

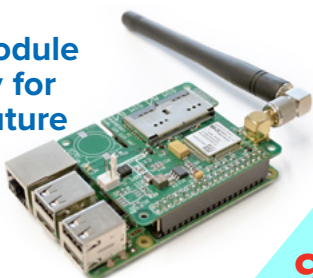
Specialized addition **SOSnews eXtra:**

## **Learning Machines**

Sci-fi or real part  
of our lives?

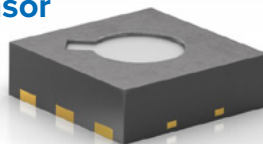


**BG96**  
IoT Module  
Ready for  
the Future



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**SGP 30**  
The Game Changing Metal  
Oxide Semiconductor  
Sensor



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**Bar TFT**  
Even an Industrial Display  
can be Wide-angle



16

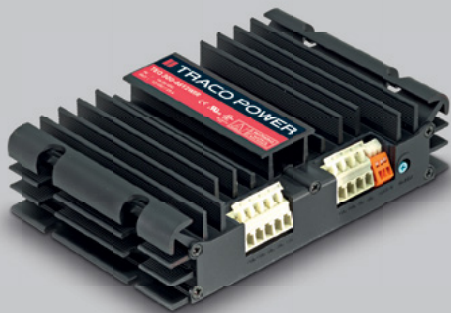
**TRACO POWER** – dedicated to design and production of high quality, state-of-the-art AC/DC & DC/DC power conversion products for Industrial & IT, Transportation & Railway, Medical & Healthcare, Automation & Control, Renewable Energy & Smart Grid. Our mission is to provide optimal power supply solutions for specific applications with regard to performance, quality, cost and functionality.

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## ADDITION SOSnews eXtra

Learning Machines



**Rastislav Talárovič**  
Head of Marketing Department  
& Google Partners Trainer

## Dear friends,

do you have your favorite movie? What is your favorite genre? I love quality sci-fi. When I was my kids' age, I devoured phrases like "I'll be back" or "There is no spoon". However, I never knew why I was so fascinated by the series of Terminator or Matrix. Now I know. Because they are, to certain extent, true.

I do not really mean the war between humans and machines, which has been the subject of various movies for centuries. I rather think about learning machines and their ability to improve on their own. Maybe you did not realize it, but the revolution of artificial intelligence is already here. We get in touch with it every time we search something on Google, use Internet translators, or write on social networks. Maybe you did not even realize that your question about the invoice you write to the mobile operator via chat is already answered by an artificial intelligence machine, so-called chatbot. Or, you may have recently saw ads for the first smartphone with artificial Intelligence.

This revolution of learning machines also brings enormous opportunities to your electronic devices. Have you ever wondered whether your device could use artificial intelligence? Not yet? The time has come, new era is already here. This is why we have prepared a special appendix about Machine learning for you. I believe you will read it with such enthusiasm as we prepared it for you.

If you still think of it as a science fiction, we have something more contemporary. Do you have your device ready to connect to IoT networks? A few weeks ago, in three countries, we organized very successful workshops on NB IoT solutions with local mobile operators. In Hungary and Slovakia, our customers could even connect our Quectel modules to the NB (narrowband) network as first. Interest was huge!

But I would like to get back to artificial intelligence. Some see it as disastrous as the creators of the Terminator or the Matrix. Is not it just our fear of ourselves? Are machines really threatening us? And if we are to be afraid, there is definitely no reason to be afraid of intelligent machines pushing us out of the world. We humans have something logically inexplicable. It is something that we will probably never teach machines. We are afraid, we are dissatisfied, but we also have passion and courage. And what is important, we have our dreams, and we love ignoring the limits. And the machines do not! I think we have an excellent chance of achieving a perfect symbiosis. It's only up to us. Humanity can create but also unnecessarily destroy..

I still see my father's smirk when I wanted to talk to him about thinking machines and artificial intelligence. "It's just a fiction, a made up film," he used to tell me. What would he say now if he read our special appendix to this edition of SOS news about learning machines? And you know what, I'm going to give it to him and watch Terminator with my boys :-)

PS: Remember, besides all your duties, that you are not a machine. Go out with your family to relax somewhere in nature, these days it is so beautiful. If you are still just such a small workaholic, take this SOS news with you :-)

Enjoy the spring and the coming summer!

  
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tel.: +40 3122 102 37  
fax: +421 55 786 04 45  
www.soselectronic.ro

# Latest news on SOS electronic...

## SOS electronic authorized distributor of FISCHER ELEKTRONIK



**FISCHER ELEKTRONIK is a supplier and a manufacturer of heatsinks, connectors and enclosures as well as a leader in providing solutions for projects including modifications based on customers' requirements. The company's customers include many globally known international companies.**

We are delighted to inform you that starting from February 6, 2018 we are able to provide you a first-hand support when it comes to FISCHER products. We have become an authorized distributor of FISCHER ELEKTRONIK products. The most popular products based on your interest

and our product managers' recommendations we can supply immediately from our stock, as these items are stocked as permanent stock assortment. Except these stock items, naturally, we also offer products available to order with the best possible price and lead time.

## Education – Exchange of Experience – Fun



Our first this year international sales representatives meeting was held in this spirit. We reunited again - colleagues from the Czech Republic, Hungary, Poland, Austria and Slovakia - to measure our strengths not only in sports disciplines, but especially to compare and evaluate the results of our work and get ready to welcome 2018. And as it is the custom, we have also invited representatives of renowned brands to keep ourselves in the picture regarding the new technologies on the market. Our friends from AAEON, APACER, LANTRONIX and 2J-antennae have trained us properly and so charged with positive energy and new knowledge we are ready to appear before you - our customers.



