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MARC NIETHAMMER
Associate Professor

November 4, 2017

Prof. Emery Berger
College of Information and Computer Sciences
University of Massachusetts Amherst

Re.: Request to add publications from medical image analysis conferences to *csrankings.org*

Dear Prof. Berger,

Thank you for establishing, running, and maintaining the *csrankings.org* website. Your website has become a highly valuable resource for prospective computer science students to assess computer science departments and take a major first step in their academic careers.

Today, computer science research influences research in nearly every field, and conversely, computer science research has become increasingly interdisciplinary. For example, computer science research is impacting research in the fields of robotics and vision, and those fields are driving a broad range of computer science research. Appropriately, publications in robotics and vision technology conferences are already included in *csrankings.org*. Just as with robotics and vision, we believe that medical image analysis also has a symbiotic relationship with a broad range of computer science research. We, therefore, petition to include publications in the three top medical image analysis conferences into *csrankings.org*.

Specifically, we suggest considering publications from the following conferences:

1. **International Conference on Medical Image Analysis and Computer Assisted Intervention (MICCAI)**. MICCAI (<http://www.miccai.org/>) was established in 1998 by fusing three smaller conferences (CVRMED, VBC, and MrCas). The intention was to bring together a critical mass of researchers in the areas of medical image analysis (e.g., segmentation, registration, and classification of medical images, such as images from computed tomography, ultrasound, or magnetic resonance imaging), medical diagnosis (e.g., computer-aided diagnosis of breast cancer in mammograms), and medical intervention (e.g., 3D visualization for surgical planning, intra-operative image registration for surgical guidance). As such, MICCAI bridges the gap between image

analysis and robotics research. MICCAI is held every year and regularly attracts >1000 participants. The first MICCAI conference was held at MIT and the MICCAI board members are typically from CS departments and CS consulting companies.

2. **International Conference on Information Processing in Medical Imaging (IPMI).**

IPMI is the oldest medical image processing conference. IPMI has been held every other year since 1969. It has a strong focus on the development of new mathematical approaches for image analysis and on supporting and training the next generation of medical image analysis scientists. While IPMI discusses the analysis of medical images, the developed techniques are very much foundational, core computer science techniques. As a case in point, many students who won the Francois Erbsmann award (IPMI's best paper award:

https://en.wikipedia.org/wiki/Information_Processing_in_Medical_Imaging) went on to computer science faculty positions. For example, Maxime Descoteaux (2009 winner, now associate professor at the Département d'informatique, Faculté des Sciences, Sherbrooke University, Canada), Ben Glocker (2007 winner, now senior lecturer of medical image computing at the Department of Computing, Imperial College, London, UK), Jeffrey Fessler (1993 winner, now William L. Root Collegiate Professor in the Electrical and Computer Science Department of the University of Michigan, Ann Arbor, USA) and others.

3. **International Symposium on Biomedical Imaging (IEEE ISBI).** ISBI is a larger and broader medical image analysis conference compared to MICCAI and IPMI. ISBI has been held yearly since 2002. It is focused primarily on students: providing them the opportunity to present their in-progress dissertations and preliminary analyses. Admittedly it has a high acceptance rate (see details below), but this enables it to achieve its mission of cutting-edge research from students. ISBI regularly attracts over 1000 participants. Just as MICCAI and IPMI, ISBI motivates CS research, is attended by CS faculty and students, and, for example, regularly holds challenges at the interface between machine learning and medical image analysis.

