Graphics **Interface** 2020

Toronto, Ontario
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Proceedings

Edited by

Fanny Chevalier
Alec Jacobson

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President's Welcoming Letter

**Canadian Human-Computer Communications Society /
canadienne du dialogue humain-machine**

Paul G. Kry
School of Computer Science
McGill University, Canada

The Canadian Human-Computer Communications Society (CHCCS) / Société Canadienne du Dialogue Humaine Machine (SCDHM) is a non-profit organization dedicated to advancing research and education in computer graphics, visualization, and human-computer interaction. The primary activity of CHCCS/SCDHM is sponsoring the annual Graphics Interface conference, the longest-running regularly scheduled conference on interactive computer graphics.

In most years, Graphics Interface has been held as part of a larger suite of conferences: the AI/GI/CRV conference, encompassing Artificial Intelligence and Computer and Robotic Vision along with Graphics Interface. This year, the decision was made to hold the conference independently, at the University of Toronto. While many GI attendees enjoyed the co-located format where there was the possibility of attending any keynote or any session, the split comes in part because the three sponsoring societies could not agree on registration rates. Thus, with the approval of the vast majority of the membership at the 2019 CHCCS annual general meeting, this year is the first of several in which the plan is to reinvigorate Graphics Interface with an inexpensive format that maximizes participation, in particular students. Following Toronto in 2020, the plan is to have the conference in Vancouver in 2021 and then Montreal in 2022 to initially focus on big centers in this rebuilding effort.

While the global pandemic has forced the conference to assume a virtual format in 2020, it promises to be an excellent event, free to all to attend, and with a selection of high quality papers in computer graphics, visualization, and human-computer interaction. Paper presentations are all pre-recorded and available on the Graphics Interface YouTube channel and will be linked from the Graphics Interface archive. Unfortunately, posters and demo session featuring new and late breaking ideas as well as work in progress are not part of the program this year due to time constraints.

In addition to its annual conference, CHCCS/SCDHM sponsors several awards. The annual Michael A.J. Sweeney Award recognizes best student papers presented at the conference. The annual Alain Fournier Dissertation Award and the Bill Buxton Dissertation Award recognize the best Ph.D. dissertations awarded in Canada during the previous year for computer graphics and human-computer interaction, respectively. The annual CHCCS/SCDHM Achievement Award is presented to a Canadian who has made substantial research contributions to computer graphics, visualization, or human-computer interaction. The CHCCS/SCDHM Service Award is presented to a Canadian who has rendered substantial service contributions to the society or to the research community. Each year the Awards Committee receives nominations and selects a winner of the Achievement Award and, from time to time, a winner of the Service Award. The current committee is chaired by Brian Wyvill (University of Victoria), and has as members Sheelagh Carpendale (University of Calgary), Michiel van de Panne (University of British Columbia), and Carl Gutwin (University of Saskatchewan). I thank the Awards committee for their efforts in selecting very well-deserving recipients. Winners of the Alain Fournier Award and Bill Buxton Award are selected by independent committees coordinated by Pierre Poulin. I am very grateful to Pierre and the members of the respective committees for their work in identifying the top dissertations of 2018. The Michael A.J. Sweeney Award winners are selected by the program co-chairs in consultation with the program committee. Finally, while there will not be an award presented at the conference this year, the CHCCS/SCDHM continues to host he Canadian Digital Media Pioneer awards which were first initiated by the GRAND NCE in 2011, with Eugene Fiume serving to coordinate the selection committee.

The Annual General Meeting of CHCCS/SCDHM is held every year during the Graphics Interface conference, to review the previous year's activities and elect the executive committee. Current members of the executive committee are

- Paul Kry, McGill University, president
- Pierre Poulin, Université de Montréal, vice president
- Michael McGuffin, École de Technologie Supérieure, treasurer
- William Cowan, University of Waterloo, past president
- Derek Reilly, Dalhousie University, editor-in-chief

All Graphics Interface attendees are invited to attend the annual general meeting. I encourage everyone interested in the future of Graphics Interface to attend and get involved.

