board of Governors Meeting

Location: Zoom Remote Meeting

Date: October 10-11, 2020

Time: The meeting convened at 10:00 am EST October 10; the meeting adjourned at 1:52 pm EST October 11, 2020

Meeting Chair: Aylin Yener

Minutes taken by: Lara Dolecek

Meeting Attendees: Erik Agrell, Erdal Arikan, Matthieu Bloch, Suhas Diggavi, Alex Dimakis, Lara Dolecek, Stark Draper, Elza Erkip, Meir Feder, Christina Fragouli, Andrea Goldsmith, Camilla Hollanti, Sid Jaggi, Tara Javidi, Vijay Kumar, Matt LaFleur (#), Olgica Milenkovic, Prakash Narayan, Henry Pfister, Vince Poor, Joachim Rosenthal, Parastoo Sadeghi, Igal Sason, Emina Soljanin, Daniela Tuninetti, Aaron Wagner, Aylin Yener, and Wei Yu.

Non-voting attendees are denoted by (#).

At 10:00 am EST, ITSoc President Aylin Yener called the meeting to order.

Attendees introduced themselves and the roll call was taken. President Yener thanked everyone for joining the meeting and especially for joining across different time zones.

The following motion was issued.

Motion: A motion was made to approve the agenda.

The motion passed.

President's Report—Aylin Yener

President Yener gave the outline of the presentation, which consisted of the following: summary of activities since the last meeting; final membership campaign stats; IEEE related updates; and lessons learned from other IEEE societies.

She went over the activities since the last meeting in June 2020, including officers election, which was completed in July, Distinguished Lecturer program, which was reinstated online in July, and Board of Governors election, which was run and executed in September. She welcomed new Board members, and expressed Big Thanks to the outgoing members. The new elected Board members for the period 2021-2023 are: Natasha Devroye, Massimo Franceschetti, Brian M. Kurkoski, Anand D. Sarwate, Vincent Y. F. Tan, and Aaron B. Wagner. She noted that Vincent and Brian are Region 10 representatives. The outgoing members are: Elza Erkip, Vince Poor, and Parastoo Sadeghi.

She then went over the membership statistics. There are 741 total new members who joined via the campaign, including 158 Student Members (116 Graduate Students), 237 Senior Members, 337 Members, 9 Fellows, and 258 new members

from Region R10. Total membership count as of October 9 is 3781 members.

Regarding the update from the IEEE, she stated that the budget is still favorable. Regarding the conference revenue, she stated that it was expectedly low, but that there were also concurrent reductions in other expenses, such as travel to IEEE meetings. She stated that there were no reported issues with our operational funding or new initiatives, and that in fact we have new approved initiatives.

President Yener then updated on the Systems Council Membership to which the Information Theory Society was invited. She stated that there is a fee to being a member but that the fee was waived. She stated that we as a society can be as involved as we want. She then went over the concrete outcomes, which are to advertise for the main conference and for the new Information Theory magazine. The Council requested one person from the society to be in their governance, and President Yener volunteered for that position.

President Yener then went over lessons from other IEEE societies, and what possible ideas can we also adopt. She mentioned that ICASSP 2020 conference while being fully remote had over fifteen thousand attendees. Successful strategies can include themed on-line lectures, more involved social media interactions, and industry engagement and competitions.

Regarding the division meetings, President Yener stated that we are with the Signal Processing Society in Division 9. Some societies are already engaging in hybrid meetings and that the fee structure is being studied.

New Committees—Aylin Yener and Wei Yu

The presenters went over the goals of the committee which are to group ad hoc committees under themes and establish standing committees, and have the chair of each committee be a BoG member at time of appointment. Then, the scope of the External Outreach committee was presented. It was stated that our society has been engaged in a number of outreach activities for non-members, and that this should continue to be the case, and that successful activities are carried out by several volunteers separately, including the book, pilot videos, and the movie. Proposal is to establish an external outreach committee as the union of the above activities and more. It was suggested to implement two or three year term limits, renewable up to two times. It was also stated that current memberships have overlaps and synergy. The presenter then went over the FITS committee and stated that the committee has been operating since May, and that it includes digital platform efforts for now, adding that in the long run, the committee can turn into a strategic committee. Aylin also asked BoG members to chair and participate in committees.

The following straw poll was issued:

Item 1: Each standing committee shall have a chair who is a BoG member at the time of appointment.

Item 2: External Outreach committee shall consist of at least five members (including the chair) and shall be responsible for coordinating the outreach efforts to general public in promoting the field and its impact.

Item 3: FITS committee shall consist of at least five members (including the chair) and shall be responsible for strategic initiatives of the society, including a unified digital presence through online activities and social networks.

A BoG member suggested to change the outreach to inreach on the other committee having a similar name, and make this one an outreach committee. Another BoG member suggested to have inbound and outbound subcommittees.

It was clarified that the chair of the standing committee should be a BoG member but the subcommittee chair need not. It was also pointed by a BoG member that for the real vote precise wording needs to be in the bylaws.

The result of the straw poll was as follows:

Item 1: 19 yes, 2 no, 2 abstain votes.

Item 2: 20 yes, 1 no, 2 abstain votes.

Item 3: 20 yes, 1 no, 2 abstain votes.

The following motion was issued:

Motion: to extend the meeting by 45 minutes.

Motion passed.

Paper Awards Committee—Wei Yu

The next presentation was given by Wei Yu on behalf of the Paper Awards committee. Wei thanked the members of the committee for their service. He then presented the status of the ITSoc paper award. He stated that there were 8 occasions for two concurrent papers, most with independent discoveries. He stated that the committee believes that it is now the time to consider allowing up to two winners, which requires a Bylaws change with 2/3 majority votes by the BoG. First, Wei went over the current bylaws and stated that this year the committee considered a total of 16 nominations, and that the size of nomination pool was similar last year. He then presented the growth chart of the Information Theory in terms of publications. It used to be that one paper was selected out of 200 published papers, but that now it is one out of 500. Next, Wei stated that the new Journal on Selected Areas in Information Theory (JSAIT) is already organizing five issues this year, and that as a result there will be significant increase in the number of overall published papers in ITSoc, as well as in the diversity of topics. He then presented Pros and Cons for expanding the award paper limit to be up to two papers per year. He also presented the comparisons with peer IEEE societies in terms of their size and number of paper awards.

The following straw poll was presented:

Item 1: The Information Theory Society Paper Award is given annually for up to two outstanding publication(s) in the fields of

interest to the Society appearing anywhere during the preceding four calendar years. The purpose of this Award is to recognize exceptional publications in the field and to stimulate interest in and encourage contributions to fields of interest of the Society. Wei stated that the Paper Awards committee members unanimously support engaging the BoG to discuss the possibility to allow the above flexibility.

Then, Wei discussed the conflict of interest. He stated that this year, 4 out of 9 members were excluded at various stages of the award deliberation process. Committee suggestion is to replace Paper Awards Committee members who are co-authors of a nominated paper. This action will be done by N&A after the nomination deadline (March 1).

