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Bio and Career Highlights

Karan Singh is an expert in Computer Graphics and Human Computer Interaction, and a Professor in Computer Science (since 2002) at the University of Toronto. Born and raised in India, he has lived and worked in many parts of the world including Canada, China, France, India, Japan, New Zealand, Singapore, and U.S.A. He holds a BTech. (1991), MS (1992), and PhD (1995) in Computer Science and Engineering. His research interests lie at the intersection of art, Artificial Intelligence (AI), Computer Graphics (CG) and Human Computer Interaction (HCI): spanning interactive modeling and animation, visual perception, visualization, sketch/touch and interfaces for the web and Augmented/Virtual Reality. Karan has been a development lead on the technical Oscar (2003) winning modeling and animation system *Maya*. He has co-founded multiple companies including sketch2/[FindSpace](#) (acquired by MRI Software 2021), [JanusVR](#), [conceptualiz](#), and [JALI Research](#), and supervised the design and research of critically acclaimed research systems [ILoveSketch](#), [MeshMixer](#) (acquired by Autodesk in 2011), and [FlatFab](#). Karan co-directs a globally reputed graphics and HCI lab, [DGP](#), has over 150 peer-reviewed publications, and has supervised over 50 MS/PhD/ postdoctoral students. He was the R&D Director for the 2005 Oscar winning animated short film *Ryan* and has had an exhibition of electronic art titled [Labyrinths](#). He was awarded a University of Toronto President's Impact Award in 2018 for contributions in computer graphics, design and animation, and an IIT-Madras Distinguished Alumni Award in 2024. His research on audio-driven facial animation *JALI*, has been used to animate speech for characters in major AAA games like *Cyberpunk 2077* and *Call of Duty: Modern Warfare 2*. His work on anatomically animated faces [Anatomy](#), was one of the important technical advances in the film [Avatar: the way of water](#), for which it was awarded the Oscar for the best Visual Effects 2023. He is an affiliate of the [BMO lab](#) for creative research in Art and Performance, the [Vector Institute](#) for AI, and has recently taken over leadership of the [School of Cities India](#) to focus on urban problems relating to people and our planet.

Degrees

- Ph.D., *Computer and Information Science*. Ohio State University. 12/92-10/95
Thesis: Realistic Human figure Synthesis and Animation for VR applications.
- M.S., *Computer and Information Science*. Ohio State University. 09/91-11/92
- B.Tech., *Computer Science and Engineering*. IIT Madras, India. 08/87-07/91

Employment

- Jul 2002- present: *Professor*, Computer Science, University of Toronto, Canada.
- Jan 2024 - present: *Associate Director*, School of Cities India, University of Toronto, Canada.
- Jan 2020-present: *Academic researcher*, Weta Digital <https://www.wetafx.co.nz>
- Jul 2017-present: *Co-Founder*, JALI Inc. www.jaliresearch.com
- Dec 2014-2020: *Co-Founder*, JanusVR www.janusvr.com (open source)
- Jul 2014-2018: *Co-Founder*, FlatFab www.flatfab.com (open source)
- Jan 2006- May 2021: *Co-Founder*, Sketch2, (acquired by MRI software).
- Jun 1999- Jun 2001: *Technical Lead*, Paraform Inc., Santa Jose, CA.
- Dec 1995- Jan.1999: *Graphics Researcher*, Alias Inc., Toronto, Canada.
- Jan 1994- Dec 1994: *Invited researcher*, Communication Systems Research Labs, Advanced Telecommunications Research (ATR), Kyoto, Japan.
- Apr 1994- Nov 1994: *Bartender*, Taberuna Matano, Nara, Japan.

Selected Visiting Professorships (since 2005)

- Winter 2020, Victoria University, New Zealand.
- Winter 2013, NUS Singapore.
- Summer 2011, INRIA Rhone-Alpes.
- Summer 2009, INRIA Sophiantipolis.
- Aug. 2008 – March 2009, Computer Science, Indian Inst. of Tech. (IIT) Delhi.
- Summer 2008, Microsoft Research, Beijing.
- Winter 2007, Computer Science, University of Pennsylvania.
- Summer 2005, Computer Science, University of Texas, Austin.