To confirm that these conferences meet the inclusion standard of csrankings.org (according to <http://csrankings.org/faq.html>) we checked the following:

1. **Number of R1 universities publishing in ISBI, IPMI, and MICCAI:** We carefully checked publications of R1 universities in MICCAI, IPMI, and ISBI over the last ten years. Remarkably, out of the 115 R1 universities, 99 have published in MICCAI, IPMI, or ISBI over the last 10 years; of these, 79 have published in MICCAI or IPMI over the last 10 years. These conferences therefore easily meet the standard of *csrankings.org* (>50 R1). See attached document for an overview of the R1 institutions and the distributions of publications across MICCAI, IPMI, and ISBI.
2. **Acceptance rates for ISBI, IPMI, and MICCAI:** We checked the acceptance rates for MICCAI, IPMI, and ISBI. For MICCAI and ISBI over the last 5 years and for IPMI (as it is only held every other year) for the last 10 years. They are as follows:
MICCAI 2013: 32.8%; 2014: 29%; 2015: 32.5%; 2016: 30.1%; 2017: 32%.
ISBI 2012: 61%; 2013: 55%; 2014: unknown; 2015: 54%; 2016: 52%; 2017: 59%. IPMI:

2009: 39%; 2011: 28%; 2013: 32%; 2015: 32%; 2017: 36%. Hence, MICCAI and IPMI are very comparable in terms of acceptance rates; ISBI's acceptance rate is a little bit higher, but as mentioned, that is purposeful to ensure that cutting-edge methods are featured. All three conferences use a double-blind (MICCAI, IPMI) or blind (ISBI) review process with full-length papers submitted at the time of the review.

As a measure of their importance, both MICCAI and IPMI publications are indexed by NIH's PubMed; their proceedings are published in the Springer Lecture Notes in Computer Science series. IEEE ISBI is an IEEE conference and hence publications are available via IEEE Xplorer.

Our reasoning for including medical image analysis as an area of computer science is based on the following facts:

1. *Just as robotics and computer vision research, medical image analysis research is widely conducted in computer science departments.* For example, out of the top 50 CS departments in the US (according to USNews) around one third have at least one full-time computer science faculty member focusing on medical imaging research according to our own survey. (This number would be substantially larger if we consider faculty with adjunct appointments.) As a case in point, all of us (see the list at the end of this letter) have appointments in computer science departments. Furthermore, as mentioned above, 99 out of the 115 R1 universities have published over the last ten years in the top 3 medical image analysis conferences.
2. *The distinction between medical image analysis, computer vision, and robotics research is fluid.* Many of us publish in computer vision as well as in medical image analysis venues. Research topics between medical image analysis, computer vision, and robotics overlap significantly, but are motivated by different application domains and hence emphasize different aspects of theory development. Furthermore, MICCAI was explicitly founded to foster communication between medical image analysis and computer-assisted intervention (i.e., robotics for medical applications).
3. *Medical image analysis is more than simply applying computer vision to medical images.* If medical image analysis and computer-assisted intervention would indeed simply be a special case of computer vision and robotics, there would be no compelling argument to add medical image analysis publications to *csrankings.org*. Due to its relation to computer vision, medical image analysis should clearly be considered firmly grounded in computer science. However, it goes much beyond traditional computer vision as challenging biomedical problems are motivating the development of advanced and novel methodologies. In fact, medical image analysis is its own scientific discipline within computer science as it fuses medical knowledge, devices (both for imaging and intervention), mathematical modeling, and computational aspects, including high performance and parallel computing, machine learning, human-computer interaction, visualization and others. It is an outstanding example of interdisciplinary computer science and an outstanding field to train the next generation of interdisciplinary computer science researchers. Interdisciplinary research and working with real data further permits rigorous testing and validation.

Based on the aforementioned reasons, we believe medical image analysis is without a doubt a subdiscipline of computer science. We, therefore, would like to request adding publications in the top three medical image analysis conferences into the list of publications which *csranks.org* considers for the ranking of computer science departments.

Many thanks in advance for considering our request. We are of course happy to further discuss by email or phone.

Best regards,



Marc Niethammer

Encl: Table of publications of R1 institutes in MICCAI, IPMI, and IEEE ISBI.

