Shantanu Rane

ADDRESS FOR CORRESPONDENCE

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RESEARCH INTERESTS

Broad areas: Applied Cryptography, signal processing, information theory
Specific topics: Secure multiparty computation, secure biometrics, differential privacy, device forensics, distributed source coding, augmented reality, visual inference, image and video compression, error concealment and error resilience.

PROFESSIONAL EXPERIENCE

Palo Alto Research Center (PARC), Palo Alto, CA
2014 – present : Senior Member of the Research Staff

Privacy-Preserving Analytics, Anonymization techniques, Secure Multiparty Computation.

Mitsubishi Electric Research Laboratories, Cambridge, MA
2007 – 2010 : Research Scientist
2010 – 2014 : Principal Research Scientist

Technical Lead for projects in Visual Inference, Privacy-Preserving Analytics, Secure Biometrics, Secure Multiparty Computation, Distributed Source Coding. Also worked in Synthetic Aperture Radar Data Compression. Details in the "Research Experience" section.

EDUCATION

Stanford University, Stanford, CA
2001 – 2007
Ph.D., Electrical Engineering, GPA: 3.71/4.0
Thesis: Systematic Lossy Error Protection of Video Signals

University of Minnesota, Minneapolis, MN
1999 – 2001
M.S., Electrical Engineering, GPA: 3.924/4.0
Research: Image inpainting, error concealment, Lossless image compression

Pune University, Government College of Engineering, INDIA
1995 – 1999
B.E., Instrumentation and Control Engineering, Ranked 1st of 360

RESEARCH EXPERIENCE

Palo Alto Research Center (PARC), 2014 - present

Privacy Preserving Analytics

Ongoing activity in analytics with data privacy and query privacy using statistical disclosure control mechanisms, homomorphic encryption and signal processing transformations.

Mitsubishi Electric Research Laboratories (MERL), 2007 - 2014

Secure Signal Processing (MERL Director's Award 2010)

Secure multiparty function computation under computational, information-theoretic and statistical security assumptions. Primary contributions at the present time include distance computation under privacy constraints, protocols using homomorphic functions, dimensionality reduction within cryptographic protocols, differential privacy for distributed databases. (more than 17 patents filed, **12 issued**.).

Visual Inference

Design of augmented reality schemes based on embeddings of scale-invariant image features. Primary contributions include a theoretical characterization of quantized nearest neighbor embeddings, and experimental results showing significant bit rate efficiency compared to state-of-the-art image retrieval schemes. (2 patents filed, **1 issued**).

Secure Biometrics

A secure fingerprint biometric system based on distributed source coding. The architecture enables authentication without storing a reference biometric at the access control device. Primary contributions include information-theoretic analysis, development of a feature transformation algorithm, design of error correcting codes for secure biometrics, participation in ISO/IEC SC37 biometric standards activity. (**3 patents issued**).

Data Hiding

Embedding information in structured graphics for applications in device forensics, watermarking and steganography. The hiding scheme is based on perturbing Bezier curves on the outlines of shapes and extraction is carried out via Procrustes analysis. The embedded information has been demonstrated to be robust to printing/scanning and multiple rounds of photocopying. (3 patents filed, **2 issued**.).

Distributed Source Coding

Design of new side information decoding algorithms for videos and multispectral and hyperspectral images. The research is driven by the need for low complexity encoding algorithms for surveillance and remote sensing. (4 patents filed, **1 issued**.)

Synthetic Aperture Radar (SAR) Data Compression

Compression of raw SAR data in a severely complexity-constrained environment. Contribution includes development and evaluation of transform-based compression algorithms, resulting in a successful bid to deliver Advanced Land Observation Satellite (ALOS-2) compression module.

Doctoral Research at Stanford University, 2001 - 2007

Systematic Lossy Error Protection of Video Signals

Invented a lossy error resilience framework using principles of distributed source coding. Implemented an error protection scheme with state-of-the-art H.264/AVC video codec under standardized testing scenarios. Performed high-rate analysis, modeling, and optimization of the end-to-end rate-distortion performance.

