

My research focuses on the development of computational techniques to analyse, anticipate, and foster social human interactions—especially those that are physically situated or virtually embodied. My vision is to enable machines to perceive and reason about the social dynamics of these exchanges, enabling smoother interactions between machines and people. The underpinnings of this work are inter-disciplinary, lying at the intersection of machine learning, computer vision, multimodal interaction, and social psychology.

EDUCATION

- 2018 - present **PhD, Computer Science (expected 2022)**
Socially Perceptive Computing Lab, Delft University of Technology, Netherlands
- 2011 - 2013 **Master of Entertainment Technology**
Entertainment Technology Center, Carnegie Mellon University, Pittsburgh, USA
- 2006 - 2010 **Bachelor of Engineering, Information Technology**
D.J.Sanghvi College of Engineering, University of Mumbai, Mumbai, India

EXPERIENCE

- Apr'16 - Jul'18 **Carnegie Mellon University - Language Technologies Institute, Pittsburgh, PA**
Senior Research Engineer (July 2017 - July 2018)
Research Engineer (April 2016 - July 2017)
Worked with the Multicomp Lab on building algorithms and systems to sense, analyze, recognize, and predict subtle human communicative behaviors in social context
- **Audiovisual Emotion Recognition**
Developed a neural approach for learning task specific bag-of-words representation within a recurrent neural network for multimodal emotion recognition
 - **SCIPR (Sensing Curiosity in Play and Responding)**
Implemented the data acquisition system for recording sessions of four children playing a board game, for the identification and modeling of behaviours to sense curiosity
 - **MultiSense**
Architected and implemented a platform for distributed processing of multimodal human behavioural signals incorporating state-of-the-art algorithms developed at the Lab
Developed a multi-device audio and video capture system for behavioural data acquisition using FFmpeg, OpenCV, and ZeroMQ
- Apr'14 - Apr'16 **ProductionPro, Inc., New York, NY**
Lead iOS and UX Developer
- Architected and implemented core client-side systems of the flagship product: a real-time collaborative platform for visualizing scripts for TV, film, and theatre
 - Designed user task flows, interaction paradigms, UI specifications, and information architecture for user facing aspects of the app. Also introduced user testing methodologies to validate designs
- Jun'13 - Apr'14 **Disney Research - Walt Disney Imagineering, Pittsburgh, PA**
Research Associate - Computer Vision
- Implemented server-side object detection and model training services employing the Discriminatively Trained Deformable Part Based Models technique
 - Developed algorithms to detect and track giraffe feeding events in video captured at Disney
- May'12 - May'13 **Walt Disney World Parks & Resorts, Orlando, FL**
New Technology Analyst - Next Generation Experience Project
- Prototyped techniques for color constancy of images captured under non-uniform illumination
 - Integrated techniques for automating color retargeting of high speed video into the existing guest media capture pipeline within the theme parks

- Jan'12 - May'12 **Microsoft - User Experience and Creative Services**, Redmond, WA
 Developer - Project Wall# (Semester Project)
 · Developed an interactive projection mapping installation prototype for the Microsoft Store front using the Kinect and Unity3D
 · Implemented shaders for native homographic correction for projection mapping within Unity3D
- Jul'10 - Jul'11 **Hungama Digital Media Entertainment Pvt. Ltd.**, Mumbai, India
 Developer - iOS Games and Interactive Installations
 · Developed an iPhone game (Toon Football - Striker Practice) for Turner Broadcasting System, Inc.
 · Implemented a gesture recognition module using the Kinect for a bank lobby installation
 · Implemented a speech-driven iOS music application using CMUSphinx OpenEars
- Jul'08 - Aug'11 **Indian Institute of Technology - Bombay**, Mumbai, India
 Project Engineer - Project OSCAR (June 2011 - August 2011)
 Research Intern - Project OSCAR (July 2008 - June 2011)
 Project OSCAR (Open Source Computer Animation Repository) was a Govt. of India funded effort to promote distance education to support under-served populations. *Website: <http://oscar.iitb.ac.in>*
 · Designed, validated, and implemented 3D authoring tools using the Blender Game Engine to enable educators to create interactive content for distance education

