Codename "RaspiTIN" - Smart Traffic Information Node PoC with

Working Group AI & ML
NOI Techpark

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IOTA

whoami

Antonio Nardella

IOTA Ecosystem - Regional Community Leader - **ecosystem**.iota.org

IOTA Evangelist Network - Member - **ien**.io

Seekyou - Digital Business Architect - **seekyou**.cc

Blockchain technology since 2011

IOTA Ecosystem projects:

- Docker - IOTA node
- PoC based on FOSS with Bosch XDK and IOTA
- **#TwoToTangle** IOTA Meetups in Bolzano/Bozen

AI & ML
taken from Wikipedia

AI

Colloquially, the term "artificial intelligence" is applied when a machine mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving"
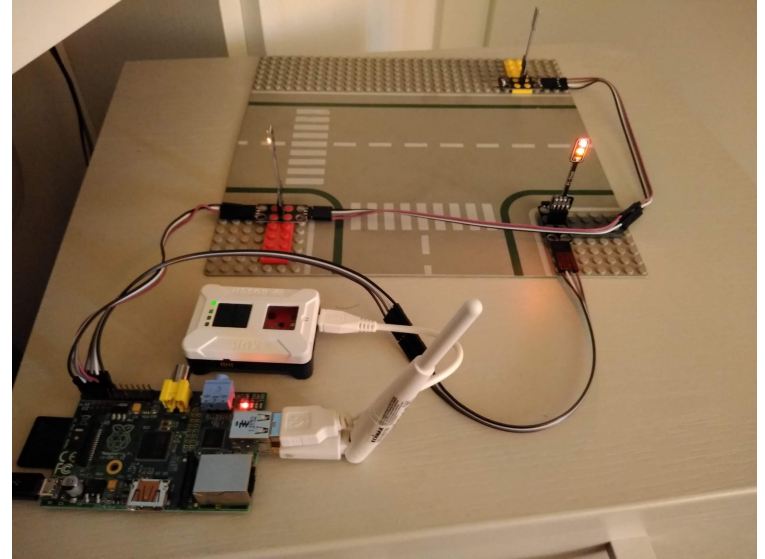
ML

Is the study of algorithms and mathematical models that computer systems use to progressively improve their performance on a specific task

IOTA EVANGELIST NETWORK

IOTA

What is codename "RaspiTIN"?

- Traffic Information Node
- Weather Station
- IOTA Node

IOTA

PoC Hardware

Raspberry PI
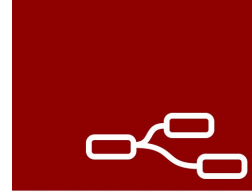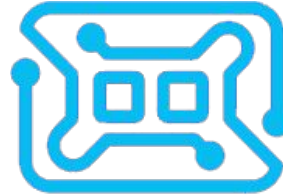Bosch XDK
PiStop Traffic Lights
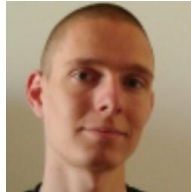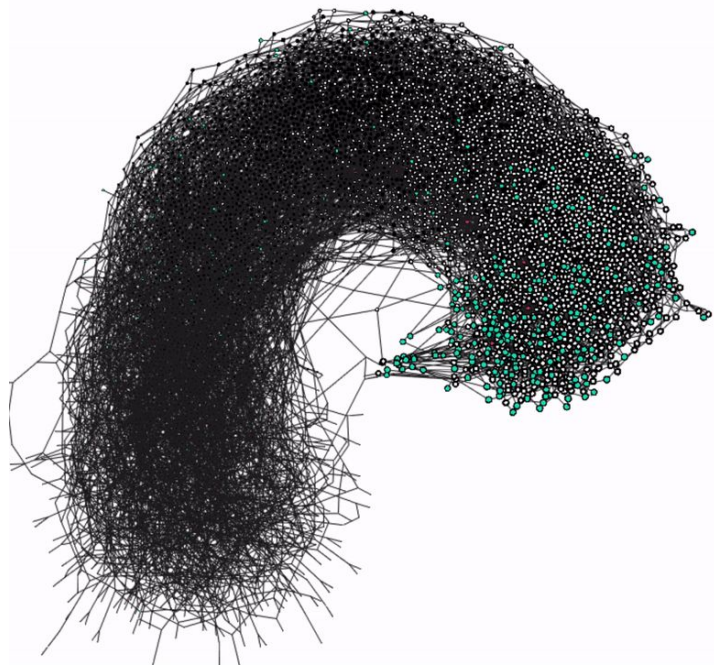Lego