Masters Research at University of Minnesota, 1999 - 2001

Error concealment of images using Inpainting, a technique using partial differential equations from fluid dynamics. Performed a detailed evaluation of compression performance of JPEG-LS of on high-resolution elevation data.

Undergraduate Project at Tata Institute of Fundamental Research, India, 1998 - 1999

Designed an angular feed-positioning system for antennas of the Giant Meterwave Radio Telescope, focusing on positioning precision, customized speed profiles, communication with control station.

MENTORING EXPERIENCE

Supervised Ph.D. student interns at MERL, Cambridge, MA, 2007 – 2014

Yagiz Sutcu, Polytechnic University of NYU
Avinash Varna, University of Maryland
Abhishek Nagar, Michigan State University
Samarjit Das, Iowa State University
Svetislav Momcilovic, Technical University of Lisbon
Manas Pathak, Carnegie Mellon University
Ye Wang, Boston University
Jingyong Su, Florida State University
Mu Li, Penn State University
Bing-Rong Lin, Penn State University
Ravi Garg, University of Maryland
Qian Xie, Florida State University
Rohit Naini, University of Illinois, Urbana-Champaign

Ph.D. Theses Co-Supervised

Ye Wang, Ph.D., Boston University, 2011.
Manas Pathak, Ph.D. candidate, Carnegie Mellon University, 2012
Juan Ramon Troncoso Pastoriza, Ph. D. candidate, University of Vigo, 2012

Teaching Experience

Teaching assistant for several undergraduate and graduate courses. My responsibilities included directing laboratory sessions, conducting problem sessions, weekly office hours, helping the instructor to generate course materials, designing and maintaining websites.

Stanford University, 2001 – 2007

Laboratory TA in the Stanford Center for Image Systems Engineering (SCIEN)

University of Minnesota, 1999 – 2001

Linear Systems and Circuits
Electronic Drives
Introduction to Electrical and Electronic Circuits
Circuits and Electronics Laboratory

ACADEMIC AND PROFESSIONAL ACTIVITIES

Information Forensics and Security Technical Committee Member, 2011 – 2013

I was elected to the IFS Technical Committee in 2010. This committee promotes research activity in information forensics, watermarking, biometrics and other areas under the aegis of the IEEE Signal Processing Society. It organizes a conference oversees a transactions journal in the field.

Associate Editor, IEEE Transactions on Information Forensics and Security, 04/2012 – 01/2015

I am covering reviews of papers submitted under the Signal Processing EDICS related to secure multiparty computation, anonymous statistics, biometrics and related areas.

Associate Editor, IEEE Signal Processing Letters, 01/2012 – 01/2014

I am covering reviews of papers submitted under the Signal Processing EDICS related to information forensics and security.

Associate Editor, Inside Signal Processing, 2010 – 2014

This is the monthly eNewsletter of the IEEE Signal Processing Society. I was in charge of Conference News and New Initiatives and Trends in Signal Processing.

Chairing

Area Chair: IEEE International Conference on Image Processing (ICIP 2013)
Technical Co-Chair: IEEE Workshop on Information Forensics and Security (WIFS 2014)
Area Chair: IEEE International Conference non Biometrics: Theory, Applications and Systems (BTAS 2015)

Technical Program Committees of Conferences

International Conference on Multimedia and Expo (ICME 2010, 2011, 2012, 2013)
IEEE Workshop on Information Forensics and Security (WIFS 2011, 2012, 2013, 2014)
European Signal Processing Conference (EUSIPCO 2012)
IAPR International Conference on Biometrics (ICB 2012, ICB 2015)
International Symposium on Multimedia for Wireless (ISMW 2008, 2012)

Session Chair at Conferences, by invitation

International Conference on Acoustics, Speech & Signal Processing (ICASSP 2010, 2011)
International Conference on Multimedia and Expo (ICME 2010)
Multimedia Signal Processing Workshop (MMSP 2010, 2012)
IEEE Workshop on Information Forensics and Security (WIFS 2010, 2011)

