

# GABRIEL DESCÔTEAUX (M.SC)

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Portfolio : [gadese.github.io](https://gadese.github.io)

**Note: Refer to my portfolio for details on completed projects, and further general information!**

## Relevant Information

- Experience: computer vision (CV), robotics, controls, deep learning, ROS, natural language processing
- Fluent in French and English, and eager to learn and face new challenges
- Demonstrated excellent organizational, communication, teamwork and project management skills
- Working in a Linux environment with HPC
- Proficiency in Python, C++, as well as experience with JAVA & MATLAB

## Education

2018-Present

### M.Sc. in Mechanical Engineering – Robotics and Mechatronics systems GPA: 4.00/4.00

*Research Group in Design, Machine Learning and Optimization for Mechatronic Systems, Polytechnique Montréal*

*Thesis: Autonomous feeding-assistance system for people with upper body disabilities*

Tools used: Keras, Tensorflow, ROS, Gazebo, MoveIt!, Kinova Mico, Intel Realsense Camera

- Implemented detection and localization in 3D of food in an image (Python & Tensorflow)
- Coded pathplanning of a 6DoF robot arm for food grasping with ROS (C++ & Python)
- Developed an OpenAI Gym Environment for reinforcement learning with a 6DoF robot arm
- Compared accuracy and performance of different solvers for the inverse kinematics of a 6DoF robot arm with a non-spherical wrist (optimization algorithms vs feed-forward neural network vs reinforcement learning)

2015-2018

### B.Sc. in Electrical Engineering

GPA: 3.84/4.00

*Polytechnique Montréal – Montréal, Quebec*

*Graduated with a focus on AI, Computer Vision, Robotics and Controls*

## Publications

Coulombe, C., **Descôteaux, G.**, Barron, O., Gamache, J.F., Saussie, D., Achiche, S., “Task Taxonomy for Autonomous Unmanned Aerial Manipulator: A Review”, IDETC-CIE, 2020. [In Press]

## Engineering Experience

2020- Present

### Research Scientist – Natural Language Processing

*Nuance Communications*

- Optimized natural language processing model (BERT) to meet client requirements using Tensorflow
- Tested and compared new model architectures to baseline in order to evaluate improvements
- Developed techniques to improve NLP model performance on very small training sets without changing model architecture: data augmentation, loss functions, post-training hand-designed filtering
- Contributed to adding new features to company software and maintaining codebase for company-wide tools using JAVA
- Worked in a High Performance Computing environment (HPC) using remote servers and remote debugging

Tools used: Python, Tensorflow/Keras, Java, Git, HPC

2020

### Research Development Intern

*Nuance Communications*

- Worked on a proof-of-concept of a CV system to help doctors with note-taking during consultations
- Implemented state-of-the-art computer vision algorithms for pose estimation and action detection in Python and Tensorflow/Keras following a literature review
- Developed a head pose estimation model using transfer learning and custom annotated data
- Deployed code on GPUs on a remote server using SSH (HPC)

Tools used: Python, Tensorflow/Keras, Git, OpenCV, CVAT, HPC

2018

### Intern – Software developer

*Analogic Canada*

- Developed defect detection algorithms for X-ray images in order to automate the X-ray detector vetting process (Python)
- Converted existing C++ algorithms in Python
- Managed and planned project using the Agile & Scrum methods

Tools used: JIRA, Confluence, Python, C++, Git, SCRUM method, OpenCV, Unit tests

2016-2017

**Research Intern in Robotics***Research Group in Design, Machine Learning and Optimization for Mechatronic Systems, Polytechnique Montreal*

- Tested optimisation algorithms for the physical parameters of a drone in order to reduce energy consumption (Genetic Algorithm, Particle Swarm, Latin Hypercube Sampling, etc.)
- Developed a control method for a 6DoF robot arm using facial recognition (C++)
- Contributed to the redaction of a publication on robust design methodology (in press)

Tools used: Matlab/Simulink, Optimization algorithms, C++, OpenCV, OpenFrameworks

2015

**Research Intern in Biomedical Imaging***Laboratory of Optical Diagnoses and Imaging, École Polytechnique de Montréal*

- Designed a variable length reference arm for Optical Coherence Tomography (OCT) in order to reduce noise in a medical image without using software correction

**Personal Projects /  
Student Groups****Personal Computer Vision Project**

- Implemented various algorithms for computer vision (ResNet, YOLO, Faster RCNN, etc.) in Keras
- Tested above algorithms with a few datasets (MNIST, Cifar-10, Coco)
- Optimized hyperparameters

Tools used: Keras, Tensorflow, Python, Pycharm, Git

**Other projects**

- Rubik's cube self-solving robot using OpenCV(Python), Scikit-Learn(K-means), ROS
- Glove to measure forces within finger tendons for rock-climbing training using IMUs, force sensors, custom-made PCBs and Arduino (B.Sc. Final year project)
- 2-wheels self-balancing robot including mathematical modeling, PID controllers (Simulink), discretization and implementation on a real-time system

2014-2018

**PolyProject (Engineering student club)**

- Technical group aiming to complete various innovative projects. Projects completed: Fiber optics sensory glove, human-like robot hand

Treasurer for the group (2016-2017) and Public Relations Manager (2015-2016)

**Honors & Awards**

2019

FRQNT research grant for M.Sc. students

2018

NSERC research grant for M.Sc. students

2015, 2016, 2017

NSERC Summer research grant for undergraduate research

2015-2019

Others by Polytechnique Montreal (for community involvement &amp; academic performance): JA DeSève award, CMC Électronique award, Vedel award, Hatch Lt. award