



# Om Agarwal

Coder. Entrepreneur. Leader.

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Featured on CBC, CTV National, CTV Atlantic, TEDx, Global News, Metro News, Nova Scotia Press, Canadian Geographic, Chronicle Herald, OMNI TV, Dalhousie News, RPM Productions

## Major Technical Skills

- **Programming Languages:** Python, C, C++, C#, HTML5/CSS3, PHP/MySQL, JavaScript (w/ jQuery & AJAX)
- **Specialties:** Machine & Deep Learning, Computer Vision, Signal Processing, Data Pre-Processing & Analysis, Natural Language Processing, Associative Learning, Numerical Computation, Database Management, Web Development, Application Design, Electronics
- **Python Packages:** TensorFlow, Theano, PyTorch, SciKit-Learn, XGBoost+LightGBM+CatBoost, Eli5, SciPy, OpenCV, Keras, NLTK, Stanford NLP, SpaCy, Gensim, GloVe, NumPy, Pandas, Matplotlib, Seaborn, Plotly, Bokeh, Pydot, BeautifulSoup, Selenium, Scrapy, Tkinter, PyQt, Django, Flask
- **Software:** AWS, GCloud, VMware, Git, FTP Clients, Putty, XAMPP, phpMyAdmin, Processing, X-CTU, MS Access, Anaconda, MATLAB, Visual Studio
- **Hardware:** Arduino, Raspberry Pi, Intel Galileo
- **Documentation:** LaTeX, XMind, Apiary, Smartdraw

## Major Industry Work

### Founder @ eXomoonAI: [Oct 2019-Present]

An IT consulting company setting a global standard of quality and expertise in data science & web development project work, eXomoonAI only assigns projects to students primarily aged 16-24 (in high-school or university) from all over Canada who are at a level comparable to experts in their field, and opens up opportunities for them to work on hard, practical, industry problems & projects.

\*Hired **12+ students** so far, with **4 companies' projects** (ranging from domains of real-estate to telemedicine) from **Mayan Technologies** (TX, USA), **KARV Data Consulting Ltd.** (NS, Canada), **TwynBrain Ltd. & Swansea University** (Wales, UK).

### Clinical Researcher @ Johns Hopkins University School of Medicine: [Feb 2020-Present]

Working with the Johns Hopkins University School of Medicine to validate & optimize individual functionalities of a platform that is able to compute a preliminary diagnosis and personalized risk factors of several mental health disorders from patient-software conversation.

### Deep Learning Engineer @ Densitas Inc.: [Sep 2018-Sep 2019]

Developed many state-of-the-art, cross-platform Deep Learning driven technologies to predict Breast Density (%-based & birads5) & Image Quality as a risk-factor for Breast Cancer, from mammograms. Work referenced in Harvard Business Review: <https://hbr.org/2019/06/what-ai-app-stores-will-mean-for-radiology>

### Data Research Analyst @ LeadSift Inc.: [Sep-Dec 2018]

Designed a system that mines and sifts through unstructured web job postings data, and applied Natural Language Processing (w/ Sequence Modelling & Named-Entity Recognition), Associative Learning, and Taxonomical Analyses in order to find the gradient relevance of such information as potential leads for B2B clients. In conjunction, created models that categorize Twitter/LinkedIn posts with job post listings in order to understand company intention to identify potential customers.

### Data Scientist @ Saint Mary's University: [May-Nov 2018]

Worked on 2 parallel industry projects assigned to Saint Mary's University's stream of Masters in Computer Science in Data Analytics program:

- 1) For pharmaceutical company **MedMira**: Designed an optimal network of several models to predict dilutions concerning the presence of Hepatitis C through data collected from MedMira's newly patented devices.
- 2) For real-estate company **RealJaja**: Mined various dimensions of comprehensive city data to serve as additional independent features to RealJaja's geographical datasets in order to improve the accuracy of their real-estate pricing predictive model.