Peer Reviewer for Technical Journals, 2001 – present

IEEE Transactions on Circuits and Systems for Video Technology,
IEEE Transactions on Communications,
IEEE Transactions on Image Processing,
IEEE Transactions on Information Theory,
IEEE Transactions on Information Forensics and Security,
IEEE Transactions on Geosciences and Remote Sensing
IEEE Transactions on Multimedia
IEEE Signal Processing Letters,
Elsevier Journal on Signal Processing: Image Communication,
Eurasip Journal on Wireless Communications and Networking,
Elsevier Journal on Performance Evaluation (PEVA),
SIAM Journal on Imaging Sciences

Peer Reviewer for Conference Proceedings, 2001 – present

IEEE International Conference on Image Processing (ICIP),
IEEE International Conference on Acoustics, Speech, Signal Processing (ICASSP),
IEEE International Conference on Multimedia and Expo (ICME)
IEEE International Conference on Communications (ICC),
IEEE International Symposium on Information Theory (ISIT)
IEEE Signal Processing Workshop,
IEEE International Symposium on Circuits and Systems (ISCAS),
IEEE Globecomm
Packet Video Workshop,
Sarnoff Symposium,
European Signal Processing Conference (EUSIPCO),
Canadian Conference on Electrical and Computer Engineering (CCECE)
Canadian Workshop on Information Theory (CWIT)
International Symposium on Multimedia for Wireless
Wireless Communication and Networking Conference (WCNC)

Video Compression Standards, 2006 – 2007 and 2011

Invited to meetings of Joint Video Team of ITU-T/MPEG to propose a systematic lossy error protection scheme as a non-normative extension to the H.264/AVC video coding

standard. Drafted Core Experiments (CEs) on error resilient transmission of RTP packetized video and presented progress reports on Core Experiments.

INCITS/M1 Biometrics Standards, 2008 – 2014

Voting Member of US National Committee for Biometric Standards. I participate in meetings of the groups M1.3 (Data Interchange Formats) and M1.5 (Biometric Performance Testing).

ISO/IEC JTC1 SC37 Standards Subcommittee on Biometrics, 2010 - 2014

Chief Editor of Working Draft WD 30136, a new standard on Performance Testing of Biometric Template Protection Schemes.

Participation in meetings of Working Groups 3 and 5 as a representative of the US Delegation to the SC 37 International Standards Organization Meetings.

HONORS AND AWARDS

Elevated to Senior Member IEEE 2012

Mitsubishi Electric Research Laboratories Directors Award 2010
In recognition of contributions to Secure Computation

Pune University Gold Medallist 1999
For first rank in the graduating class of Instrumentation and Control Engineering (1/360)

J. N. Tata Scholarship for higher education in the United States 1999

IEEE Concepts Best Undergraduate Project Award 1999
For *Angular Feed Positioning System for Antennas of the Giant Meterwave Radio Telescope*. Also, awarded best project in microprocessors and peripheral interfacing.

Maharashtra State Meritorious Student Scholarship 1995-99
Awarded for excellence in freshman through senior years.

Higher Secondary Certificate Examination 1995
Ranked *3rd in General Merit* List out of more than 100,000 students
Ranked *1st in Vocational Sciences* (Physics, Chemistry, Mathematics, Electronics)
Ranked *1st in Physics*

National Talent Search Scholarship 1993
Awarded by the Government of India to 750 students every year after written exams and interviews in physics, chemistry, biology, mathematics, history, civics, geography and economics

JOURNAL PUBLICATIONS AND BOOK CHAPTERS

1. S. Rane, Standardization of Biometric Template Protection, IEEE Multimedia Magazine, Vol. 21, No. 4, pp. 94--99, October 2014.

2. S. Rane, Y. Wang, S. C. Draper and P. Ishwar, Secure Biometrics: Concepts, Authentication Architectures and Challenges, IEEE Signal Processing Magazine, September 2013, vol. 30, no. 5, pp. 51-64, September 2013.

