



Industry at CRA's Conference

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Computing Research Association Industry (CRA-I) Steering Committee Members

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CRA-Industry Takeaways

- CRA-I should become the natural convener of industries in the computing research community.
- CRA-I should help form more connections between industry and academic researchers.
- CRA-I should help broker the sharing of resources among various companies, academia, and government to increase communication and collaboration.
- CRA-I should broaden the focus of CRA outreach efforts to be more inclusive of researchers who work in industry.

Introduction

The Computing Research Association (CRA) created their newest committee CRA-Industry (CRA-I) in the fall of 2020 to convene industry partners on computing research topics of shared interest and connect them with CRA's academic and government constituents for mutual benefit and improved societal outcomes. Since 2020, the committee's activities have included virtual roundtables, workshops, and an inaugural meeting at CRA's flagship conference at Snowbird, Utah in July 2022. CRA's flagship conference is a biannual invitation-only meeting for chairs of departments of Computer Science, Computer Engineering, and Information Technology, and leaders from U.S. industrial and government computing research laboratories and centers interested in computing research issues. CRA-I held an inaugural meeting at the 2022 flagship conference to introduce the community to the new committee. Common themes emerged from these discussions, which showcase where the industry community is right now and what needs to be worked on with CRA-I's help.

One of the themes that emerged was that CRA-I should become an important convener in the community and create an increased culture of sharing among industry computer research organizations. One aspect of this goal is to connect to smaller companies, identifying their computing research needs, and developing best practices that could be shared for engaging in open computing research. Such best practices could be developed using the experience larger companies already have in supporting computing research. Other aspects of this theme include

publishing research openly, sharing data when possible, and building up local computing research ecosystems on a regional basis.

Another theme discussed was that CRA-I should enable and encourage the sharing of resources among various companies, academia, and government to increase communication and collaboration. These activities and relationships benefit industry in numerous ways, including recruiting students from academia and informing policy makers with their practical understanding of how computing research issues related to their customers and products.

It was also discussed how CRA-I should broaden the focus of CRA's outreach efforts, such as career workshops, to be more inclusive of researchers who work in industry. Given that many students with PhDs in computing join industry, helping those individuals in their early career would be very beneficial. Similarly, while it is clear that many undergraduates choose not to get a PhD, few educational resources exist that explain to students the value of getting a PhD if they plan to work in industry.

A final theme was that CRA-I needs to more directly connect industry representatives with academia. This would not only give industry access to PhD and undergraduate students but also allow industry researchers to bring their practical knowledge and perspective related to cutting-edge computing research problems into the classroom. CRA-I could help with connections by introducing students who are already engaged with CRA's other committees to industry representatives doing research.

Inaugural CRA-Industry Meeting

The inaugural CRA-I meeting brought together over 55 participants from academia, industry, and government for an afternoon before CRA's flagship conference at Snowbird. It helped set the stage for the industry track at the CRA Conference and introduced the community to CRA-I. Presentations were from Erwin Gianchandani (National Science Foundation's Assistant Director for Translation, Innovation, and Partnerships), Gregory D. Hager (Director of Applied Science for Amazon Physical Stores), Elizabeth Mynatt (Dean of Khoury College of Computer Sciences at Northeastern University), and Fernando Pereira (Vice President and Engineering Fellow at Google). These keynotes were followed by the breakout sessions which were geared towards CRA-I's engagement within itself, CRA, and the community.