### Software Developer @ Hope Blooms: [Jul 2017-Jun 2018]

Developed 3 systems to augment the productivity of a local greenhouse:

- 1) Created AMM (Agricultural Monitoring Matrix), a hardware + software structure, that monitors and manipulates physical environmental factors of an agricultural space, such as the temperature, humidity, air quality, soil nutrient level (w/ moisture), and ambient lighting, all in real-time.
- 2) Additionally, created PlantNet, an AI providing qualitative insights into plants' health by highlighting the disease they are prone to, based on several prognostic factors including their photograph.
- 3) Complemented this system with an Aquaponics logging utility to aid in keeping water quality optimal for the health of the fish, through the ongoing sensing and reporting of many parameters such as the water's dissolved oxygen, turbidity, pH, temperature, and more.

## Major Project Work

### Doc-Typ – Standardizing & Augmenting Clinical Psychiatric Diagnostics through Deep Learning & Natural Language Processing: [Jun 2019-Present]

Created a platform that can produce biopsychosocial formulations computing psychiatric diagnostics, and risk factors. An ensemble of customized models encompassed of novel adaptive data representation strategies, specifically, recurrent transfer-learning with distinct vectorizations, quantitative textual insight extraction, and dependency structures transformations, led to a 79% validation accuracy with 0.73 interrater reliability for risk factor predictions, whereas a unique combination of a models trained on textually rendered network graphs and deep contextualized word embeddings led to a 74% validation accuracy with 0.66 interrater reliability for diagnosis predictions. Packaged into a cloud-based python application, these clinical outputs aim to increase access to quality psychiatric services in an affordable and standardized format.

\***Live Application:** <https://doctyp.net>

### DetectTimely v3.7 – An Augmentation in Diagnostic Potency of Breast Cancer through a Cloud-Based DL Framework to Compute Tumor Malignancy Risk: [Sep 2018-Jun 2019]

An unprecedented breast cancer prediction software focusing on the development of a web based multi-platform solution for augmenting prognostic strategies to diagnose breast cancer, from a variety of different testing inputs (histology, mammography, cytopathology, and fine-needle aspiration cytology), all in an automated fashion through deep learning models.

\***Application Video:** <https://om-agarwal.com/docs/detecttimely-video.wmv>

### Lesion-ify – Skin Lesion Characterization: [Jan-Mar 2019]

A comprehensive application that probabilistically classifies a suspected image of one's skin into several subcategories of malignancy and benignity, through web form and real-time mobile image inputs.

### eDepress – Depression Spotter: [Jan-Mar 2019]

A solution that provides proactive insight into depressive media expressed by a patient. It uses artificial intelligence to reflect on a patient's public social media feeds, and provides the doctor with an early risk-factor analysis, that can lead to depression & suicidal ideation.

### EnviroNet – A Systemic Approach to Maximize Agricultural Vitalities by Leveraging Automation-Induced DL Techniques for a Manipulative Monitoring Matrix: [Jan-Dec 2018]

A novel advancement in the parallel workings of deep learning-based software PlantNet and flexible automation inducing AMM (both created for a local greenhouse), functioning to attain the parameters of an optimal growing environment for every plant, compromised for individuality. The system explores the possibility of finding associative properties between a plant's environment and its well-being, presented as part of a web application.

### VitSys – Vital Signs' Interconnected Triage Device: [Jan-Mar 2018]

A low-cost all-inclusive device to wirelessly and continuously measure heart rate/pulse, oxygen saturation, body temperature, and ECG signals. First responders, and paramedics will be able to receive real-time updates of vital signs on an online dashboard, eliminating the need of patient reassessment.

### PronePercept – Car Collision Detection & Communication Network: [Jan-Dec 2017]

An integrated electronic system that dispatches logistics of a road accident just as it happens from your car to the nearest emergency service, along with the insurer, letting them know your location, impact degree and angle, your V.I.N., and more. via radio, web & phone.