On behalf of the society, and of all those who have worked to put on this year's conference, I extend a warm welcome to all the attendees of GI 2020. I wish to thank this year's co-chairs, Alec Jacobson and Fanny Chevalier, along with the committee members and referees for all their hard work in creating the conference program. I also thank David Levin for serving as a general chair. And most important, I wish to thank all the authors who submitted their research. Without their commitment there would be no conference.

A Message from the Technical Program Chairs

Fanny Chevalier
University of Toronto, Canada

Alec Jacobson,
University of Toronto, Canada

Graphics Interface is the premier international conference in Canada devoted to research in computer graphics, visualization, and human-computer interaction. It is an interdisciplinary conference featuring outstanding keynote speakers, high-quality papers presented by researchers from Canada and abroad, and an awards program celebrating the best in Canadian HCI and graphics. It is also the oldest continuously-scheduled conference in the field: it began in 1969 as the "Canadian Man-Computer Communications Seminar," before taking on its modern name of "Graphics Interface" in 1982.

This is Graphics Interface's 46th year and has been the year of several exciting changes. We have introduced a multiple-deadline model, with a fast turn around for reviews and decisions. This allowed more flexibility for the authors, and the possibility to revise and resubmit their work at a subsequent deadline in case of a rejection. We also transitioned to open reviews, following the lead of top venues in machine learning and computer vision. All anonymous submissions and reviewers' comments were made public on the OpenReview platform, allowing for more transparency in the reviewing process. We consider the Graphics Interface 2020 technical program to have been a great success. We received 87 submissions, up from 50 in 2019, and among these the international program committee accepted a total of 45 papers, up from 26 in 2019 (52% acceptance rate).

The program committee consisted of 92 experts spanning various areas of Graphics, HCI and Visualization. Each paper received a full review from three committee members. A double-blind reviewing process was used: the identity of the paper authors was not known by any of the program committee members. We thank the program committee for ensuring quality, rigor, and integrity in the reviewing process. Anonymous reviews are publicly available on OpenReview.

The Michael A. J. Sweeney Award is awarded at the conference to the best student papers in graphics and HCI. Since 2012, authors of selected computer graphics and visualization papers have been invited to submit extended and revised manuscripts to be considered, with partial reviewer continuity, for journal publication in special sections of IEEE Transactions on Visualization and Computer Graphics (TVCG) and Computers & Graphics. We look forward to seeing the final extended versions of these selected papers later this year.

The conference was initially scheduled to take place at the University of Toronto, Ontario from May 28th to 29th, 2020, but has been moved online due to the public health concerns. The paper program is presented in the form of pre-recorded talks, made available to the whole community on the Graphics Interface official Youtube channel. The virtual, live conference program includes talks given by two keynote speakers, one achievement award winner, one service award winner, and two dissertation award winners. The keynote speakers this year are Mira Dontcheva (Adobe Research) and Wilmot Li (Adobe Research), who are each well known for exemplary contributions to their respective disciplines.

In 2020, the Graphics Interface awards committee chose two highly deserving recipients for the CHCCS/SCDHM Achievement Award; congratulations to Ravin Balakrishnan (University of Toronto) and Dinesh K. Pai (University of British Columbia). This year the Service Award is presented to Kellogg Booth (University of British Columbia), congratulations and big thanks to him for his multiple, impactful contributions over the four decades to the Canadian and international computer graphics, visualization, and human-computer interaction community through his many roles in the organization and its conferences.

Lastly, we extend our congratulations to the two dissertation award winners: Teddy Seyed (University of Calgary)— 2020 Bill Buxton Dissertation Award, and Chakravarty R. Alla Chaitanya (McGill University) — 2020 Alain Fournier Dissertation Award. Further information about all the award winners can be found in the proceedings.

