

EDUCATION

- **La Laurea Magistrale in LM-27 Ingegneria delle Telecomunicazioni**

Issued by Politecnico di Milano on 23/07/2021

Internet Engineering Track

Master Thesis: Machine learning-based DoS attacks detection for MQTT sensor networks

In this thesis work, I tried to classify and detect DoS attacks in a smart home contains MQTT-based IoT devices with a data science approach. Firstly, I simulated a smart home contains MQTT-based IoT devices and three different DoS attackers to generate data. After simulating and launching devices, I sniffed the network to collect the data and generating the dataset. Then, I labeled the dataset as a multi-value and binary classification. In binary, our classes were malicious and legitimate; however, in multi-value classification, we had to classify different categories of DoS attacks. Then, I cleaned the dataset in terms of dealing with missing values (removing or imputing data), removing highly correlated data with the targets, and balancing the dataset to have a more reliable and realistic dataset. After that, feature engineering was performed to generate new features. Then, I presented "10-Best Features Dataset". To decrease the training time of machine learning algorithms and the complexity, I performed feature selection. Due to the numerical data and categorical target classes, I chose the 10-Best Features to find the 10 best and more relevant features with the targets. After finding 10-best features, "10-Best Features Dataset" was proposed. Then I trained Random Forest, K-nearest neighbor, and Support Vector Machine algorithms on "10-best Features" and "Full-Featured" datasets to propose an offline machine learning classifiers. Then, I evaluated the feasibility of online classification by measuring the performance of classifiers indirectly, in other words, I trained machine learning models on the datasets and evaluated them in different flow duration to trade-off detection delay and classifiers' accuracy. After evaluating all the classifiers with learning curves and confusion matrices, I proposed SVM as a binary classifier and Random Forest as a multi-value classifier and we noticed the trade-off between detection delay and classifiers' accuracy as a result of online machine learning models. In this thesis work, I have become master with data science skills (e.g., Python, Pandas library, Numpy library, Scikit-learn library, Matplotlib and Seaborn data visualization libraries).

Certification number: 0721-0234

Duration: September 2018 - July 2021

- **B.S. Information Technology Engineering**

Issued by Islamic Azad University of Mashhad - Iran on 1/11/2017

Certification number: 3500843

Duration: September 2013 - November 2017

MASTER'S DEGREE COURSES AT POLITECNICO DI MILANO

- **Performance Evaluation of Computer Systems**

The course addresses the problem of capacity planning of computer infrastructures. The topics considered are: performance modelling concepts and techniques, workload and traffic characterization, simulation of users behavior, measurement techniques and tools for end-to-end response time of web applications.

Duration: September 2020 - January 2021 — 5 ECTS (125 hours workload)

- **Data Management for the Web**

The course provides foundations of Information Retrieval, Web Information Retrieval and Semantic Web, Open/Linked Data.

Duration: September 2020 - January 2021 — 5 ECTS (125 hours workload)

- **Geophysical Imaging**

The course presents the seismic, electrical and electromagnetic investigation methods, from the first up to the data collection and processing.

Duration: September 2020 - January 2021 — 5 ECTS (125 hours workload)

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- **Hypermedia Applications(Web and Multimedia)**

This course aims at providing students with the knowledge and skills needed to design and to implement complex, high quality web based hypermedia applications for stationary and mobile devices.

Duration: February 2020 - June 2020 — 5 ECTS (125 hours workload)

- **Computer Graphics**

The course explains the basic theory of Computer Graphics, using several programming examples with the OpenGL API. The goal is to show how to design, engineer and develop computer graphics software for various applications.

Duration: February 2020 - June 2020 — 5 ECTS (125 hours workload)

- **Digital Innovation Lab**

The course develops across three activities: group work on a business case provided by the teacher, in-class activities, and bi-weekly classes. The Business case is the core of the course, where students will work on an idea from the field study to its conception and design.

Duration: February 2020 - June 2020 — 5 ECTS (125 hours workload)

- **Wireless and Mobile Propagation**

This course addresses the fundamentals of radiowave propagation, with particular emphasis on wireless and mobile systems.