3. S. Rane and P. Boufounos, Privacy Preserving Nearest Neighbor Methods, IEEE Signal Processing Magazine, vol. 30, no. 2, pp. 18-28, March 2013.

4. M. Pathak, B. Raj, S. Rane and P. Smaragdis, Privacy-Preserving Speech Processing, IEEE Signal Processing Magazine, vol. 30, no. 2, pp. 62-74, March 2013

5. Y. Wang, S. Rane, S. C. Draper and P. Ishwar, A Theoretical Analysis of Authentication, Privacy and Reusability Across Secure Biometric Systems, IEEE Trans. Information Forensics and Security, vol. 7, no. 6, pp. 1825-1840, December 2012.

6. A. Vetro, S. C. Draper, S. Rane and J. S. Yedidia, Securing Biometric Data, in *Distributed Source Coding - Theory and Applications*, P. L. Dragotti and M. Gastpar Eds., ISBN-13: 978-0-12-374485-2, Elsevier Academic Press, 2009.

7. S. Rane, P. Baccichet, and B. Girod, Systematic Lossy Error Protection of Video Signals, IEEE Trans. Circuits and Systems for Video Technology, vol. 18, no. 10, pp. 1347-1360, October 2008.

8. P. Baccichet, S. Rane, and B. Girod, Systematic Lossy Error Protection based on H.264/AVC Redundant Slices and Flexible Macroblock Ordering, Journal of Zheijang University, Science A, vol. 7, no. 5, pp. 727-736, May 2006.

9. D. Rebollo-Monedero, S. Rane, A. Aaron, and B. Girod, High-Rate Quantization and Transform Coding with Side Information at the Decoder, EURASIP Signal Processing Journal, Special Issue on Distributed Source Coding, Invited paper, No. 86, pp. 3160-3179, November 2006.

10. B. Girod, A. Aaron, S. Rane, D. Rebollo-Monedero, Distributed Video Coding, Proceedings of the IEEE, Special Issue on Advances in Video Coding and Delivery, Invited Paper, Vol. 93, No. 1, pp. 71-83, January 2005. [**more than 1000 citations**]

11. S. Rane, M. Bertalmio, G. Sapiro, Structure and Texture Filling-in of missing image blocks for Wireless Transmission and for Compression Applications, IEEE Trans. Image Processing, Vol. 12, No. 3, pp. 296-303, March 2003. [**more than 100 citations**]

12. S. Rane, G. Sapiro, Evaluation of JPEG-LS, the new lossless and near-lossless still image compression standard, for Compression of High Resolution Elevation Data, IEEE Trans. Geosciences and Remote Sensing, Vol. 39, No. 10, pp. 2298-2306, October 2001.

PEER-REVIEWED CONFERENCE PUBLICATIONS

1. Y. Wang, P. Ishwar and S. Rane, An Elementary Completeness Proof for Secure Two-Party Computation Primitives, IEEE Information Theory Workshop (ITW 2014), Hobart, New Zealand, November 2014.

2. J. Freudiger, S. Rane, A. Brito, and E. Uzun, Privacy-Preserving Data Quality Assessment for High-Fidelity Data Sharing, ACM Workshop on Information Sharing and Collaborative Security, A Workshop of Computer and Computer Security Conference (CCS 2014), Scottsdale, AZ, November 2014.

3. S. Rane and E. Uzun, A Fuzzy Commitment Approach to Privacy Preserving Behavioral Targeting, ACM Workshop on Security and Privacy in Mobile Environments (SPME 2014, A Mobicomm Workshop), Maui, Hawaii, September 2014.

4. R. Naini, S. Rane and S. Ramalingam, A Vanishing Point-Based Global Descriptor for Manhattan Scenes, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2014), Florence, Italy, May 2014.

5. Y. Wang, P. Ishwar and S. Rane, Information-theoretically Secure Three-Party Computation with One Corrupted Party, IEEE International Symposium on Information Theory (ISIT 2013), Istanbul, Turkey, July 2013.