Finally, we would like to thank the many people who contributed time and effort to the behind-the-scenes conference organization, especially David Levin, Paul Kry, Kellogg Booth, Brian Wyvill, Pierre Poulin and Meghan Haley. Thanks also go out to Spencer Rose for the conference web design and maintenance, OpenReview support team for handling the electronic submission and review system. For further information about the Graphics Interface conference series you can visit the official web site

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University of Toronto, Canada

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CHCCS/SCDHM Executive Committee

Service Award 2020

**Canadian Human-Computer Communications Society /
Société canadienne du dialogue humain-machine**

Kellogg Booth
University of British Columbia
CHCCS/SCDHM Service Award
Recipient 2020

The 2020 CHCCS/SCDHM Service Award of the Canadian Human-Computer Communications Society is presented to Dr. Kellogg Booth for his contributions over four decades to the Canadian and international computer graphics, visualization, and human-computer interaction community through his many roles in the organization and its conferences.

Our organization depends on service and commitment from its community. Typical of Dr. Booth, he is quick to point out that his is only the latest in a history of extensive service contributions recognized by this award. Dr. Wayne Davis was the longest-serving President of the organization, leading it through a renaming to the Canadian Human-Computer Communications Society (CHCCS) in 1991 and a renaming of the conference to Graphics Interface (GI) after Dr. Ron Baecker and William (Bill) Buxton organized an off-year conference with that name in 1982. Booth credits Davis and Dr. Fred Peet, who served as Treasurer for the organization for almost three decades, for their tireless work overseeing the organization and the conferences. Davis's contributions were recognized by the second-ever CHCCS Achievement Award in 1992. Peet's contributions were recognized by the first-ever CHCCS Service Award in 2005. Subsequent service awards recognized notable CHCCS members for contributions to large-scale community infrastructure (Gary Perlman, 2007 ; James Stewart, 2008), digital media research management (Adrian Sheppard, 2017) and intellectual mentorship (Pierre Poulin, 2019). This is not an award given lightly.

However, few have carried the CHCCS torch with more dedication and perseverance than Kelly Booth. He has been involved with CHCCS from its very early days. He began with what became the annual Graphics Interface (GI) conference in 1981, serving as local arrangements co-chair for the former Canadian Man-Computer Communications Society's biennial conference and on the program committee. He has continued to serve on the conference's program committees off and on over the years, as well as serving as general co-chair in 1992 for the first AI/GI/VI triple conference in Vancouver and again in 2005 for the renamed AI/GI/ CRV triple conference in Victoria, and as program co-chair for GI in 1998. When he was not on the GI program committee, he often served as a reviewer for the conference. He was elected President of the Canadian Human-Computer Communications Society in 2002 and served six years in that role and another six as Past Chair. As President, his goal was to preserve the founders' legacy of what had become an internationally recognized annual conference on computer graphics, visualization, and human-computer interaction. The first conference in 1969 was conceived by a group of researchers from academic, government, and industry labs who foresaw the importance of emerging technologies such as computer graphics and the importance of considering the interplay between humans and the interactive computer systems being designed for their use.

Conferences were held every second year and the Canadian Man-Computer Communications Society (CMCCS) was formed as a special interest group within the Canadian Information Processing Society (CIPS) to provide sponsorship for the conference.

In addition to his other roles, Booth actively encouraged the annual "triple conference" that brought together GI with the Canadian conference on artificial intelligence and the Canadian conference on computer vision. With Dr. Alain Fournier, Booth served as general co-chair for the first of the triple conference, held in 1992 at the University of British Columbia in Vancouver, six years after a double conference at UBC featuring GI and the computer vision conference. He served on the steering committee for the triple conference for many years, first as one of two official CHCCS representatives and then as an informal advisor. During this time, the triple conference became an annual event, in part due to his enthusiastic support for having a broad-based Canadian venue to showcase the highly cross-disciplinary advances demonstrating synergy between the underlying themes of artificial intelligence, graphics, HCI, vision, and visualization.

