

Sidharth Sahdev

sidharth.sahdev@gmail.com
<https://www.sidharthsahdev.com>
+1 647.517.4406, +33 758.463.946

Research Interests

- Computer Vision
- Robotics
- Machine Learning
- Human Computer Interaction
- Signal Processing
- Augmented Reality

Education

- Sept 2015 – June 2017 **Master of Science, Applied Computing**
Department of Computer Science, University of Toronto, Toronto, Canada.
Research focus: Machine Learning & Human Computer Interaction.
Thesis Advisor: Prof. Eugene Fiume/Dr. Ricardo Jota.
- May 2014 – July 2015 **Bachelor Research in Human Computer Interaction**
INFRES Department, Telecom ParisTech, Paris, France.
Research focus: Human Computer Interaction & Robotics.
Thesis Advisor: Dr. Gilles Bailly.
- Aug 2011 – July 2015 **Bachelor of Engineering (Honors), Electronics & Communications**
Electrical Engineering Department, Birla Institute of Technology & Science, Pilani, Hyderabad, India.
Research focus: Electronics & Image Processing.
Mentor: Prof. S.K. Sahoo/Prof. Suman Kapur.

Summer School

- August 2020 **CIFAR Deep Learning + Reinforcement Learning Summer School, DLRLSS'20**
Montreal, Canada (Virtual).
- July 2018 **12th International Computer Vision Summer School, ICVSS'18**
Sicily, Italy.

Publications

- ACM SIGCHI 2017 **Sidharth Sahdev**, Clifton Forlines, Ricardo Jota, Bruno De Araujo, Braon Moseley, Jonathan Deber, Steven Sanders, Darren Leigh, Daniel Wigdor. GhostID: Enabling Non-Persistent User Differentiation in Frequency-Division Capacitive Multi-Touch Sensors. CHI '17. (10 + 3 pages. **AR: 25%**)
- ACM SIGCHI 2016 Gilles Bailly, **Sidharth Sahdev**, Sylvain Malacria, Thomas Pietrzak. LivingDesktop: Augmenting Desktop Workstation with Actuated Devices. CHI '16. (10 + 3 pages. **AR: 23%**)
- IEEE VLSI-SATA 2015 Apurva Kumari, **Sidharth Sahdev**, S.K. Sahoo; Improved Single Image and Video Dehazing Using Morphological Operation; VLSI-SATA '15. (5 pages)

Skills

- Programming languages:** C, C++, Python, Processing, Java, GLSL, CUDA.
- Operating System:** Linux, Mac OS, Windows.
- Libraries:** numpy, scipy, sklearn, OpenCV, OpenGL, Tensorflow, PyTorch, Caffe, OpenAI.
- Software Tools:** Docker, Git, AWS, DevOps, QT, MATLAB, ROS, Visual-Studio, Redis, LabVIEW, Android Studio, Kivy, ccstudio, basic Keil, Xilinx, Ispice, Electric, Eagle, ORCAD, QtSpim, Netsim, Opnet, Solid Edge ST-7, AutoCAD.
- Hardware:** GPUs, SDI video cards, Arduino Development Platform, Raspberry Pi, AVR, Altera DEC-1 boards, basic ARM Cortex M4, spectrum analyzer, TMS320C6713 DSP Processor (basic).
- Sensors:** 2-d LIDARs, Intel RealSense, Thermal Cameras, Kinect, leap motion, Capacitive FDM based multi-touch sensors, IMUs, high precision PTZF cameras, magnetic field based hand-held sensing, ultrasonic sensors.
- Assembly languages:** Basics of ASM x86, MIPS, and NIOS II.

