

IEEE Signal Processing Society PROGRESS

Support for underrepresented talent in the field of signal processing

Promoting Diversity in Signal Processing (PROGRESS) is a new initiative of the IEEE Signal Processing Society (SPS), aiming to motivate and support women and underrepresented minorities to pursue academic careers in signal processing; see ieeeprogess.org. The PROGRESS logo, as seen in Figure 1, was created by Marija Iloska, a Ph.D. student, and Prof. Petar Djuric, of Stony Brook University, New York, United States. PROGRESS includes workshops at ICASSP and ICIP conferences as well as follow-up surveys and mentoring teleconferences. This article describes the first PROGRESS workshop and reports on the results of a survey that was taken by the workshop participants.

Women and underrepresented minorities account for only 11% of the SPS's membership. At PROGRESS, we believe that diversity and inclusion are pillars of innovation. The key to increasing diversity and inclusion in signal processing is a more diverse faculty. Such faculty offer role models and are well positioned to draw women and underrepresented minorities to the field and inspire them for excellence.

The first PROGRESS workshop was held virtually on 26–27 October 2020, during ICIP 2020. It was attended by 202 students from 34 different countries:

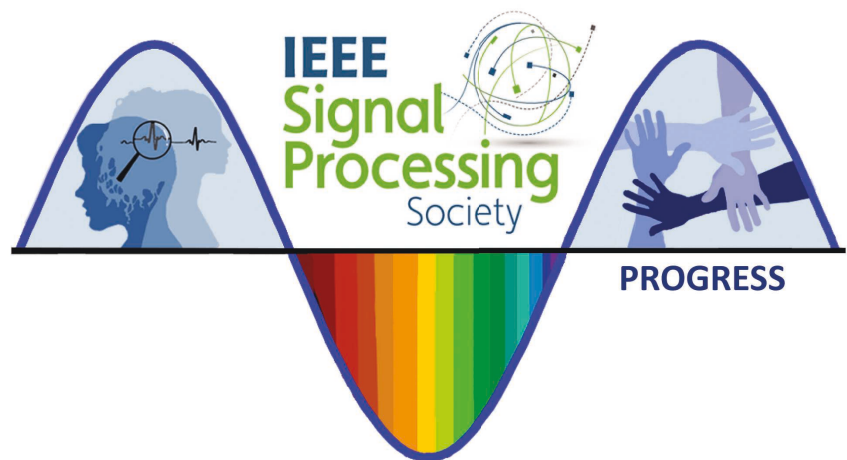


FIGURE 1. The PROGRESS logo; see ieeeprogess.org for more information.

the United States (57), India (42), China (40), Canada (7), the United Arab Emirates (UAE, 6), Bangladesh (5), Spain (3), Sri Lanka (3), Switzerland (2), Tunisia (2), Malaysia (2), the United Kingdom (2), Egypt (2), Ireland (2), Brazil (2), Austria (2), and one each from Colombia, Ecuador, Algeria, Australia, Italy, Lebanon, Indonesia, Ghana, Greece, Pakistan, Peru, Poland, Portugal, Qatar, Saudi Arabia, and Turkey.

The workshop started with a greeting from SPS President Dr. Ahmed Tewfik. Day 1 included an inspirational talk by Prof. Mary (Missy) Cummings, faculty of electrical and computer engineering (ECE) at Duke University, who is a leading researcher in human–

robot interaction and one of the U.S. Navy's first female fighter pilots. It also included two panels of high-profile academics from around the world discussing the faculty-hiring process in their countries. The first panel was scheduled at a time convenient for the Eastern Hemisphere. It was moderated by IEEE SPS Vice President, Membership Prof. K.V.S. Hari of the Indian Institute of Science Bangalore, India, and it featured Dr. Lina Karam, dean of the School of Engineering at Lebanese American University, Beirut, Lebanon; Dr. Hussain Al-Ahmad, dean of Engineering at the University of Dubai, UAE; Dr. Zhi-Quan Tom Luo, academic vice president of the Chinese

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University of Hong Kong, Shenzhen, China; and Dr. Markus Rupp, university professor, Technische Universität Wien (TU Wien), Vienna, Austria.

The second panel was scheduled at a time convenient for the Western Hemisphere. It was moderated by Prof. Ana Isabel Pérez-Neira of Universitat Politècnica de Catalunya, Barcelona, Spain, a member of the SPS Board of Governors. It featured Prof. Stella Batalama, dean of the College of Engineering and Computer Science, Florida Atlantic University, Boca Raton, Florida, United States; Prof. Christian Jutten, University Grenoble-Alpes, Grenoble, France; Prof. Kon-

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stantina Nikita, National Technical University of Athens, Greece; Prof. Nikolaos Sidiropoulos, chair of ECE at the University of Virginia, Charlottesville, Virginia, United States; Prof. Roy Yates, chair of the Faculty Search Committee of Rutgers University, Piscataway, New Jersey, United States; and Prof. Anderson Rocha, director of the Institute of Computing, University of Campinas, Brazil.

