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CASE STUDY

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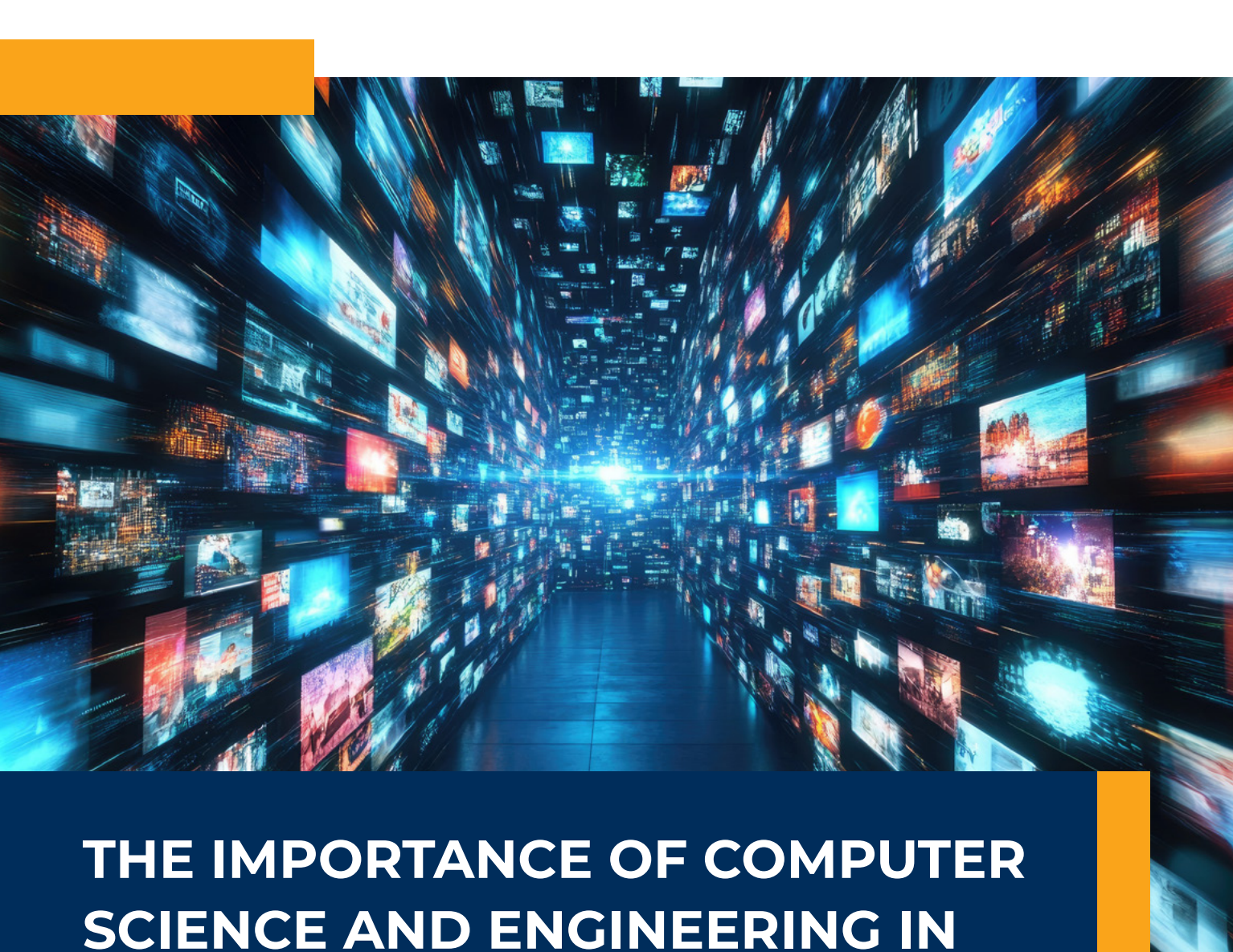
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Table Of Contents

The Importance Of Computer Science And Engineering In Today's Interdisciplinary Research Environment	3
Why Computer Science And Engineering Is So Important Today	4
Breaking Boundaries	4
Revolutionizing Bommunication	5
The Rise of Interdisciplinary Research	6
Collaboration in the Digital Age	7
How Institutions Can Stay Ahead	8
How the CSDL Is Pivotal In Supporting Scientific Progress	9
Case Study (Hernán Astudillo)	10
Setting the Stage for the Future	13



THE IMPORTANCE OF COMPUTER SCIENCE AND ENGINEERING IN TODAY'S INTERDISCIPLINARY RESEARCH ENVIRONMENT

Technology is changing the world as we know it. Computer science and engineering, hand in hand with AI, is supercharging progress and redefining the boundaries of possibility. This revolution is transforming industries and unlocking new levels of collaboration across disciplines and around the world.