Industry Experience

- June 2019 – Present **Senior Robotics Engineer**, iFollow SAS, Paris, France (full-time).
Machine Learning Researcher (Oct 2020)
- iFollow is a collaborative robotics company that provides tailored use-cases for automation in the supply-chain warehouses. I work on robot perception, mapping and navigation.
 - Principle Investigator to explore AI based robotics solutions. (Cloud Computing/ Python)
 - Worked on setting up data and cloud infrastructure to handle robots' data. (Python)
 - Lead of Deployment and integration software stack for multi-robot collaboration for different supply-chain warehouse use-cases, supervising a team of deployment engineers.(shell scripts/CI-CD/DevOps)
 - Worked on implementing a ros_to_redis communication link for warehouse simulation environment for robots to demonstrate order-picking operation. (C++/ Python/ Protocol Buffers/ Redis)
 - Worked on popular dynamic path planning algorithms in ROS. (C++)
 - Worked on implementing perception & control algorithms for automatic docking of robots using 2-d LIDARs. (C++)
- April 2019 – Present **Advisor**, NuPort Robotics Inc., Toronto, ON, Canada (part-time).
- NuPort Robotics is an autonomous driving company that provides logistics solutions for short-haul freight management. I am a Technical and Business consultant to the company.
 - Project lead on using 5G technology to explore bandwidth and latency gains in Autonomous Guided Vehicles' (AGVs) data transmission.
 - Provide technical roadmaps and insights for the sensor stack for AGVs.
 - Work on Scientific Project Proposals and Govt. applications.
 - Involved in remote teleoperations for AGVs.
- August 2017 – May 2019 **Research Engineer**, MTL.AI Inc., Montréal, QC, Canada (full-time).
- MTL.AI is an augmented reality based startup for marketing and digital advertising in the sports industry with clients across Europe.
 - Worked on automated solutions for image segmentation of HD-broadcast video using state-of-the-art deeplearning methods and improving the baseline for digital content replacement for European football club advertisements (Python).
 - Worked on implementing optimized and trained geometry models for localization of sport fields using techniques in Computer Graphics, machine learning and mathematical optimization (C++/Python).
 - Worked on computer vision techniques for real-time (@50fps HD video feed) pixel accurate image segmentation, image registration, image retrieval and matching, radial distortion estimation (Python/C++/GLSL).
 - Integration Software for HD/UHD Video Capture Cards, Redis database and different DAW (digital audio workstation) MIDI controllers (C++).
 - Integration Software applications for sports video broadcasting centers (C++).
- May 2016 – May 2017 **Researcher**, Tactual Labs Co., Toronto, ON, Canada (full-time).
- Tactual Labs Co. is an innovator in human-to-computer sensing and processing technology with a veteran team leading the development of the most responsive and capable user interface technologies.
 - Worked on Enabling User-Differentiation in Frequency-Division Capacitive Multi-Touch Sensors using concepts in Machine Learning, Signal & Image Processing. Designed, Implemented and tested a novel differentiation & sensing algorithm that can discriminate between multiple users and single user's hands on a 10-inch tablet form factor prototype capacitive sensor. Also, developed interaction techniques that depict the mobility and usefulness of the sensing technology (Python/Java/Octave).
- May 2012 – July 2015 **Junior Researcher** in R&D, Security Defence Systems, Baddi, HP, India (part-time).
- Security Defence Systems is a 32-year-old ISO 9001 company that manufactures the largest range of sophisticated EOD equipment. I have worked in the organization part-time for three years during term breaks (C/C++/MATLAB and embedded systems).
 - Exhibitor at INTERSEC Exhibition 2014 held in Dubai, UAE by Messe Frankfurt.
 - Exhibitor at North Technology Symposium 2013, Udhampur, India by Indian Northern Command.

- Oct 2013 – July 2015 **Software Developer**, xCelle in Bio Innovations & Technologies Pvt. Ltd., Hyd., India (part-time).
- A start-up company that provides cost effective rapid detection and testing devices for diseases in rural and urban areas. I have been a core team member since the inception of the idea (C/MATLAB).
 - Development of an indigenous chip for testing antibiotic sensitivity of pathogens found in the human urinary tract. A Sponsored research project under NPMASS DRDO. I was the lead in making an electronic prototype that reads the biological sample, runs in-house lab developed diagnostic algorithms and gives out user readable information on hardware display, through a MATLAB exe and an Android App. Also, helped in mechanical assembly of three mechanisms to detect antibiotic for cultured bacteria.
- Nov 2011 – July 2014 **Technical Lead**, Valonia, Hyderabad, AP, India (part-time).
- Valonia is an educational startup that provides a revolutionary way of imparting practical skills to students. I delivered lectures and took workshops on Robotics and Electronics in various colleges across India. Also, judged national technical events at colleges.