There were numerous important topics raised in these presentations and we mention a few here as examples. Dean Elizabeth Mynatt described the history of the "Tire Tracks" Diagram¹ including the most recent update that identifies and describes two patterns, resurgence and confluence, reflecting the path from federally funded academic research to economic impact in the US.² Fernando Pereira described how the Transformer AI architecture and its first big application, BERT, emerged at Google from the interplay between the problems of

¹ [The "Tire Tracks" Diagram Corrected and Humanized by National Academy Workshop Report » CCC Blog](#)

² [Elizabeth D. Mynatt - From Tire Tracks to Subway Maps: How Computing Innovation Fuels US Industries - MediaSpace @ Georgia Tech \(gatech.edu\)](#)



understanding natural language, especially search queries, and rapid advances in deep learning. He also explained how responsible, high-quality use of this new technology demanded multiple cycles of experimentation and refinement over several years. Greg Hager discussed the technical and research challenges Amazon faces creating their Amazon Go checkout free stores. He highlighted the important perspectives that industry can bring to academic researchers and vice versa. Finally, Erwin Gianchandani explained the motivation for the creation of the new National Science Foundation (NSF) Directorate for Technology, Innovation and Partnerships (TIP) – and specifically how NSF intends to increasingly leverage public and private partnerships to advance research, innovation, and workforce development, all with an eye toward societal, economic, and technological impacts.

During the breakout session there was discussion that CRA-I should focus on companies that are most interested in Computer Science research. Some of these companies might not have a research group developed yet, but may be starting one soon. CRA-I could provide advice in the form of best practices on a range of things, such as joint appointments, IP policies that universities and industry can use, infrastructure, and publishing industry sponsored work. Best practices could be a way for CRA-I to communicate values across the community. It was also discussed that CRA-I could be the natural convener among industry for the various Requests for Informations (RFI) that regularly come out of the Federal Register. CRA-I could help reach out to relevant people at each company to get their response and help develop a joint response document providing a broader industry research perspective. A document in which many companies agree upon would be very powerful and show a unique collaboration that otherwise would not have happened without CRA-I.

Computing Research in Industry

The first session in the industry track at CRA's flagship conference was focused on computing research in industry. It was moderated by Ben Zorn (Microsoft Research) and the panelists were Susan Dumais (Microsoft Research), Fernando Pereira (Google), Lisa Amini (IBM), and Kristin Lauter (Meta). This session looked at what it means to do computing research in an industrial setting. Computation is in the process of transforming all areas of a business, from the way work gets done to the products and services that are created. As a result, companies are increasingly investing in fundamental computer science research in support of their strategic goals.

This panel was a unique opportunity for the audience to hear about the diverse perspectives and approaches different companies take to investing in computing research. It started with each panelist providing a high level description of their research approach and organization. Then the discussion considered topics that included research problem selection, incentives, communication, and talent.

Some of the presenters from the industry research organizations take an open science approach to their research and actively seek collaboration with academic partners. They mentioned taking a long-term (even up to 10 years) perspective on investing in computing research and finding ways to engage with academics and also connect with federal research funding programs. Pasteur's Quadrant was mentioned as a way to think about the different



kinds of research investments and understand and communicate those both internally and to the broader public audience³. The audience also heard that companies are seeing a growing number of researchers and applied scientists across product teams instead of just within a separated research organization. There are a growing number of participants in industry computing research from adjacent disciplines (beyond CS, ECE, etc.).

The panelists discussed how researchers are incentivized within their companies and also the need to balance the potential for bottom-up research to lead to unnecessary redundancy, which can be a problem at larger companies. Each company had a different perspective on communication, and both improving external communication (with academics, the public, etc.) and internal communication (between product organizations, etc.) were considered ongoing challenges. The panelists talked about the value in identifying research collaborators and in their hiring decisions.

From the discussion, it is clear that some large tech companies are already focused on computing research and have resources to support their growing needs. Larger institutions have knowledge of what works and panel sessions like this one help the rest of the community understand what they've learned from their experiences. Organizations like CRA, specifically CRA-I, could help increase these connections between companies, and especially help bring insights that larger companies already have to smaller companies or companies just starting a research program. Likewise, the newest directorate at the National Science Foundation (NSF), Technology, Innovation and Partnerships (TIP) is eager to connect with industry of all sizes and grow key areas of collaboration and engagement. CRA-I could put together best practices documents, for example, and in turn help the industry research community learn how to connect with NSF and other Government agencies.