## We've organized our first NB-IoT workshop in Hungary

**Our Hungarian colleagues from SOS electronic in cooperation with T-Systems Hungary and Quectel as one of the first tested NB-IoT technology.**

On Wednesday, 14 March 2018, we organized the first of the NB-IoT workshops with prominent companies - Quectel Wireless Solutions and T-System Hungary. A successful Wednesday workshop was preceded by an internal workshop held on Tuesday 13.3.2018 that we organized for the employees of T-Systems Hungary.

During these two days, we worked with about 50 participants.

Present enthusiasts could try out the operation of the Quectel BC95 NB-IoT module on an available network from T-Systems Hungary. The network is not yet covered throughout the entire Hungary so we organized this workshop at T-Systems.

During the workshop, in addition to the presentation, participants were also given the opportunity to try out the Smart Module, Combo Module MC60E and BC95 NB-IoT module programming. Such practical training was organized in Hungary for the first time.



## We are growing at a record pace, we need YOU

**For the last few weeks, when being asked questions like: “...and by the way, how are you?”, we no longer answer with familiar phrases. We are happy to say that we have a record.**

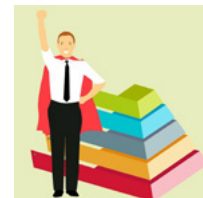
2017 was historically record-breaking and we have started 2018 in this spirit too.

In the January, you, our customers, helped us to achieve the record sales. We beat our last year's turnover and raised it by 10%. Thank you!

However, there's quite a lot of work when we want to achieve

ve records. It seems it's too much. We need help. We're looking for people for the sales and purchase departments to strengthen our colleagues' teams.

Are you interested in working with us? In case of interest, let us know at: [career@soselectronic.com](mailto:career@soselectronic.com)



## We're again more colourful

**We change the building looks every two years. Don't you believe? Check out our gallery.**



We change the dress of our wall at the entrance to the building every two years. The coloured canvas that is hanged up is also an

art of our children. This year, we asked children from Slničnica Satellite for help. Our cooperation was just great. Together with our SOS kids, they worked on it one January Saturday. The graphic part was covered by the Košice artist, Zuzana Bobrovská.

Hanging up the canvas was preceded by a long wait due to harsh weather conditions. Voluntarily climb on the roof at wind speed of 28km / hour is more than courageous. But we did it! On March one day, the weather had mercy on us. We hanged it up during heavy rain.

Our canvas' launch was realized by Mr. Rastislav Trnka, Chairman of Košice county and director representative of the children's home Mrs. Iveta Koreňová.

With children from the satellite, we enjoyed good fun while throwing confetti and paper flowers at the canvas. We thank everyone for an amazing work they did and for happy smiles.

So, see you in 2 years.

## A book is a device to ignite the imagination. Share your favourite one with others!

Every year, there are more and more people in our company, employees and their family members. During one meeting, we realized that whether our children are small or big, or even if we don't have any kids, we all love reading. And therefore, in March – national reading month, we organized the first company book yard sale.

The book collection first featured children's titles, then a few novels, detectives, cookbooks, various encyclopaedias, books on health but there were also books in English and Hungarian. And so, when preparing morning or afternoon coffee, we were often flipping over the pages of some of them ...

The number of books was gradually growing and so we scheduled a meeting one Saturday afternoon, during which we were reading some short stories from various fairy tales to our kiddos. Not only our children, but also children from the foster home Zelený Dom in Košická Nová Ves, participated in the competition for the most beautiful bookmark. Everybody got sweet and also material rewards.

Kids had fun, we adults stopped for a moment and with a coffee in one hand (and a cake in the order) we were picking up the best, flipping through



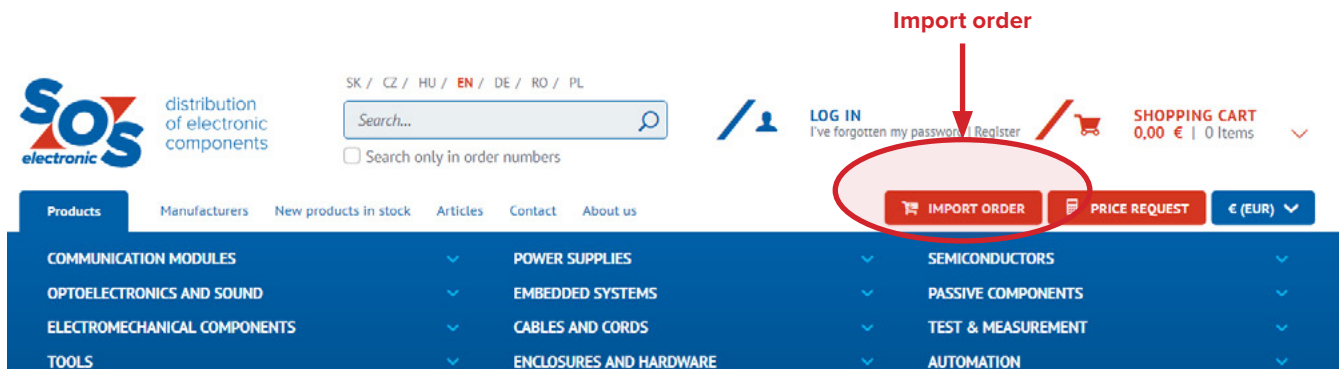
the pages, reading and listening. In any case, however, each of us has taken not only a few new books, but also a good feeling of pleasantly spent time.

