

Nurturing Diversity and Reducing Implicit Evaluation Bias

This column is a renewed effort to reaffirm our ethical values and propose strategies to increase diversity and inclusion in our professional society. These are days of tough political, economic, and social debate around the world and in the United States. Despite much of what is currently happening in the news, when it comes to the IEEE and our IEEE Control Systems Society (CSS), I wish to state that we do have ethical principles, translate them into fair and inclusive conduct, and form a nonprofit organization that strives to operate with integrity.

Figure 1 is an infographic on the outcome of a recent IEEE survey on women's experiences in technology. Frankly, the survey discloses depressing and unacceptable statistics about the unethical treatment of some of our colleagues in professional environments. (I am unaware, at this time, of similar surveys for other underrepresented groups.)

Some observations are in order. First, I deeply believe that diverse organizations enjoy numerous advantages, including being more creative, performing better, catering to a wider talent pool, and providing a more satisfactory environment for all their members. According to our IEEE Code of Ethics [1], CSS welcomes all professionals who work in our field of interest—independently of race, religion, disability, age, national origin, sexual orientation, gender identity, or gender expression. Each of us has the responsibility and the privilege to improve our community.

Every day, each of us has an opportunity to lean forward and contribute positively toward creating a more diverse professional society.

We need to be conscious of our potential prejudice and implicit biases. Every day, each of us has an opportunity to lean forward and contribute positively toward creating a more diverse professional society. We strive to allow all our members to have productive careers free from discrimination and harassment.

REAFFIRMATION OF THE IEEE CODE OF CONDUCT, CODE OF ETHICS, AND NONDISCRIMINATION POLICY

As a first response to the information in Figure 1, the IEEE Technical Activity Board (TAB, the IEEE board that most directly oversees the CSS) approved a statement reaffirming the IEEE Code of Conduct, Code of Ethics, and Nondiscrimination Policy in February 2018; see <https://www.ieee.org/about/compliance.html#code-of-conduct> and <https://www.ieee.org/about/corporate/governance/p9-26.html>. Every time each of us renews our IEEE membership, we explicitly agree to abide by these codes. This is the statement that was reaffirmed, with my personal vote in support:

IEEE members are committed to the highest standards of integrity, responsible behavior, and ethical and professional conduct. The IEEE Technical

Activities Board reaffirms its commitment to an environment free of discrimination and harassment as stated in the IEEE Code of Conduct, IEEE Code of Ethics, and IEEE Nondiscrimination Policy.

EFFORTS AND STRATEGIES BY THE IEEE CONTROL SYSTEMS SOCIETY

While we all have our hearts in the right place, it takes careful thinking and hard work to be effective at diversity and inclusiveness. We, as CSS, have a number of initiatives and activities in this broad area. Space is available for only a few highlights here; I will report elsewhere on a new initiative focusing on young engineers outside academia (as part of the IEEE Young Professionals effort).

- » The CSS Outreach Fund provides financial support for activities that introduce, promote, or extend control systems principles to a new and/or diverse audience. Daniel Rivera chairs the committee managing this fund. Recent example activities include: 1) a winter school on cyberphysical systems enhancing the research and educational activities of an underdeveloped region in India and including participants from

Women's Experiences in Tech

In a recent IEEE survey, 4,579 women responded to questions on being a woman in tech. The detailed findings reveal discouraging experiences and perceptions within the industry.

Many women experienced the same negative incidents at alarmingly high rates...

73%

Have Experienced Negative Outcomes in Their Careers Attributed to Being a Woman

71%

said questions or comments were addressed to males when questions should have been addressed to her

58%

were asked inappropriate questions during interviews

39%

were assigned lower-level tasks

37%

were excluded from networking opportunities

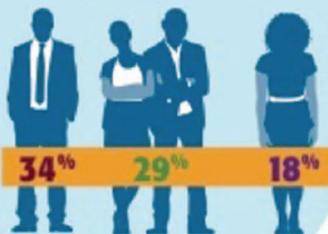
28%

have experienced unwanted sexual advances

86% from colleagues
58% from a superior
45% from a client

WOMEN FEEL MISTRUSTED

Women report feeling a lack of trust from all levels across an organization.



by male colleagues by management by female colleagues

GROUP DIFFERENCES

Those in the **US** have more negative perceptions and were more likely to experience negative outcomes

Those who work in **private industry** were more likely to have negative perceptions and experience negative outcomes

FAMILY MATTERS

51%

felt need to speak less about family to be taken seriously

38%

of mothers on maternity leave returned early for fear of negatively impacting career

For more information on this study, please contact women-in-tech-project@ieee.org

IEEE
Advancing Technology
for Humanity

FIGURE 1 The results of a recent IEEE survey on women's experiences in technology. For more information on this study, please contact women-in-tech-project@ieee.org.

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several underdeveloped countries, 2) a summer camp for video-game-based learning for girls in middle schools, and 3) an outreach project designed for minority and female students to learn control technology using LEGO Mindstorm kits. See <http://ieeecss.org/general/past-and-present-outreach-projects> for more information.