Research Experience

- May 2016 – Sept 2016 **Graduate Research Student**, Dynamic Graphics Project Lab, University of Toronto, Canada. Advised by Prof. Daniel Wigdor/Dr. Ricardo Jota.
- Worked on a novel User Differentiation technique on Capacitive Multi-Touch Sensors.
 - Designed a new input discrimination technique using signal processing and machine learning principles.
 - Conducted a 21 participants User study for my graduate research project & presented at weekly HCI research meetings.
- Jan 2016 – May 2016 **Research Assistant**, Centre for Vision Research, York University, Toronto, Canada. Advised by Prof. John K. Tsotsos.
- Designed a backpack detector for surveillance cameras using Convolutional Neural Networks.
 - Created a dataset and experimented with different deep neural network architectures.
- Jan 2015 – July 2015 **Research Intern**, LTCI, CNRS, Télécom ParisTech, Université Paris-Saclay, Paris, France. Advised by Dr. Gilles Bailly/Dr. Sylvain Malacria.
- Worked on the LivingDesktop: an augmented desktop with the mouse, keyboard and monitor capable of moving to improve ergonomics, foster collaboration, leverage context and reinforce physicality in a desktop workstation.
 - This work is at the intersection of Robotics & HCI and involved using computer vision techniques for multiple object tracking, designing and implementing the entire prototype (Hardware, Software in C++ & Arduino & Mechanical) and implementation of novel interaction scenarios for a desktop workstation.
- May 2013 – July 2013 **Internship**, Centre for Electronic Engineering and Research Institute, Govt. of India, Rajasthan, India. Advised by Dr.-Ing. Jagdish Lal Raheja.
- Generated real-time anaglyph images using computer vision algorithms and Kinect for Windows sensor. It was aimed at testing the features of a 3-D endoscope using Kinect.

Academic Projects

- Sept 2015 – May 2016 **Graduate coursework**, Department of Computer Science, University of Toronto, Toronto, Canada
- **Deep Learning:** learned about state-of-the-art methods for many Computer Vision and Natural Language Processing applications. *Project work titled BackpackDetector: A Deep Learning Approach for Specific Object Detection for Surveillance Systems.*
 - **Parallel Programming:** learned about CUDA-C on NVIDIA GPUs. *Project work titled An Evaluative Study of CUDA Implementation of Histogram of Oriented Gradient (HOG) Descriptor for Images.*
 - **Machine Learning:** Graduate course on machine learning. *Project work titled An Evaluation of the state of the art techniques for the detection and classification of SVHN digits using local image descriptors.*
 - **Computer Vision:** learned about principles in radiometry, robust estimation, tracking, and recognition.
 - **Human Computer Interaction:** an empirical research analysis course in HCI. *Project work titled A Comparative Evaluation of Two User Interfaces on Smartwatches.*

- Jan 2014 – Nov 2014 **Selected Undergraduate Projects**, Birla Institute of Technology & Science - Pilani, Hyderabad, India.
- **Perceptual Computing: interactions with 3D objects.** Worked with the leap motion sensor to study and implement the interactions with 3-D objects to sculpt out a point cloud created by a Kinect sensor.
 - **Image and Video Encryption.** Studied various cryptography algorithms and implemented the Elliptic curve cryptosystem for fast image and video encryption
 - **Whether degraded image and video processing.** Implemented computer vision technique to remove haze/fog from images and live streaming videos.

Peer Reviewing

Journal Reviewing

Institution of Engineering and Technology Image Processing Journal (IET IP)
• 2015 (1)

Conference Reviewing

Human Robot Interaction (HRI)
• 2017 (1)

Human-Computer Interaction with Mobile Devices and Services (MobileHCI)
• 2017 (1)

Teaching

- Teaching Assistant at University of Toronto for courses on Python Programming (Winter '17, Fall '16), R Programming (Winter '16) and Microprocessor Systems (Fall '15).
- Mentor to First, Second and third year undergraduate students for the courses on Image Processing and Robotics under a knowledge-based exchange program *Student Mentorship Program* during the academic year 2013-14 at BITS Pilani.

Personal Projects

2018

- Inverse kinematics and stepper motor integration of a **SCARA Robot** using Arduino & Raspberry Pi.
- Playing around with a Xsens Inertial Measurement Unit.

2017

- Exploring with a Nvidia **Jetson TX2** developer kit to understand the scope of embedded deeplearning.

2013

- Implemented an Under Vehicle Surveillance System (**UVSS**) proof-of-concept. Used image processing and machine learning techniques to detect any foreign object at the under belly of a vehicle. Created a dataset of 18 different vehicle chassis to test my approach. (Fall '13)
- Build a servo motor speed control model using MATLAB & Simulink interfaced with Arduino. (Fall'13)
- Selective Removal of Impurities among Objects: Build a kicker mechanism to remove blocks moving on a conveyer belt based on color and shapes using an overhead camera and Arduino. (Fall '13)
- Ball follower: Build a bot that traces a colored ball with an on-bot camera using Arduino microcontroller and image processing techniques. (Winter '13)

2012

- Maze Solver: Build a bot that can solve a given maze using PID for drive & a right first algorithm for search. (Fall '12)
- Switched Mode Power Supply (**SMPS**): Build a robust power supply to charge a 12V lead acid battery typically used in many robotics kits. (Summer '12)
- Line Follower: Build a six sensor PID algorithm based line follower that was included as part of the project kit for Valonia that sold over 300 kits through the course of our workshops. (Winter '12)

