

# Soumil Chugh

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## Education

### **Masters of Applied Science /** University of Toronto, Canada

Majoring in **Computer Engineering** with a CGPA of 3.9

AUG 2018 - PRESENT

### **Bachelor of Engineering /** Panjab University, Chandigarh, India

Excelled in **Electronics and Communication** with a GPA of 3.4

AUG 2011 - MAY 2015

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## Professional Experience

SEP 2015 - JULY 2018

### **Hardware and Software Engineer /** Jana Care, Bengaluru, India

- Led the software and hardware system design of an FDA approved Bluetooth enabled Robotic System that measures HbA1c (Avg Glucose) levels of a person.
- Member of the software research and development team that designed a smartphone-based portable blood monitoring device.

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## Research Experience

### **Masters Thesis | Eye Tracking | Computer Vision**

**University of Toronto, Canada**

**Aug 2018 - Present**

- Designed a real-time eye tracking system for a Virtual Reality head mounted device using a hybrid approach of Deep Learning and 3D Model of the eye.
- Major Contributions: 1) Subpixel center estimation of eye features such as pupil, iris, corneal reflections using semantic segmentation. 2) Designed a novel deep learning algorithm for mapping corneal reflections with their light sources. 3) A mean accuracy of less than a degree for the end-end eye tracking system across 6 subjects under varying scenarios.

### **Undergraduate Thesis | Biomedical | Embedded Systems**

**CSIR-CSIO, Chandigarh**

**Jan 2015 - Jun 2015**

- Designed a low cost, calibration free biomedical finger probe that measures heart rate, blood oxygen level, and hemoglobin non-invasively. Error rates of less than 10% across 10 subjects

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## Academic Projects

- **Object Detection in Aerial Images | Tensorflow | Opencv | Python**  
Designed an object detector using RCNN and FPN for aerial images to detect 7 different categories of object in the Stanford drone dataset. Achieved MAP of 70%.
- **Segmentation of Lanes on Road | Tensorflow | Opencv | Python**  
Designed a Segmentation algorithm using a fully convolutional network for identifying curved or straight lanes on a road under different weather conditions. Average IOU of 0.75 is achieved.
- **Pupil Center Estimation using Smartphone | Tensorflow | Opencv | Python**  
Designed a CNN based regression network for subpixel pupil center estimation in eye images obtained from a smartphone's infrared camera for eye tracking. A mean pixel error of 1 is achieved.
- **Visual Question Answering Tool | Tensorflow | Opencv | Python**  
Designed a CNN/RNN based visual question answering tool with the input being an image and a corresponding question related to the image and output being answer to that question. Achieved 55% accuracy on test data.
- **ExpoSocial Android Application**  
Designed an android application named ExpoSocial which is a therapy management app meant for patients suffering from social anxiety.

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## Publications

- A Binocular VR Infrared-based Eye Tracker with a CNN Feature Extractor and 3D Gaze Estimation Model, ACM Transactions on Human Computer Interactions, **2020** (Under Review).
- Detection and Correspondence Matching of Corneal Reflections for Eye Tracking Using Deep Learning, ICPR, **2020** (Under Review).
- Non-invasive hemoglobin monitoring device, IEEE, **2015**.
- Low cost calibration free Pulse oximeter, IEEE, **2016**.
- Exudates Segmentation in Retinal Fundus Images for the Detection of Diabetic Retinopathy, IJERT, **2014**.
- Effect of Different Signal Processing Techniques on a Calibration Free Pulse Oximeter, IEEE, **2018**

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## Awards and Honours

- Recipient of **Rogers scholarship** during Masc for 2 years from the Electrical and Computer Engineering Department at University of Toronto, Canada.
- Recipient of **scholarship** in the sophomore year of undergraduate by the State Administration for being among the top five students in the Electronics and Communication department.
- Awarded **certificate of appreciation** by Jana Care for my contributions to the company.