Day 1 also included two panels of academics sharing their faculty experiences. The first panel, targeting the Eastern Hemisphere, featured Prof. Deepa Kundur, chair of the Department of ECE, University of Toronto, Canada; Prof. Anubha Gupta, Indraprastha Institute of Information Technology, Delhi, India; Prof. Qian He, University of Electronic Science and Technology, Chengdu, China; Prof. Islem Rekik, Istanbul Technical University, Turkey; and Prof. Odette Scharenborg, Delft University of Technology, The Netherlands.

The second panel, targeting the Western Hemisphere, featured Prof. Carol Y. Espy-Wilson of the University of Maryland, College Park, United States; Prof. Piya Pal of the University of California San Diego; Prof. Roxana Saint-Nom of Universidad Argentina de la Empresa, Buenos Aires, Argentina; Prof. Xiangnan Zhong of Florida Atlantic University, United States; and Prof. Donald

S. Williamson of Indiana University, Bloomington, United States.

There were also two question and answer (Q&A) sessions, moderated by Prof. Petar Djuric, chair of the Department of ECE at Stony Brook University, New York, United States; Prof. Pascale Fung of the Hong Kong University of Science and Technology, Hong Kong;

Prof. Monica Bugallo, director of the Women in Science and Engineering Program at Stony Brook University, New York, United States; Prof. Stella Batalama, dean of the College of Engineering and Computer Science, Florida Atlantic University, United States; Prof.

Rabab K. Ward of the University of British Columbia, Vancouver, Canada, who is director of IEEE Division 1X and past president of the SPS; Prof. Raquel Assis of Florida Atlantic University, United States; Prof. Behnaz Ghoraani of Florida Atlantic University, United States; Prof. Xiangnan Zhong of Florida Atlantic University; and Prof. Sareh Taebi of Florida Atlantic University, United States.

Day 2 included professional training on concepts and tools to support career success, including networking and general information from the negotiation literature, delivered by C.K. Gunsalus & Associates. There were also two panels on how one can obtain funding. The participants of the first panel included Prof. Raed Shubair of New York University Abu Dhabi, UAE; SPS Regional Director Prof. Woon-Seng Gan of Nanyang Technological University, Singapore; Prof. Christian Jutten of the University Grenoble-Alpes, France; Prof. Deepa Kundur, chair of the Department of ECE at the University of Toronto, Canada; and Prof. Zhi-Quan Tom Luo, academic vice president of the Chinese University of Hong Kong, Shenzhen, China. The second panel included Prof. Zhi Tian of George Mason University, Fairfax, Virginia, United States, who is also a

member of the SPS Board of Governors; Prof. Konstantina Nikita, National Technical University of Athens, Greece; Prof. Ana Isabel Pérez-Neira of Universitat Politècnica de Catalunya, Spain; and Prof. Markus Rupp, TU Wien, Austria.

Talks on advanced educational tools were given by Laura Acion, associate researcher scientist, Instituto de Cálculo, Universidad de Buenos Aires–National Research Council of Argentina, Argentina; Prof. Waheed Bajwa of Rutgers University, Piscataway, New Jersey, United States; and Prof. Raj Rao Nadakuditi of the University of Michigan, Ann Arbor, United States.

A survey was distributed to the students three weeks after the workshop and concluded on 15 December 2020. The survey asked the participants to rate their interest in the various sessions of the workshop. It also asked the participants to rate from 1 to 10 their interest in a postdoctoral or faculty position before attending PROGRESS and after attending PROGRESS. Twenty-five students responded to the survey. The results suggested that, before PROGRESS, 10 of the 25 students expressed interest 8 or higher, while after PROGRESS, 18 students indicated interest 8 or higher. This shift of interest in favor of pursuing an academic position was very encouraging. Also supportive were the comments of the participants, some of which are given here.

- “I found learning from global and international leaders in academia very helpful.”
- “The workshop made me aware of various opportunities in foreign countries and the benefits of choosing the field of signal processing.”
- “It gave me a better understanding of academia. I could see how faculty members and researchers with academic positions around the world contribute to the broader spectrum of learning (and teaching) and how efforts are being made for inclusivity and diversity. I think it gave me a sense of optimism and confidence to pursue an academic position in the future.”

- “I am doing my Ph.D. in a relatively new university. The PROGRESS workshop helped me to get a better exposure of how things operate in other universities and their culture. It really got me motivated when professors of high reputation spent their time to interact and share their knowledge with early researchers like me.”
- “In the panel with faculty who shared their experiences, it became clear that everybody struggles at some time in their academic career. This made me more confident that an academic position is actually within my possibilities.”
- “The PROGRESS motivated me a lot, especially because we had a lot of wonderful examples of how a

career could be merged and coexist perfectly with the private life of anybody and it should be up to us to decide where is the boundary.”

- “Hearing how women have actually been able to combine a career in academia and still have a family is very helpful. In my country, there are almost no women in my field of research in permanent academic positions, so there are not really any role models, and it was very interesting to hear from women around the globe about their experiences.”