For institutions, the challenge is no longer whether to embrace change, it's what to do to stay ahead of the race.

In this paper, we explore the powerful influence of computer science and engineering today and into the future. We lay out the critical steps institutions must take to be leaders in this dynamic environment, and share the perspectives of subject experts who are at the forefront of change.

WHY COMPUTER SCIENCE AND ENGINEERING IS SO IMPORTANT TODAY

Computer science and engineering is integrated into almost every aspect of modern living. It's the force behind technological innovation, and the building blocks of the digital society we live in today. The power of computer science to speed up discovery is more apparent now than ever before. It's driving a whole new era in research.

BREAKING BOUNDARIES

Computers today are able to process and analyze data on a massive scale. Vast and complex datasets, previously impossible to analyze, can now be explored to reveal patterns and insights which would never before have been discoverable. Researchers are now able to build computational models which simulate and predict outcomes in critical areas such as climate change and disease trajectories.

- » AI is facilitating the identification of new drugs and new therapeutic applications. [Sanofi's digital twins](#) allow potential new drugs to be tested on virtual patients, speeding up clinical trials and delivering effective treatment to patients.



In essence, computer science and engineering provides the computational power, communication infrastructure, and innovative tools that transform scientific research, making it more efficient, collaborative, and impactful on a global scale.

Hironori Washizaki

Associate Dean of the Research Promotion Division,
Waseda University, Tokyo, Japan

2025 IEEE Computer Society President



- » The British Antarctic Survey's [Wildlife from Space](#) project allows endangered wildlife to be conserved from space using satellite image recognition, with highly accurate and cost-effective results.
- » The use of AI in environmental monitoring is enabling accurate disaster forecasts and pollution detection, such as [IceNet](#)'s sea ice forecasting system.

REVOLUTIONIZING COMMUNICATION



The way we communicate today has been transformed, and that transformation is largely down to computer science. The very foundation of the Internet, computer science provides the infrastructure to enable instant communication worldwide.

Research teams can work together now in real time, using digital platforms for shared

resources, messaging and instant conferencing. This is all the more important given that today's problems are broader and bigger than a single discipline. The huge increase in cross-disciplinary collaboration is only made possible by computer science acting as a transdisciplinary framework.

THE RISE OF INTERDISCIPLINARY RESEARCH

As we've already seen, the problems the world faces today are complex and span multiple disciplines.

Take COVID-19, which saw the need for researchers to come together from across the research landscape. Experts from many disciplines including the medical sciences, computer sciences, humanities and social sciences all worked closely to deliver solutions,

disseminate research outcomes, and educate the public.

Similarly, AI ethics is a highly interdisciplinary field, which deals not only with the development of technology but also its impact on society. The diversity of interests means drawing on expertise from computer science, philosophy and ethics, law, social sciences, and more besides.



AI has come of age, it is not just a niche computer science field. It has a profound impact technologically, scientifically, and socially. So it is a very exciting time to enter the field of AI, but we also have a lot of responsibility to create the technology that will benefit everybody.

Fei-Fei Li

Sequoia Professor, Stanford Institute for Human-Centered AI, speaking at the CVPR Conference, Seattle, June 2024



Traditional boundaries are being blurred as a result, with new, 'blended' disciplines emerging. Digital humanities applies data science to traditional humanities fields such as literature, history and philosophy to develop new understandings of culture and society. Bioinformatics combines biology and computer

science to address the understanding and treatment of diseases. Universities are developing new curricula, such as AI, Ethics and Society (Birkbeck, London University) and Environmental Science and Policy (Plymouth State University).

COLLABORATION IN THE DIGITAL AGE

Advances in technology are enabling researchers to work across disciplines, fuelling this new, more holistic approach to addressing complex research problems. Digital platforms facilitate efficient teamwork in real time across institutions and geographical locations.