## **FaunaCast – Wildlife Preservation Framework Inciting the Automated Deterrence of Animals through Principalized Networking:** [Jan-Jun 2017]

A barrier network, working to deter animals from pre-designated areas that may be harmful to them through database driven sensor-activated irritable high-frequency sounds specific to the approaching recognized species.

## **StopBeingBullied – A Novel Approach to Ease Bullying:** [Jan 2015-Dec 2016]

A smart system to report, fictionalize, and monitor bullying incidents, generating real-time statistics on the nature of bullying happening in a public school.

## **Major Volunteer Work**

### **Co-founder @ InspoScience Canada:** [Oct 2019-Present]

InspoScience Canada is a non-profit organization that provides avenues for aspiring young scientists in Canada to feature their research at global research and innovation fairs. Focused on recognizing the very best of high school scientific talent, InspoScience Canada provides students with the opportunity to travel internationally, exchange ideas & cultures with other top youth from all across the world and showcase their work to experts in the field. Competitive fairs also open up possibilities for getting recognized with prestigious awards and honors for students' distinguished work.

### **Machine Learning Researcher @ McGill University:** [Jun 2019-Aug 2019]

Worked with the McGill Neurotechnology Group (MENTAL), to create an application that gamifies EEG data collection for a semi-autonomous brain-controlled wheelchair for the disabled.

### **Signal Processing Researcher @ Dalhousie University:** [Sep 2018-Nov 2018]

Worked with the Dalhousie Neuroscience Lab to create a platform for personalizing learning needs by detecting when students experience difficulty when engaging with an academically-stimulating medium (research paper, MOOC, etc.).

### **Social Entrepreneur @ Hope Blooms:** [Sep 2016-Aug 2018]

Served as a community youth leader in my community of North-End Halifax, to help alleviate the issues we collectively faced: stigma against people of color, social-exclusion, food-insecurity & poverty. Co-led the following initiatives:

- 1) Salad Dressing Business: Made salad dressings from fresh herbs (after helping grow them year-round in our greenhouse), and helped sell them at Atl. Superstores, with a portion of all proceeds going towards post-secondary scholarships for fellow youth. Helped with everything from blending, bottling, packaging, graphic designing/marketing to pitching & selling.
- 2) Green Juice Business: Juiced fresh vegetables (primarily grown in our community garden) and sold them at the local farmers' market every Saturday morning during the winter time, with 100% of proceeds going towards fundraising to buy Christmas presents for youth.

Additionally, helped grow over 6000+ pounds of organic fruit & vegetables in just 2 yrs.; helped host monthly community suppers, all free, for upwards of 60 people; helped provide new-coming Syrian refugee families with 15+ garden plots to grow their own food; helped prepare & deliver organic soups for seniors citizens; helped educate & empower other youth in the community.

## **Major Awards/Honors**

### **Science Fairs: Multi-Year Honours**

#### INTERNATIONAL LEVEL [Ages 16-17]

- \$20,000 Scholarship to Rochester Institute of Technology @ GENIUS Olympiad - cancelled due to COVID-19 - (Rochester NY, USA)
- 3<sup>rd</sup> Overall + Trip to the Int. Festival of Eng., Science & Tech. in Tunisia (IFEST2) @ MAGMA Exporecerca Jove International Research Fair (Barcelona, Spain)
- 4<sup>th</sup> (Best International) in Computer & Information Engineering @ Taiwan International Science Fair (Taipei, Taiwan)
- Team Canada Representative & Ambassador @ International Movement for Leisure Activities in Science and Technology: Expo-Sciences International (Abu Dhabi, UAE)

