Tipalo

# Explainable AI Mini-Summit

**17 Feb 2021**

In partnership with: RE • WORK

| | | |
|---|---|---|
| **Topic** | **General-purpose AI:** | **A Digital Bio-Brain with an Artificial Nervous System** |
| **Speaker** | **Walter Crismareanu** | Founder & CEO |
| **AI startup** | **Tipalo, Switzerland** | https://www.tipalo.com/ |
| **AI approach** | **Biological intelligence** | no math, no matrix multiplication, no formulas, no algorithms |

## Biology

- **The brain consists of connected neuronal cells**, organizing themselves in neural nets with own specialty
- **By adding new ties between cells**, the neural nets can adapt interactively to new stimuli from the body
- **The rules how and when to create new ties between cells** are contained within the genetics of the neurons
- **Via a Self-Learning Mechanism**, neural nets can store and retrieve accumulated knowledge

## Intelligence

**- Where can we find intelligence in nature?**

Within the brain of every living biological organism, as a system of networks forming a Nervous System

**- How does intelligence work?**

Intelligence is a logic framework to process information based on existing knowledge,
while updating the knowledge pool with new information gathered via own experience

**- What does intelligence need?**

Every intelligence needs a body to connect with and a time frame in order to act and react

**- What is intelligence?**

**Intelligence is LOGIC ALIVE, because it consists of living logic cells called neurons.**

## Outcome

- Tipalo takes the **brain as a template for intelligence** and develops **technology with similar biological features**
- Tipalo uses **own libraries of connected neural nets** and **mimics the logic of adding new ties between neurons**
- Tipalo uses a **Self-Learning Mechanism as interaction between neural nets**, enabling hereby a **Digital Bio-Brain**
- Tipalo **links the brain to a body hardware** with sensors, actors and organs, creating hereby **living machines**

## Organisation

Tipalo uses the following organisation regarding neuronal cells:

**neuron** **- can interactively create new ties with other cells,** where the weights can be positive and negative

**neural group** - neurons are **organized in distinct groups for a specific purpose**, pre-defined or user-defined

**neural net** **- organized in separate acting groups,** not like the sequential layers known from conventional nets

**ANS** - represents **all the neural nets including the connectivity layer**, which links neural nets together

**Result**

**New ties can be created between cells, within a group, within a neural net and within the ANS**

## Description

**Tipalo develops an own software with the following biological features:**

**PNN** **-** Programmable Neural Net is an own type of neural nets, organized in groups, **allowing new ties between cells**

**SPL** **-** Self-Programming Logic enables the individual neural nets to adapt to new situations, **by creating new ties**

**SLM** **-** Self-Learning Mechanism, provides the accumulation and retrieval of knowledge in neural nets **via new ties**

**ANS** **-** Artificial Nervous System, offers the logic framework needed to perform all **neural nets required for specific purposes**

## Technology

**- The generic ANS** is the logic library, which simulates all specific neural nets needed for the structure of the body hardware

**- The dedicated ANS** of a product line has a certain level of intelligence, equipped with pre-defined knowledge

**- The VHDL real-time operating system** creates a time flow, where all active cells are processed within 1 ms

**- The corresponding body** contains the connected hardware with sensors, actors and organs of the embedded system

# Levels of intelligence

| **Level** | **biological equivalent** | **AI product lines** | **capacity** (cells) | **density** (ties/cell) |
|---|---|---|---|---|
| L1 | insects | robodogs, drones | 1M | 16 |
| L2 | mammals/fishes/birds | pilots for vehicles | 1G | 256 |
| L3 | primates | robotic workers | 10G | 1024 |

## AI product

**General-purpose AI as digital bio-brain, enables:**

**- autonomous exploration** of the surrounding environment

**- knowledge accumulation** via own experience

## AI product lines

- **robodog**, for intruder detection and landscape exploring + surveillance

**- drone**, for autonomous delivery and landscape exploring + surveillance