Selected Honours and awards

- *IIT Madras Distinguished Alumni Award*, 2024. <https://acr.iitm.ac.in/latestdaas/prof-karan-sher-singh/>
- *Avatar: the way of water*, Oscar VFX, 2023 (Facial animation R+D).
- *University of Toronto, President's Impact Award*, 2018
<https://research.utoronto.ca/honours-awards/presidents-impact-award-academy>
- *Canadian Human Computer Communications Society, Lifetime Achievement Award*, May 2019.
<http://graphicsinterface.org/awards/chccs-scdhm-achievement/karan-singh/>
- *University of Toronto Inventor of the year Award* 2015.
- *MITACS 2008-2009 Mentorship Award of Excellence*.
- *Indo-Canada Chamber of Commerce (Technology Award)*, 2008.
- **Ryan**. (Software R&D Director) **Oscar** (Best Animated Short) 2005, *Cannes* 2004, Kodak Discovery, Young Critic's Prize, Canal+ Best Film, *SIGGRAPH* 2004, Los Angeles, CA, Electronic Theater, Jury Prize, *Annecey* International Film Festival 2004, Jury Award, *Prix Arts Electronica* 2004, Golden Nica, *Ottawa* animation festival, Grand Prize, *Genie* (Best Canadian Animation) 2005.
- **Maya 1.0, 1998. (Technical Oscar 2003**, only 38 such awards since 1930) for R&D work on character and facial animation tools that is now the de facto commercial standard in modeling and animation.

Litigation Consulting (testifying expert)

- Align (Morrison Foerster Case No. 6:24-cv-00187-ADA-DTG).
- Figma (Morrison Foerster NDCAL 3:24-cv-06507-JD).
- Maxell (Mayer Brown, No. 5:23-cv-00092-RWS).
- Align (Bartlit Beck, C.A. No. 6:20-cv-00979).
- Align (Bartlit Beck, C.A. No. 18-886-LPS).
- Align (Paul Hastings, C.A. No. 17-1647-LPS, C.A. No. 18-886-LPS).
- Apple (Gibson Dunn NDCAL 12-cv-00630-LHK).
- Apple (Morrison Foerster ITC 337-TA-796, NDCAL Case No. 11-cv-01846 LHK).
- PARTEQ Research and Development (Susman Godfrey No. 2:I4-cv-53 E.D. Tex.).
- Leapfrog (Morrison Foerster C.A. No. 14-261-RGA).

Selected Patents (25 in total)

1. System and method for generation of an interactive color workspace M Shugrina, W Zhang, F Chevalier, S Fidler, K Singh, US Patent 11,263,791, 2022.
2. System and method for animated lip synchronization P Edwards, C Landreth, E Fiume, K Singh, US Patent 10,839,825, 2020.
3. Method and system for linking a first virtual reality (VR) immersive space with a second VR immersive space. James McCrae, Karan Singh. (US pat. 10,593,105, 2020).
4. Interactive labyrinth curve generation and applications H. Pedersen, K. Singh (US pat. no. 7928983), 2006.
5. Method and apparatus for geometric model deformation using wires K. Singh (U.S. patent no. 6,204,860) 1999.

Selected Keynotes, Invited Lectures and Colloquia ACM Distinguished Speaker 2017-2020

- *Expressive Facial Modeling and Animation*. Keynote: ACM Symposium on Computer Animation SCA, Aug. 2024.
- *High performance Interfaces for Modeling and Animation* Keynote: (ACM/EG High Performance Graphics 21)
- *Expressive Facial Modeling and Animation*. Keynote: ACM Motion in Games, Nov. 2019.
- *...On Creative Visual Communication*. Keynote, SIBGRAPI, SIBGAMES 2018.
- *The immersive internet: colloquium VRTO, LSI 2017, SIGGRAPH 2017, SIGGRAPH asia 2017*.
- *Making Faces*. Distinguished Lecture: Animafest Zagreb, June 13, 2015.
- *The future of internet interaction*. Meet the Media Guru, Future ways of living, Milan, June 11, 2015.
- *Perception, Drawing and Interactive Modeling*. College de France June 8, 2015. <http://www.college-de-france.fr/site/marie-paule-cani/symposium-2015-06-08-11h45.htm>
- *Psychorealism, anatomy and animation*, Chinese International film festival, Hangzhou April 2007.
- *Art and science of computational anatomic modeling*, Ontario Science Center, Nov. 2005.
- *Labyrinths and Mazes*, INRIA Grenoble June 2005, Ross Program 2005.