And since we really had a lot of books, they made us a nice company for a few days, and we believe it was not the last time. Hopefully, it will become a good habit for us not to put a good book to shelf after reading it but we will take it among us. And it does not have to be only in March, a month of books.

# Do you have orders with a large number of items?

## Import them into our eshop very quickly

Use our eshop tool called “order import” (also called BOM - Bill of Material - import). You can find it at the top menu of our site.



### How does it work?

If you have your order ready in your information system, you can definitely export it, for example to Excel or as a CSV or TXT file. You can quickly import such format into our eshop.

### Process of importing

Following steps need to be taken:

1. Select import method (there are two ways - Import from CSV/TXT file or via Mailbox)
2. Start importing
3. Once it is completed, a report showing the import status will appear
4. In case of errors, solve the problem lines
5. Go to the Shopping Cart and continue with the ordering process

### Example

I am importing two items: 100pcs of BC 546 transistor and 50pcs of electrolytic capacitor 1000uF/16V. Imported file looks like this:

```
BC546;100
1000uF/35V;50
```

When you start importing, you'll see the following report:

IMAGE	TYPE / DESCRIPTION	ORD.NUMBER	PRICE PER UNIT	QUANTITY	IN STOCK	MOQ	MULTIPLICATOR
<b>Quick purchase</b>							
We have found more products containing the name you entered. Please choose your product by checking the box on the left side.							
<b>Products paired according to our product names or your labels</b>							
Your product name: tma0505							
<input type="checkbox"/>	TMA 0505 D DC/DC module 1W 5VDC/5VDC +100mA SIP7	3567	3,2200 €	10 pcs.	751 pcs.	1 pcs.	1
<input type="checkbox"/>	TMA 0505 S DC/DC module 1W 5VDC/5VDC 200mA SIP7	5089	2,6800 €	10 pcs.	3475 pcs.	1 pcs.	1
Your product name: 4700uf							
<input type="checkbox"/>	HC 4700uF 20% 50V (HC1M478M30025HA159) Aluminium Electrolytic Capacitor D30x25mm	70045	1,0500 €	50 pcs.	71 pcs.	2 pcs.	1
<input type="checkbox"/>	HC 4700uF 20% 63V (HC1M478M25040HA) Aluminium Electrolytic Capacitor D30x30mm	70048	1,3800 €	50 pcs.	129 pcs.	1 pcs.	1
<input type="checkbox"/>	HE 4700uF 20% 50V (HE1M478M25055HA) Aluminium Electrolytic Capacitor D25x35mm P10	155188	0,9510 €	50 pcs.	3 pcs.	2 pcs.	1
<input type="checkbox"/>	RD 4700uF 20% 10V (RD1A478M12025PL159) Aluminium Electrolytic Capacitor D12,5x25mm P5	64373	0,1580 €	50 pcs.	1700 pcs.	10 pcs.	1
<input type="checkbox"/>	RD 4700uF 20% 16V (RD1C478M16025PA) Aluminium Electrolytic Capacitor D16x25mm P2,5	64377	0,1980 €	50 pcs.	410 pcs.	10 pcs.	1

Example of the report after importing the order.

There is a red message saying that a number of products that fit the imported data were found when importing the order. Therefore, I need to choose the product I need. In case of transistor it is 5 items, in case of capacitor it is 2 items.

When choosing a product, seeing the price and stock status (columns on the right) can be of a great help. Select the product on the left and submit the form. Items are imported into the Shopping Cart.

### What are the technical conditions for the import?

Finally, just a few details on what to do to get the import done correctly:

- Use the product name or SOS order number
- Use semicolon or tab key as a delimiter
- Place each item on a separate line

**Adrián Lipták**  
webteam manager

# Latest articles to read...

## The First Samples of BOXER Industrial Computer in Stock



Choose: an ultra-thin, high-performance or mid-range class with many interfaces. Up to 55 types of AAEON BOXER industrial fan-less computers in our offer. You will definitely find the right one for you.



**AAEON**  
an ASUS assoc. co.

## Ultra Low Power ISM modules RFM300(H)W



Your next project may need a reliable and low power wireless communication. If it is an alarm system, door access or home automation project, you will probably need wireless communication.



**HOPPERF**  
ELECTRONIC

## New PRO thermal cameras using Delta-T function



Fluke Ti 480 PRO and Fluke Ti 450 PRO are new thermal cameras surpassing their predecessors with a number of improvements. Intuitive user display, higher temperature range, better sensitivity or a novelty - Mark Delta-T - analysis of temperature differences.



**FLUKE**

## Were you influenced by regulation of fluorinated greenhouse gases in aerosols?



Never mind, we bring you Dust Off and Freeze sprays with a new formula.



**KONTAKT**  
CHEMIE

## ResiStant to water, resiStan to vibrations - The ST-Series



The Hirschmann's (from BELDEN) ST series, with its robuST and compact power connectors is particularly suitable for power supply and signal transmission in induSTrial inSTallations and mechanical engineering.



**HIRSCHMANN**  
A Belden Company

## TechNexion TEP – robust and powerful Panel PCs



Are you looking for a stylish touch screen terminal for the attendance system? Or even something more powerful? You will definitely choose from the TechNexion TEP series.



**TechNexion**

## M8 / M12 Connector System



Everything you may need for safe and reliable communication in harsh industrial environments.



**TE**  
connectivity

## Verified and Improved Differential Pressure Sensors



Sensirion SDP800 series sensors are the reliable solution for precise air flow measurement in most demanding but cost sensitive HVAC applications, such as VAV controllers, burners, heat recovery ventilation systems and filter monitoring.