Duration: February 2020 - June 2020 — 5 ECTS (125 hours workload)

- **Communication Network Design**

The course is intended to provide the knowledge and tools necessary to design and plan communication networks.

Duration: September 2019 - January 2020 — 5 ECTS (125 hours workload)

- **RF Systems**

The target of the course is to introduce the radio front-end of a communication system with reference to its main macro elements (subsystems).

Duration: September 2019 - January 2020 — 10 ECTS (250 hours workload)

- **Computing Infrastructures**

The course covers the data center architectures, ranging from the analysis of the single components to the global infrastructure. The focus is on the foundations required to understand the design of computing infrastructures that are scalable, available, secure and flexible at the same time. Virtualization, cloud computing and storage systems are analyzed in depth to show how they can be used to support challenging tasks such as big-data applications and high-performance computing.

Duration: February 2019 - June 2019 — 5 ECTS (125 hours workload)

- **Business Information Systems**

The course provides a methodology to align IT design choices with business objectives. The course defines the concept of IT architecture, classifies the fundamental IT design choices and maps these choices onto the IT architecture from both a software and an infrastructural point of view.

Duration: February 2019 - June 2019 — 10 ECTS (250 hours workload)

- **Wireless Networks**

The goal of the course is to teach students the methodologies for modelling, analyzing, and designing wireless networks.

Duration: February 2019 - June 2019 — 10 ECTS (250 hours workload)

- **Multimedia Internet**

This course is focused on enabling Next-Generation network architectures for the delivery of high-quality multimedia services. Key services such as VoIP, multimedia streaming will be analyzed, both in a classic delivery framework and in peer-to-peer/P4P architectures.

Duration: February 2019 - June 2019 — 10 ECTS (250 hours workload)

- **Internet of Things**

The course will provide the basics on the enabling technologies of the Internet of Things which can be classified into two broad families: Wireless Sensor Networks (WSNs) and Radio Frequency Identification Systems (RFID).

Duration: February 2019 - June 2019 — 5 ECTS (125 hours workload)

- **Fundamentals of operations research**

The course aims at providing the students with the modeling skills and methodological tools to model and solve a wide range of decision-making problems arising in computer science and other fields. The main topics include graph and network optimization, linear programming, and integer programming.

Duration: September 2018 - January 2019 — 5 ECTS (125 hours workload)

- **Software Engineering 2**

Master's degree course at Politecnico di Milano

The software process and software standards, Design patterns, Software architectures and architectural styles.

Duration: September 2018 - January 2019 — 5 ECTS (125 hours workload)

- **Fundamentals of Electromagnetic fields**

The main objective of the course is to provide the basic concepts of electromagnetic theory and to discuss the most common applications.

Duration: September 2018 - January 2019 — 5 ECTS (125 hours workload)

- **Fundamentals of Signals and Transmission**

The course presents a comprehensive overview about the fundamentals of signals and transmission systems. The course provides the instruments to analyze deterministic signals and random processes, with a thorough treatment of Fourier analysis and noise in communication systems.

Duration: September 2018 - January 2019 — 5 ECTS (125 hours workload)

CERTIFICATES

- **Recommendation Engine Bootcamp**

Issued by Udemy on 25/07/2021

This course presents various recommendation engines including Content based filtering, collaborative filtering, Singular value decomposition. In this course, I learned how to create a movie recommendation engine as well as a book recommendation engine and an Open job analyzer system.

Certification no: UC-418be8f4-646f-4b9e-a2fd-8cd654a1b5cc — Duration: 4.5 total hours

- **Python for Data science and Machine learning Bootcamp**

Issued by Udemy on 09/05/2021

This course teaches how to program with Python, how to create amazing data visualizations, and how to use Machine Learning with Python. I have become a master in libraries like Pandas, Numpy, Matplotlib, Seaborn, and Scikit-learn. In this course, I learned how to work with different kinds of data, how to clean the dataset, and feature engineering. This course also covered Recommender systems and natural language processing.