The following straw poll was presented:

Item 2: Authors of papers nominated for the ITSoc Paper Award should not serve on the Paper Awards Committee.

A discussion among the BoG members regarding the status of the paper award ensued. A BoG member said that it might be hard to differentiate between one paper and one result. Another BoG member said that a single award would be most prestigious and that other awards could be instituted. Some BoG members raised a concern that increasing the paper limit would lower the prestige. A BoG member said that the increase would give the committee needed flexibility.

The result of the straw poll was:

Item 1: 14 yes, 6 no, 0 abstain votes.

Item 2: 20 yes, 0 no, 0 abstain votes.

IT Schools—Stark Draper

The next presentation was given by Stark Draper as the Chair of the ITSoc Schools Committee. Stark first thanked Parastoo and Christina for their service. He recalled that 3 of the 4 Schools planned for 2020—NASIT'20 (Vancouver, July), EASIT'20 (Seoul, August), India'20 (Kanpur, July)—were deferred to 2021. He stated that ESIT'20 (Stuttgart), originally scheduled for May will be held November 23-27 as a virtual school. He shared ESIT'20 update from Christian Senger and Stephan ten Brink as school organizers. The update is that lectures will be pre-recorded, and videos will be ITSoc-branded for consistency. He also stated that the ESIT organizers are in close contact with lecturers and will be providing support. In particular, videos will be made available online prior to event; time during the event will be used for moderated Q&A with speakers and for live interaction with school attendees; participants will provide posters together with one-minute-madness videos; two, maybe more, virtual poster session will be hosted by Christian and Stephan. Each poster will have a “sub-session” to allow participants to hop from poster-to-poster and to interact with the poster presenter directly. Proposed registration fees for the school are: free for ITSoc members, 30 Euro for IEEE members, 100 Euro for non-IEEE members. ESIT will be the only school held this year. The organizers will send back feedback and share best practices.

Stark also stated that all deferred schools plan to hold their events in 2021. Vienna school organizers are to be contacted if they are still interested. He also mentioned that a School needs to be somewhat decoupled from the hosting university so as to avoid conflict of interest with the employer.

There was a brief discussion indicating that Stark's term as the school subcommittee chair is ending this year. There will be a BoG vote in accordance with our bylaws for the confirmation of the new chair.

The meeting entered a recess at 1.40 pm EST on Saturday, October 10.

The meeting resumed at 10 am EST on Sunday, October 11.

First, President Yener took the roll call. The following members were in attendance: Erik Agrell, Erdal Arikan, Matthieu Bloch, Suhas Diggavi, Alex Dimakis, Lara Dolecek, Stark Draper, Elza Erkip, Meir Feder, Christina Fragouli, Andrea Goldsmith, Camilla Hollanti, Sid Jaggi, Tara Javidi, Vijay Kumar, Matt LaFleur (#), Olgica Milenkovic, Prakash Narayan, Henry Pfister, Vince Poor, Joachim Rosenthal, Parastoo Sadeghi, Igal Sason, Emina Soljanin, Daniela Tuninetti, Aaron Wagner, Aylin Yener, and Wei Yu.

All attendees joined remotely via Zoom; non-voting attendees are denoted by (#).

10:00-10:05 Attendance

10:05-10:25 Treasurer's Report (Wagner)

Treasurer's Report—Aaron Wagner

The next report was given by Aaron Wagner in his role as the Society's Treasurer. This was Aaron's last report as his term is ending this year.

Aaron started with overview of how the funds are allocated towards general funds and special projects. He then went over the status of various categories comprising 2020 general funds.

He noted that IEEE carries conference insurance with a pandemic rider. This should cover the difference between expected \$103K and actual \$31K ISIT surplus for ISIT 2020. The payout will likely occur in 2021, but there will be no coverage for ISIT 2021.

Next, Aaron said that 2020 Special Projects were scrapped due to the pandemic and the new list was made, with fewer items.

Next, Aaron went over the 2021 General Funds. He stated that in 2021, unlike how it is normally done, IEEE did not make any requests/recommendations, even for the bottom line. They only sent forecasts for the line items that they control. Aaron reported that he submitted the budget. He went over the key details of the proposed budget, stating that it in the worst case has \$61k deficit.

Then, Aaron went over the financials of the IT Transactions. There was a continued downward trend which was suddenly reversed last year. Aaron investigated this phenomenon and figured out that the upward spike was due to the overall IEEE profit increase. His take-away point was that shorter papers have financial benefit. Editorial considerations towards that practice could be a financially beneficial cultural change.

EiC Transactions on Information Theory—Igal Sason

Next report was given by Igal Sason in his capacity as the Editor-in-Chief of the IT Transactions. Igal presented candidates for the positions of Associate Editors of the Transactions. He stated that there is a need in the technical areas for which these candidates are proposed. He provided biographies and list of key publications for each candidate.

BoG was appreciative that there were candidates from industry. A BoG member expressed concern that there was no gender diversity amongst the candidates. Igal stated that 20% of current editors are females. Another BoG member expressed concern that the editorial board is moving more towards CS. It was echoed that the diversity should be sought from within the community. Another BoG member suggested that criteria should be well known to solicit a broad pool of candidates to make the process transparent. It was also suggested to keep a record of who was invited and had accepted or declined.

The following motions were issued:

Motion: To approve Alekh Agrawal (Machine Learning Area) as an Associate Editor.

Motion: To approve Salman Beigi (Quantum Information Theory Area) as an Associate Editor.

Motion: To approve Pradeep Kiran Sarvepalli (Quantum Information Theory Area) as an Associate Editor.

Motion: To approve Akshay Krishnamurthy (Machine Learning Area) as an Associate Editor.

All four motions passed.

Online Committee—Matthieu Bloch reporting on behalf of Brian Kurkoski

Next presentation was given by Matthieu who was filling in for Brian. He went over the development of the new itsoc.org website. He stated that copyright compliance is encouraged to avoid glitches. The goal of the new site is to make a unified online presence. Project is going well so far and Matthieu praised Brian for his leadership. Matthieu stated that expenses are coming up and budget is being spent, and that the maintenance cost is likely to decrease in the future. Matthieu showed initial pages, and stated that the committee welcomes inputs now as they start rollout in 2-3 weeks.

FITS Report—Matthieu Bloch

Next presentation was given by Matthieu on behalf of the Future of the Information Theory Society (FITS) Committee. Matthieu over the executive summary which is to unify and strategize all our online activities. He presented several ongoing efforts, which are: IEEE single sign-on authentication; hosting of media resources and integration with website; support for remote events; Distinguished Lecturer (DL) recordings; organization of hybrid meetings; leveraging web to support and enhancing BITS magazine. Several efforts are on track and some such as DL lecture recording are delayed. Matthieu went over the status of the IEEE

authentication, summarizing that this set-up will be released with the new website by the online committee. Then, Matthieu went over the status of hosting of multimedia resources and stated that the new AWD CDN integration will be released with the new website by online committee. Next, Matthieu presented the status of the support for remote events, stating that the support will also be available with the new website. He stated that the committee needs help for unified licensing of the content. Regarding support for remote events and video conferencing, he went over both the short term objectives as well as long term vision. He stated that related expenses are not just operational but can also be viewed as a conference expense. Matthieu stated that big organizations are doing remote conferencing in new and radical ways, and that now is the opportunity to innovate. Regarding Distinguished Lecturer program recordings, Matthieu stated that it is in progress. He emphasized that there is a lot more than meets the eye, and that volunteer help is needed. Regarding the organization of hybrid meetings, Matthieu went over the current situation and on-going efforts. Erik has started the first draft of guidelines. The committee needs help in the form of an additional pair of eyes. Next, Matthieu went over the status of BITS on the Web. There has been constant communication with Rob Calderbank to enhance BITS with online content. Matthieu presented representative examples, including 2 pages on polar codes, and 2 minute videos to support published articles. He stated that help is needed here as well.