6. R. Garg and S. Rane, A Keypoint Descriptor for Alignment-Free Fingerprint Matching, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2013), Vancouver, Canada, May 2013.

7. P. T. Boufounos and S. Rane, Efficient Coding of Signal Distances Using Universal Quantized Embeddings, Data Compression Conference (DCC 2013), Snowbird, UT, March 2013.

8. B. -R. Lin, Y. Wang and S. Rane, "A Framework for Privacy Preserving Statistical Analysis on Distributed Databases", IEEE International Workshop on Information Forensics and Security (WIFS 2012), Tenerife, Spain, December 2012.

9. M. Li, S. Rane and P. Boufounos, Quantized Embeddings of Scale-Invariant Image Features for Mobile Augmented Reality, IEEE International Workshop on Multimedia Signal Processing (MMSP 2012), Banff, Canada, September 2012. [**Top 10% paper award**]

10. W. Sun and S. Rane, A Distance-Sensitive Attribute Based Cryptosystem for Privacy-Preserving Querying, IEEE International Conference on Multimedia and Expo (ICME 2012), Melbourne, Australia, July 2012.

11. P. Boufounos and S. Rane, Secure Binary Embeddings for Privacy Preserving Nearest Neighbors, IEEE International Workshop on Information Forensics and Security, (WIFS 2011), Iguazu Falls, Brazil, December 2011. [**30% acceptance**]

12. S. Rane, P. Boufounos, A. Vetro and Y. Okada, Low-complexity rate-efficient SAR raw data compression, SPIE Defense and Security, Algorithms for Synthetic Aparture Radar Imagery XVIII, Orlando, FL, April 2011.

13. S. Rane and W. Sun, Privacy-Preserving String Comparisons based on Levenshtein Distance, IEEE Workshop on Information Forensics and Security (WIFS 2010), Seattle, WA, December 2010. [**28% acceptance**]

14. S. Rane, Y. Wang, P. Boufounos and A. Vetro, Wyner-Ziv Coding of Multispectral Images for Space and Airborne Platforms, Picture Coding Symposium (PCS 2010), Nagoya, Japan, December 2010.

15. M. Pathak, S. Rane and B. Raj, Multiparty Differential Privacy via Aggregation of Locally Trained Classifiers, Neural Information Processing Conference (NIPS 2010), Vancouver, BC. Canada, December 2010. [**24% acceptance**]

16. S. Momcilovic, Y. Wang, S. Rane and A. Vetro, Toward Real-time Side Information Decoding on Multi-core Processors, IEEE International Workshop on Multimedia Signal Processing (MMSP 2010), Saint Malo, France, October 2010.

17. Y. Wang, S. Rane, W. Sun and P. Ishwar, On Unconditionally Secure Computation with Vanishing Communication Cost, 48th Allerton Conference on Communication, Control and Computing, Monticello, IL, October 2010.

18. S. Rane, W. Sun and A. Vetro, Privacy-Preserving Computation of L1 Distance for Multimedia Applications, IEEE International Conference on Multimedia and Expo (ICME 2010), Singapore, July 2010. [**15% acceptance for papers**]

19. A. Nagar, S. Rane, and A. Vetro, Privacy and Security of Features extracted from Minutiae Aggregates, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2010), Dallas, TX, March 2010.

20. S. Das, S. Rane, and A. Vetro, Hiding Information Inside Structured Shapes, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2010), Dallas, TX, March 2010.

21. Y. Wang, S. Rane, and A. Vetro, Leveraging Reliable Bits: ECC Design Considerations in Secure Biometrics, IEEE International Workshop on Information Forensics and Security (WIFS), London, England, December, 2009. [**30% acceptance**]

22. S. Rane, W. Sun and A. Vetro, Secure Distortion Computation among Untrusting Parties using Homomorphic Encryption, IEEE International Conference on Image Processing (ICIP 2009), Cairo, Egypt, November, 2009.

23. W. Sun, and S. Rane, On Information Leakage during Secure Verification of Compatibility between Signals, 11th Canadian Workshop on Information Theory (CWIT 2009), Ottawa, Canada, May, 2009.

