

## TrashBeat – Build a smart trashcan

2-LINER description: Design and develop a self-learning trashcan, bu using sensors and a backend processing pipeline with machine learning, to create an intelligent and timely signal when it's time to be emptied.

[Description of the assignment]

- In our ToThePoint offices of the Cronos campus, there are a lot of trash cans to keep everything tidy.
- We want to add sensors to the trashcans to collect data so an intelligent backend service can signal in time when a certain trash can should ideally be emptied.
- The ideal time to send out the signal is not necessarily when a certain capacity is exceeded. Because for example: there is a difference between a trashcan that has only 30% capacity left on Wednesday afternoon at 1PM or the same trashcan on Friday afternoon at 1PM – because there are different usage scenario's in place on both of these days.
- One way to map the usage patterns is to define it in a deterministic manner. But to us it seems more learnative (and more correct) to let the trashcans themselves learn to become aware of their environment and the usage patterns surrounding it.
- Your assignment is therefore twofold:
  - Realize a hardware component (select and implement sensors and its microcontrollers) so you can start measuring and collecting data to send it to the processing backend
  - Develop software to
    - Recognize patterns in the usage data and have it send out notifications based on these patterns so the trashcans can be emptied in a smart point in time.

[Goals]

- Develop an IoT architecture with attention for bot hardware and software (such as energy consumption and scalability of the processing software-side)
- Develop a hardware prototype
- Develop a backend business logic
- Iteratively build a machine learning model to make smart calls about when it is or isn't necessary to initiate an emptying of the trashcan
- Develop a visualization of progress

[What will you gain?]

- You'll learn to prototype and adjust your product
- Capture and process relevant real-time data
- Explore the possibilities and limitations of sensors
- Gain knowledge and experience with designing and deploying a machine learning solution
- That lovely feeling you'll get knowing your design will effectively be used in a real-life scenario

[What do you need?]

- Creativity and the will to succeed
- A motivated personality to keep pushing until you find the right solution
- You'd love to see hardware and software working together
- You love to explore real-time data and stream processing
- You acknowledge that an exciting time is ahead with machine learning applications
- You're looking forward to learning a heck of a lot in a relatively short time period

[Technologies you'll be using]

- Microcontrollers
- Cloud backend
- Messaging infrastructuur
- Spark en MLLib
- ReactJS en D3.js

