

# People detection machine vision implementation on a low power MCU

## Description

More and more applications that might benefit from a inference algorithms are popping up. For example people counting, seat occupancy detection, track anomalies, bearing wearout,...

On the other hand, bringing all the sensor data to a single node in the train and to a cloud takes a lot of power and bandwidth resources. So sharing the processing load over all sensor nodes (edge computing) has a better power efficiency and because heat dissipation is shared it also improves reliability.

Today, more and more actors come with solutions to run neural networks on a microcontroller based devices :

- STM32 API for ST MCUs
- Google Edge Computing (edge TPU)
- TensorFlow Lite for MCUs
- Renesas MCUse-AI translator for TensorFlow or Caffe
- e-IQ API & NXP Vision AI for i.MX RT or 7
- etc.

This thesis will be two-fold:

### 1- Create a machine vision model

To train a machine vision model for robust inference of train seat occupancy status detection, a somewhat large variety of pictures with different ambient conditions & people/luggage/seat color will be needed (100-1000 pictures).

Both students will perform a supervised machine learning with existing Open Source Software (TensorFlow or other to be selected) in a format that can be translated later to the selected MCU platform.

The data needs to be tagged for 3 states (for each of the pair of seats) depending on seat state (empty, used by people or luggage). Kids should also be differentiated from luggage.

### 2- Evaluate the model

The trained model will then be translated to run on the selected MCU platform development kit and its accuracy will be evaluated depending on :

- picture resolution/quality (for low cost sensor selection)
- RAM/CPU per FPS needed for inference (for appropriate MCU selection)

The development kit, selected and bought in advance at the very beginning of the thesis, should support inference on it's MCU with existing translating tools and have a SD card port for inference data input and be close to the final needs (low power & low cost MCU)

If you are interested in this topic, please also register this on the Televic website at:

<https://www.televic.com/en/careers/internships-and-students> so we can confirm the topic is still available.

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### About Televic Rail

With over 30 years of experience in designing, manufacturing and maintaining on-board communication and control systems, Televic Rail is a leading, trusted partner for railway operators and train builders worldwide.

Its Passenger Information Systems and Control Systems are high quality, tailor-made solutions that offer the flexibility, user-friendliness and stability that our clients ask for. Our various types of on-board control systems such as our bogie monitoring systems are innovative yet reliable products which are designed specifically for the railway business.

Trains and trams all around the world are equipped with Televic Rail solutions, from New Zealand to Canada, from China to the United States, from India to Belgium, England and France.

### Contact

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### Nature of the work

Level	Specialty	Type of work.	Location	Type of activities	Num of students
Academic Master, PhD	AI / Machine Learning, Electronics / Hardware, Embedded Software	Research: 33% Implem.: 33% Experim.: 33%	Televic	Design, Experimenting, Implementation, Literature study, Measurements, Programming	1 or 2