Selected Publications (last 10 years, 150+ in total) <http://www.dgp.toronto.edu/~karan/pubs.htm>

- [KCS25] “*Squidgets: Sketch-based Widget Design for Scene Manipulation*”, J. Kim, , F Chevalier, K. Singh, *ACM UIST 2025 Best Paper Honorable Mention* (8 pages).
- [PGS25] *Model See Model Do: Speech-Driven Facial Animation with Style Control*, Y. Pan, L. Gafemann, K. Singh, *ACM SIGGRAPH 2025* (9 pages).
- [P+25i] *Painting with 3D Gaussian Splat Brushes*, K. Pandey, A. Hu, C. Tsang, O. Perel, M. Shugrina, K. Singh, *ACM SIGGRAPH 2025* (9 pages).
- [PAS24] *S³: Speech, Script and Scene driven Head and Eye Animation*, Y. Pan, R. Agrawal, K. Singh, *ACM Transactions on Graphics (TOG)*, presented at *SIGGRAPH 2024* (12 pages).
- [Y+24] *3D-Layers: Bringing Layer-Based Color Editing to VR Painting*. E. Yu, F. Chevalier, K. Singh, A. Bousseau. *ACM Transactions on Graphics (TOG)*, presented at *SIGGRAPH 2024* (15 pages).
- [N+24] *Surface-Filling Curve Flows via Implicit Medial Axes*. Y. Noma, S. Sellan, N. Sharp, K. Singh, A. Jacobson. *ACM Transactions on Graphics (TOG)*, presented at *SIGGRAPH 2024* (11 pages).
- [P+24] *Diffusion Handles: Enabling 3D Edits for Diffusion Models by Lifting Activations to 3D*. K Pandey, P Guerrero, M Gadelha, Y Hold-Geoffroy, K. Singh, N. Mitra. *Highlight IEEE CVPR 2024*. (13 pages)
- [Y+24ii] *ProInterAR: A Visual Programming Platform for Creating Immersive AR Interactions*. H. Ye, J. Leng, P. Xu, K. Singh, H. Fu, *ACM CHI 2024* (15 pages).
- [F+23] *MAGIC: Manipulating Avatars and Gestures to Improve Remote Collaboration*. Catarina Fidalgo, Mauricio Sousa, Daniel Mendes, Rafael dos Anjos, Daniel Medeiros, Karan Singh, and Joaquim Jorge. *IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR)*, 2023.
- [PCS23] *Juxtaform: interactive visual summarization for exploratory shape design*, K. Pandey, F. Chevalier, K Singh. *ACM Transactions on Graphics (TOG)*, to be presented at *SIGGRAPH 2023* (14 pages).
- [C+22] *Animatomy: an Animator-centric, Anatomically Inspired System for 3D Facial Modeling, Animation and Transfer*. B. Choi, H. Eom, B. Mouscadet, S. Cullingford, K. Ma, S. Gassel, S. Kim, A. Moffat, M. Maier, M. Revelant, J. Letteri, K. Singh. *ACM Transactions on Graphics (TOG)*, presented at *SIGGRAPH Asia 2022* (9+14 pages).
- [P+22] *VOCAL: Vowel and Consonant Layering for Expressive Animator-Centric Singing Animation* Y. Pan, C. Landreth, E. Fiume, K. Singh. *ACM Transactions on Graphics (TOG)*, presented at *SIGGRAPH Asia 2022* (9 pages).
- [PBS22] *Face Extrusion Quadmeshes*. K. Pandey, J Baerentzen, K Singh. *ACM Transactions on Graphics (TOG)*, presented at *SIGGRAPH 2022* (9 pages).
- [Y+22] *Piecewise-Smooth Surface Fitting onto Unstructured 3D Sketches*. E Yu, R Arora, J Baerentzen, K Singh, A Bousseau *ACM Transactions on Graphics (TOG)*, presented at *SIGGRAPH 2022* (17 pages).
- [CSG21] *PosterChild: Blend-Aware Artistic Posterization*. CKT Chao, K Singh, Y Gingold. *Computer Graphics Forum* 40 (4), 87-99. (13 pages).
- [AS21] *Mid-Air Drawing of Curves on 3D Surfaces in Virtual Reality*. R. Arora and K. Singh. *ACM Transactions on Graphics (TOG)*, presented at *SIGGRAPH 2021* (17 pages).
- [KS21] *Optimizing UI Layouts for Deformable Face-Rig Manipulation*. J. Kim and K. Singh. *ACM Transactions on Graphics (TOG)*, *SIGGRAPH 2021* (12 pages).