He has been very active in the CHCCS awards program. The first award in 1990 was a "one off" to honor Dr. Marceli Wein, another early pioneer whose influence helped shape the uniquely Canadian aspects of the conference, while also growing it into an international venue for top quality research. This was followed two years later by the second award to Wayne Davis and then one award in each of the three years 1994, 1995, and 1996 that established the formal Achievement Award program. After a hiatus of nine years, Achievement Awards became an annual event in 2005. Booth served on the awards committee for three years during this time and later a second five-year term during much of which he chaired the committee. Under his leadership, the CHCCS Service Award was established, and the Alain Fournier and the Bill Buxton Dissertation Awards and the Canadian Digital Media Pioneer Awards were incorporated into the CHCCS awards program.

The annual Michael A. J. Sweeney best student conference paper and the best conference poster award programs were also solidified during this time. Each award recognizes a different aspect of accomplishment within the fields of computer graphics, visualization, and human-computer interaction.

Dr. Kellogg S. Booth is Professor Emeritus of Computer Science at the University of British Columbia. He previously held a faculty position in Computer Science at the University of Waterloo and prior to that worked as a computer scientist at Lawrence Livermore National Laboratory while completing two graduate degrees at the University of California, Berkeley. His undergraduate degree from Caltech was in mathematics. He became interested in computing while a student at Palos Verdes High School where he learned programming in a local science club and during a field trip to Systems Development Corporation the importance of what became the field of human-computer interaction when he was told that half the people developing the SAGE software had mathematics degrees and the other half had psychology degrees.

Michael A. J. Sweeney Award 2020

Canadian Human-Computer Communications Society /
Société canadienne du dialogue humain-machine

The CHCCS/SCDHM honours the memory of Michael A. J. Sweeney through an annual award to the best student papers presented at each year's Graphics Interface conference. The winning papers selected by the program committee, one graphics paper and one HCI paper, are chosen from among accepted papers that have a student as lead author and for which one or more student authors are presenting the paper.

Best Student Papers 2020

In Memory
Michael A. J. Sweeney, 1951-1995

PART-BASED 3D FACE MORPHABLE MODEL WITH ANTHROPOMETRIC LOCAL CONTROL

Donya Ghafourzadeh (Ubisoft La Forge), Cyrus Rahgoshay (Ubisoft La Forge), Sahel Fallahdoust (Ubisoft La Forge), Adeline Aubame (Ubisoft La Forge), Andre Beauchamp (Ubisoft La Forge), Tiberiu Popa (Concordia University), Eric Paquette (École de technologie supérieure)

EXPLORING VIDEO CONFERENCING FOR DOCTOR APPOINTMENTS IN THE HOME: A SCENARIO-BASED APPROACH FROM PATIENTS' PERSPECTIVES

Dongqi Han (Simon Fraser University), Yasamin Heshmat (Simon Fraser University), Carman Neustaedter (Simon Fraser University)

Alain Fournier Award 2019

**Canadian Human-Computer Communications Society /
Société canadienne du dialogue humain-machine**

On August 14th, 2000, Dr. Alain Fournier passed away. He was a leading international figure in computer graphics, and a strong and frequent contributor to the Graphics Interface conference. His insights, enthusiasm, wisdom, vast knowledge, humour, and genuine friendship touched everyone he met.

The "Alain Fournier Memorial Fund" was created to celebrate his life, to commemorate his accomplishments, and to honour his memory. It rewards an exceptional computer graphics Ph.D. dissertation defended in a Canadian University over the past year. The winning dissertation is selected through a juried process by a selection committee consisting of accomplished researchers in computer graphics.

For more information about the "Alain Fournier Memorial Fund", and information about donation, please visit http://graphicsinterface.org/awards/alain-fournier/.

Chakravarty R. Alla Chaitanya
McGill University
CHCCS/SCDHM Alain Fournier
Award Recipient 2019

Chakravarty R. Alla Chaitanya is the recipient of the 2019 Alain Fournier Ph.D. Dissertation Award. His dissertation, entitled "Robust Numerical Solutions to High-dimensional Physics-based Integration Problems", addressed several important problems in the areas of Monte Carlo-based light transport simulations, learning-based image denoising, and interactive acoustic simulation.

