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# Nathan Touboul

## Software Engineer

Portfolio: nathantouboul.com
GitHub: NathanTouboul
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## Main skills

| | |
|---|---|
| **Programming** | Python (*NumPy, Pandas, TensorFlow*) - C/C++ (STL) - JavaScript - HTML/CSS - Concepts: OOP, multithreading |
| **Tools** | Linux - Bash - Git - ADB - LaTeX - MATLAB/Simulink |
| **Language** | French (Native) - English (Fluent) |

## Work Experience

**Software Engineer – Automotive Team** **March 2022 - Today**
*Qualcomm* *San Diego, CA*
- For the purpose of improving the automotive chipsets of Qualcomm, I have written over 150 APIs for a framework tool designed to enable in-vehicle features, built by a large team of developers, using virtual machines, git, QNX, and ADB.
- I implemented **Vulkan APIs** graphics features supporting **OpenCL**, **OpenGL** and **EGL** by implementing kernels, contexts and command queues. Currently, I am focusing on enabling support of the audio APIs **ALSA** for Linux by designing a capture-playback loop using C++ and Python.

**Machine Learning Engineer Intern** **Jun 2021 - Aug 2021**
*Kapaix Ltd* *London, England (Remote)*
- To assess the quality of a database for a Big Data Management company, I designed neural network architectures for anomaly detection purposes, analyzing discrepancies in frequencies and amplitudes of data points in time series.
- I preprocessed the dataset by building histograms with variable time frames: I used **PCA** and **k-means clustering** as the first analysis tool. I constructed two ML architectures to compensate for the limited training dataset: a classification model and an autoencoder model, using dense and convolutional layers with **Python:** ***Keras - TensorFlow - Pandas***.

## Technical projects

**Research Project: Navigation Integrity of Lidar-based localization** **Sep 2021 - Dec 2021**
*Navigation Lab - Illinois Institute of Technology* *Chicago, Illinois*

**Lidar-based localization of autonomous vehicles** in an area with low **GNSS availability**, with a Velodyne's Puck sensor to compensate for **IMU** drift to ensure landmark identification against the misassociation problem. I established an error model to quantify precise $3\sigma$ probabilities of tree misdetection, considering multiple sources of noise. I also researched the implementation of the Error Correction Codes domain **(Hamming and BCH codes)** for navigation safety.

**Master's Thesis: Isogeometric Representation of Turbojet Blades** **Sep 2020 - Dec 2020**
*Structure Mechanics Laboratory - INSA* *Lyon, France*

Building an algorithmic solution to merge CAD and FEA methods through Non-Uniform Rational Basis Spline **(NURBS)** manipulations. I designed an adaptive fillet to join the blade and its root volumes by implementing a fillet patch mesh on **Python:** ***NumPy - geomdl***.

**Other personal projects:**
- *Path Finding app using C++ and Qt: real-time visualization of algorithms (Dijkstra, A*, Maze Generation) through multithreading.*
- *VGG16 and ResNet50 blood cells classification, using TensorFlow and image data generators.*
- *Neural Network from scratch (without built-in functions) compared to Fisher's Linear Discriminant with TensorFlow.*
- *Graph SLAM from scratch, using Lidar measurements from the Victoria Park Dataset.*
- *Kinematics and dynamics modeling of a Scara Robot with PID and linearized command control.*
- *Drive cycle designed for autonomous vehicles: testing Wh and SOC consumption by simulating the pursuit of a standard car.*
- *Consciousness and Neuroscience research project: Statistical and Bayesian Brain.*

## Education

**Master of Engineering** – ***Illinois Institute of Technology*** **Jan 2021 - Dec 2021**
*Robotic Motion Planning* ***(SLAM, Kalman filter)*** *- Machine Learning* ***(PCA, Clustering, CNN, RNN)*** *- Electric Vehicles* ***(EPA drive cycles)***

**Master of Science in Mechatronics** – ***National Institute of Applied Sciences - France*** **2018 - 2022**
*Control Theory* ***(PID, optimal LQR control)*** *- Robotics - State-Space Analysis* ***(Simulink)*** *- Fluid and Thermodynamics - CAD* ***(CATIA, SolidWorks)***

**Bachelor of Engineering in Electronics and Computer Science** – ***CPE Lyon - France*** **2015 - 2018**
*Programming - Analog and Digital Systems* ***(Microcontrollers implementation)*** *- Electronic Architectures* ***(VHDL Design on FPGA)*** *- Mathematics & Physics*

## Activities

**Job on Campus, Admissions Office at Illinois Tech (Salesforce and GeckoEngage Chatbot)** **Apr 2021 - Dec 2021**
**Student Government Association at INSA Lyon** **2019 - 2020**
**Physics and Mathematics tutor** **2017 - 2020**