- [A+21] *Interactive Modelling of Volumetric Musculoskeletal Anatomy*. R. Abdrashitov, S. Bang, D. Levin, A. Jacobson, K. Singh. *ACM Transactions on Graphics (TOG), SIGGRAPH 2021* (13 pages).
- [K+21] *Levitating Rigid Objects with Hidden Rods and Wires*. S. Kushner, R. Ulinski, K. Singh, D. Levin, A. Jacobson, *Computer Graphics Forum CGF, Eurographics 2021*. R. (12 pages).
- [B+21] *Space, Time, and Choice: A Unified Approach to Flexible Personal Scheduling*. V. Bilbily, E. Huynh, K. Singh, F. Chevalier. *ACM Symposium on User Interface Software and Technology, ACM UIST, 484-497* (14 pages).
- [DSG21] *SurgeonAssist-Net: Towards Context-Aware Head-Mounted Display-Based Augmented Reality for Surgical Guidance*. M. Doughty, K. Singh, N.R. Ghugre. *International Conference on Medical Image Computing and Computer-Assisted Intervention (ACM MICCAI 21)*. (11 pages).
- [Y+21] *CASSIE: Curve and Surface Sketching in Immersive Environments*. E. Yu, R. Arora, T. Stanko, J. Baerentzen, K. Singh, A. Bousseau. *CHI Conference on Human Factors in Computing Systems (ACM CHI 2021)* (14 pages).
- [PCS21] *Color by Numbers: Interactive Structuring and Vectorization of Sketch Imagery*. A.D. Parakkat, M.P. Cani, K. Singh. *CHI Conference on Human Factors in Computing Systems (ACM CHI 2021)* (11 pages).
- [X+20] *RigNet: Neural Rigging for Articulated Characters*. Z. Xu, Y. Zhou, E. Kalogerakis, C. Landreth, K. Singh. *ACM Transactions on Graphics 2020 (SIGGRAPH)* (14 pages).
- [S+20] *Nonlinear Color Triads for Approximation, Learning, and Direct Manipulation of Color Distributions*. M. Shugrina, A. Kar, S. Fidler, K. Singh. *ACM Transactions on Graphics 2020 (SIGGRAPH)* (14 pages).
- [ACS20] *Interactive Exploration and Refinement of Facial Expression using Manifold Learning*. R. Abdrashitov, F. Chevalier, K. Singh. *ACM UIST 2020*. (10 pages).
- [BFS19] *Signifier-Based Immersive and Interactive 3D Modeling*. A. Bærentzen, J.R. Frisvad, K. Singh, *25th ACM Symposium on Virtual Reality Software and Technology, (ACM VRST, 2019)*.
- [A+19] *MagicalHands: Mid-Air Hand Gestures for Animating in VR*. R. Arora, R.H. Kazi, D.M. Kaufman, W. Li, K. Singh. *(ACM UIST 2019)* (10 pages).
- [X+19] *Predicting Animation Skeletons for 3D Articulated Models via Volumetric Nets*. Z. Xu, Y. Zhou, E. Kalogerakis, K. Singh. *2019 International Conference on 3D Vision (3DV)*. (10 pages).
