

# Antonio D'Aquilio

## Building Physics | Machine Learning



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📍 London, UK

## 📖 PUBLICATIONS

### A surrogate CFD model using Machine Learning for fast design explorations of the indoor environment

*IBPSA 2023 - Shanghai*

Introducing a novel approach for the prediction of the resulting indoor environment performance of a HVAC system. The surrogate modelling approach implements a fully Convolutional Neural Network architecture and can output physics field such as air temperature, velocity and age of air. The model is able to predict results 4 order of magnitudes faster than standard CFD, with low MAE metrics, which can be used to optimise thermal comfort and indoor air quality.

### Simulating natural ventilation in large sports buildings. 🌐

*SimAUD 2016 - London*

An investigation of the potential for a novel workflow capable of capturing airflow and temperature distribution within large volume spaces such as indoor swimming pools.

### Exploration of Design Alternatives using Multivariate Analysis Algorithms 🌐

*SimAUD 2016 - London*

Investigation of SOM clustering algorithm for the support of early stage multivariate exploration of architectural designs. Winner of the 'Best Paper' award at the SimAUD conference.

## 👤 PROFILE

Hi there, I am a Principal Engineer working at the intersection of Building Physics and Machine Learning. During my career I have developed software and innovative tools to enable automation, data analysis and efficiency across the entire project delivery process. I am currently developing novel Machine Learning techniques with the goal of introducing new services and products.

## 📁 PROFESSIONAL EXPERIENCE

### Hoare Lea

*Principal Building Physicist - Team Lead*

May 2022 - present | London, UK

Running a team of 6 focusing on the delivery of innovative computational workflows, automation software and Machine Learning applications. Envisioned and currently working on a Machine Learning technique for the real-time prediction of the performance of the indoor environment and HVAC systems. Thanks to the novelty of this technique, I have published a research paper at IBPSA 2023 conference.

### Introba (ex. Integral Group)

*Senior Building Physicist*

Oct 2017 - Dec 2021 | London, UK

Accelerated the transition to computational and parametric design workflows within the team, including climate analysis, detailed energy modelling, complex daylighting as well as indoor and outdoor comfort analysis making use of Computational Fluid Dynamics (CFD).

### Arup

*Graduate Mechanical Engineer*

Jan 2016 - Sep 2017 | Amsterdam, Netherlands

Developed computational workflows for the delivery of complex building physics analysis within the early design stages of projects, looking at solar radiation, daylighting and natural ventilation analysis.

Developed capability statement videos showing the company's cutting-edge parametric approach to analytics and design optimisation.

## SKILLS

**Programming** (*Python / Matlab / Javascript*)

**Data Science** (*Numpy / Pandas / Sklearn / Pytorch*)

**Data Visualisation / Dashboarding**  
(*Matplotlib / Seaborn / Bokeh / Streamlit*)

**Database** (*SQL*)

**API/Web scraping** (*Flask / BeautifulSoup*)


**Version control** (*Git / Github*)

**Building Physics** (*EnergyPlus / IES / Therm / Radiance / OpenFOAM*)

## PROJECTS


### **EPW Weather analysis tool**

*python / streamlit / bokeh / numpy / pandas / pythermalcomfort*

I created a web-app for exploratory analysis of EPW weather files (a standard file format widely used to store typical annual weather data). Several interactive plots allow the user to play with the data contained in the file and find patterns and customise the data analysis process. You can access the WIP web app here .

### **Pills**

*python / numpy / pytorch / sklearn / matplotlib / tqdm*

For a long period of time and on a daily schedule, I had to count vitamin pills for my own consumption (no worries, it was for general wellbeing - nothing serious). Because I found it a repetitive, boring and error-prone task, I asked myself if I could teach an algorithm to count the pills for me. This  jupyter notebook is what I came up with.

### **Pigeon**

*python*

This is a tool that allows the quick simulation of natural ventilation rates between rooms within the Grasshopper parametric environment.

## COURSES

### **Machine Learning Professional Certificate** *IBM*

Jul 2023 - present

Regression, Classification, Recommender systems, Clustering, Scikit-Learn, Python, NumPy, Pandas, Data Science, Matplotlib, Seaborn, SQL

### **Machine Learning**

*Coursera / DeepLearning.AI*

Dec 2021 - Feb 2022

Linear Regression, Support Vector Machine, Logistic Regression, Artificial Neural Networks, K-means clustering, Principal Component Analysis, MATLAB

## EDUCATION

### **Delft University of Technology (TU Delft)** *MSc Building Technology (cum laude)*

Sep 2013 - Jun 2015 | Delft, Netherlands

Master thesis on the use of Genetic Algorithms for the optimisation of building's energy performance and natural ventilation in the early stages of the design process.

### **Roma Tre University** *Architecture Sciences (cum laude)*

Sep 2009 - Mar 2013 | Rome, Italy

## CERTIFICATIONS

### **MCIBSE / CEng**

*Chartered Engineer and Member of CIBSE*

## LANGUAGES

**Italian** (*Native speaker*),

**English** (*Highly proficient*),

**Spanish** (*Limited working proficiency*)