- » The CSS Women in Control Committee, chaired by Linda Bushnell, aims to “promote membership, to gather and disseminate appropriate information about women in CSS and the profession, and to facilitate the development of mentoring and programs to promote the retention, recruitment, and growth of women CSS members.” The committee was founded 30 years ago by Bozena Pasik-Duncan, Molly Shor, and Cheryl Shrader. In coordination with joint efforts by the American Automatic Control Council and International Federation of Automatic Control (IFAC), this committee organizes regular welcome luncheons, networking events, and training sessions at our main yearly conferences. The committee also maintains a gender-informed database of CSS volunteers, meant to inform the volunteer selection process for editorial boards, leadership positions, and award nominations.
- » The CSS Technical Committee on Control Education, historically led by Bozena Pasik-Duncan and currently chaired by Anthony Rossiter, has an exceptional track record organiz-

ing workshops for high school students and teachers twice per year at the IEEE Conference on Decision and Control (CDC), American Control Conference, and selected IFAC meetings. Over 15,000 middle school, high school, and undergraduate students from diverse backgrounds and their instructors have been reached through these workshop over the last 20 years.

I believe we all owe a great debt of gratitude to Anthony, Bozena, Daniel, Linda, and all other volunteers engaged in these CSS outreach activities. I am also proud to mention that CSS volunteers play critical roles at the IEEE level in the area of inclusiveness and diversity. Long-time CSS member Pasik-Duncan is the current chair of IEEE Women in Engineering, one of the “largest international professional organizations dedicated to promoting women engineers and scientists and inspiring girls around the world to follow their academic interests to a career in engineering.” Elena Valcher, our *IEEE Control Systems Letters* editor-in-chief and past CSS president, is a member of the IEEE TAB Committee on Diversity and Inclusion, “responsible for ensuring that TAB policies, procedures, and practices are conducive to creating and maintaining a diverse and inclusive environment.”

REDUCING THE EFFECT OF IMPLICIT EVALUATION BIAS

Starting with the Nobel award-winning work [1] by Tversky and Kahneman on prospect theory and intuitive judgement, psychological research has established that cognitive biases are widespread. Cognitive biases

and heuristics are ways for the human brain to quickly compute an answer, without having to recall and elaborate all relevant evidence. Implicit biases toward certain groups may lead to irrational performance evaluations, such as the highly cited [2] and [3], which demonstrate the sadly remarkable gender bias in teaching evaluations.

On the positive side, peer-reviewed research [4] has also focused on how to reduce gender stereotypes. In the context of students evaluating teachers, evidence shows that students provide more accurate performance evaluations when they take time to review specific aspects of the teacher performance rather than quickly relying on general impressions. In other words, it is beneficial to present the information in such a way that options are easier to evaluate objectively on the stated criteria. (I thank Jordan Berg for bringing this research to my attention during his distinguished and effective service at the U.S. National Science Foundation.)

In short, here are some strategies that may help mitigate implicit evaluation biases.

- » Be informed and inform your colleagues about implicit biases.
- » Reduce time pressure, focus, and avoid jumping to conclusions before analyzing all evidence.
- » Adopt a structured recall strategy: 1) establish explicit evaluation criteria, 2) recall specific evidence of positive and negative behavior, 3) rate the individual on each criterion, and 4) only finally express summary evaluations.

Note that nowhere in this column are quotas advocated: participation quotas are unethical and demeaning of the deserved achievements of our colleagues from underrepresented groups. And yet, we have a responsibility to ensure that every search at every level has a rich pool of applicants/nominees/candidates and careful efforts are made to be inclusive. On a related note, I

(continued on p. 13)

of the original hardware used for its invention.

COMMON THEMES

The story of this amplifier illustrates many themes in the history of technology. Although the invention can be traced to a “flash of insight” by a single person, the inventor was well trained in mathematics, engineering, and science, and had been working with others in this area. The development of the amplifier was truly a team effort at Bell Labs; theorists with excellent mathematical skills developed a theory that helped engineers understand the original invention and develop it further. The application of the invention by Hewlett

and Packard not only started a new business, but reinforced the connections between the university and the electronics industry that became a characteristic of what people later called the Silicon Valley style of invention. Thus, the history of the negative feedback amplifier is an excellent example of the complex interplay between theory, experiment, and practice in the institutional settings of established industrial research labs, booming businesses, and

expanding universities that became common in the US electronics industry after World War II [20].

The story of this amplifier illustrates many themes in the history of technology.

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» PRESIDENT'S MESSAGE (continued from p. 10)

suggest reading about the Rooney Rule, as implemented by the U.S. National Football League, at https://en.wikipedia.org/wiki/Rooney_Rule.

CONCLUDING REMARKS

I sincerely hope that the CSS initiatives reviewed here will convince current and prospective CSS members from underrepresented groups that their contributions are very much appreciated and they should feel that they belong with us. I also sincerely hope that the proposed strategies to reduce evaluation bias may be valuable in your professional career.

Despite all these efforts, much work lies ahead if we are to have more success at inclusiveness. As a data point, we have a very small fraction of women members in our Society: 7% versus an IEEE-wide percentage of 12%. As a second data point, current and recent female membership in the CSS Board of Governors has been greater than 25%. Please regard this column as an open call for strategies and initiatives in CSS that can accomplish increased diversity. I welcome any input on how to achieve this goal; my e-mail is bullo@ucsb.edu. Additionally, this topic will

be discussed at upcoming CSS Board of Governors meetings, including the meeting at the CDC in Miami. Attendance is open to all CSS members.

At our local elementary school, my son's first grade teacher asked a deceptively simple question of all children: “What is fairness?” My son and his friends play soccer at school, and, after careful reasoning and passionate debate, they agreed that “fairness is about passing the ball.” So, please, pass the ball, and give equal opportunities and full respect to everybody around you!

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