The problem of efficiently computing the light and sound transport in complex environments is fundamental to a wide range of applications, and it is the focus of intense research activities, both in academic and industrial settings. Dr. Chaitanya's work in this area made several high impact breakthroughs resulting in several top-level publications as well as successful technology transfer to the public domain and in commercial products. In the first contribution of his dissertation, he proposes a new light path sampling approach that is much more robust than other state-of-the-art methods when applied to radiometrically complex scenes. He released his code to the open-source domain in order for the research community to have easy access to this new method. Next, in his dissertation, he proposes a machine learning-based image denoising architecture tailored to the nature of Monte Carlo-based image synthesis algorithms. In this method, he employs a customized recurrent image denoising architecture, coupled with a novel temporally-coherent patch-based training methodology. His method outperformed the state-of-the-art in both accuracy and performance by several orders of magnitude, and it is incorporated in NVIDIA's OptiX ray tracing package. Last but not least, in his last part of his dissertation, he applied his acquired expertise and insights on light transport to the field of interactive acoustic simulation. In this context, he developed a novel adaptive sampler that leveraged symmetries in the problem in order to improve the performance of existing methods – without sacrificing accuracy – by an order of magnitude.

Dr. Chaitanya's multidisciplinary research accomplishments are an inspiration to new generations of students that are looking to models to shape up their careers. Not only has Dr. Chaitanya published several highly cited articles in top-tier journals and conferences, but he accomplished a rare high level of technology transfer both in the public domain as well as in state-of-the-art commercial products.

Dr. Chaitanya obtained his B.Tech. in Computer Science and Information Technology from Jawaharlal Nehru Technological University in 2004, his M.A.Sc. in Electrical and Computer Engineering from The University of British Columbia in 2008 and his Ph.D. in Electrical Engineering from McGill University in 2019 under the supervision of Prof. Derek Nowrouzezahrai. During his Ph.D. studies, he completed research internships at NVIDIA Research and Microsoft Research, and he was a visiting scholar at the University of Tokyo. He has received departmental and faculty excellence awards at the Université de Montréal and McGill University. He now works at Facebook Reality Labs as a Research Scientist, where he continues to apply his skill set to advance the state-of-the-art in problems in the interactive virtual and augmented reality domains.
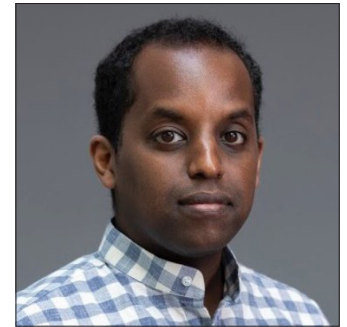
Bill Buxton Dissertation Award 2019

**Canadian Human-Computer Communications Society /
Société canadienne du dialogue humain-machine**

The award is named in honour of Bill Buxton, a Canadian pioneer who has done much to promote excellence, both within Canada and internationally, in the field of Human-Computer Interaction. Bill truly advocates HCI. He challenges how academics and practitioners think, and inspires them to do things differently. This is why we are proud to name this award after him.

The award is determined through a juried process by a selection committee consisting of accomplished researchers in Human-Computer Interaction.

Teddy Seyed
University of Calgary
CHCCS/SCDHM Bill Buxton Award
Recipient 2019

The recipient of the 2019 award for the best doctoral dissertation completed at a Canadian university in the field of Human-Computer Interaction is Dr. Teddy Seyed.

In his dissertation, Entrepreneurial Thinking in the Design of Ubiquitous Computing, he demonstrates a multi-disciplinary approach to contextualizing the development of ubiquitous computing. Teddy's ubiquitous devices and toolkits have opened up new areas of research and enabled both other researchers and end users to build more contextually relevant ubiquitous computing devices. His investigations have covered a wide breadth of domains and device/system types, including multi-surface systems for emergency response, physical device sharing with the Lendable Phone, and detachable screens for smart watches with Doppio. His Mannequette and StitchKit systems put prototyping power into the hands of end users and uniquely bridge the fashion and tech world with a human-centered research lens. Teddy's scholarly work has already gained recognition through numerous awards, including three best paper honourable mention awards, and he has more than 380 citations. His publications provide evidence of an impressive record of collaboration within academics and industry.

