Bibliometrics—Measuring *Pervasive Computing’s* Impact

Great news: in 2017, for the second year in a row, *IEEE Pervasive Magazine* had the highest Impact Factor of all 13 IEEE Computer Society magazines. While the Impact Factor went slightly down from 3.25 in 2016 to 3.022 in 2017, it was still well above the average of 1.94 of all Computer Society magazines and the average of 1.747 of all periodicals within the same class (“Computer Science, Information Systems”) in the InCites database maintained by Clarivate Analytics. Our Impact Factor ranks 77th across all 155 IEEE publications and 15th across all 33 Computer Society publications.

**METRICS**

A quick definition may be useful here: the 2017 Impact Factor of *IEEE Pervasive Computing* is the number of times an article published in the magazine in the last two years (2015–2016) was cited in any of the InCites-included publications in 2017, divided by the total number of citable (feature-length) articles in *IEEE Pervasive Computing* in 2015–2016. Variations on these dates are used in the 5-year Impact Factor, which covers 2017 citations of articles published in 2012–2016, and the Immediacy Index, which counts 2017 citations of articles published in 2017. For these metrics, *IEEE Pervasive Computing* ranks 2nd and 3rd, respectively, among all Computer Society magazines (5-year Impact Factor of 2.916, second only to *IEEE Intelligent Systems*; Immediacy Index of 0.826, just behind *IEEE Cloud Computing* and *Computer*, the Computer Society’s flagship publication).

The Impact Factor is a so-called “popularity” metric, as it does not differentiate among citation sources: a citation from an article in *Science* counts just as much as one from the *Journal of Obscurity*. It has also been criticized for counting “self-citations”—citations from an article in a journal to other articles in the same journal. This is because unscrupulous editors have been found to make article acceptance conditional upon citing more of the periodical’s other articles, thus artificially driving up citation numbers1 (incidentally, *IEEE Pervasive Computing* still ranks...
first among all Computer Society magazines even if self-citations are removed). As a result, Clarivate Analytics monitors publication self-citations and blacklists journals that excessively self-cite or otherwise try to “game” the Impact Factor. You can see the currently suspended titles at http://ipsience-help.thomsonreuters.com/incitesLiveJCR/JCRGroup/titleSuppressions.html.

To address the criticism that the Impact Factor does not distinguish among citation sources, several alternative “prestige” bibliometrics have been proposed. The most well-known are the Eigenfactor and the related Article Influence Score, both spanning not two but five prior years (they are based on 2017 citation counts to articles published in IEEE Pervasive Computing in 2012–2016).

The Eigenfactor metric was proposed by Carl Bergstrom2 in 2007 and can probably be best summed up as “Google PageRank for periodicals.” It classifies journals and magazines that receive many citations as more important than others, and in turn weighs their citations to another publication higher than a citation from a lesser-cited publication. One way to visualize this metric is to imagine a scholar randomly pulling a journal or magazine from a library shelf, then arbitrarily selecting an article from the issue and in turn one of its references. The scholar then pulls out the referenced periodical and selects the next article and next reference. The Eigenfactor of a periodical is then the probability that the scholar ends up holding an issue of this periodical in his or her hands.

Like a raw citation count, the Eigenfactor will be higher for periodicals that publish many articles. To adjust the Eigenfactor for the size of a periodical (similar to what is done for the Impact Factor), one can normalize this metric by the number of articles published per year. Adjusting the resulting score by a factor so that it averages to 1 across all periodicals results in the Article Influence Score, which allows direct comparisons across periodicals. For example, a journal with an Article Influence Score of 2 is twice as “influential” as one with a score of 1.

How does our magazine fair under these “prestige” metrics? IEEE Pervasive Computing is a small periodical, publishing only 4 issues a year, for a total of around 20–25 citable articles. Not surprisingly, it has a relatively small Eigenfactor of only 0.00134: our “scholar in the library” would pull up an issue from IEEE Pervasive Computing 0.134 percent of all time. However, adjusting for the number of citable articles, the Article Influence Score is 0.682, ranking just behind Computer (0.703)—still pretty good. Overall, our score ranks 119th across the 155 IEEE publications, 24th across the 33 Computer Society publications, and 8th among the 13 Computer Society magazines.

You can find more information on these metrics, including their definitions, at the Clarivate Analytics Blog at https://clarivate.com/blog/tag/journal-metrics. If you or your institution has a corresponding journal subscription, you can inspect these and other bibliometric indicators directly at https://jcr.incites.thomsonreuters.com. IEEE has also published a statement on the “Appropriate Use of Bibliometric Indicators for the Assessment of Journals, Research Proposals, and Individuals” at http://ieeearchcenter.ieee.org/wp-content/uploads/ieee_bibliometric_statement.pdf.

What does this all mean? For a relatively small publication such as IEEE Pervasive Computing, these are great numbers. Given that, on average, 15 percent of the articles in a periodical contribute over 50 percent of the Impact Factor,3 a small publication must ensure that every article is of high quality. We are certainly fortunate to be able to recruit amazing guest editors that put together high-quality issues on up-to-date topics. Of course, the relevance of these issues is due to the strong submissions we receive from our authors: thank you for contributing to IEEE Pervasive Computing! Having an all-star editorial board not only helps attract strong submissions but also ensures our rigorous review process. And the issues that our board chooses to focus on clearly resonate with our readership. This is reflected in our impressive download numbers from IEEE Xplore: in downloads per issue (5,052), our magazine ranks 4th among Computer Society magazines, behind only Computer, IEEE Internet Computing, and IEEE Security and Privacy. In 2016, we had about half that many downloads (ranking 7th).

