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Tiny ML powered Artificial Nose Project kit with Wio Terminal

A TinyML-powered artificial nose project kit with Wio Terminal and Edge Impulse, featured on Make: Magazine, for real-time smell detection and Azure IoT visualization.

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Overview



Build an AI-powered artificial nose with the Wio Terminal, Grove Multichannel gas sensor, and Edge Impulse to detect and identify smells, displaying results on the Wio Terminal LCD. Connect to Azure IoT Central for real-time analysis and visualization, with applications like spotting burning food or spoiled milk and monitoring office cleanliness.

Key Features

Thanks to Benjamin Cabé, now you can follow up the most comprehensive tutorial to build your AI-powered artificial nose that can sort coffee from tea, or identify whatever else you train it to smell. The Artificial Nose is powered by the **Wio Terminal**, Grove Multichannel gas sensor, and a TinyML neural network-based free online tool **Edge Impulse**.

The project was recently featured on the cover of Make: Magazine. Please visit **PROJECTS FROM MAKE: MAGAZINE Second Sense: Build an AI Smart Nose** with the full tutorial and story behind the Artificial Nose!

Benjamin's **blog posts** will share with you and dive deeper into why this project is so important to him. In particular, Benjamins demonstrated in the blog how it helped him understand more about AI than he ever thought. Besides, he eventually ended up connecting the "nose" to Azure IoT so that everything can be analyzed and visualized in real-time through **Azure IoT Central**.

Artificial Nose Background

"Some time back in May 2020, I'm guessing like many other people, I spent quite some time trying to perfect my bread recipe - including trying to determine when my sourdough starter would be in the ideal condition to bake perfect baguettes.

Fast-forward to a few weeks later, I had assembled a full-blown (pun intended!) artificial nose. It can be used for a wide variety of applications, from helping folks suffering from anosmia to spot the smell of burning food or spoiled milk, to monitoring the cleanliness of office buildings, etc." -- Benjamin Cabé

Benjamin spent a long time trying to perfect this machine learning recipe on a tiny device, if you have a chance to read the **magazine of MAKE: Vol.77**, you will find this project is featured on the cover!

Start your Machine Learning and IoT Journey:

With this kit, you will get all the required parts to build a device that can detect what's in the air and identify each smell, and then displays the results on Wio Terminal LCD. Since the Wio Terminal is an Azure certified device, not only can the artificial nose sense and tag the scents you want to know in the air, but everything can be analyzed and visualized in real-time through **Azure IoT Central**. Furthermore, there are endless possibilities for extending the capabilities of the nose, with over 300 Grove modules that are compatible with the Wio Terminal.

More importantly, you can automatically trigger rules when, for example, a bad smell is being detected, therefore allowing the nose to be much smarter than if it were just a standalone, offline, device.

Connecting the Artificial Nose to Azure IoT Central

Connecting the Artificial Nose to Azure IoT Central – Real-time telemetry.

Benjamin Cabé's artificial nose project will help you learn new tools such as TensorFlow Lite and Edge Impulse, that you can use to train AI modules right now. **Follow Benjamin's all open-source libraries and tutorials**, with the Wio Terminal, Grove - Multichannel Gas Sensor v2, Grove - MOSFET, you will be ready to learn Machine Learning the easiest way for how to use frameworks like TensorFlow Lite to squeeze trained AI on this ATSAMD5119 ARM Cortex-M4 powered IoT device.

Features:

- The cost-effective and easiest way to learn Machine Learning and use frameworks like TensorFlow Lite.
- Sense and tag scents in the air, visualize through Azure IoT Central
- More than 300 Grove modules support, ready for your endless possibilities

Application

- Detects what's in the air, identifies the smell, and then displays results on Wio terminal LCD.
- Suffering from anosmia to spot the smell of burning food or spoiled milk
- Monitoring the cleanliness of office buildings, analyze and visualize data on Azure IoT platform.

Other Materials you need (not necessary if you don't plan on 3D printing the nose enclosure):

- 3D printed nose enclosure Download the 3D files for free at **thingiverse.com/thing:4493907.**
- **Grove - MOSFET for Arduino**
- **Grove - 4 pin Male Jumper to Grove 4 pin Conversion Cable (5 PCs per Pack)**
- **25x25x10mm 5V DC fan**
- **Fan finger guard** 25×25mm FG-2
- **Wio Terminal Battery Chassis** (optional)
- **Breadboard Jumper Wire**
- M2 and M3 screws, nuts, and washers
- USB-C right-angle cable (optional)

Seeed also offers **3D printing service** to make your invention idea come to life fast. Upload your 3D files to get an instant quote.

Documentation

- **MAKE: Second Sense: Build an AI Smart Nose**
- **Schematics & Wiring diagram** ;
- **Firmware source code** ;
- **3D enclosure model files**.
- **Github repository**

Author

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Wio Terminal is an ATSAMD51-based microcontroller with wireless connectivity supported by Realtek RTL8720DN. Instead of being a single embedded functional module attached with a LCD and different modules, Wio Terminal is all-in-one equipped with Screen + Development Board + Input/Output Interface + Nice Enclosure, making it an efficient and Ready to use device.

The variety of over 300 Grove modules ecosystem made by Seeed is ready to meet your different needs. This IoT kit will also help you identify your business or industry components that can be improved with IoT. Explore and develop more possibilities combining SAMD51 MCU and Azure IoT together with the ongoing software development of Wio Terminal and the community

Why TinyML

Machine Learning can be easy and tiny.

TinyML is a field of study in Machine Learning and Embedded Systems that explores machine learning on small, low-powered microcontrollers, enabling secure, low-latency, low-power and low-bandwidth machine learning inferencing on edge devices.

Product Gallery











Applications

- **Detects air, identifies smell, displays on Wio terminal LCD**
- **Anosmia aid: spot burning food or spoiled milk**
- **Office cleanliness monitoring & analysis on Azure IoT**

Resource Links

- https://www.seeedstudio.com/Tiny-ML-powered-Artificial-Nose-Project-kit-with-Wio-Terminal-p-4999.html

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