A BoG member stated that expenses can be budgeted for to support BITS. Another committee member suggested to integrate content with the existing online IT content. Another BoG member suggested to have a part of the content be outward for public, and another part be login-based for the society's members, as a part of the membership value.

After a short break the meeting continued.

Conference Committee—Vijay Kumar

The next presentation was given by Vijay as the chair of the conference committee. He started by going over the members of the committee and thanking them for their service. Next, he went over the status update for 2021: ITW 2020 is most likely virtual; ISIT 2021 preference by the organizers is virtual/hybrid/in-person, in that order; ITW 2021 will be hybrid if possible, else virtual. For the next set of conferences, the status update from the organizers is: ISIT 2022 had the conflict of interest resolved, and in-person is preferred; ITW 2022 organizers are rethinking the proposal given the feedback; ISIT 2023 in-person or hybrid is preferred; and potential ISIT 2024 organizers are rethinking proposal given comments, and looking for guidance.

Regarding ITW 2020 to be held in Riva del Garda, Italy, Vijay stated that the new dates in April 2021 are confirmed as are participants and the organization team. It is likely that the format is fully virtual, with a small chance of being in person. Submission deadline has been extended and online contracts and virtualization are in progress.

Regarding ISIT 2021 to be held in Melbourne, Australia, Vijay went over various format choices and cancellation penalties. All options are open with virtual being most likely. He went over deposits and sponsorship as well as preliminary budget for the virtual format. Vijay stated that the organizers will postpone

decision on changing to either virtual or hybrid until last minute possible. Once they decide, their request to the BoG is to conduct a quick motion to approve of their conversion to virtual or hybrid as the case might be.

He next went over the status of ITW 2021 to be held in Kanazawa, Japan. He noted that there will be two ITWs that year. Preference from the organizers is to make it hybrid, then virtual. Vijay went over the format of different choices and associated cancellation penalties.

For ISIT 2022 to be held in Helsinki, Finland, the preference from the organizers is to have it in-person, then virtual, as hybrid was seen as a challenge. A conflict of interest involving IEEE and Aalto University arose as the conference treasurer is also Aalto employee. This issue was resolved with President Yener's help. Vijay stated that format and contract agreements are in progress.

For ITW 2022 to be held in Goa, India, Vijay stated that the organizers will rethink the conference format and report back at the next BoG meeting.

For ISIT 2023 to be held in Taipei, Taiwan, the organizers are watching closely how will Globecom 2020 be conducted in the hybrid format, as the same venue is planned to be used for ISIT. Hybrid model is preferred.

For ISIT 2024 to be held in New York City, which is in the pre-proposal stage, the organizers are re-thinking the situation, due to high local cost and the pandemic crisis, and are looking for guidance from BoG.

Vijay stated that the action items are to fill vacancies on the committee, and to re-think topics and format of future IT conferences and workshops.

Constitution and Bylaws Committee—Elza Erkip

The next presentation was given by Elza as the Chair of the Constitution and Bylaws Committee. She went over the purpose and responsibilities of the committee, and its members. She thanked the members for their service. In regards to the new publication BITS, Elza stated that EiC is Rob Calderbank and that the Steering Committee (SC) Chair is Christina Fragouli. She then stated that the bylaws need to be updated to reflect the new journal. Next Elza presented three issues: update the Publications Committee; inclusion of the BITS governance in the bylaws; and ex-officio BoG membership.

Next, Elza went over the Publication Committee structure, raising a point for discussion regarding the representation on BoG. She also raised a question whether the steering committee should be appointed by VP of Publications or Nominations and Appointments Committee. Regarding BITS governance, she raised a point of discussion whether BITS EiC should be a voting member of the Board as an ex-officio member. She next went over the Ex-Officio BoG membership and presented 3 options: 1) to add BITS EiC, 2) to add BITS EiC and with Transactions Executive Editor (EE) no longer ex-officio BoG member, 3) to have an appointed VP of Pubs who is the only ex-officio BoG member representing Publications.

She went over the pros and cons of different options, and stated that option 1 is preferred by Transactions EiC and EE, that option 2 is preferred by BITS SC Chair, and that option 3 is preferred by BITS EiC, JSAIT EiC, and JSAIT SC Chair.

A discussion among the Board members ensued. Several BoG members presented arguments for favoring option 1 and several presented arguments for favoring option 3.

The following motion was issued.

Motion: to extend the meeting by one hour.

Motion was approved.

After the motion was approved, the discussion continued. It was concluded that it would be beneficial to investigate this issue further.

The following straw poll was issued.

To add BITS EiC and Chair of the Steering Committee to the Publications Committee.

The result of the straw poll was: 20 yes, 1 no, 2 abstain votes.

3 options plus another new option to investigate further and abstain

The following poll was issued in regards to the ex-officio BoG membership.

Vote for one of the following options:

- **Option 1:** Add BITS EiC to the BoG
- **Option 2:** Add BITS EiC to the BoG, Transactions EE no longer ex-officio BoG Member
- **Option 3:** Have an appointed VP of Pubs who is the only ex-officio BoG member representing Publications
- **Option 4:** Investigate further options involving nonvoting ex-officio BoG members Abstain

The result of the straw poll was: option 1–6 votes; option 2–1 vote, option 3–4 votes, option 4–10 vote, 6 abstains.

In conclusion, Elza said she would follow up.

Constitution and Bylaws Committee—Elza Erkip

The next presentation was given by Elza on behalf of the Constitution and Bylaws Committee. Members of the committee

are Elza Erkip (SPP, Chair) and Emina Soljanin (JPP). Elza went over potential bylaws changes regarding new committees, paper awards, and publications. She stated that reaching unanimous vote needed for change is hard over email as no response is abstain.

Diversity and Inclusion Committee—Stark Draper

The next presentation was given by Stark. He thanked members of the committee for their service and acknowledged everyone's input and help.

He went over the 4 phases, which are 1) Start-up, Jul-Oct'20, 2) Quick wins (QW), Sep-Dec'20, 3) Assess & Analyze (AA), Oct'20-Aug'21, and 4) Build & Launch (BL), 2021–2022. First two will be done by the end of the year and the third will be done by next ISIT. Current focus of the committee includes: governance, data, and activities. He then presented context & purpose of the committee, its responsibilities, and a detailed project plan. Next, Stark went over the IEEE Information Theory Society reporting on D&I efforts in Governance, in Awards, in Symposia, and in Publications. Committee's detailed response was organized bullet by bullet.