Institutions are increasingly encouraging interdisciplinary research. Much of this is driven by the need to align with funder priorities, who are prioritizing this more collaborative approach to research to align with societal impact goals. Major funders including Horizon Europe, UKRI, the European Research Council, the Bill and Melinda Gates Foundation and the NSF all explicitly prioritize interdisciplinary work.

The IEEE Computer Society Digital Library ([CSDL](#)) showcases numerous real-world examples of collaborative breakthroughs from applied computer science.

» [UAV Swarms in Smart Agriculture:](#) [Experiences and Opportunities](#) highlights the integration of robotics, AI, ecology and data science to solve complex agricultural problems. This innovation in smart agriculture also paves the way for applications in other environmental fields.



- » [Intelligent Health Monitoring Through Skin-based Wearable Devices: A systematic Review](#) demonstrates the huge progress made in health monitoring when medicine and computer science come together.
- » [An Overview of Artificial Intelligence Ethics](#) addresses the societal impact and ethical concerns around the widespread, and growing, application of AI.

HOW INSTITUTIONS CAN STAY AHEAD

Technology is advancing at lightning speed. It's paramount for institutions to stay ahead of developments in order to enhance, or even retain their position in the research ecosystem.

- » Investing in digital infrastructure is a given, with platforms that allow the seamless integration of collaborative tools and systems. Facilitating researchers' work allows them to work more efficiently.
- » As AI becomes more embedded in learning, teaching must increasingly focus on critical thinking. Human judgment is central to research - in assessing the quality of information and questioning assumptions in order to make informed decisions.
- » Reassessing their curriculum on a regular basis enables institutions to continue to be innovative and produce highly relevant research. Focusing on how their research translates into real world applications improves their status as potential partners with industry.
- » As we've seen, it's crucial to encourage collaboration, both within disciplines and institutions and across them. Simplifying the potential for teamwork and the sharing of data speeds up the research process. It's also vital to keep pace with funders' demands.
- » Providing access to key resources helps institutions stay competitive. Faster and easier access to high quality information facilitates rapid innovation and enhances research integrity. The CSDL is a highly reputable and trusted source of information in computer science and the leading collection of computer science research globally.



HOW THE CSDL IS PIVOTAL IN SUPPORTING SCIENTIFIC PROGRESS

The CSDL facilitates innovation and collaboration by delivering immediate access to the largest and most comprehensive database across the spectrum of computer science and engineering. With more than 1 million top-quality articles, papers and conference publications, the CSDL addresses the hottest and most current computing topics, enabling researchers to build for the future on the latest technological advances. With its extensive scope, it encourages collaborative opportunities amongst researchers and technical professionals in different sub-disciplines, who can then connect their expertise for interdisciplinary work.

Bridging the gap between theory and practice, the CSDL draws on authoritative and trusted insights from world-renowned experts in academia and industry. This underpins its value as a core teaching resource, ensuring teaching is based on best practise and in line with industry demands.



The CSDL has been a longstanding and reliable source of scientific and technological information in all the countries where I have worked, since the 1980s.

Hernán Astudillo

Professor of Informatics, Health and Wellness
Technology Institute, Andres Bello University, Chile

I invite my students to look for papers in the CSDL to reference in their papers and presentations

Harvey Alférez

Professor and Director of the Center for Innovation
and Research in Computing, Southern Adventist
University, Tennessee

CASE STUDY

HERNÁN ASTUDILLO

Professor of Informatics, Health and
Wellness Technology Institute, Andres
Bello University (UNAB), Chile

THE BROAD VALUE OF THE CSDL IN TEACHING AND RESEARCH

Hernán Astudillo worked as an Applications Architect for consulting companies in the USA and Chile before joining academia, first in Brazil and now in Chile. A prolific author, Hernán is currently Professor of Informatics at UNAB, and Principal Investigator at the Institute of Technology for Innovation in Health and Wellness. His research interests include software engineering, software architecture, digital government, cultural informatics, and maturity models. Hernán is clear that being a member of IEEE is crucial in his fields of interest.





How Do You Use the CSDL in Your Teaching?

A: The CSDL an essential resource in many ways, providing access to a large amount of scientific literature at a reasonable cost. It's helped me a lot in my teaching, especially with my PhD students.

