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Introduction

The eleventh annual SPIE conference on Independent Component Analysis (ICA), Compressive Sampling, Wavelets, Neural Networks, Biosystems and Nanoengineering, continues our yearly tradition of contributing and communicating knowledge to one another. The SPIE Defense Security and Sensing (DSS) Symposium has provided our community with the proper venue to exchange information, provide education through short courses and networking through various hospitality events. Boasting over 500 exhibiting vendors and talks given by over 7000 scientists and engineers worldwide, the symposium is an immense gathering. Our conference however, is relatively small, but has a rapid dissemination of the timely work in the disciplines covered. New to the conference this year is Compressive Sampling and post conference publication. We appreciate the timely submissions of our authors and the patience of our readers.

Being co-chairs, we often face questions about our goals and focus for the future of the conference series. To state the question plainly, how has the conference endured, and how can it continue to endure and evolve in a changing scientific environment? The answer lies partly in the following secret: We have adapted a workable system tested by the Nobel Foundation for over half a century—passing the baton of honor… "The past award recipients shall determine the new awardees." The role SPIE and the co-chairs serve are to act as facilitators for the decision process. A major difference between the systems is a lack of recourse in supporting the awardees. Thus we have improvised a temporary win-win-win solution: in order to prepare the interdisciplinary audience, state of the art knowledge is disseminated by both past and present award recipients, who are encouraged to teach short courses at the meetings.

Driven by our desire to learn from nature, the SPIE conference on wavelets has evolved, and is now in its 18th year with SPIE. When the conference started 18 years ago (1994 in Orlando) progress began slowly. Then, year after year, knowledge began growing, building, and changing. The evolution of knowledge has led to a strong foundation for the work this year. The use of wavelets has seen much progress from a biomedical standpoint, from the 2012 Wavelet Pioneer Award Recipient Prof. Zuowei Shen (National University of Singapore), we have learned how to apply wavelet frames to image restoration, image segmentation and surface reconstruction. Unsupervised learning uses artificial neural networks to imitate the human brain's ability to learn from sensor pairs, a vector (not scalar) time series of data. The 2012 recipient of the Unsupervised Learning Neural Network Independent Component Analyses (ICA), Dr. Emmanuel Vincent (IRISA / INRIA Rennes, France), explained how ICA can be used for audio source separation and multisource audio content retrieval. Compressive sampling is not

a post-processing compression, e.g. wavelet JPEG 2000 standard. Assuming a sparse information content, k degree of freedom, Emmanuel Candes of Caltech (now at Stanford), Justin Romberg of GIT, Terrence Tao of UCLA and currently by David Donoho of Stanford (CRT&D) took a pseudo-orthogonal set of m linear mixtures, m~1.3 k, of the original sensed data X. CRT&D applied an efficient linear programming to recover the original pixel data in LMS sense at the *a priori* constraint of sparseness, e.g. min. |X|. The 2012 Pioneer Award in Compressive Sampling was presented to Prof. Richard Baraniuk (Rice University) for demonstrated signal processing. We introduced our 2012 Nano-Engineering Pioneer Award recipient Prof. Yiping Zhao (University of Georgia), who will provide insight from the field of practical SERS sensing. He demonstrated that the aligned silver nanorod (AgNR) array substrates engineered by the oblique angle deposition method are capable of providing extremely high SERS enhancement factors (>10^8). Today we are able to see and explore single-molecule activities using superresolution fluorescence microscopy that was invented by our 2012 System Biology Pioneer Award recipient, Prof. Xiaowei Zhuang (Harvard University). Finally, the powerful feature selection techniques are applied to the problems in bioinformatics by the Biomedical Wellness award recipient Prof. Lipo Wang (Nanyang Technological Univ., Singapore). The biomedical wellness challenges and opportunities are described by Dr. John F. Tangney (Office of Naval Research), the 2012 Leadership Award recipient in Biomedical Wellness. We wish to thank all of 2011 recipients, who headed the selection process for this year's awardees: Prof. John Benedetto, Prof. Metin Sitti, Dr. Hiroshi Nakajima, Prof. Doug Lauffenburger, Prof. Soo-Young Li and Dr. Hyung-Min Park. The conference would not be a success without you and your generous contributions.

We would also like to thank the SPIE technical support staff and last but certainly not least, we would like to thank the members of the program committee, especially the great effort led by our Web Master Yufeng Zheng, establishing a website collecting our accomplishment over the past 18 years.

Harold Szu
Liyi Dai