Signees:

Ron Alterovitz, Associate Professor, Department of Computer Science, University of North Carolina at Chapel Hill

Stephen Aylward, Senior Director of Strategic Initiative at Kitware and Adjunct Associate Professor at the Department of Computer Science, University of North Carolina at Chapel Hill

James C. Gee, Associate Professor of Radiologic Science in Radiology and in Computer and Information Science, University of Pennsylvania

Guido Gerig, Institute Professor and Department Chair, Computer Science & Engineering, New York University

Polina Golland, Professor, Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology

Gordon L. Kindlmann, Associate Professor, Department of Computer Science, University of Chicago

Michael I. Miller, Director of the Center of Imaging Science, Herschel and Ruth Seder Professor of Biomedical Engineering, Professor of Electrical and Computer Engineering, Johns Hopkins University

Marc Niethammer, Associate Professor, Department of Computer Science, University of North Carolina at Chapel Hill

Stephen M. Pizer, Kenan Professor, Department of Computer Science, University of North Carolina at Chapel Hill

Dinggang Shen, Jeffrey Houpt Distinguished Investigator, Professor of Radiology and Adjunct Associate Professor of Computer Science, University of North Carolina at Chapel Hill

Martin Styner, Associate Professor, Departments of Computer Science and Psychiatry, University of North Carolina at Chapel Hill

Baba Vemuri, Wilson and Marie Collins Professor in Engineering; Department of Computer and Information Science and Engineering, University of Florida, Gainesville

Rene Vidal, Professor of Biomedical Engineering, Computer Science, Mechanical Engineering, and Electrical and Computer Engineering, Johns Hopkins University

Attachment: Table of publications of R1 institutes in MICCAI, IPMI, and IEEE ISBI.

R1 universities with publications in MICCAI, IPMI, or IEEE ISBI in the last 10 years
(determined via google scholar)

Out of these 115 institutions which are classified as R1, only 16 have no publications in MICCAI, IPMI, or IEEE ISBI which are the top conferences in medical image analysis. Hence, 99 R1 institutions have published at MICCAI, IPMI, or IEEE ISBI within the last 10 years.

	MICCAI	IPMI	IEEE ISBI
Arizona State University	X	X	X
Boston College	X	-	-
Boston University	X	-	X
Brandeis University	-	-	-
Brown University	X	-	-
California Institute of Technology	X	-	X
Carnegie Mellon University	X	X	X
Case Western Reserve University	X	-	X
Clemson University	-	-	-
Colorado State University-Fort Collins	-	-	-
Columbia University in the City of New York	X	-	X
Cornell University	X	X	X
CUNY Graduate School and University Center	-	-	-
Duke University	X	X	X
Emory University	X	X	X
Florida International University	X	X	X
Florida State University	X	X	X
George Mason University	-	-	-
George Washington University	X	-	X
Georgetown University	-	-	X
Georgia Institute of Technology	X	-	X
Georgia State University	-	-	X
Harvard University	X	X	X
Indiana University-Bloomington	X	X	X
Iowa State University	-	-	X
Johns Hopkins University	X	X	X
Kansas State University	X	-	-
Louisiana State University and Agricultural & Mechanical College	X	-	X

