

Thermal efficiency mapping over large urban areas

Students for a summer project wanted!

I am currently looking for up to two students to help me lay the foundations of a future startup.

The facts

Buildings are responsible for approximately 40% of EU energy consumption and 36% of greenhouse emissions, therefore being the largest energy consumer in Europe [1]. Identifying the least energy efficient buildings and their worst performing parts could be a key step in developing a more energetically sustainable housing park and mitigating climate change, as well as to contribute in the green economy.

The idea

I am currently developing a new method for mapping the thermal efficiency of buildings and their parts (windows, roofs, doors, etc) over large urban areas. The long term goal is to build an autonomous optical sensor that can measure the thermal efficiency of the buildings around it as it moves through the streets. The detector involves thermal vision, LIDAR technology, positioning systems and several complex algorithms to process and extract information from the large amounts of gathered data. This novel and innovative product would then become the basis for a future startup.

The summer project

I am looking for up to two students to join my work during summer 2021. The students would work in one of the following two sub-projects:

- Image detection through deep learning: machine learning techniques have experienced a very fast progress during the last decade, to the point that artificial algorithms can nowadays be better at recognizing images than most humans are. In this project, we will train a deep neural network to recognize buildings and different elements within them from a set of images.
- Algorithm design for mapping and spatial positioning: being able to tell the position of where you are and that of the object you are looking at might be somewhat intuitive for us humans, but implementing that skill in a machine is not completely straight-forward. In this project, we will design and implement an algorithm to identify the post-addresses of each building the detector is looking at.

The requirements

The students applying for this projects should be enrolled in their 3rd year and upwards of their education in physics, engineering or computer science. They should be familiar with Matlab programming, fluent in English and have the capacity to work independently. Having taken courses related to computational physics and knowledge of Object Oriented Programming (OOP) is not necessary but is considered a positive asset.

What can I offer you

For the participation in the project the students gets a number of ECTS. The exact amount of credits involved is opened for negotiation upon the student priorities and will depend on the degree of involvement and the amount of invested hours according to the university guidelines. A suggested amount is 7.5 hp, although smaller & larger amounts are possible. The work is expected to take place during the summer 2021 (June-July-August), mostly in a remote fashion. The working schedule is flexible, with exact starting and ending dates to be agreed in advance.

How to apply

In order to apply, send me a short description (around 10 lines) of yourself, your interests and in which sub-project you would like to participate (see above), together with your CV. You may (if

you wish) include your preferences in the amount of credits you would like involve in the project, preferred starting and ending dates, time availability, etc. Send me your application, or any questions you might have about the project, to aitordand@physicalthinking.tech **before 30th April**. For any questions and details regarding credits registration, please contact Krister Wiklund at krister.wiklund@umu.se

About the supervisor

My name is Aitor De Andres and I am 3rd year PhD student in Umeå University doing research in ultrafast optics. During my free time I like to develop my own projects and ideas, with the future vision of becoming a part-time professor and to manage my own private company on the side. Two years ago I registered myself as a single-person company and started to collaborate with different tech-related startups and companies. After learning a great deal from them, I feel at the moment confident enough to start laying the foundations of a future startup, which is the reason why I decided to start this project.

References

[1] – Energy performance of buildings directive, EU commission, “https://ec.europa.eu/energy/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en”, accessed on March 16th, 2021