In his well-written and very thorough thesis, Teddy weaves together elements of human-computer interaction (HCI), ubiquitous computing, physical prototyping, and entrepreneurship. He demonstrates how entrepreneurial efforts can both feed off of, and feed into, an academic research program, and provides insightful reflections that highlight where this cross-pollination works well and where it creates challenges. Teddy's entrepreneurial reflections can provide valuable guidance to doctoral students generating HCI research products that are commercializable.

Teddy Seyed earned his PhD in Computer Science from the University of Calgary, under the supervision of Dr. Frank Maurer and Dr. Tony Tang. He has published at top-tier venues in the field, including first author publications at ACM CHI 2016; ACM ITS 2012, 2015; ACM IUI 2013; ACM ISS 2016; ACM UIST 2017; ACM DIS 2016, 2019; and IEEE 3DUI 2014. In addition, he co-founded multiple startups and a non-profit for STEAM education in Canada. He also interned at Microsoft Research twice, where he currently holds a postdoctoral research position.

Funding from an anonymous donor established this award in 2011 in honour of Bill Buxton, a Canadian researcher, designer, and musician who has done much to promote excellence in the field of Human-Computer Interaction, both within Canada and internationally. Bill challenges how academics and practitioners think, and he inspires them to do things differently. He is a true advocate for HCI.

The award is determined through a juried process by a selection committee consisting of accomplished researchers in Human-Computer Interaction. This year, the jury was Dr. Audrey Girouard (Carleton University), Dr. Carl Gutwin (University of Saskatchewan) and Dr. Robert Xiao (University of British Columbia). Dr. Celine Latulipe (University of Manitoba) facilitated the process.

Achievement Award 2020

Canadian Human-Computer Communications Society /
Société canadienne du dialogue humain-machine

The CHCCS/SCDHM Achievement Award is presented periodically to a Canadian researcher who has made a substantial contribution to the fields of computer graphics, visualization, or human-computer interaction. Awards are recommended by the CHCCS/SCDHM Awards Committee, based on nominations received from the research community.

Ravin Balakrishnan
University of Toronto
CHCCS/SCDHM Achievement Award
Recipient 2020

A 2020 CHCCS/SCDHM Achievement Award from the Canadian Human-Computer Communications Society is presented to Dr. Ravin Balakrishnan. This award recognizes his significant and varied contributions in the areas of Human Computer Interaction (HCI), Information and Communications Technology for Development, and Interactive Computer Graphics. Ravin's work has had a tremendous impact on real-world applications. His research includes early innovations in areas such as 3D user interfaces, large display input, multitouch gestures, freehand input, and pen-based computing, which has informed and inspired techniques and technologies that are now commonplace in commercial products.

Ravin is a Professor at the Department of Computer Science, University of Toronto. He served as the department's chair from 2015-2019. He earned his Ph.D. in Computer Science from the University of Toronto, working with Bill Buxton (himself an earlier recipient of this same award), while concurrently a part-time researcher at Alias|wavefront. He was elected to the ACM CHI Academy in 2011, is the recipient of an Alfred P. Sloan Research Fellowship (2007), an Ontario Premier's Research Excellence Award (2003), the Bell University Laboratories Associate Chair in HCI at the University of Toronto (2002-2006), a Canada Research Chair (2006-2016) and multiple best paper awards at the top conferences in his field (ACM CHI, CSCW, UIST). In addition to working with students and colleagues at Toronto, he collaborates with researchers at leading industrial laboratories and universities worldwide, including stints as a visiting researcher at Mitsubishi Electric Research Laboratories and HP Labs, a visiting professor at the University of Paris & INRIA, and a visiting researcher at Microsoft Research's Redmond, Beijing, Bangalore and Cambridge labs.