24. A. Varna, S. Rane and A. Vetro, Data Hiding in Hard-Copy Text Documents Robust to Print, Scan and Photocopy Operations, IEEE International Conference on Acoustics, Speech and Signal Processing, Taipei, Taiwan, April, 2009.

25. G. Fraidenraich, Z. Xu, S. Rane and J. Cioffi, On Capacity of Frequency Selective Multipath Channels with Path Correlations, 9th IEEE International Workshop on Signal Processing Advances in Wireless Communications, Recife, Brazil, July 6-9, 2008.

26. Y. Sutcu, S. Rane, J. S. Yedidia, S. C. Draper, and A. Vetro, Feature Extraction for a Slepian-Wolf Biometric System using LDPC Codes, IEEE International Symposium on Information Theory (ISIT 2008), Toronto, Canada, July 2008.

27. P. Baccichet, S. Rane, A. Chimienti and B. Girod, Robust Low-Delay Video Transmission using H.264/AVC Redundant Slices, IEEE International Conference on Image Processing, San Antonio, Texas, September 2007

28. S. Rane, D. Rebollo-Monedero, B. Girod, High-Rate Analysis of Systematic Lossy Error Protection of a Predictively Encoded Source, Proceedings of the Data Compression Conference (DCC 2007), Snowbird, Utah, March 2007.

29. P. Baccichet, S. Rane, and B. Girod, Systematic Lossy Error Protection based on H.264/AVC Redundant Slices and Flexible Macroblock Ordering, Proceedings of the Packet Video Workshop, Hangzhou, China, April 2006.

30. S. Rane, P. Baccichet and B. Girod, Modeling and Optimization of a Systematic Lossy Error Protection based on H.264/AVC Redundant Slices, Picture Coding Symposium (PCS 2006), Beijing, China, April 2006.

31. S. Rane and B. Girod, Systematic Lossy Error Protection based on H.264/AVC Redundant Slices, SPIE Visual Communications and Image Processing (VCIP 2006), San Jose, CA, USA, Vol. 6077, January 2006.

32. S. Rane, A. Aaron and B. Girod, Error-Resilient Video Transmission using Multiple Embedded Wyner-Ziv descriptions, Proceedings of the IEEE International Conference on Image Processing (ICIP 2005), Vol. 2, pp. 666-669, Genoa, Italy, September 2005.

33. X. Zhu, S. Rane and B. Girod, Systematic Lossy Error Protection for Video Transmission over Wireless Ad Hoc Networks, SPIE Visual Communications and Image Processing (VCIP 2005), Vol. 5960, pp. 1849-1860, Beijing, China, July 2005.

34. S. Rane and B. Girod, Systematic Lossy Error Protection versus Layered Coding with Unequal Error Protection, SPIE Image and Video Communications and Processing, Vol. 5685, San Jose, CA, USA, January 2005.

35. D. Rebollo-Monedero, S. Rane and B. Girod, Wyner-Ziv Quantization and Transform Coding of Noisy Sources at High Rates, Proceedings of the Asilomar Conference on Signals and Systems, Vol. 2, pp. 2084-2088, Pacific Grove, CA, USA, November 2004.

36. S. Rane, A. Aaron, and B. Girod, Systematic Lossy Forward Error Protection for Error Resilient Digital Video Broadcasting - A Wyner-Ziv Coding Approach, Proceedings of the IEEE International Conference on Image Processing (ICIP 2004), Vol. 5, pp. 3101- 3104, Singapore, October 2004.

37. A. Aaron, S. Rane and B. Girod, Wyner-Ziv coding with Hash-based Motion Compensation at the Receiver, Proceedings of the IEEE International Conference on Image Processing (ICIP 2004), Vol. 5, pp. 3097-3100, Singapore, October 2004.

38. S. Rane, A. Aaron, and B. Girod, Systematic Lossy Forward Error Protection for Error Resilient Digital Video Broadcasting, SPIE Visual Communications and Image Processing (VCIP 2004), Vol. 5308, San Jose, CA, USA, January 2004.