Training PhD students is about more than just teaching them how to write a thesis. It's about how to become a researcher, spot trends, and how to make themselves useful members of the scientific community. The CSDL is an excellent means of training, and getting people used to exploring the global literature. In seminars I get my PhD students to read two or three papers on a given topic every week.

For undergraduates, in their 3rd or 4th year they don't really care about research, but it's important so I get them to read research in the CSDL every two weeks.

It's a great resource, short and sweet, and it helps them advance by opening their eyes to new things. It really pushes my students out of their comfort zone - even though they have some understanding of English, reading a professional paper in a foreign language is something else. All my students have now published in IEEE conferences and journals.



What's your experience of the learning and teaching resources?

A: I've also found the learning and teaching resources useful, as they help you innovate. They present different ideas, which encourages you to think out of the box. Some of the material is right to the point so I use it as a secondary resource, and my students like this too.





How does the CSDL help you in your research?

A: It's been awesome. It's so comprehensive. I use the CSDL every day, for myself and for my students. I must be a heavy user as I get warning emails telling me not to share my account!

The content I access most is scientific articles from conferences, as well as journals, surveys

and opinion pieces. Conference proceedings are essential because in my field everything happens at conferences.

In software engineering there are important newsletters, which help me keep in touch with my colleagues. This is especially useful as Chile is so far away.



As an Author, is the CSDL an

Important Place to Publish?

A: Amongst the first places I consider publishing in is the CSDL's Transactions on Software Engineering,, which is the flagship journal in software engineering.

There are several other key journals in CSDL too. Almost all the conference proceedings I publish in are the CSDL, maybe 10 to 20 papers a year.



Tell Us About Your User

Experience of the CSDL

A: It's easy to use and intuitive. There's a good search engine so I can find what I'm looking for. The coverage is international and the quality's good too - most A* conferences are the CSDL.

Regarding the scope, it's just right for me. I do a lot of interdisciplinary work, in heritage computing and health informatics, with my core interest in software engineering. Other people in faculty, for example in informatics and electronics, use the CSDL too as it's in scope.



SETTING THE STAGE FOR THE FUTURE

In today's rapidly evolving research landscape, computer science and engineering is the key to accelerating discovery. It's the framework that connects disciplines and unlocks solutions to the wide-ranging problems we see in the today's interdisciplinary world.

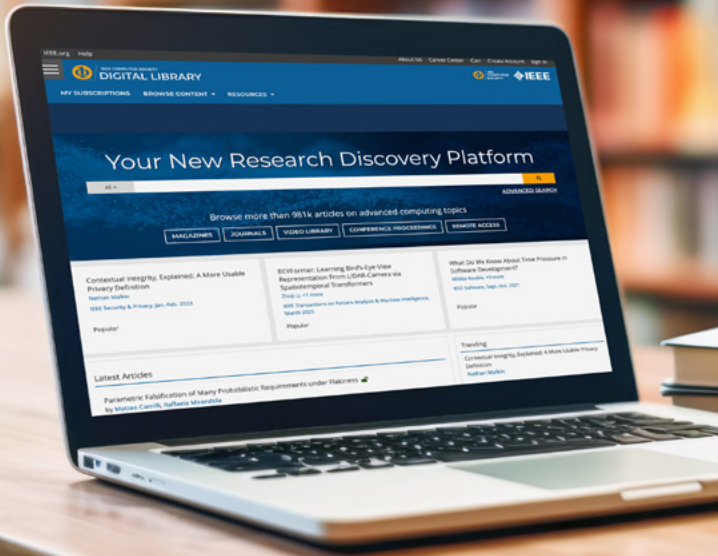
If they embrace the tools this critical subject discipline has to offer, institutions will not

only survive today's challenges, they will thrive. By investing in digital infrastructure and trusted resources like IEEE's CSDL, they will be best placed to collaborate and exploit interdisciplinary opportunities, leading the way in shaping the future of research.



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The IEEE name and ownership of the Computer Society Digital Library (CSDL) represent a standard of excellence, credibility and a commitment to advancing research in computing and engineering.

Learn more about how the **CSDL** can help you in your work. Get in touch with us for a free trial or demonstration, or to discuss your institution's needs.

Harvey Alférez

Professor and Director of the Center for Innovation and Research in Computing, Southern Adventist University, Tennessee



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