- [A+19ii] *Volumetric Michell trusses for parametric design & fabrication*. R. Arora, A. Jacobson, T.R. Langlois, Y. Huang, C. Mueller, W. Matusik, W. Matusik, A. Shamir, K. Singh, D. Levin. *Proceedings of the ACM Symposium on Computational Fabrication, (ACM SCF 2019)* (13 pages).
- [S+19ii] *Creative Flow+ Dataset*. M. Shugrina, S. Fidler, K. Singh. *Computer Vision and Pattern Recognition (IEEE CVPR) 2019*.
- [S+19] *Color Builder: a Direct Manipulation Interface for Versatile Color Theme Authoring*. M. Shugrina, W. Zhang, F. Chevalier, S. Fidler, K. Singh. In *Proceedings of the CHI Conference on Human Factors in Computing Systems (ACM CHI '19)*.
- [L+19] *HoloDoc: Enabling Mixed Reality Workspaces that Harness Physical and Digital Content*. Z. Li, M. Annett, K. Hinckley, K. Singh and D. Wigdor. In *Proceedings of the CHI Conference on Human Factors in Computing Systems (ACM CHI '19)*.
- [AJS19] *A system for efficient 3D printed stop-motion face animation*, R. Abdrashitov, A. Jacobson, K. Singh. *ACM Transactions on Graphics 2019 (SIGGRAPH)* (12 pages).
- [X+18] *Model-Guided 3D Sketching*, P. Xu, H. Fu, Y. Zheng, K. Singh, H. Huang, C.L. Tai, *IEEE Transactions on Visualization and Computer Graphics 2018*. (13 pages).
- [Z+18] *VisemeNet: Audio-Driven Animator-Centric Speech Animation*. Y. Zhou, C. Landreth, E. Kalogerakis, K. Singh. *ACM Transactions on Graphics 2018 (SIGGRAPH 2018)*.
- [A+18] *SymbiosisSketch: Combining 2D & 3D Sketching for Designing Detailed 3D Objects in Situ*. R. Arora, R. Habib, T. Grossman, K. Singh, and G. Fitzmaurice. *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems 2018* (12 pages).
- [WS17] *Bend-a-rule: a fabrication-based workflow for 3D planar contour acquisition*. M. Wei, K. Singh. *Proceedings of ACM Symposium on Computational Fabrication SCF 2017*, (8 pages).
- [S+17] *Participatory Shelter Design for Displaced Populace: Reflections from a User Study*. S. Sabie, S. Easterbrook, C. Munteanu, K. Singh, O. St-Cyr, F. Hashim. *HCI across Borders Symposium 2017*. (7 pages)
- [A+17ii] *Experimental Evaluation of Sketching on Surfaces in VR*. R. Arora, R. Habib, F. Anderson, T. Grossman, K. Singh, and G. Fitzmaurice. *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems 2017* (12 pages).
- [A+17] *SketchSoup: Exploratory Ideation using Design Sketches*. R. Arora, I. Darolia, V. P. Nambodiri, K. Singh and A. Bousseau, *Computer Graphics Forum, CGF 2016* (11 pages).