**SENSIRION**  
THE SENSOR COMPANY

## Take Advantage of the "Silent Switcher" Architecture



Linear Technology's "Silent Switcher" architecture greatly reduces EM emissions.



**LINEAR**  
TECHNOLOGY

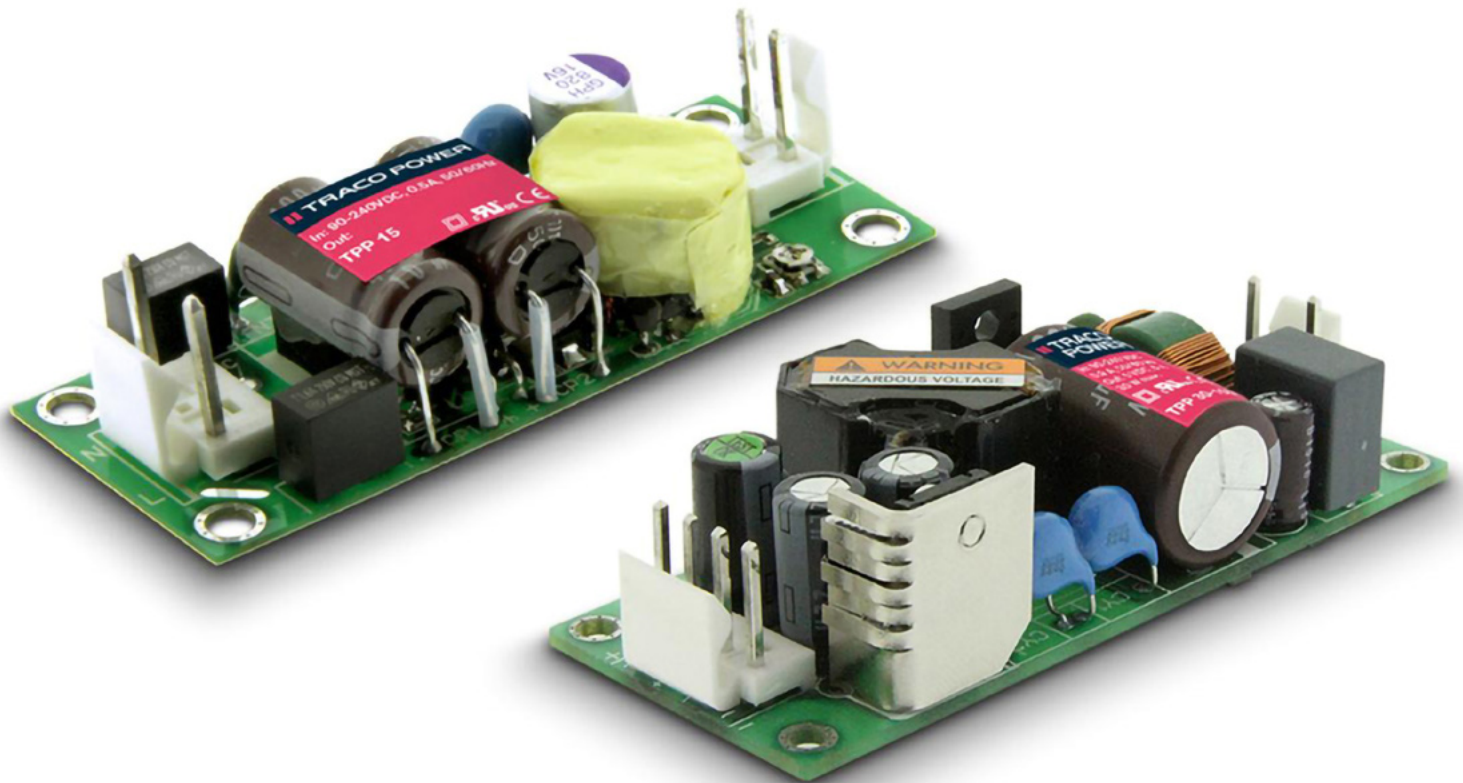
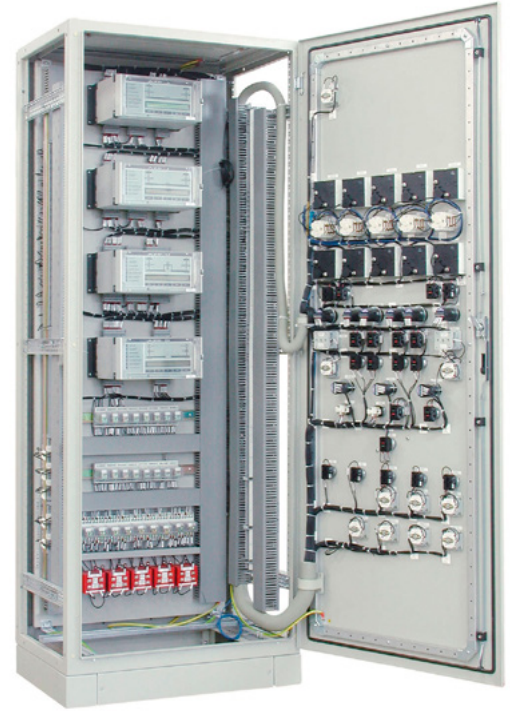
# Open Frame AC/DC Converters for Medical Applications

**15W and 30W Open Frame AC/DC converters with extended temperature range and high isolation for medical applications from TRACO POWER.**

These 15W and 30W AC/DC power supplies feature a reinforced double I/O isolation system according to the latest medical safety standards IEC/EN/ES 60601-1 3rd edition for 2 x MOPP and are approved for an operating altitude of 5000 m.