Across the broad domains of HCI research that Ravin has worked on, a common thread is the theoretical underpinnings on which his work is based. Even his most creative and innovative work is conducted with an impressive level of scientific rigour. Through his contributions and methodologies, he has played a significant role in the recognition of HCI as a science, by the top Computer Science departments worldwide. It is thus only fitting that he was one of the first Professors of HCI to serve as Chair of a Computer Science Department at a leading academic institution, where he spearheaded significant growth in both faculty and student enrolments including the hiring of 29 new tenure stream professors over a four year period.

While Ravin's research accolades and publication record is substantial, perhaps his greatest contribution to the HCI community has been the academic tree he has formed through his mentorship of students, and the resulting growth of HCI as a field both in Toronto and internationally. He has mentored over 50 graduate students and Post-Docs, who have gone on to faculty and research positions at leading international institutions. Many of these graduates are now recognized leaders themselves: recipients of Sloan Fellowships; chairs and organizers of top tier HCI research conferences; leaders of HCI Industry Research Labs; and, founders and CEOs of successful start-ups.

Achievement Award 2020

**Canadian Human-Computer Communications Society /
Société canadienne du dialogue humain-machine**

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Dinesh K. Pai
University of British Columbia
CHCCS/SCDHM Achievement Award
Recipient 2020

A 2020 CHCCS/SCDHM Achievement Award from the Canadian Human-Computer Communications Society is presented to Prof. Dinesh K. Pai (UBC) for his numerous high-impact contributions to the field of computer graphics research.

His highly interdisciplinary research is focused on developing computational models of human movement. He has made significant contributions to physics-based animation, multisensory displays including haptics and sound, robotics, biomechanics, and neural control of movement. In support of this, he has developed many novel software and hardware systems related to multisensory capture for humans, sound, and physical properties of the world.

At UBC he directs the Sensorimotor Systems Laboratory, whose state-of-the-art facilities include custom-built skin and fabric measurement devices, 3D full body color scanners, motion capture systems, a suite of skin measurement instruments, an ultrasound system, EMG systems, several eye trackers, haptic interfaces, force sensors, and robots. He founded the UBC spinoff company Vital Mechanics Research, to translate his basic research in skin and tissue simulation into applications. Software from Vital Mechanics has been used in the visual effects and apparel industries.

Prof. Pai has an exceptional track record of mentorship. More than a dozen of the Ph.D. students and postdocs he has supervised or co-supervised now hold faculty positions, including eight in Canada: at McGill, Ottawa, Toronto (2X), Saskatchewan, Simon Fraser, BCIT, and UBC. Others include professors at Stanford, Texas A&M, George Mason, and Birmingham and research scientists at Adobe, Beijing Film Academy, and CNRS France. Many of his students now have leadership roles in the graphics and haptics industries.

Prof. Pai's scholarship has been recognized by named professorships, awards, prestigious grants, and numerous invited lectures. He has been Professeur Invité at the Collège de France, Paris, and appointed Santa Chiara Chair in Cognitive Science at the University of Siena, Italy. He holds a Tier 1 Canada Research Chair, and received UBC's Killam Research Prize. He received one of the most competitive and prestigious international research grants in life science, from the Human Frontier Science Program. He has given more than 100 invited lectures, including the Teruko Yata Distinguished Lecture at Carnegie Mellon University, Stanford's Broad-Area Colloquium, Distinguished Lectures at Columbia and Penn, Institute Colloquium at Max Planck Institute for Biological Cybernetics, Germany, and several conference keynotes.

Prof. Pai received his Ph.D. from Cornell University, Ithaca, NY, and his B.Tech. degree from the Indian Institute of Technology, Madras. He has been a Professor at Rutgers University; held visiting professorships at Carnegie Mellon University's Robotics Institute and New York University's Center for Neural Science; and a Fellowship of the BC Advanced Systems Institute. See https://sensorimotor.cs.ubc.ca/pai/ for more information.