#### NATIONAL LEVEL [Ages 12-16]

- 4x Excellence Award – 2x Gold Medal & 2x Bronze Medal  
w/ \$10k Cumulative Scholarship to Western University  
w/ \$5k Scholarship to Dalhousie University & University of Manitoba & University of New Brunswick  
w/ \$4k Scholarship to University of Ottawa & University of British Columbia (Vancouver)
- 3x Challenge Award – Top Project in “Information” Category
- Gwyn Morgan & Patricia Trottier Foundation - Youth Can Innovate – Top Senior Project Award (Cash Prize)
- University of Toronto Faculty of Applied Science & Engineering Award - Full Scholarship to Da Vinci Engineering Enrichment Program
- The Actuarial Foundation of Canada Special Award (Cash Prize)
- Lassonde Golden Ticket – Full Scholarship to York University STEM Entrepreneurship Summer Externship

#### REGIONAL LEVEL [Ages 12-17]

- 6x Canada-Wide Science Fair Nationals Qualification – 3x Consecutive Best in Fair Project Award  
w/ Fully Paid Trips to Fredericton NB, Montreal QC, Regina SK, Ottawa ON & Edmonton AB  
w/ \$3k Cumulative Scholarship to Dalhousie University & Saint Mary's University
- 3x Best Engineering Project Award - Engineers Nova Scotia (Cash Prize)
- 3x Best Use of Math and/or Computer Science Award - Nova Scotian Institute of Science (Cash Prize)
- Best (Human) Health Project Award – Dalhousie Faculty of Health (Cash Prize)
- Engineers and Geoscientists of BC Award (Cash Prize)
- Dr. Nicola Simmons Award in Cognition Studies (Cash Prize)
- Advanced Systems Integrators Award (Cash Prize)

### **Government Recognition**

- Received an Honorary Mention at the Nova Scotian House of Assembly by the Minister of Internal Services (The Hon. Patricia Arab) for Winning 1st place at the Nova Scotia Open Data Contest [Age 16]
- Received a Congratulatory Letter from the Nova Scotian Premier (The Hon. Stephen McNeil) for being a Recipient Finalist of the Nova Scotian Minister of Entrepreneurship's Awards of Excellence [Age 15]
- Presented my “EnviroNet” Application Live @ Hope Blooms Greenhouse to the Canadian Minister of Families, Children and Social Development (The Hon. Jean-Yves Duclos), Nova Scotia's Minister of Agriculture and Minister of Fisheries and Aquaculture (The Hon. Keith Colwell), & Halifax Minister of Parliament (The Hon. Andy Filmore) (The Hon. Andy Filmore) [Age 15]
- Received a Certificate of Recognition for Exemplary Work & Contributions to Scientific Research from Prime Minister of Canada (The Rt. Hon. Justin P.J. Trudeau), & Minister of Science (The Hon. Kirsty Duncan) [Age 14]
- Demonstrated my “PronePercept” Application to the Canadian Prime Minister (The Rt. Hon. Justin P.J. Trudeau), Minister of Science (The Hon. Kirsty Duncan), Canada's Chief Science Advisor (Dr. Mona Nemer), & Canada's Most Recent Nobel Prize Laureate (Dr. Arthur B. McDonald) - Invited as 1 of Top 9 High School Researchers in the Country to Attend Canada's First Ever Prime Minister's Science Fair held at the Office of the Prime Minister and the Queen's Privy Council in Ottawa, Canada [Age 14]

### **Innovation Awards**

- American Psychological Association (APA) Honourary Award Recipient – International Science & Engineering Affiliated Fair Award [Age 17]
- Nova Scotia's Discovery Youth Award 2019 – Recognized as the Best & Brightest Embodiment of Scientific Advancement in the Province [Age 16]
- Placed 3<sup>rd</sup> @ Sanofi BioGenius Atlantic Canada Research Competition (Cash Prize) [Age 15]
- Disney's FIRST® LEGO League Global Innovation Award Finalist Team - International Recognition for the Demonstration of Excellence through our Application “Wildlife Preservation Framework” - Top 20 of 1500+ Int. Teams (Washington DC, USA) [Age 14]

- Won Best Solution Challenge @ FIRST® LEGO League Provincial Competition [Age 14]