The earth leakage current is below 100 µA, which makes the units suitable for BF (body floating) applications. The excellent efficiency of up to 91.5% offers a high power density in the packaging format 25.4x66.2mm (1.0" x 2.6") (15 Watt) and 34.6x84.8mm (1.36" x 3.34") (30 Watt). The full load operating temperature range covers -40°C to +60°C, while it goes up to 85°C with 50% load derating.

The units operate in compliance with the medical EMC emission and immunity levels according to the latest standard IEC 60601-1-2 4th edition. All TRACO POWER products assigned to "Medical" category are subject to ISO 14971 – "Application of risk management to medical devices". The quality management for design and production is certified as per ISO 13485, while the production quality is controlled according to the acceptance criteria of IPC-A-610 class 3.

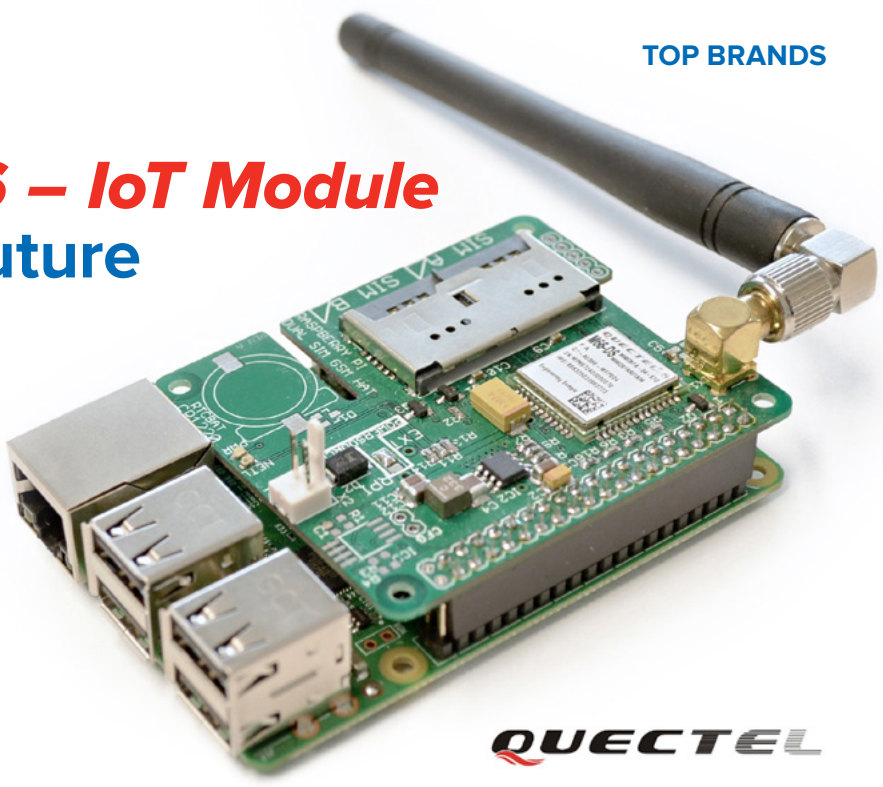


Order no.	Type	Description	Guide price
286837	TPP15-105A-J	AC/DC Module 15W 85-264VAC/5VDC/3000mA	31,90 €
286848	TPP30-115A-J	AC/DC Module 30W 85-264VAC/15VDC/2000mA	40,20 €



# QUECTEL BG96 – IoT Module Ready for the Future

**BG96 is an interesting new product of the IoT modules producer Quectel. It combines an LTE Cat.M1/Cat.NB1/EGPRS module, offering a maximum data rate of 375kbps downlink and uplink.**



It features ultra-low power consumption, and provides pin-to-pin compatibility with Quectel LTE module EG91/EG95, Cat.NB1 (NB-IoT) module BC95, UMTS/HSPA module UG95/UG96 and GSM/GPRS module M95.

With a cost-effective SMT form factor of 22.5mm × 26.5mm × 2.3mm and high integration level, BG96 enables integrators and developers to easily design demanding applications with fairly high transmission speeds and low power consumption comparing to other technologies

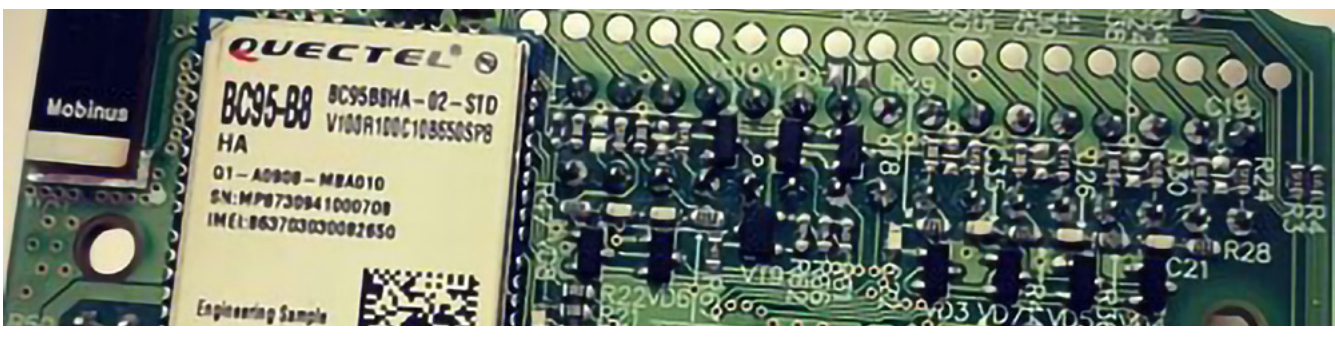
such as LoRaWAN and Sigfox. Its advanced LGA package allows fully automated manufacturing for high-volume applications.