Via the survey, the students also suggested topics for future PROGRESS workshops, including a session on preparation of a CV, cover letters, statements, grant writing, a list of opportunities

(postdoctoral, faculty, and scholarships), a list of platforms where one could find tools to sharpen signal processing skills, a mentorship program, and a forum for Q&A beyond the workshop.

The next PROGRESS workshop will be virtual and is scheduled for 4–5 June 2021—right before ICASSP 2021. More information can be found at ieeeprogress.org.

Author

Athina Petropulu (athinap@soe.rutgers.edu) is a Distinguished Professor of electrical and computer engineering at Rutgers, the State University of New Jersey, president-elect of the IEEE Signal Processing Society, and director of PROGRESS.



LECTURE NOTES

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via the Leibniz generalized product rule, $(d^n/dt^n)\{f(t)g(t)\} = \sum_{k=0}^n \binom{n}{k} f^{(n-k)}(t)g^{(k)}(t)$:

$$\begin{aligned}
 x_p^{(2)}(t) &= f^{(2)}(t)g(t) + 2f^{(1)}(t)g^{(1)}(t) \\
 &\quad + f(t)g^{(2)}(t) \\
 &= 9\exp(-3t)u(t) + 2(-3\exp(-3t))\delta(t) + \exp(-3t)\delta^{(1)}(t) \\
 &\stackrel{(a)}{=} 9\exp(-3t)u(t) - 6\delta(t) \\
 &\quad + [\delta^{(1)}(t) + 3\delta(t)] \\
 &= 9\exp(-3t)u(t) - 3\delta(t) \\
 &\quad + \delta^{(1)}(t). \tag{30}
 \end{aligned}$$

In line (a), the basic and advanced versions of the product rule in Table 1 are applied. The advanced product rule states that $f(t)\delta^{(1)}(t) = f(0)\delta^{(1)}(t) - f^{(1)}(0)\delta(t)$, and substituting $f(t) = \exp(-3t)$ into this relation gives the term in the square brackets of line (a). We see that the final result given by either (29) or (30) matches the one by the partial fraction expansion, provided that we handle the differentiation of $x_p(t)$ in the generalized sense, obeying the rules of Dirac delta function manipulation.

What we have learned

We have studied generalized functions, limits, and derivatives as well as their applications in some signal processing problems. These notes aim to show that many familiar equalities are valid only in the generalized sense. Hence, the equality signs should be replaced with $\stackrel{(g)}{=}$ in many calculations involving Dirac delta functions, unit step functions, and so on. Interested readers can examine classical signal processing textbooks of Papoulis [3] and Bracewell [4] for a brief treatment of generalized functions. For more information, readers are invited to examine [7], [9], and [10].

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Author

Çağatay Candan (ccandan@metu.edu.tr) received his Ph.D. degree in electrical engineering from the Georgia Institute of Technology, Atlanta, in 2004. He is a professor in the Department of Electrical and Electronics Engineering, Middle

East Technical University, Ankara, TR-06800, Turkey. His research interests include statistical signal processing and its applications in array signal processing and radar/sonar signal processing.

References

- [1] A. V. Oppenheim, A. S. Willsky, and S. H. Nawab, *Signals & Systems*, 2nd ed. Englewood Cliffs, NJ: Prentice Hall, 1999.
- [2] A. V. Oppenheim, R. W. Schaffer, and J. R. Buck, *Discrete-Time Signal Processing*. Englewood Cliffs, NJ: Prentice Hall, 1999.
- [3] A. Papoulis, *The Fourier Integral and Its Applications*. New York: McGraw-Hill, 1962.
- [4] R. Bracewell, *The Fourier Transform & Its Applications*, 3rd ed. New York: McGraw-Hill, 1999.
- [5] “Wikipedia contributors, Freeman Dyson,” Wikipedia, 2020. Accessed: July 29, 2020. [Online]. Available: https://en.wikipedia.org/wiki/Freeman_Dyson
- [6] Y. Yamamoto, *From Vector Spaces to Function Spaces: Introduction to Functional Analysis with Applications*. Philadelphia: Society for Industrial and Applied Mathematics, 2012.
- [7] M. J. Lighthill, *An Introduction to Fourier Analysis and Generalised Functions*. Cambridge, U.K.: Cambridge Univ. Press, 1952 (online republication 2012).
- [8] D. G. Luenberger, *Optimization by Vector Space Methods*. Wiley-Interscience, 1969.
- [9] G. Temple, “Theories and applications of generalized functions,” *J. London Math. Soc.*, vol. s1-28, no. 2, pp. 134–148, 1953. doi: 10.1112/jlms/s1-28.2.134.
- [10] G. Temple, “The theory of generalized functions,” *Proc. R. Soc. Lond. A*, vol. 228, no. 1173, pp. 175–190, 1955. [Online]. Available: <https://www.jstor.org/stable/99615>