- [E+16] *JALI: An Animator-Centric Viseme Model for Expressive Lip-Synchronization*. P. Edwards, C. Landreth, E. Fiume, K. Singh. *ACM Transactions on Graphics 2016 (SIGGRAPH 2016)* (11 pages).
- [X+16] *Using Isophotes and Shadows to Interactively Model Normal and Height Fields*. Q Xu, S Liu, Y Gingold, K Singh. *Computers & Graphics 2016* (13 pages).
- [WSK16] *Foreshortening produces errors in the perception of angles pictured as on the ground*. M Wnuczko, K Singh, JM Kennedy *Attention, Perception, & Psychophysics 78 (1), 309-316, 2016* (8 pages).
- [H+16ii] *Multi-Device Storyboards for Cinematic Narratives in VR*. R. Henrikson, B. Araujo, F. Chevalier, K. Singh, R. Balakrishnan (ACM UIST 2016) (11 pages).
- [LS16] *Gestural Motion Editing using Mobile Devices*. N. Lockwood, K. Singh. (ACM Motion in Games 2016) (6 pages).
- [H+16] *Storeoboard: Sketching Stereoscopic Storyboards*. R. Henderson, B. Araujo, F. Chevalier, K. Singh, R. Balakrishnan. *Proceedings of the SIGCHI conference on Human Factors in computing systems (CHI '16)*. (12 pages).
- [A+16] *Snake Charmer: Physically Enabling Virtual Objects*. B Araujo, R Jota, V Perumal, JX Yao, K Singh, D Wigdor. *Proceedings of the TEI'16: Tenth International Conference on Tangible Embedded, and Embodied Interaction*. (9 pages).
- [dPS15] *SecondSkin: Sketch-based Construction of Layered 3D Models*. C. de Paoli, K. Singh. *ACM Transactions on Graphics 2015 (SIGGRAPH 2015)* (10 pages).
- [B+15] *Modeling Character Canvases from Cartoon Drawing*. M. Bessmeltsev, W. Chang, A. Sheffer, K. Singh. *ACM Transactions on Graphics 2015 (SIGGRAPH 2015)* (14 pages).
- [C+15] *ColorBless: Augmenting Visual Information for Colorblind People with Binocular Luster Effect*. S. Chua, H. Zhang, M. Hammad, S. Zhao, S. Goyal, K. Singh. *ACM Transactions on Computer-Human Interaction (TOCHI), 21, 6 (January 2015), Article 32, (presented at CHI'15)* (20 pages)
- [XGS 15] *Inverse Toon Shading: Interactive Normal Field Modeling with Isophotes*. Q. Xu, Y. Gingold, K. Singh. SBIM, Expressive 2015 Best Paper Award.
- [X+14] *True2Form: 3D Curve Networks from 2D Sketches via Selective Regularization*. B. Xu, W. Chang, A. Sheffer, A. Bousseau, J. McCrae, K. Singh. *ACM Transactions on Graphics 2014 (presented at SIGGRAPH 2014)*. (13 pages).
- [BAS14] *Interactive Shape Modeling using a Skeleton-Mesh Co-Representation*. A. Baerentzen, R. Abdrashitov, K. Singh. *ACM Transactions on Graphics 2014 (presented at SIGGRAPH 2014)*. (10 pages).
- [SS14] *Flow complex based shape reconstruction from 3D curves*. B. Sadri, K. Singh. *ACM Transactions on Graphics 2014 (presented at SIGGRAPH 2014)*. (15 pages).
- [X+14ii] *Zero-latency tapping: using hover information to predict touch locations and eliminate touchdown latency*. H. Xia, R. Jota, B. McCanny, Z. Yu, C. Forlines, K. Singh, and D. Wigdor. *Proceedings of the 2014 symposium on User Interface Software and Technology (ACM UIST)*. (9 pages).
- [MUS14] *FlatFitFab: Interactive Modeling with Planar Sections*. J. McCrae, N. Umetani, K. Singh *Proceedings of the 2014 symposium on User Interface Software and Technology (ACM UIST)*. (10 pages).
- [A+14] *Mosaic: Sketch-Based Interface for Creating Digital Decorative Mosaics*. R. Abdrashitov, E. Guy, J. Yao, K. Singh. *Expressive: Sketch-Based Interfaces and Modeling, 2014*. Best paper Award.
- [F+14] *LACES: Live Authoring Through Compositing and Editing of Video Stream*. D. Freeman, S. Santosa, F. Chevalier, R. Balakrishnan and K. Singh *Proceedings of the SIGCHI conference on Human Factors in computing systems (CHI '14)*. April 2014.

Selected Teaching (44 undergraduate courses, 16 graduate courses at U of Toronto)

- CSC 317 Computer Graphics.
- CSC 373 Algorithm Design, Analysis and Complexity.
- CSC 199 The Natural world and computer graphics.
- CSC 148 Introduction to Computer Science.
- CSC 490 Capstone Design Course: Stroke, touch and mobile interaction
- CSC 491 Capstone Design Course: Interactive Graphics.
- CSC 2529 Character Animation.
- CSC 2505 Geometric Modeling.
- CSC 2521 Topics in HCI/Graphics: Sketch interaction, perception and modeling.
- CSC 2521 Interactive 3D modeling for design and fabrication.
- CSC 2524 Topics in Interactive Computing AR/VR.
- CSC 2529 Facial animation.