A rich set of Internet protocols, industry-standard interfaces (USB/UART/I2C/Status Indicator) and abundant functionalities (USB drivers for Windows XP, Windows Vista, Windows 7/8/8.1/10, Linux and Android) extend the applicability of the module to a wide range of M2M applications such as wireless POS, smart metering, tracking, etc.

### Key Benefits

- LTE Cat.M1 & Cat.NB1 & EGPRS module with ultra-low power consumption
- Compact SMT form factor ideal for size-constrained applications with tight space
- Support powerful ThreadX, which can host customers' applications
- Easy drop-in migration to GSM/GPRS/HSPA/LTE modules
- Fast time-to-market: Reference designs, evaluation tools and timely technical support minimize design-in time and development efforts
- Robust mounting on PCB and rich set of interfaces

Order no.	Type	Description	Guide price
255495	BG96 MA-128-SGN	LTE CatM1/CatNB1/EGPRS Module	25,27 €
262914	BG96MATEA-128-SGN	LTE Cat M1/Cat NB1/EGPRS Module on Adaptor Board	42,80 €



# Get ready for 5G!

Yes, the 5G network is coming. In February 2018, during the Winter Olympics in South Korea, the operation of the first 5G network was launched.

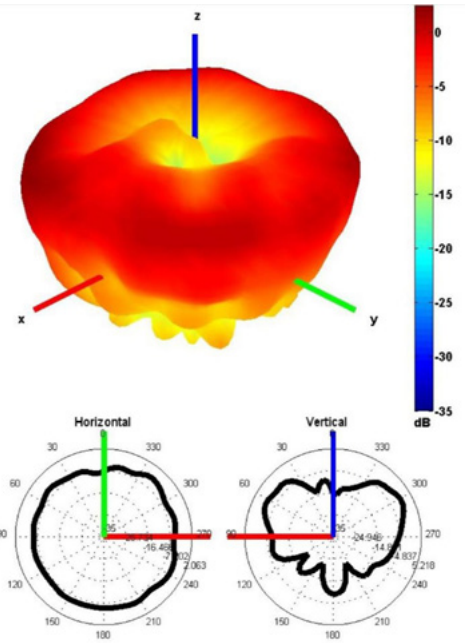


**5G**

5G networks use frequency band in 3400-3800MHz range (for Europe). For these applications, 2J comes with an omnidirectional magnetic antenna. Mechanical dimensions of 2J3757M are identical to 2J301M, which has very positive impact on price.

Customizable cable length and connector type are available, which is a standard option for all models from 2J. Wide operating temperature range and UV stable PC/ABS case makes this antenna suitable for worldwide operation.

Customizable cable length and connector type are available, which is a standard option for all models from 2J. Wide operating temperature range and UV stable PC/ABS case makes this antenna suitable for worldwide operation.



### Electrical specification

- frequency range: 3300-3900MHz
- return loss: ~-17,2dB
- VSWR: ~1,4:1
- efficiency: ~38,9%
- peak gain: ~2,1dB
- impedance: 50 Ohm
- polarisation: linear
- max. input power: 35W
- dimension: 30,9x71,5mm
- color: black

Order no.	Type	Description	Guide price
271756	2J3757M-300LMR100-C20N	Antenna 5GHz LMR100 3m SMA Ni Black	9,30 €
111999	2J301M-250RG174-C20N	GSM Antenna RG174U 2,5m SMA M Ni	3,28 €



# Secure data transfer with dual band WiFi module xPico®200

LANTRONIX®

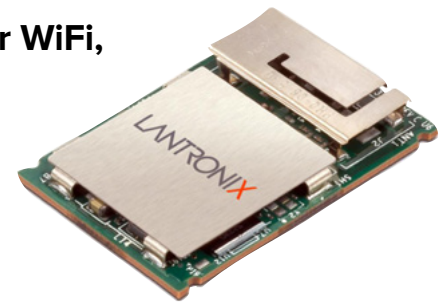
If you need highly reliable and secure data transfer over WiFi, xPico Wifi240/250 is the right solution for you.

xPicoWiFi240/250 from Lantronix provides seamless and secure Ethernet, Wi-Fi and/or Bluetooth connectivity (xPico250), and again shifts the capabilities of OEMs's manufacturers and accelerates the development process.

Packed in a small, SMT ready 17x25x2mm package, the xPico 240/250 with dual

band (2,4/5GHz) radio is the first WiFi module featuring advanced enterprise security, networking intelligence, and pre-integration with theMACH10™ management software platform.

xPico® 200 series delivers the power of an IoT gateway in an industry-leading compact footprint.