Industry-Academia Partnerships

The second session in the industry track at the CRA Conference at Snowbird was focused on industry-academia partnerships. It was moderated by Divesh Srivastava (AT&T) and the panelists were Elizabeth Mynatt (Northeastern University), Chris Ramming (VMWare), Jennifer Rexford (Princeton University), Vivek Sarkar (Georgia Tech), and Benjamin Zorn (Microsoft Research). This session looked at several important trends in computing research that have emerged in the past five years. These trends include: (i) significant increases in the level of interaction between professors and companies in certain computing disciplines, which take the form of joint appointments, and (ii) increasingly, companies are highly motivated to engage both professors and graduate students working in specific technical areas, because companies view computing research and technical talent as a core aspect of their business success.

There are many benefits of joint appointments, as one panelist said it increases the “pace and scope” of research. The opportunities for collaboration are tremendous and can create an ecosystem within a campus by pulling resources, programming expertise, and building a set of

³ [Pasteur's quadrant - Wikipedia](#)



companies (incubation, model for future industry engagement) in one area. There is also potential for academic principles/values to inform future industry products, research, and development roadmaps through increased collaborations.

The panelists also discussed the challenges of joint appointments, including the money it can cost a university and the inability to equally divide time. One panelist suggested that companies should be encouraged to value these interactions and suggested that collaborations with academia could count toward an industry person's performance review as they take time/energy and benefit the company.

The panelists and audience members suggested that CRA-I could help with this idea and provide a joint appointment experience. CRA-I could designate individuals as "CRA-I Teaching Fellows" or "Distinguished CRA-I Teaching Fellows," which would give their teaching efforts in academia more visibility. This new prestige could give researchers a chance to interact with the next generation of computer scientists, while providing a tremendous value to companies by giving them access to PhD and Master CS students before they leave academia. "CRA-I Teaching Fellows" could also help with the booming undergraduate enrollment and lack of teaching faculty currently facing our community.

Techlash in Context: What Should CS Departments and Tech Companies Do?

The final session in the industry track at the CRA Conference was focused on what computer science departments and tech companies need to understand about techlash. The moderator was Vivek Sarkar (Georgia Tech) and the panelists were Lorrie Cranor (Carnegie Mellon University), Alfred Spector (Former Two Sigma CTO and Google VP), Moshe Vardi (Rice University), and Nirit Weiss-Blatt (Author of "The Techlash and Tech Crisis Communication"). In past decades, CS departments and tech companies have been admired as drivers of positive change. However, there is now a growing undercurrent of negative associations with tech companies, which is also being transferred to CS departments in their interactions with industry⁴. Adding fuel to fire, the current rapid growth and adoption of AI technologies threatens to further amplify this backlash.

Panelists remarked that the community's response should be to increase transparency of both positive and negative impacts of technology, since techlash is partly a response to a perceived lack of transparency. Computer Science departments and companies can rebuild a positive image for tech in academia and industry by increasing communication. CRA-I best practices documents, for example, could also highlight example relationships that showcase positive mutual interactions and should help with this growing techlash.

⁴ <https://www.nytimes.com/2020/01/11/style/college-tech-recruiting.html>



Summary

Industry-academic engagement in computing research is crucial. Technical and societal challenges in the field are significant, “all hands on deck” are needed to create technology worthy of the trust society increasingly places in it. Thankfully, computer science is a field where industry wants to engage with academic research. Academia educates students (who predominantly go into industry) and conducts open and long-term research. Industry trains employees, makes things happen in practice, has scale/pace/scope, and does cutting-edge research. There are challenges to aligning incentives, to getting it right. The field should work harder to share best practices, and help new companies get it right. This could expand the scope of industry engagement to focus more on the non-IT companies that are rapidly transformed by tech. With CRA-I’s help, companies could be encouraged to become more open so research can benefit all.

If you would like to get involved with CRA-I, please email us at industryinfo@cra.org.