Membership Committee—Christina Fragouli

The next presentation was given by Christina Fragouli on behalf of the membership committee. The following motion was issued:

Motion: To extend the deadline for nominations for Distinguished Lecturers, Padovani Lecturer, and Goldsmith Lecturer to November 15, 2020.

The motion passed.

BITS Magazine—Christina Fragouli, Presented for Rob Calderbank

Christina presented on behalf of Rob. She went over the timeline, highlighting that first publication will appear in 2021. She then presented the new magazine logo. She summarized the advertising campaign, status of the Manuscript Central submission and the website. New initiative funding proposed by Aaron and approved by Aylin were used towards new magazine efforts. Rob has started soliciting inputs and submissions. End of October is targeted as the submission deadline.

Discussion—Aylin Yener

President Yener led the closing discussion. She highlighted that a lot was accomplished despite the circumstances. She thanked outgoing members Vince Poor, Parastoo Sadeghi and Elza Erkip for their extensive service to the BoG.

In Memorium: Joy Thomas 1963–2020

Suhas Diggavi, Abbas El Gamal and Ioannis Kontoyiannis

Joy Thomas passed away on September 28, 2020, at the young age of 57. Joy is best known for his seminal textbook “Elements of Information Theory,” co-authored with his PhD advisor the late Thomas Cover. His book literally rewrote the way information theory is taught, making it much more accessible not only to graduate students interested in communication and compression, but to a much broader audience from many fields, including physics, computer science, mathematics, statistics and the social sciences. The book has been the standard text for the majority of information theory courses worldwide, helping educate tens of thousands of students and attracting generations of new researchers to the field, even as the interest in information theory has expanded from communication to other applications. As a testament to the book’s impact on research, it has garnered 58,000 citations (according to Google scholar), and this number is an underestimate of its broader impact on education.

Joy’s technical contributions, however, went far beyond his textbook. In the sections that follow we describe some of these contributions, viewed through the lens of the stages of his career.

The Stanford Years 1984–1990

Joy came to Stanford after completing his Bachelor of Technology degree at the Indian Institute of Technology (IIT), Madras, India, in 1984. He was admitted to the IIT as a 16-year old, after securing All-India Rank #1 in the famed Joint Entrance Exam (JEE) for the IITs. He joined Stanford University on the Charles LeGeyt Fortescue scholarship, awarded by the IEEE to a single freshman graduate student in Electrical Engineering each year. He was later awarded an IBM PhD fellowship during the final 3 years of his PhD.

Joy’s PhD thesis, supervised by the famed information theorist Thomas Cover, contains what is perhaps the first thorough investigation on the role of feedback in networks [JT-PhDthesis]. It had already been known for several decades that feedback does not increase the capacity of memoryless point-to-point channels, though it could help simplify coding schemes. There had also been several works in the 1970s and 1980s which showed that feedback can increase the capacity of certain networks. Joy’s thesis was a tour-de-force in understanding the role of feedback in many types of networks, and at the time of its writing it had the best results for the capacity of feedback networks. It showed that feedback could increase capacity by at most a factor of two in multiple access networks (think wireless uplink, where several users communicate with a base station) [JT-IT1987]. It also showed that feedback can help significantly in interference networks (think wireless communication with multiple users simultaneously transmitting to different receivers). His thesis also established a set of fundamental entropic and convex-geometric inequalities, which still stand today in terms of their use and the elegance of their information-theoretic proofs, and which demonstrate the utility of information theory in proving basic inequalities in mathematics (also see [DCT-1991]).

The IBM Years 1990–1999

After completing his PhD in 1990, Joy joined the IBM Thomas J. Watson Research Center. He worked on a diverse set of topics including data compression, connections between queueing theory and information theory, as well as the (then) emerging area of data mining. He was an early advocate for the application of information-theoretic ideas and techniques to problems involving the understanding of large-scale data, a path which led to his successful entrepreneurial efforts described later.

Along with Cheng-Shang Chang, Joy explored the interaction between information theory and queueing theory. Their collaboration started with the observation that the large deviation principle is a key mathematical tool linking these two areas. They identified the entropy functional as a key notion in describing effective bandwidth in queueing networks, and their collaboration led to two papers [CTK-QS1994,CT-JSAC1995] on this topic.

Joy also worked on using data compression techniques for caching in computer systems. Part of that research contributed to the development of Memory eXtension Technology (MXT) which was implemented in the IBM Pinnacle memory controller chip. That technology has lived on through numerous generations of refinement, and it is now part of IBM’s Active Memory Expansion technology used across all of their computer systems, from industry standard x86 servers through their Power Enterprise servers.

The MXT idea was to insert a compressor/decompressor between cache and memory: Decompress on cache misses, compress on writeback. One needed something akin to a universal source coding algorithm (they chose Lempel-Ziv) to make this work, but Lempel-Ziv methods require a long buffer in order to be effective, and compressing buffers of that size was challenging to do quickly, even in hardware. The solution was a shared dictionary approach: Parallelize the process, allowing each compressor to share its history with the others. The results were impressive: Memory was compressed by a factor of three, with negligible performance impact. This enabled executing workloads that previously needed hours to be completed in minutes. Though Joy did not write technical papers on this work, some of his contributions are documented in several patents [PatentIBM1, PatentIBM2, PatentIBM3].

The Startup Years 1999–2020

In 1999 Joy left IBM to join the founding team at Stratify, a pioneer in unstructured data management, auto-generating taxonomies, and conceptual classification models (see [Pat-Stratify]). Joy served as Stratify’s Chief Scientist, until it was acquired by Iron Mountain in 2007.

In 2011, Joy co-founded InsightsOne. At the time, due to the availability of inexpensive large-scale computing and large amounts of data, significant efforts were being made to develop predictive models for engagement and advertising using online behavioral

observations. InsightsOne harnessed the commercial opportunity to use big data and associated tools for the purpose of designing and creating a predictive analytics platform, which could be used by the healthcare, retail, telecom and financial services industries.

Joy was instrumental in developing technical solutions to problems arising in this platform's design. He formulated the entire project as a graph problem, where actions by agents were represented as sequences of time-stamped typed events, with arbitrary attribute-value pairs. Attributes' values could be arranged into hierarchies, giving coarser and finer attribute descriptions. The main idea behind this formulation was to facilitate the identification of patterns at differing levels of abstraction. The sequence of events for each agent could be combined into a single graph, with each node representing an action at a certain chosen level of abstraction.

Joy's key contribution was something that might seem obvious in hindsight, but was not obvious before—a characteristic he shared with his PhD advisor Thomas Cover. His insight was that a sequence of interactions that a person has with a business is an excellent predictor of her behavior over the course of the next few interactions. This insight upended the state-of-the-art at that time which viewed interactions as a bag rather than a sequence. Joy worked out algorithms that were effective in finding predictive patterns in these high dimensional spaces. These algorithms created a significant lift in performance across applications. This work led to several patents, including [Pat-Insights].