PoC Software

Node RED
IOTA Tangle
XKD2MAM.io

Rewrite in Python by Alexander Lang

IOTA

IOTA Tangle Technology

The unique data structure being utilized in IOTA

- Protocol for the Internet of Things
- Directed Acyclic Graph (DAG)
- Scalable framework for transactions
- Micropayments
- Quantum Immune (level 3 - 243-trits) **Winternitz signature scheme**
- MAM - Masked Authenticated Messaging
- A transaction in IOTA consists of 2673 trytes (if encoded) ~ 1,55 KByte.
- Ternary is faster, more energy efficient and it also takes up less space
- Ternary is very important for AI and NeuralNetworks

Ternary neural networks for resource-efficient AI applications
https://ieeexplore.ieee.org/document/7966166

IOTA
EVANGELIST
NETWORK

IOTA

Codename "RaspiTIN" and the Tangle

IOTA **M**asked **A**uthenticated **M**essaging

Fetch IOTA MAM Data

Public ▾ | enter root-address here... | 🔍 ⊘

☑ Autoscroll   ☐ Pretty print (JSON)   ☐ Syntaxhighlighting (JSON)

Data as JSON over MAM

```
{
    "red": 1,
    "xdk2mam": [
            {
                    "Pressure": "98600"
            },
            {
                    "Temperature": "31180"
            },
            {
                    "Humidity": "36"
            }
    ],
    "device": "ANXDK8190",
    "timestamp": "10568",
    "orange": 1,
    "green": 0,
    "city": "Bolzano",
    "position": [
            {
                    "Latitude": 25.1212,
                    "Longitude": 55.1535
            }
    ],
    "Direction": "W-E, E-W"
}
```

https://mam.tangle.army/fetch?address=RFVOGAVLYJMXNDQ
WPZBJSQCFMPTJSVDIBUUQF9C9UMSSXODULFLMDDRTNS
AJAWNDUNMDYYKASXSWYUVQS

Smart Road Crossing

Transfer Location

```
            {
                    "Humidity": "36"
            }
    ],
    "device": "ANXDK8190",
    "timestamp": "10568",
    "orange": 1,
    "green": 0,
    "city": "Bolzano",
    "position": [
            {
                    "Latitude": 25.1212,
                    "Longitude": 55.1535
            }
    ],
    "Direction": "W-E, E-W"
}
```

Smart Road Crossing

Transfer Traffic light state (UK standard)

```
{
    "red": 1,
    "xdk2mam": [
        {
            "Pressure": "98600"
        },
        {
            "Temperature": "31180"
        },
        {
            "Humidity": "36"
        }
    ],
    "device": "ANXDK8190",
    "timestamp": "10568",
    "orange": 1,
    "green": 0,
```

IOTA EVANGELIST NETWORK

IOTA

Smart Road Crossing

Transfer Environmental data

```
{
    "red": 1,
    "xdk2mam": [
        {
            "Pressure": "98600"
        },
        {
            "Temperature": "31180"
        },
        {
            "Humidity": "36"
        }
    ],
    "device": "ANXDK8190",
    "timestamp": "10568",
    "orange": 1,
    "green": 0
```

IOTA EVANGELIST NETWORK

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Smart Road Crossing

Green Wave -
or brake earlier, CO_2 reduction

*Priority for Emergency Vehicles -
and emergency lane

The semi-/autonomous vehicle knows the status and the time to status change of the traffic lights and can adapt the speed to take advantage of the green wave or begin breaking

Set the traffic lights on road crossing to red and give priority to emergency vehicles in the needed direction. Inform the vehicles on the route to create an emergency lane

*TBD

Smart Road Crossing

Weather data -
street condition

The vehicle knows the condition of the street (wet/ice/snow) and can adapt the speed to optimize to a secure braking distance

*Information sharing -
Plattform, App

Using the High Mobility API it is possible to use their standardized API to connect to cars.
Sharing information with Apps like Google Maps/Open Streemap, Runtastic and others

*TBD

High Mobility API

Powerful Auto API
The most comprehensive standardised API for connected cars at your disposal.