Relevant Coursework

Graduate Courses:	Deep Learning in Computer Vision, Visual Perception for Autonomous driving (audited), Programming Massively Parallel Multiprocessors and Heterogeneous Systems, Foundations of Computer Vision, Introduction to Machine Learning, Human-Computer Interaction, Technical Entrepreneurship, Communication for Computer Scientists.
Electronics courses:	Information Theory and Coding, Digital Signal Processing, Communication Systems, Communication Networks, Signals and Systems, Control Systems, Electromagnetic Field and Microwave Engineering, Electromagnetic Theory, Microprocessors and Interfacing, Electronic Devices, Digital Design, Analog and Digital VLSI design, Analog Electronics, Microelectronic Circuits, Electrical Machines, Electrical Sciences.
Computer courses:	Computer Graphics, Cryptography, Machine Learning, Computer Architecture, Computer Programming.
Mathematics courses:	Calculus, Differential Calculus, Algebra and Matrices, Optimization, Probability & Statistics.
Online courses:	Machine Learning – Stanford, Image and Video Processing – Edmund T. Pratt, Jr. School.

Conferences Attended

ICRA 2020	Virtual International Conference on Robotics and Automation, Paris, France.
MILIPOL 2019	International Exhibition on defense and Security equipment, Paris, France.
SOLUTRANS 2019	Exhibition on warehouse and transport Logistics, Lyon, France.
ICRA 2019	International Conference on Robotics and Automation, Montreal, Canada.
CES 2019	Consumer Electronics Show, Las Vegas, USA.
NeurIPS 2018	International Conference on Neural Information Processing Systems, Montreal, Canada.
TMLS 2018	Toronto Machine Learning Summit, Toronto, Canada.
CANSEC 2017	Security Canada Expo, Ottawa, Canada.
CHI 2017	International Conference on Human Computer Interaction, Denver, USA.
BEST 2014	Biotechnology Student Entrepreneurship Teams organized by ABLE and DBT, Bangalore, India.
INTERSEC 2014	Exhibition on International Security organized by Messe Frankfurt, Dubai, UAE.
NTS 2013	North Tech Technology Symposium organized by Indian Northern Command, Udhampur, India.

Grants & Scholarships

- Project lead for a \$CAD 200,000 budget 5G remote operations for autonomous truck supported by a grant awarded by OCE 5G ENCQOR with collaboration with NuPort Robotics Inc. (2020).
- OCE TalentEdge scholarship for \$CAD 30,000 to conduct an eight-month research internship at Tactual Labs in Collaboration with the University of Toronto (2016-17).
- Received a grant of € 4,800 for my Bachelor thesis work in France for six months at Telecom ParisTech, Paris (2015).
- Received Raman Charpak Internship Scholarship by Campus France to work in France. Was among top 34 students in India to get the award (2014).
- Received 80% & 40% merit scholarships offered to top 1% & 2% (650 students) of BITS Pilani for two terms (2011-12).

Awards & Honours

- Winner of Biotechnology Entrepreneurship Student Teams (BEST India 2014) organized by the Association of Biotechnology Led Enterprises (ABLE); won a prize money of Rs. 500,000 (\$10,000) for a successful startup under xBITS.
- Winner of SRISHITI (Biotechnology based startup competition), Hyderabad, covered by national news and media.
- **Best paper award** for *Improved Single Image and Video Deblurring Using Morphological Operation* during ATMOS 2014 (National Technical Meet-up event of BITS Pilani).
- Felicitated at **BITSAA Global Meet 2014** for coming up with a startup idea on Under Vehicle Surveillance System
- Co-judge at the Technical festival of Chaitanya Bharathi Institute of Technology, Hyderabad for the event *Power of Ideas*.
- Acting Judge for the paper presentation competition during ATMOS 2013.
- **Best paper award** for *Real-time generation of anaglyphs* during ATMOS 2013 (National Technical Meet-up event of BITS Pilani).
- Won the maze solver competition at ATMOS 2013
- Received the **bronze standard in the international award** for the young people in the D.O.E (Duke of Edinburgh).
- **Tri-City topper** among all ICSE (The Indian Certificate of Secondary Education) schools in 2009, was felicitated by the State Bank of Patiala and Taj Group of hotels.

Hobbies

Tennis

Represented school twice at state level. Member of All India Tennis Association for three years.
Now an enthusiast.