InsightsOne was acquired by Apigee in 2014, which was later acquired by Google in 2016. One of the challenges at Apigee was that decisions had to be made very quickly at "line speed." In order to protect Apigee customers from unwelcome bot attacks, Joy was able to design a collection of local "rules," each of which was simple and amenable to efficient implementation, but which when combined and applied collectively were able to get close to the quality that a much more global (and expensive) system could achieve. This balance came from his deep understanding of both the theory and the practical constraints within which the theory was to be applied.

Joy the Person

Joy was a remarkable human being, humble, gracious, generous, patient and eternally calm. Gentleness and generosity are the first qualities that everyone who knew Joy remembers him for. These qualities are reflected in his unusually large network of close friends. He was a perfectionist and a role model in every way—intellectually, as a person, and as a friend. Several of us have also experienced his amazing cooking skills, demonstrating that his talents went far beyond academic and technical achievements. He was an avid traveler and shared that passion with his son Joshua, having visited all the 7 continents together. And he shared his

passion for classical music with his daughter Leah. He leaves behind his two children, Joshua and Leah, and his wife Priya. He will be very sorely missed.

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References

- [JT-PhDthesis] Joy Thomas, "The role of feedback in multiuser information theory", Ph.D. thesis, Stanford University, 1990.
- [JT-IT1987] Joy A. Thomas, "Feedback can at most double Gaussian multiple access channel capacity", *IEEE Transactions on Information Theory*, 33(5): 711-716, 1987.
- [DCT-IT1991] Amir Dembo, Thomas M. Cover, Joy A. Thomas, "Information theoretic inequalities", *IEEE Transactions on Information Theory*, 37(6): 1501-1518, 1991.
- [CTK-QS1994] Cheng-Shang Chang, Joy A. Thomas, Shaw-Hwa Kiang, "On the stability of open networks: A unified approach by stochastic dominance", *Queueing Systems Theory and Applications*, 15(1-4): 239-260, 1994.
- [CT-JSAC1995] Cheng-Shang Chang, Joy A. Thomas, "Effective Bandwidth in High-Speed Digital Networks", *IEEE Journal on Selected Areas in Communications*, 13(6): 1091-1100, 1995.
- [PatentIBM1] Peter Franaszek, John Robinson and Joy Thomas, "Adaptive multiple dictionary data compression", US patent # 5870036, 1999.
- [PatentIBM2] Peter Franaszek, John Robinson, Joy Thomas, "Parallel compression and decompression using a cooperative dictionary", US patent # 5729228, 1998.
- [PatentIBM3] Vittorio Castelli, Peter A. Franaszek, Joy Thomas, "Method and apparatus for prediction of computer system performance based on types and numbers of active devices", US patent # 8234229, 2012.
- [Pat-Stratify] Joy Thomas, Mohana Lakhamraju, George Mathew, Pangal Nayak, Gollakota Ramana, John O. Lamping, "Techniques for organizing data to support efficient review and analysis", US patent # 7945600, 2011.
- [Pat-Insights] Anant Jhingran, Krishna Kesavan, Joy Thomas, Jagdish Chand, Sridhar Rajagopalan, "Automatically extracting profile feature attribute data from event data", US patent # 10255300, 2019.

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Asymptotic Analysis of an Ensemble of Randomly Projected Linear Discriminants
..... *L. B. Niyazi, A. Kammoun, H. Dahrouj, M.-S. Alouini, and T. Y. Al-Naffouri* 914

SPAWC²⁰²¹ Lucca, Italy

September 27 -30, 2021

SPAWC 2021 invites original contributions in the following (but not limited to) areas:

- MIMO systems (massive-, multi user-, cell-free, ...)
- Machine learning for wireless communications and networking
- Cooperative communication
- Resource allocation
- Sparse signal processing for wireless communications
- Millimeter wave and terahertz communications
- Full duplex systems
- Cognitive radio and networks
- Cooperative, compressed, and sparse sensing
- Machine-to-machine, device-to-device communications
- Modeling, estimation and equalization of wireless channels
- Acquisition, synchronization, localization and tracking
- Signal processing for optical, satellite, and underwater communications
- Energy efficiency and energy harvesting
- Distributed signal processing and uncoordinated access
- Internet of things
- Cache-aided communications
- Broadband, ultra-reliable, and low latency solutions for 5G and beyond
- Experimental setups

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The 22nd IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), will be held in Lucca, Tuscany, Italy, on September 27-30, 2021. A flagship workshop of the IEEE SP Society SPCOM technical committee, SPAWC 2021 will combine cutting edge research in the fields of signal processing, communication theory, information theory, statistical learning, wireless networking and more.

All invited and regular papers, with up to 5 pages of technical content (including references), will be published through IEEE Xplore.

Structure of the Technical Program

The technical program will follow the successful style of SPAWC, with morning and afternoon keynote talks, and poster sessions in between.

A Call-for-Special-Sessions on hot topics in the society will be published. In addition to the keynotes, the program will feature several SPAWC Talks given by leaders in both academia and industry. While each keynote will provide an introduction and overview of a topic, in a style that suits all the attendees, the SPAWC talks disseminate the latest developments in the same topic area as the keynotes.

Tutorial and Special Session Proposals

Tutorials will be held on September 27, 2021. Brief tutorial proposals should include title, outline, contact information, biography and selected publications for the presenter(s), and a description of the tutorial and material to be distributed to participants. Special session proposals should include title, rationale, session outline, contact information, and a list of invited papers.

Student Paper Contest Guidelines

The committee will select approximately 10 papers for the Student Paper Contest. Final selection of 3 winners will be made after the completion of Student Paper Contest on September 27, 2021.

Data Competition

SPAWC 2021 will include a data competition to develop algorithms for a problem related to signal processing and communication theory.



www.spawc2021.com

Important Dates

- | | |
|-------------------------------------|----------------|
| • Special Session Proposals Due | March 21, 2021 |
| • Decisions for Special Sessions | March 28, 2021 |
| • Paper Submissions Due | April 11, 2021 |
| • Acceptance Notification | July 5, 2021 |
| • Revised Paper Upload Deadline | July 11, 2021 |
| • Author Registration Deadline | July 11, 2021 |
| • Travel Grant Application Deadline | July 11, 2021 |



11th International Symposium on Topics in Coding

Montréal, Québec, Canada, August 30th – September 3rd, 2021



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François Gagnon,
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Co-sponsored by the
IEEE Information Theory Society

Call for Papers

The 11th International Symposium on Topics in Coding* will be held from Monday August 30th to Friday September 3rd, 2021, in Montréal, Québec, Canada. The symposium will be an opportunity to acquire a broad overview of the current status of advanced research in all areas of coding theory and its applications. All original contributions will be considered, in both theoretical and applied fields. Topics for submission include, but are not limited to, the following:

- Error-control coding
- Turbo, LDPC, polar, and product-like codes
- Bit-interleaved coded modulation
- High-throughput decoding
- Hardware and software implementations
- Performance bounds
- Iterative equalization and detection
- Message-passing algorithms
- Joint source-channel coding
- FEC for optical communications
- Coding for wireless communications
- Coding for storage
- Coding for distributed computation

In addition, papers that broaden the reach of coding, including emerging fields and novel applications of coding, are encouraged. The symposium will include regular papers for oral and poster sessions as well as invited papers. Accepted and presented papers/posters will appear in the symposium proceedings and in IEEEExplore.