SELECTED HONORS & AWARDS

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| 2015 | (For ProductionPro) Audience's Choice, Made in New York Media Center Demo Day |
| 2012 | To Innovation And Beyond, Walt Disney World New Media Group |
| 2011 | The Award of First Penguin, Entertainment Technology Center, Carnegie Mellon University |
| 2011 | K.C. Mahindra Scholarship for post-graduate studies |
| 2011 | Bharat Petroleum Corporation Scholarship for higher studies |
| 2009, 2010 | Sir Dorabji Tata Trust Scholarship for excellence in undergraduate studies |

PUBLICATIONS

- P05. *Multimodal data collection for social interaction analysis in-the-wild*
 Hayley Hung, **Chirag Raman**, Ekin Gedik, Stephanie Tan, and Jose Vargas Quiros
 In Proceedings of the 27th ACM International Conference on Multimedia (MM), 2019, Tutorial
- P04. *Towards automatic estimation of conversation floors within F-formations*
Chirag Raman and Hayley Hung
 In Proceedings of the 8th IEEE International Conference on Affective Computing and Intelligent Interaction Workshops and Demos (ACIIW, EMERGent Workshop), Oral
- P03. *Multimodal Polynomial Fusion for Detecting Driver Distraction*
 Yulun Du, **Chirag Raman**, Alan W Black, Louis-Philippe Morency, and Maxine Eskenazi
 In Interspeech 2018, 19th Annual Conference of the International Speech Communication Association, 2018
- P02. *Auto-Grading for 3D Modeling Assignments in MOOCs*
 Swapneel Mehta, **Chirag Raman**, Nitin Ayer, and Sameer Sahasrabudhe
 In IEEE 18th International Conference on Advanced Learning Technologies (ICALT), 2018, Full Oral
- P01. *Integrating Verbal and Nonverbal Input into a Dynamic Response Spoken Dialogue System*
 Ting-Yao Hu, **Chirag Raman**, Salvador Medina Maza, Liangke Gui, Tadas Baltrusaitis, Robert Frederking, Louis-Philippe Morency, Alan W Black, Maxine Eskenazi
 In Proceedings of the Thirty-First AAAI Conference on Artificial Intelligence, 2017, Demo Track

TEACHING

- Teaching Assistant Manager **Social Signal Processing 2018.**
Data Mining 2019.
Delft University of Technology
- Instructor **Game Architecture and Programming 2010.**
D.J.Sanghvi College of Engineering, University of Mumbai

SERVICE

- Organizer **Symposium on Interdisciplinary Insights into Group Dynamics, TUDelft. 2018.**
- Reviewer **IEEE Intl. Conference on Automatic Face & Gesture Recognition (FG) 2020.**
IEEE Transactions on Affective Computing 2019.
AAAC Intl. Conference on Affective Computing & Intelligent Interaction (ACII) 2019.
Group Interaction Frontiers in Technology Workshop, ACM ICMI 2018.
- Technical Reviewer **Unity 4 Game Development HOTSHOT. 2013-2014.**
Packt Publishing
- Tutorials / Training **Online tutorials - Introduction to Blender 3D, Project OSCAR. 2011.**
Indian Institute of Technology Bombay, India
Workshop - Introduction to Blender 3D. 2011.
D.J.Sanghvi College of Engineering, University of Mumbai, India
- Jury **Building Virtual Worlds Festival. 2013.**
Entertainment Technology Center, Carnegie Mellon University

SELECTED PRESS

- MultiSense **ARTE.** L'intelligence artificielle va-t-elle nous dépasser? Oct 2018.
CNN. Anthony Bourdain - Parts Unknown. Oct 2017.
VOA News. Future combines Human, Machine Intelligence, Scientists Say. Oct 2016.
- ProductionPro **Forbes.** New Broadway App Makes The Creative Process A Snap. Aug 2017.
NBC News. The App Changing the Way Hollywood Makes Your Favorite Shows. Jun 2017.
New York Business Journal. ProductionPro wins Demo Day at Brooklyn's Made in NY Media Center. Oct 2015.
- Project OSCAR **Hindustan Times.** Project OSCAR - Animation to make engineering lessons easier, more fun. 2009.