Certification no: UC-803188c7-9f65-4cb7-b787-220bd8eb030e — Duration: 25 total hours

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- **SQL for Data science**

Authorized by University of California, Davis, Issued by Coursera on 10/03/2021

This course is designed to give the fundamentals of SQL and working with data so that one can begin analyzing it for data science purposes. In this course, I learned common operators and how to combine the data. I used case statements and concepts like data governance and profiling. I interpreted the structure, meaning, and relationships in source data and used SQL as a professional to shape the data for targeted analysis purposes.

Certification no: 4QKXGZ684Q96 — Duration: 4 weeks of study, 3-5 hours per week

- **Machine learning for all**

Authorized by University of London, Issued by Coursera on 02/01/2021

In this course, I understand how modern machine learning technologies work. I performed my own project, collected the data, trained the model, and tested it.

Certification no: 636PW5PPAJF4 — Duration: 4 weeks of study, 4-5 hours per week

TECHNICAL SKILLS

- **Programming Languages**

Experienced: Python, SQL

Familiar: C++, Javascript, Java, Matlab

- **Software Development**

Programming Paradigms, GIT, CLI, Agile Methodology

- **Data Science and Machine Learning**

Jupyter, Matplotlib, Seaborn, Numpy, Pandas, Scikit-learn, Tensorflow, Surprise-scikit (Recommender system library)

- **Database Management Systems**

MySQL, SQLite

- **Telecommunication and IoT**

Wireshark, Argus Tool, MQTT, TCP-IP, GSM, GPRS, LTE, 5G

- **Web Developing**

HTML5, CSS3, Bootstrap 4, Wordpress

- **Word Processing**

LaTeX, Microsoft Word

- **Microsoft Office**

Microsoft Excel, Microsoft Word

SOFT SKILLS

- **Teamwork**

- **Hard Worker**

- **Problem Solving**

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LANGUAGES

- **English** [Advanced]
- **Italian** [Intermediate]
- **Persian** [Native]

PROJECTS

- **Machine learning-based DoS attacks detection for MQTT sensor networks**

Master Thesis Project

Programming language and Libraries: Python - Pandas - Numpy - Scikit-learn - Matplotlib

Github: <https://github.com/alighanad/Master-Thesis>

Kaggle: <https://www.kaggle.com/alighannadrad/mqttdata>

Duration: September 2020 - July 2021

- **Recommendation engines**

Movie recommendation engines,

I worked on this project through the Recommendation engines course. After exploring the dataset, I cleaned the dataset in terms of imputing the missing values, performing feature engineering to extract new features, and removing redundant features. After that, I analyzed the dataset to understand better kinds of data. I visualize the best profitable movies or most popular movies on social media. Finally, I made functions to recommend movies based on Language, Actor, Similar Genre, and Similar movies.

Programming language and Libraries: Python - Pandas - Matplotlib

Certificate: <https://www.udemy.com/certificate/UC-418be8f4-646f-4b9e-a2fd-8cd654a1b5cc/>

Link: <https://drive.google.com/drive/folders/1AUOcYrIbRfx4S5evu-zkg6s6ak9nXRUI?usp=sharing>

Duration: July 2021

- **Voluntary Association Website**

My group mates and I developed a voluntary association website for the hypermedia course.

Hypermedia course project.

Tools and Programming languages: HTML5, CSS3, Bootstrap, Javascript

Link: <https://voluntary-association.herokuapp.com/>

Duration: February 2020 - July 2020

- **Design a Mobile Radio Network to serve mobile users in a medium-sized regions**

My group mates and I designed a Mobile Radio Network to serve mobile users in medium-sized regions with Radio Mobile software. In this project, we used optimization algorithms to maximize the performance (cover most of the area) with less number of the base stations.

Wireless Mobile Propagation course project

Software: Radio Mobile

Duration: July 2020

- **Design an Optical network on a large scale with Net2Plan software**

My group mates and I designed an Optical network on a large scale with Net2Plan software. In this project, we considered a secondary path in case of failure in each node of the Network. we used optimization algorithms to have short paths between nodes.

Communication Network Design course project

Software: Net2Plan

Duration: December 2019

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