Submissions

Authors are invited to submit a full manuscript (not exceeding 5 pages in double-column format) via the symposium website:

<http://www.istc2021.org>

Important Dates

Paper submission deadline: **April 25th, 2021**
Notification of acceptance: **July 5th, 2021**
Camera-ready paper due: **August 1st, 2021**

For further information regarding paper submission, registration, accommodation, and travel, please consult the symposium website.

* Formerly the International Symposium on Turbo Codes & Iterative Information Processing.



Symposium Committee

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Tadashi Wadayama Nagoya Inst. of Tech.
Shun Watanabe Tokyo Univ. of A&T

Finance

Shigeaki Kuzuoka Wakayama Univ.

Local Arrangement

Hiroshi Fujisaki Kanazawa University

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Elsa Dupraz IMT Atlantique
Takayuki Nozaki Yamaguchi Univ.

Publications

Lei Lui JAIST
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IEEE Information Theory Society



Financial Support

- Kayamori Foundation of Informational Science Advancement
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ITW2021

October 17–21, 2021 in Kanazawa, Japan

The 2021 IEEE Information Theory Workshop (ITW2021) is currently scheduled to be held October 17-21, 2021 as a hybrid in-person/online event. The in-person component will be held at Kanazawa Bunka Hall in Kanazawa, Japan. If it becomes necessary to hold an online-only event, every effort will be made to provide networking opportunities and an interactive experience, while remaining a venue for dissemination of top-quality research in information theory.

Kanazawa is located in the middle of Honshu, the main island of Japan, and can conveniently be reached by train or airplane from Tokyo. Bordered by the Sea of Japan and the Japanese Alps, Kanazawa was also recognized as the world's first UNESCO Creative City in the field of crafts and folk art. Kanazawa Bunka Hall is centrally located in Kanazawa, with easy access to hotels, restaurants and transportation.

Call for Papers

Interested authors are invited to submit papers describing novel and previously unpublished results on all areas on coding and information theory, including but not limited to the focus topics below:

- ▶ Low-Latency Communications
 - Low-latency communications in multi-user information theory
 - Low-latency communications for wireless applications
 - Application of low-latency communications techniques
- ▶ Information-Theoretic Security
 - Physical layer security
 - Secure computation under information-theoretic security
 - Information-theoretic security for privacy
- ▶ Machine Learning for Communications
 - Neural networks for communication systems
 - Machine learning-based transceiver algorithms
 - Information-theoretical understanding of deep learning
- ▶ Codes in the Cloud
 - Coded computation
 - Private information retrieval
 - Distributed storage

Paper Submission

Authors should submit papers according to the guidelines which will later appear at:

<http://itw2021.org>

Accepted papers will appear in the symposium proceedings. To be published in IEEE *Xplore*, an author of an accepted paper must register and present the paper. IEEE does not guarantee inclusion in IEEE *Xplore*.

Paper submission deadline April 30, 2021

Acceptance notification August 2021

Further information will be posted on the symposium web site as it becomes available.

IEEE Journal on Selected Areas in Information Theory

Special Issue on

Beyond Errors and Erasures: Coding for Data Management and Delivery in Networks

The focus of this special issue is on the applications of coding to the broad area of networking for efficient exploitation and delivery of data. Various coding techniques have been devised to tackle erasures and achieve fundamental limits of compression to recover a message with a fidelity criterion. Motivated by the research in this direction and a wide variety of applications at the intersection of distributed systems and networking, this special issue will focus on key aspects ranging from employment of coding for enhancing the efficiency of networking, protocols, computation and delivery in distributed systems, to maintaining consistency in updates and improving accessibility in distributed storage systems, as well as providing desired performance tradeoffs in terms of efficiency, delay and atomicity.

Topics: Authors are encouraged to submit their work on the topics including, but not limited to:

Networking coding for delay and robustness
Coding in protocols
Multipath and multihop coding, recoding
Coding for streaming
Intersection of coding and queueing, queueing analysis of coded delivery
Distributed coding for content access, in caches and the edge
Coding for distributed and parallel systems
Coding for efficient updates

Important Dates:

Manuscript Due: May 1, 2021
Final to Publisher: Nov. 5, 2021

Acceptance Notification: Oct. 15, 2021
Expected Publication: Dec. 2021.

Senior Editor:

Raymond Yeung (The Chinese University of Hong Kong)

Guest Editors:

| | | |
|---------------------|-------------------|--|
| Elza Erkip, NYU | Deniz Gündüz, ICL | Stratis Ioannidis, Northeastern University |
| Joerg Kliewer, NJIT | Derya Malak, RPI | Muriel Médard, MIT |
| R. Srikant UIUC | | |

Submission Guidelines: A summary of key guidelines for submission has been provided by the IEEE Journal on Special Areas in Information Theory. Prospective authors are encouraged to refer to the [Author Information](#) in the special issue webpage.



2021 IEEE North American School of Information Theory

The 2021 IEEE North American School of Information Theory (NASIT) will be held **Monday, June 21 to Friday, June 25, 2021**.

The school will be a **virtual** event featuring long-format **tutorials** from leading experts and interactive **poster sessions**.

Our tutorial lecturers are

David Tse, Stanford University, **Padovani Lecturer**

Michelle Effros, California Institute of Technology

Negar Kiyavash, École Polytechnique Fédérale de Lausanne

Douglas Stebila, University of Waterloo

Wei Yu, University of Toronto

Lizhong Zheng, Massachusetts Institute of Technology

In addition to attending the tutorials, graduate students and postdoctoral researchers will have the opportunity to discuss their work in interactive poster sessions. The idea of the sessions is to provide an informal and relaxed setting for students to get experience in presenting and to discuss their ideas and their research. Posters are not refereed, and presenting previously published results as well as tutorial-style posters are welcome. We encourage early registration of posters by May 15, 2021.

For further details: <http://conferences.ece.ubc.ca/nasit2021>

NASIT organizers

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Ian Blake

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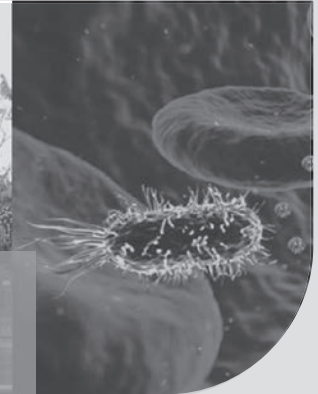
CENTER FOR SCIENCE OF INFORMATION
NSF SCIENCE & TECHNOLOGY CENTER
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JTG/IEEE ITSoc Summer School 2021

Department of Electrical Engineering

Indian Institute of Technology Kanpur



Information Theory, Signal Processing, Telecommunication, and Networking

June 28 - July 01, 2021

Welcome to the Twelfth Joint Telematics Group (JTG)/IT Society Summer School to be organized by the Department of Electrical Engineering at IIT Kanpur. The school was seeded by the JTG to serve as a platform for distinguished researchers to deliver lectures spanning contemporary research areas in signal processing, telecommunication, networking and information theory, for students, faculty, and researchers from all over India.