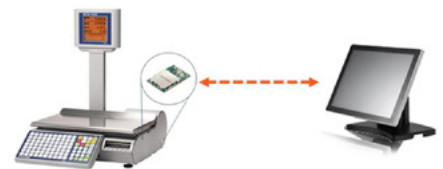


### xPico® 200 Highlights

- robust dual-band 802.11 a/b/g/n Wi-Fi
- Bluetooth SmartReady 4.2 (xPico 250)
- Lantronix Soft AP+Client allows connection for service purposes without interrupting machine field operation
- TruPort® Security ensures enterprise level security of both, data-at-rest and data-in-motion
- TruPort® Serial and TruPort® Socket technology supports a wide range of communication protocols
- Industrial grade design for operation in extreme environments (-40°C to +85°C)
- 5-year! Limited Warranty



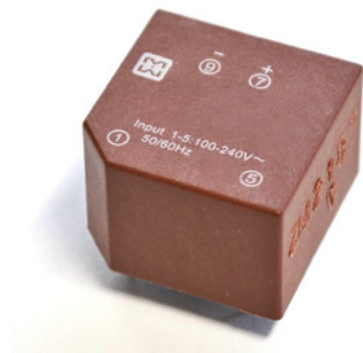
Order no.	Type	Description	Guide price
236145	XPC240100B	xPico 240 Emb GW, Wi-Fi, Eth, Dual U.FL, LGA, BULK	32,80 €
288293	XPC240300EK	xPico 240 Evaluation Kit, Emb IoT GW Wi-Fi, Eth, Dual-band	102,38 €



# 16grams, 25x25x16mm, 3Watt – this is the Myrra 48000



Myrra builds on the success of the 47000 series with the new AC/DC converter series 48000. Let's check some of its features in the given example.



Myrra builds on the success of the 47000 series with the new AC/DC converter series 48000. Let's check some of its features in the given example.

Converter has to supply electronic device with micro controller with nominal

## Features

- direct replacement for EE20 size transformers
- output power 3W up to ambient temperature 50°C, 2,5W at 60°C and 1W at 80°C
- output voltage 3,3 to 24V
- short circuit output protection
- standby power consumption less than 0.15W
- safety standards VDE, ENEC, UL

supply voltage of 3.3V. Ambient temperature range is -20 to 80°C. Current consumption is 20uA in sleep mode, max consumption is 250mA.

We have two options in this case: using model 48021 or 48022 + linear or switching voltage regulator 5/3.3V.

### Model 48021

- output voltage accuracy:  $E1 = \pm 5\%$
- output voltage load regulation:  $E2 = \pm 5\%$
- dynamic response, 50-100% load change:  $\pm 10\%$  rated output voltage
- output voltage line regulation:  $E3 = \pm 5\%$
- ripple & noise: 200mV p-p.

Microcontroller's maximal operating voltage is typically 3.6V, absolute max voltage is typically 4V. Voltage higher than 4V can damage the microcontroller.

In the worst case scenario, DC output voltage can be  $3.3V + E1 + E2 + E3 = 3,795V > 3.6V$ . When we add  $\pm 0.33V$  overshoots and ripple 200mV p-p, output voltage can reach  $4.325V > 4V$ . Brief worst case analysis has shown us that model 48021 is not suitable for our device.

The real output voltage tolerance can be better, but this has to be confirmed by testing and measurements – which is a time consuming task.

### Model 48022 + Voltage Regulator 5/3,3V

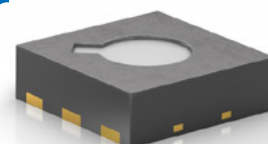
This variant is more expensive but it will certainly meet all requirements. We need to determine if we are going to use linear or switching voltage regulator 5/3.3V.



# SGP 30 – The Game Changing Metal Oxide Semiconductor Sensor

**SENSIRION**  
THE SENSOR COMPANY

Sensirion's SGP30 volatile organic compounds (VOC) and CO<sub>2</sub>eq multi-pixel sensor is the first of its kind in many aspects.



## The First Siloxane Resistant Metal Oxide Semiconductor (MOS)VOC Sensor

Siloxanes, in traditional metal oxide semiconductor (MOS) sensors (which is of low molecular weight), can easily be thermally decomposed to silicone dioxide (SiO<sub>2</sub>) by the working temperature of sensor sensing element. SiO<sub>2</sub>

would cause deactivation of the catalyst in the sensing element and therefore, decrease the sensor's resistance in the air, alter its sensitivity to target gas and increase response time. Changes are irreversible, long term exposure to siloxanes makes sensor non-functional.

Sensirion's proprietary metal-oxide technology and multi-pixel platform provide

the SGP30 with an unmatched robustness against siloxanes resulting in a unique long-term stability and accuracy.

The First MOS Sensor with accuracy specification

Every SGP30 sensor is calibrated during production. Only sensors fulfilling the specification reach customers.

## Features

- outstanding long-term stability, only Siloxane-resistance MOS sensor
- two air quality information based on multi-pixel technology: - total VOC concentration, - hydrogen-based CO<sub>2</sub>eq concentration
- low power consumption: 48 mA at 1.8V
- easy-to-integrate: - I2C interface, - 2,45 x 2,45 x 0,9mm DFN package, - 1,8V power supply

Order no.	Type	Description	Guide price
260028	SGP30	Volatile Organic Compounds (VOC), CO <sub>2</sub> eq sensor	7,34 €
262685	SEK-SGP30	Evaluation Kit for SGP30, SHTC1, SHTW2, SHT3x	75,00 €



# Welcome to the 3D FLASH Memory World **Apacer**

Access the best

**Apacer will launch 3D NAND TLC FLASH based products during the year 2018. Is there any reason to worry? Absolutely not.**

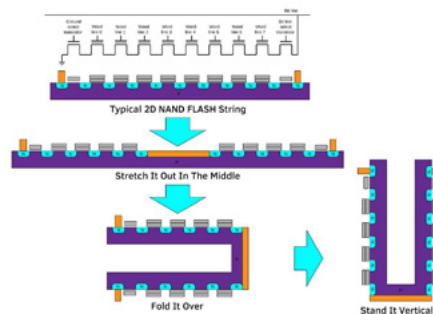
Apacer will use Toshiba chips manufactured by BiCS3 TLC NAND process, which guarantees 3 000 P/E cycles. 3D NAND TLC products will be covered by the same warranty as 2D NAND MLC based products; i.e. 2 years or the period ending on the date when the SSD has exceeded 3 000 Average Erase Count, which is indicated by Apacer's SMART software.