### Hackathon Winnings

- “Social Impact” Challenge Award Winner – VR Headset Prize @ NUVO Network & United Way of Halton & Hamilton's Hack the NU (Against 80+ Undergraduate Students) [Age 17]
- 2nd Place - \$1k in Amazon Web Services Credit @ Neuro-Brainhack & Launch-Oceans SURGE Dalhousie University Innovation Sandbox Back-Back Hackathons (Against Several Post-Graduate Teams) [Age 16]
- 1st Place – \$4k Cash Prize @ Nova Scotian Provincial IBM Open Data Contest (Against 150+ Graduate Students) [Age 16]

### Major Speaking Engagements

Type	Venue/Event	Audience	Location
<u>Personal Story/Motivation Speech</u>	<b>Nova Scotia Discovery Awards</b>	250+	[Halifax NS, Canada   Age 17]
<u>*TEDx Talk*</u>	<b>Warszawski Uniwersytet Medyczny</b> <a href="https://www.youtube.com/watch?v=RDqY2tzqOv0">https://www.youtube.com/watch?v=RDqY2tzqOv0</a>	500+	[Warsaw, Poland   Age 16]
<u>Project Acknowledged</u>	<b>Georgia Psychiatric Physicians Association – Summer CME Meeting</b>	100+	[Omni Amelia Island FL, USA   Age 16]
<u>Project Demonstration</u>	<b>Minister of Entrepreneurship’s Awards of Excellence</b>	50+	[Halifax NS, Canada   Age 15]
<u>Academic Lecture</u>	<b>Lal Bahadur Shastri Institute of Technology &amp; Management</b>	75+	[New Delhi, India   Age 15]
<u>Project Presentation</u>	<b>Wallace McCain Centre for Pancreatic Cancer (Princess Margaret Hospital)</b>	25+	[Toronto ON, Canada   Age 15]
<u>Personal Story/Motivation Speech</u>	<b>Centre for Entrepreneurship Education &amp; Development Conference</b>	50+	[Halifax NS, Canada   Age 15]
<u>Project Presentation</u>	<b>Sable Island National Park Reserve Annual Provincial Conference</b>	150+	[Dartmouth NS, Canada   Age 15]
<u>Research Showcase</u>	<b>Office of the Prime Minister and the Queen’s Privy Council</b>	25+	[Ottawa ON, Canada   Age 14]
<u>Project Demonstration</u>	<b>APATAS - International Conference of Cyber-Crime &amp; Computer Forensics (ICCCF)</b>	100+	[Vancouver BC, Canada   Age 13]

### Publications

- *Agarwal, O. (2019). An Augmentation in the Diagnostic Potency of Breast Cancer through a Deep Learning Cloud-Based AI Framework to Compute Tumor Malignancy & Risk.* Volume 3, Issue 6 (pp. 1-24). International Research Journal of Innovations in Engineering and Technology (IRJIET). <https://om-agarwal.com/assets/docs/papers/detecttimely.pdf>
- *Conrad, C., Agarwal, O., Woc, C. C., Chiles, T., Godfrey, D., Krueger, K., ... & Newman, A. (2019). On Using Python to Run, Analyze, and Decode EEG Experiments.* In Information Systems and Neuroscience (pp. 287-293). Springer. <https://om-agarwal.com/assets/docs/papers/pveea.pdf>
- *Agarwal, O. (2018). A Systemic Approach to Maximize Agricultural Vitalities by Leveraging Automation-Induced Deep Learning for a Manipulative Monitoring Matrix.* Proceedings of the 17th IRAJ Research Fom (IRF) Conference. <https://om-agarwal.com/assets/docs/papers/environet.pdf>
- *Agarwal, O. (2018). A Novel Approach to Ease Bullying.* Volume 1 Issue 2. Canadian Science Fair Journal (CSFJ). <https://om-agarwal.com/assets/docs/papers/stopbeingbullied.pdf>