Brief Note on JTG: The JTG, comprising of faculty from various IITs and IISc, was formed with the aim of imparting cutting-edge technical knowledge in signal processing, telecommunications, networking, and allied fields to engineers, scientists, faculty and industry personnel from all over India. The JTG organizes the prestigious National Conference on Communication (NCC), held annually across member IITs and IISc.

2021 Padovani Lecturer: Prof. Muriel Médard



Muriel Médard is the Cecil H. Green Professor in the Electrical Engineering and Computer Science (EECS) Department at MIT. She leads the Network Coding and Reliable Communications Group at the Research Laboratory for Electronics at MIT. Her research interests include network coding, information theory, wireless networks, and optical networking.
<https://www.rle.mit.edu/people/directory/muriel-medard/>

Course 1: Introduction to Molecular Communications

This course will provide a detailed introduction to state-of-the-art molecular communications. Beginning with a demonstration of how molecular communication fits with the standard framework for analyzing communication systems, it will discuss various models for molecular communication, effective communication strategies, and information-theoretic analysis. The course will also include a practical perspective on the experimental validation of these results. The participants will be introduced to two successful, low-cost, tabletop experimental systems used in published research.

Speaker: Prof. Andrew Eckford



Andrew Eckford is an Associate Professor in the Department of Electrical Engineering and Computer Science at York University, Toronto, Ontario. His research interests include the application of information theory to biology, and the design of communication systems using molecular and biological techniques.
<http://www.andreweckford.com/>

Course 2: Machine Learning in Communications

The course will introduce concepts in statistical learning theory, including hypothesis classes and their complexity, followed by VC dimensions and generalization bounds in terms of VC dimensions, estimation theoretic interpretation of machine learning algorithms. Popular machine learning algorithms will be analyzed as ML and MAP estimators of appropriate generative models. Deep neural networks, an information-theoretic interpretation of neural networks based on the idea of an information bottleneck, and the role of point processes in machine learning will also be described.

Speaker: Prof. Harpreet S. Dhillon



Harpreet S. Dhillon joined Virginia Tech in 2014, where he is currently Associate Professor of Electrical and Computer Engineering and the Elizabeth and James E. Turner Jr. '56 Faculty Fellow. His research interests include communication theory, wireless networks, stochastic geometry, geolocation, and machine learning.
<https://www.dhillon.ece.vt.edu/>

Summer School 2021 will also include faculty talks in emerging areas in signal processing, communications, and information theory.

Registration Fees

Students and Postdocs
Rs. 100+ 18% GST

Faculties and Govt/Industry Professionals
Rs. 500 + 18% GST

Online School

Due to COVID-19 restrictions, the 12th JTG/IEEE IT Society summer school will be a virtual event for the first time in its history

Contact

For any query send us a mail at jtg2021@iitk.ac.in

or write to us at

Adrish Banerjee
Department of Electrical Engineering
IIT Kanpur
Kanpur 208016
UP, India

<http://www.iitk.ac.in/jtg2021>

2021 IEEE EAST ASIAN SCHOOL OF INFORMATION THEORY

KAIST, SOUTH KOREA

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National University of Singapore

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Fudan University

EASIT 2021 (Virtual), Aug 3-6

The 2021 IEEE East Asian School of Information Theory (EAIST) will be held **August 3 (Tue) to 6 (Fri)**. This is the Inaugural East Asian School of Information Theory. The School will be a virtual event featuring long-format tutorials from leading experts and interactive poster sessions.

Lecturers



Yuejie Chi
Carnegie Mellon University
Goldsmith Lecturer
2021



Changho Suh
KAIST
Distinguished Lecturer
2020-22



Vincent Tan
National University of Singapore
Distinguished Lecturer
2018-19



Lingfei Jin
Fudan University



Lalitha Sankar
Arizona State University
Distinguished Lecturer
2020-22



Deniz Gunduz
Imperial College London
Distinguished Lecturer
2020-22

Sponsored by



Poster Session

In addition to attending the tutorials, graduate students and postdoctoral researchers will have the opportunity to discuss their work in **interactive poster sessions**. The idea behind the sessions is to provide an informal and relaxed setting for students to get experience in presenting and to discuss their ideas and research. Posters are not refereed, and presenting previously published results as well as tutorial-style posters are welcome.

For further details: <http://csuh.kaist.ac.kr/easit>



THE FOLLOWING EMAIL ANNOUNCEMENT CONCERNING THE CANCELLED 2020 ALLERTON CONFERENCE IS BEING SENT TO YOU ON BEHALF OF PROFESSOR ALEJANDRO DOMINGUEZ-GARCIA AND PROFESSOR MAX RAGINSKY.

Hello everyone –

Based on preliminary discussion over Zoom on Tuesday, April 7th, and on the subsequent survey, the votes are overwhelmingly in favor of postponing the Allerton Conference to Fall 2021. While this was not an easy decision to make, as the Allerton Conference is an intellectual highlight of the Fall semester for many of us, we feel that this is a prudent course of action in the face of uncertainty surrounding the COVID-19 pandemic.

Best regards,

Alejandro Dominguez-Garcia and Max Raginsky
Allerton Conference Co-Chairs

Call for Papers: Due July 8, 2021

Manuscripts can be submitted from June 12-July 6, 2021 with the submission deadline of July 6th being firm. Please follow the instructions at allerton.csl.illinois.edu.

CONFERENCE CO-CHAIRS | ALEJANDRO DOMINGUEZ-GARCIA AND MAX RAGINSKY

INFORMATION FOR AUTHORS | Regular papers suitable for presentation in 20 minutes are solicited. Regular papers will be published in full (subject to a maximum length of eight 8.5" x 11" pages, in two column format) in the Conference Proceedings. Only papers that are actually presented at the conference and uploaded as final manuscripts can be included in the proceedings, which will be available after the conference on IEEE Xplore. For reviewing purposes of papers, a title and a five to ten page extended abstract, including references and sufficient detail to permit careful reviewing, are required.

IMPORTANT DATES | 2021

JULY 6 – Submission Deadline

AUGUST 3 – Author Notification Authors will be notified of acceptance via email by August 6, 2020, at which time they will also be sent detailed instructions for the preparation of their papers for the Conference Proceedings

AFTER AUGUST 7 – Registration Opens

SEPTEMBER 29 - OCTOBER 1 – Conference Dates

September 28 – Opening Tutorial Lectures at the Coordinated Science Lab, University of Illinois at Urbana-Champaign: Mihailo Jovanovic, University of Southern California and Tamara Broderick, Massachusetts Institute of Technology

September 30-2 – Conference Sessions at the University of Illinois Allerton Park & Retreat Center. The Allerton House is located 26 miles southwest of the Urbana-Champaign campus of the University of Illinois in a wooded area on the Sangamon River. It is part of the 1,500 acre Robert Allerton Park, a complex of natural and man-made beauty designated as a National natural landmark. Allerton Park has 20 miles of well-maintained trails and a living gallery of formal gardens, studded with sculptures collected from around the world.