<u>Massachusetts Institute of Technology</u>	X	X	X
<u>Michigan State University</u>	X	-	X
<u>New York University</u>	X	X	X
<u>North Carolina State University</u>	-	-	X
<u>Northeastern University</u>	X	-	X
<u>Northwestern University</u>	X	-	-
<u>Ohio State University</u>	X	X	X
<u>Oregon State University</u>	-	-	-
<u>Pennsylvania State University-Main Campus</u>	X	-	X
<u>Princeton University</u>	X	X	X
<u>Purdue University-Main Campus</u>	X	-	X
<u>Rice University</u>	-	-	X
<u>Rutgers University-New Brunswick</u>	X	X	X
<u>Stanford University</u>	X	X	X
<u>Stony Brook University</u>	X	X	X
<u>SUNY at Albany</u>	-	-	X
<u>Syracuse University</u>	-	-	X
<u>Temple University</u>	X	-	X
<u>Texas A&M University</u>	X	-	X
<u>Texas Tech University</u>	-	-	-
<u>University of Tennessee</u>	X	-	-
<u>University of Texas at Arlington</u>	X	X	X
<u>University of Texas at Austin</u>	-	-	X
<u>University of Texas at Dallas</u>	X	-	X
<u>Tufts University</u>	-	-	X
<u>Tulane University of Louisiana</u>	-	-	X
<u>SUNY at Buffalo</u>	X	X	X
<u>University of Alabama at Birmingham</u>	X	-	X
<u>University of Arizona</u>	-	-	X
<u>University of Arkansas</u>	-	-	-
<u>University of California-Berkeley</u>	X	X	X
<u>University of California-Davis</u>	X	X	X
<u>University of California-Irvine</u>	X	-	X
<u>University of California-Los Angeles</u>	X	X	X
<u>University of California-Riverside</u>	-	-	X
<u>University of California-San Diego</u>	X	X	X
<u>University of California-Santa Barbara</u>	X	-	X

<u>University of California-Santa Cruz</u>	-	-	X
<u>University of Central Florida</u>	X	X	X
<u>University of Chicago</u>	X	X	X
<u>University of Cincinnati-Main Campus</u>	-	-	X
<u>University of Colorado Boulder</u>	-	-	X
<u>University of Connecticut</u>	-	-	-
<u>University of Delaware</u>	X	-	X
<u>University of Florida</u>	X	X	X
<u>University of Georgia</u>	X	X	X
<u>University of Hawaii at Manoa</u>	-	-	-
<u>University of Houston</u>	X	X	X
<u>University of Illinois at Chicago</u>	X	-	X
<u>University of Illinois at Urbana-Champaign</u>	X	X	X
<u>University of Iowa</u>	X	X	X
<u>University of Kansas</u>	-	-	-
<u>University of Kentucky</u>	X	-	X
<u>University of Louisville</u>	X	X	X
<u>University of Maryland-College Park</u>	-	-	X
<u>University of Massachusetts-Amherst</u>	-	-	-
<u>University of Miami</u>	X	-	X
<u>University of Michigan-Ann Arbor</u>	X	X	X
<u>University of Minnesota-Twin Cities</u>	X	-	X
<u>University of Mississippi</u>	-	-	-
<u>University of Missouri-Columbia</u>	X	-	X
<u>University of Nebraska-Lincoln</u>	-	-	-
<u>University of New Mexico-Main Campus</u>	-	-	X
<u>University of North Carolina at Chapel Hill</u>	X	X	X
<u>University of North Texas</u>	-	-	X
<u>University of Notre Dame</u>	X	-	X
<u>University of Oklahoma-Norman Campus</u>	-	-	-
<u>University of Oregon</u>	-	X	X
<u>University of Pennsylvania</u>	X	X	X
<u>University of Pittsburgh-Pittsburgh Campus</u>	X	X	X
<u>University of Rochester</u>	X	-	X
<u>University of South Carolina-Columbia</u>	X	-	-
<u>University of South Florida-Main Campus</u>	-	X	X
<u>University of Southern California</u>	X	X	X

<u>University of Utah</u>	X	X	X
<u>University of Virginia-Main Campus</u>	-	-	X
<u>University of Washington-Seattle Campus</u>	X	X	X
<u>University of Wisconsin-Madison</u>	X	X	X
<u>University of Wisconsin-Milwaukee</u>	-	X	X
<u>Vanderbilt University</u>	X	X	X
<u>Virginia Commonwealth University</u>	-	-	X
<u>Virginia Polytechnic Institute and State University</u>	X	-	X
<u>Washington State University</u>	-	-	-
<u>Washington University in St Louis</u>	X	X	X
<u>Wayne State University</u>	X	-	X
<u>West Virginia University</u>	X	-	X
<u>Yale University</u>	X	X	X