39. A. Aaron, S. Rane, E. Setton, and B. Girod, Transform-domain Wyner-Ziv Codec for Video, SPIE Visual Communications and Image Processing (VCIP 2004), Vol. 5308, San Jose, CA, USA, January 2004.

40. A. Aaron, S. Rane, R. Zhang, and B. Girod, Wyner Ziv coding for Video: Applications to Compression and Error Resilience, Proceedings of the Data Compression Conference (DCC 2003), pp. 93-102, Snowbird, UT, USA, March 2003. [**more than 100 citations**]

41. S. Rane, J. Remus, G. Sapiro, Wavelet Domain Reconstruction of Lost Blocks in Wireless Image Transmission, Proceedings of the IEEE International Conference on Image Processing (ICIP 2002), Poster, Vol. 1, pp. 309-312, Rochester, NY, USA, September 2002.

42. S. Rane, M. Bertalmio, G. Sapiro, Structure and Texture Filling-in of missing image blocks for Wireless Transmission and Compression, Proceedings of the IEEE International Conference on Image Processing (ICIP 2002), Poster, Vol. 1, pp. 317-320, Rochester, NY, USA, September 2002.

INVITED CONFERENCE PUBLICATIONS

1. H. Mansour, S. Rane, P. Boufounos and A. Vetro, Video Querying via Compact Descriptors of Visually Salient Features, IEEE International Conference on Image Processing (ICIP 2014), Paris, France, October 2014.

2. Y. Wang, S. Rane and P. Ishwar, On Unconditionally Secure Multiparty Computation for Realizing Correlated Equilibria in Games, IEEE Global Conference on Signal and Information Processing, Austin, TX, December 2013.

3. P. Boufounos and S. Rane, Embedding-based Representation of Signal Distances, IEEE Global Conference on Signal and Information Processing, Austin, TX, December 2013.

4. S. Rane, P. Boufounos, and A. Vetro, Quantized Embeddings: An Efficient and Universal Nearest Neighbor Method for Cloud-based Image Retrieval, SPIE Optics and Photonics; Applications of Digital Image Processing, San Diego, CA, August 2013.

5. S. Rane and W. Sun, An Attribute-based Framework for Privacy Preserving Image Querying, IEEE International Conference on Image Processing (ICIP 2012), Special Session on Recent Advances in Cryptography and Image Processing, Orlando, FL, October 2012.

6. Y. Wang, S. Rane, P. Boufounos and A. Vetro, Distributed Compression of Zerotrees of Wavelet Coefficients, IEEE International Conference on Image Processing (ICIP 2011), Brussels, Belgium, October 2011.

7. M. Pathak, S. Rane, W. Sun and B. Raj, Privacy-Preserving Probabilistic Inference with Hidden Markov Models, IEEE International Conference on Acoustics Speech and Signal Processing (ICASSP 2011), Prague, Czech Republic, May 2011.

8. Y. Wang, S. Rane, S.C. Draper and P. Ishwar, An Information-Theoretic Analysis of Revocability and Reusability in Secure Biometrics, Workshop on Information Theory and its Applications (ITA 2011), San Diego, CA, February 2011.

9. A. Nagar, S. Rane, and A. Vetro, Alignment and Bit Extraction for Secure Fingerprint Biometrics, SPIE Conference on Electronic Imaging, Workshop on Biometric Security, San Jose, CA, January 2010.

10. S. Rane, W. Sun and A. Vetro, Secure Function Evaluation based on Secret Sharing and Homomorphic Encryption, 47th Allerton Conference on Communication, Control and Computing, Monticello, IL, October, 2009.

11. Y. Sutcu, S. Rane, J. S. Yedidia, S. C. Draper, and A. Vetro, Feature Transformation for a Slepian-Wolf Biometric System based on Error Correcting Codes, Computer Vision and Pattern Recognition (CVPR 2008), Workshop on Biometrics, Anchorage, Alaska, June 2008.