So please keep sending us your best work, and continue to read our latest issues! You can find us in the Computer Society’s Digital Library (https://www.computer.org/csdl), as a digital magazine in PDF and EPUB format at myCS (https://mycs.computer.org), or through IEEE Xplore (https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=7756).
IN THIS ISSUE

This issue focuses on “The Specter of Malicious Computing,” and guest editors Alastair Beresford, Cecilia Mascolo, and Marco Gruteser have selected three articles that highlight a range of security issues in future IoT infrastructures. You can find details about their selection in the Guest Editors’ Introduction.

This issue also includes a regular feature article. In “Privacy-Preserving Incentive Mechanisms for Mobile Crowdsensing,” Xinglin Zhang, Lingyu Liang, Chengwen Luo, and Long Cheng survey recent efforts to integrate privacy-protection techniques with mechanisms that motivate users to participate in mobile crowdsensing.

This issues features no less than six edited departments: Conferences, Education and Training, IoT News, Pervasive Healthcare, Smart Homes, and Wearable Computing.


In the Education and Training department, Orit Shaer and Evan Peck describe their experiences “Teaching Pervasive Computing in Liberal Arts Colleges.” They argue that a liberal arts education, with its focus on interdisciplinarity and lifelong learning, can play a critical role in preparing future leaders and innovators in our community. They describe how they integrate ethics and critical thinking into their classes, as well as how their students’ broader educational focus has impacted project-based courses.

Our new IoT News department editor, Fahim Kawsar, has recruited Elisa Giaccardi of Delft University of Technology to discuss her ideas on meta-design and the IoT. In “Things Making Things: Designing the Internet of Reinvented Things,” Elisa speculates that our future IoT might not be crafted by designers alone, but also by the things themselves. Instead of user-centered design, we might soon be employing “thing-centered” design, in which daily artifacts observe their actual use and share their unique perspectives with us (“thing ethnography”). Feel free to share your thoughts on this provocative piece with the department editor—you can reach Fahim at fahim.kawsar@nokia-bell-labs.com.

In the Pervasive Healthcare department, editors Gabriela Marcu and Jesus Favela have invited Mike Martin, Robert Weibel, Christina Röcke, and Steven M. Boker to report on the newly emerging field of semantic activity analysis. In “Semantic Activity Analytics for Healthy Aging: Challenges and Opportunities,” the authors explain that the semantic analysis of activity data lies at the heart of “contextualized health,” allowing individuals to better understand the implications of the raw multidimensional activity data. This will be especially relevant for healthy aging, where the sheer wealth of available data will only pay off if it can lead to actionable advice for both doctors and patients.

CHI 2018 is also the focus of our Smart Homes department. In “Smart Homes, Inhabited,” editors A.J. Brush, Mike Hazas, and Jeannie Albrecht highlight research presented at the conference as well as articles from a special issue of ACM Transactions on Computer-Human Interaction, all of which explore how people actually live in smart homes. They group the reviewed work into three areas: energy implications, speech interaction, and end-user programming. If you are interested in the latter, look out for our April–June issue next year, in which guest editors James Landay, Jueuntha Song, and Nuria Oliver present recent research on “Conversational User Interfaces and Interactions.”

In our Wearable Computing department, Fahim Kawsar, Chulhong Min, Akhil Mathur, and Alessandro Montanari present “Earables for Personal-Scale Behavior Analytics.” The authors have produced an in-ear acoustic sensor platform, eSense, that can track a range of head-related activities such as eating, drinking, shaking, and nodding as well as whole-body movements. They are giving away eSense units to interested researchers, so make sure to read the article for information on the platform and how to apply!
Finally, we have a Spotlight department contribution from editorial board member Joe Paradiso and his coauthors David B. Ramsay and Steven Hamburg. In “Making Air (Quality) Visible: Exploiting New Technology to Dramatically Improve Atmospheric Monitoring,” they describe their vision of an air quality monitoring ecosystem featuring well-known data repositories, a semantic framework for interoperability, and automated and collaborative tools to measure, interpret, and share data. If you work in this space, consider submitting to our upcoming special issue on “Pervasive Data Science and AI,” coedited by editorial board members Nigel Davies, Nicholas Lane, and Mirco Musolesi. The submission deadline is 1 November (title and abstract should be sent via email by 22 October); accepted articles will be published in the July–September 2019 issue. Of course, you can always find our latest Call for Papers at our magazine website: http://computer.org/pervasive.

TEAM UPDATES

Another issue, another set of team changes. First off: a heartfelt “Dankeschön” to our long-term editorial board member (and former AEIC), Albrecht Schmidt! After tremendous service to IEEE Pervasive Computing, including acting as AEIC from January 2011 until June 2014, as well as running our highly popular departments “Innovations in Ubicomp Products” and “Human Augmentation,” Albrecht is stepping down. Thank you for your tremendous support for the magazine all those years!

We unfortunately also need to say goodbye to our editor, Chris Nelson. He joined our team last October after the first round of reorganization of the Computer Society publication process, and the editorial staff will be shuffled again in a just-announced second round. Chris worked tirelessly to make the transition to the new process as smooth as possible, both for us volunteers and for our authors. Chris did an amazing job editing the final submissions; he also strongly supported our editorial team in putting together each issue, using the new Editorial Management System. He will be sorely missed!

REFERENCES


ABOUT THE EDITOR IN CHIEF

Marc Langheinrich is a professor in the Faculty of Informatics at Universitàdella Svizzera Italiana (USI) in Lugano, Switzerland, where he heads the Research Group for Ubiquitous Computing. His main research interest are pervasive displays, usable privacy, and ubiquitous computing. Langheinrich received his PhD in computer science from ETH Zürich. Contact him at langheinrich@ieee.org.