Plenary Lecture: TBA

SEPTEMBER 29 – Final Paper Deadline Final versions of papers that are presented at the conference must be submitted electronically in order to appear in the Conference Proceedings and IEEE Xplore.

PAPERS PRESENTING ORIGINAL RESEARCH ARE SOLICITED IN THE AREAS OF:

- Biological Information Systems
- Coding Techniques and Applications
- Coding Theory
- Data Storage
- Information Theory
- Multiuser Detection and Estimation
- Network Information Theory
- Sensor Networks in Communications
- Wireless Communication Systems
- Intrusion/Anomaly Detection and Diagnosis
- Network Coding
- Network Games and Algorithms
- Performance Analysis
- Pricing and Congestion Control
- Reliability, Security and Trust
- Decentralized Control Systems
- Robust and Nonlinear Control
- Adaptive Control and Automation
- Robotics
- Distributed and Large-Scale Systems
- Complex Networked Systems
- Optimization
- Dynamic Games
- Machine Learning and Learning Theory
- Signal Models and Representations
- Signal Acquisition, Coding, and Retrieval
- Detection and Estimation
- Learning and Inference
- Statistical Signal Processing
- Sensor Networks
- Data Analytics
- Power System Control and Optimization

I ILLINOIS

The Allerton Conference is co-sponsored by the **Coordinated Science Lab** and the **Department of Electrical and Computer Engineering**.

WEBSITE | allerton.csl.illinois.edu EMAIL | amellis@illinois.edu

TECHNICAL CO-SPONSORS





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Tutorials

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Neda Aboutorab

Student Travel Grants

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The 2021 IEEE International Symposium on Information Theory (ISIT) will run as a virtual event 12–20 July 2021. The symposium will be delivered via a state-of-the-art virtual platform, which will provide both real-time and recorded presentations, tutorials and interactive networking opportunities.

Interested authors are encouraged to submit previously unpublished contributions from a broad range of topics related to information theory, including but not limited to the following areas:

- Communication and Storage Coding
- Coding Theory
- Coded and Distributed Computing
- Combinatorics and Information Theory
- Communication Theory
- Compressed Sensing and Sparsity
- Cryptography and Security
- Detection and Estimation
- Deep Learning for Networks
- Distributed Storage
- Emerging Applications of IT
- Information Theory and Statistics
- Information Theory in Biology
- Information Theory in CS
- Information Theory in Data Science
- Learning Theory
- Network Coding and Applications
- Network Data Analysis
- Network Information Theory
- Pattern Recognition and ML
- Privacy in Information Processing
- Quantum Information Theory
- Shannon Theory
- Signal Processing
- Source Coding and Data Compression
- Wireless Communication

Submitted and published manuscripts should not exceed 5 pages in length plus an optional extra page containing references only. Submitted manuscripts should be of sufficient detail to be evaluated by expert reviewers in the field. Full information about paper submission is on the conference website:

<http://isit2021.org/>

Paper submission deadline: ~~27 January 2021~~ 3 February 2021

Notification of acceptance: 23 April 2021

Note that the symposium runs over nine days, starting on 12 July and finishing on 20 July 2021 (the dates are based on Australian Eastern Standard Time). Online tutorials are held 17–18 July, and are included in all registration types. For the most recent information, visit the website and follow us on Twitter @ieee_itsoc.

The organizing committee looks forward to your scholarly contributions and participation in ISIT 2021.

Sponsors and Supporters



Conference Calendar

| DATE | CONFERENCE | LOCATION | WEB PAGE | DUE DATE |
|------------------------------|---|--|---|----------------|
| March 24–26, 2021 | The 55th Annual Conference on Information Sciences and Systems (CISS) | Johns Hopkins University, MD, USA (virtual) | https://ciss.jhu.edu/ | Passed |
| March 29–April 1, 2021 | IEEE Wireless Communications and Networking Conference (WCNC) | Nanjing, China (hybrid) | http://wcnc2021.ieee-wcnc.org/ | Passed |
| April 11–15, 2021 | IEEE Information Theory Workshop (ITW) | Virtual Conference | http://itw2020.it/home | Passed |
| April 13–15, 2021 | The 24th International Conference on Artificial Intelligence and Statistics (AISTATS) | Virtual Conference | https://aistats.org/aistats2021/ | Passed |
| May 4–8, 2021 | The 9th International Conference on Learning Representations (ICLR) | Virtual Conference | https://iclr.cc/ | Passed |
| May 10, 2021 | The 4th Age of Information Workshop (AoI) | Virtual Workshop | https://infocom2021.ieee-infocom.org/age-information-workshop/ | Passed |
| June 21–25, 2021 | The 53rd Annual ACM Symposium on the Theory of Computing (STOC) | Virtual Conference | http://acm-stoc.org/stoc2021/ | Passed |
| June 21–25, 2021 | IEEE North American School of Information Theory (NASIT) | University of British Columbia, Vancouver, Canada (virtual) | http://conferences.ece.ubc.ca/nasit2021/ | — |
| June 28–July 1, 2021 | JTG/IEEE ITSoc Summer School | Indian Institute of Technology Kanpur (virtual) | http://www.iitk.ac.in/jtg2021/ | — |
| July 7–10, 2021 | The 34th Annual Conference on Learning Theory (COLT) | Boulder, Colorado, USA (hybrid) | http://learningtheory.org/colt2021/index.html | Passed |
| July 12–20, 2021 | IEEE International Symposium on Information Theory (ISIT) | Melbourne, Victoria, Australia (virtual) | https://2021.ieee-isit.org | Passed |
| July 18–24, 2021 | The 38th International Conference on Machine Learning (ICML) | Virtual Conference | https://icml.cc/ | Passed |
| August 3–6, 2021 | IEEE East Asian School of Information Theory (EASIT) | Korea Advanced Institute of Science and Technology, Daejeon, South Korea (virtual) | http://csuh.kaist.ac.kr/easit/ | — |
| August 30–September 3, 2021 | The 11th International Symposium on Topics in Coding (ISTC) | Montréal, Canada (hybrid) | https://istc2021.org/ | April 25, 2021 |
| September 27–30, 2021 | The 22nd IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC) | Lucca, Italy (hybrid) | https://www.spawc2021.com/ | April 11, 2021 |
| September 29–October 1, 2021 | The 58th Annual Allerton Conference on Communication, Control, and Computing | Allerton, University of Illinois at Urbana-Champaign, USA | https://allerton.csl.illinois.edu/ | July 8, 2021 |
| October 17–21, 2021 | IEEE Information Theory Workshop (ITW) | Kanazawa, Japan | http://itw2021.org/ | April 30, 2021 |