Cross-Brand Compatible
Connect and communicate with vehicles across multiple carmaker brands in a single development effort.

Immersive Car Emulators
Test car capabilities or build simulations to test your app scenarios on true-to-life virtual vehicles.

Carmaker Workspaces
Organise your work, access developer programs and test using the latest digital models via designated carmaker workspaces.

Hardware Enabled
Enjoy running your applications on hardware that is already built into the vehicles; an authentic testing ground for your innovative app or service.

Privacy And Security
The platform implements end-to-end encryption between the car and the SDKs. This granular permissions system ensures the car owner's privacy.

Goals

RaspiTIN:
- Enable a path to Smart Road Crossings
- Connection to High Mobility API
- Collect and sell traffic Datasets for ML/Research
- Collect and sell weather data for ML/Research

AI:
- Traffic optimization
- Predictions for semi-/autonomous cars and test out planning scenarios
- Integrating an AI system for traffic lights (signal) control
- Finding mechanisms for fleet operators and cities to work together by sharing data about congestion or pollution hotspots, and rerouting around the problem before it becomes serious

Mike MacKenzie - flickr
Attribution 2.0 Generic (CC BY 2.0)

IOTA EVANGELIST NETWORK

IOTA
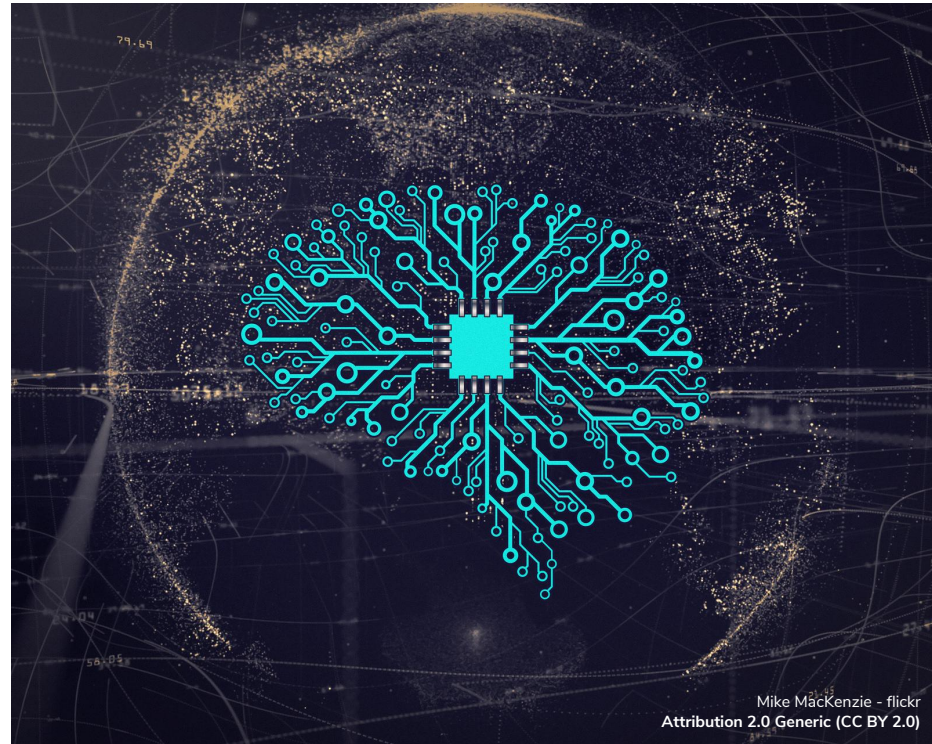
Homework done

Competitors/Partners

- Aitech.vision: AI Traffic based on images (no go in bad weather conditions)
- Nanyang Technological University in Singapore
- Advantech
- Alibaba City Brain: sorts through a mass of incoming data from 300 traffic lights, 500 CCTV cameras, public transport systems and other streams in order to minimise road congestion
- Ford and other manufacturers
- TU Graz
- Senseable City Lab" at the MIT - Carlo Ratti

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