12. S. Rane and B. Girod, Analysis of Error-Resilient Video Transmission based on Systematic Source-Channel Coding, Picture Coding Symposium (PCS 2004), San Francisco, CA, USA, December 2004.

13. A. Aaron, S. Rane, D. Rebollo-Monedero, and Bernd Girod, Systematic Lossy Forward Error Protection for Video Waveforms, Proceedings of the IEEE International Conference on Image Processing (ICIP 2003), Vol. 1, pp. 6109-612, Barcelona, Spain, September 2003.

CONTRIBUTIONS TO SCIENCE MAGAZINES AND ARTICLES

1. Ivars Peterson, Filling in Blanks, Science News, May 11, 2002.

2. Kathy Svitil, A Digital Fix for Damaged Artwork, Discover Magazine, October 2002.

3. Enhancing your Image, Mathematical Moments Series (#24), American Mathematical Society.

STANDARDIZATION CONTRIBUTIONS

1. S. Rane, P. Baccichet and B. Girod, Systematic Lossy Error Protection based on H.264/AVC Redundant Slices, Document No. JVT-S025, 19th JVT meeting, Geneva, Switzerland, March 31-April 7, 2006.

2. S.Rane, P. Baccichet and D. Y. Suh, Core Experiments on Parity Based Schemed for Error Resilience in H.264/AVC and SVC, Document No. JVT-S306, 19th JVT meeting, Geneva, Switzerland, March 31-April 7, 2006.

3. S. Rane, P. Baccichet and B. Girod, Progress report on CE6: Systematic Lossy Error Protection based on H.264/AVC Redundant Slices and Flexible Macroblock Ordering, Document No. JVT-T093, 20th JVT meeting, Klagenfurt, Austria, July 15-21, 2006.

4. P. Baccichet, S. Rane and D. Y. Suh, Core Experiment 9 on Error Resilience Schemes for H.264/AVC and SVC, Document No. JVT-T309, 20th JVT meeting, Klagenfurt, Austria, July 15-21, 2006.

5. S. Rane, P. Baccichet and B. Girod, Progress report on CE9: Systematic Lossy Error Protection based on H.264/AVC Redundant Slices, Document No. JVT - U057, 21st JVT meeting, Hangzhou, China, October 21-26, 2006.

6. S. Rane, Secure Biometrics: Principles, Implementation & Metrics, INCITS/M1.5 Task Group Meeting, Morgantown, WV, April 6-9, 2010. Also presented as a US Contribution to Working Group 5 of the ISO SC37 Subcommittee on Biometrics, Kuala Lumpur, Malaysia, July 15, 2010

7. S. Rane, Performance Evaluation of Biometric Template Protection Systems, A technical contribution to M1.5, INCITS/M1 meeting, Gaithersburg, MD, April 2012. Also presented as a US Contribution to Working Group 5 of the ISO SC37 Subcommittee on Biometrics, Paris, France, July 11, 2012

OTHER INVITED TALKS AND PANELS

WD30136 Performance Testing of Template Protection Schemes, April 2014
International Biometric Performance Testing Conference, NIST.

The Many Homes of Contemporary Video, April 2014
IEEE INFOCOM 2014 Workshop on Communication and Networking Techniques for Video, Toronto.

Privacy-Security Tradeoffs in Biometric Template Protection, February 2014
ECE Colloquium, Tufts University

Quantized Scale-Invariant Embeddings for Mobile Augmented Reality, March 2013
EE Graduate Seminar, Worcester Polytechnic Institute

Distance Computation under Privacy Constraints, February 2010
Language Technologies Institute (LTI) Colloquium, Carnegie Mellon University

Secure Biometrics based on Slepian-Wolf Coding, April 2010
West Virginia University

Comparing Signals under Privacy Constraints, October 2010
Cloud Computing Symposium, Stony Brook University

WORK AUTHORIZATION INFORMATION

Indian citizen, US Permanent Resident (*EB1 Outstanding Researcher*)