## 2D FLASH Technology Reaches Manufacturing Limits

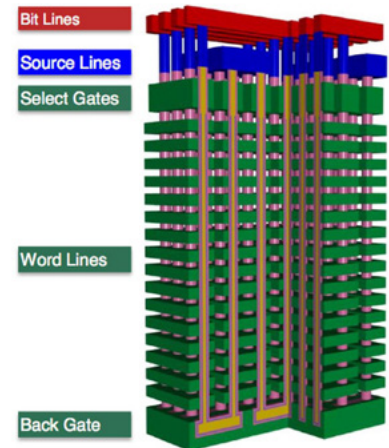
Current generation of Apacer SSD is based on 2D MLC flash memories produced by 15nm process. Low number of electrons that can be stored in the floating gate (FG) and the increasing interference between adjacent memory cells keep the chip capacity from increasing by reducing the geometry of the manufacturing process. With the reduction of the memory cell size, the floating gate (FG) is also reduced in the x-axis direction.

With unchanged gate thickness, the

number of electrons that can be stored in the gate decreases, so the thickness of the gate must therefore be increased. However, as the cells get closer together, the capacity between the FGs of the individual cells increases, thereby increasing their mutual influence.



To minimize the interference, the manufacturers modified the shape of the control gate (CG) to the "cap" around the FG. This way, the capacity between CG and FG was increased, while the capacity between adjacent FGs was decreased. A further decreasing of distance between



en cells is no longer possible because it would not leave space for the CG.

## Will 2D NAND Disappear Soon from The Market?

Answer is NO.

3D NAND FLASH technology is cost effective compared to 2D MLC for SSD capacity 32GB and more.

## SCD30 is More Than Just the NDIR CO<sub>2</sub> Sensor

**SENSIRION**  
THE SENSOR COMPANY

**Sensirion SCD30 is a calibrated module with NDIR CO<sub>2</sub>, humidity and temperature sensors. Measuring of CO<sub>2</sub> concentration and automatic ventilation on demand guarantees healthy workplace and even saves the energy.**

### Why Measure CO<sub>2</sub> concentration?

#### Health Aspect

American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) recommend

maintaining indoor CO<sub>2</sub> concentrations at—or below—1,000 ppm in schools and 800 ppm in offices.

At 1000 to 2000ppm of CO<sub>2</sub>, people complain about drowsiness and poor air. CO<sub>2</sub> concentration between 2 000 to 5 000ppm can cause headaches, sleepiness, poor concentration, loss of attention, increased heart rate and slight nausea. 5 000ppm is the daily exposure limit (8hours).

#### Energy Consumption

Most heating, ventilation and air condition-

ing systems (HVAC) re-circulate a significant portion of the indoor air. Air exhaled by humans contains in average 35,000 to 50,000 ppm of CO<sub>2</sub> (100 times higher than outdoor air). Without adequate ventilation, the CO<sub>2</sub> concentration increases. However, ventilation requires subsequent heating or cooling of the air, which increases energy consumption. The solution is simple – measure the concentration of CO<sub>2</sub> and ventilate in a way that the CO<sub>2</sub> concentration does not exceed the recommended value.

#### NDIR Sensor Module Principle

NDIR (Non Dispersive Infra-Red) sensor uses the fact that CO<sub>2</sub> molecules absorb infrared radiation of certain wavelengths. The higher the CO<sub>2</sub> concentration, the more radiation CO<sub>2</sub> absorbs. The wavelength of 4.3µm has the maximum absorption for CO<sub>2</sub> and minimal absorption for other gases in the air.

### Features

- Calibrated, linearized and temperature compensated module
- Dual sensor detection guarantees superior long term stability
- Integrated RH and temperature sensor
- CO<sub>2</sub> measuring range 400...10 000ppm
- Accuracy ± (30ppm + 3%)
- I2C and UART interface

Order no.	Type	Description	Guide price
290529	SCD30	Calibrated NDIR CO <sub>2</sub> , Temperature and RH Sensor Module	34,30 €
290550	SEK-SCD30	Evaluation Kit for SCD30	125,00 €

# Do you know that a 3-colour backlight can improve legibility of the display?

**Normal, service or critical mode? Any statuses of your device can be easily distinguished by a simple backlight colour change.**

It's a well-known fact that a human brain can more easily and quickly understand a picture or pictogram rather than ordinary text. In cases when your device displays various parameters or it works in various modes, it's very beneficial for the user to be able to easily distinguish its status – for example, whether a measured parameter is OK or it exceeded some defined value.



## Features

- compact LCD character and graphic modules with a selectable backlight – various combinations are available
- high quality displays with a relatively high contrast
- extremely low power consumption (without backlight), typ. 100's of  $\mu\text{A}$
- extremely flat: only 2.0 mm without backlight and 5.8 mm with backlight
- can be soldered directly into the PCB without any further assembly
- character displays: 4-bit, 8-bit and SPI interface
- graphic displays: SPI interface, some also I2C
- single 3.3V or 5V power supply - also for the LED backlighting
- temperature range  $-20..+70^{\circ}\text{C}$ , integrated temperature compensation

Order no.	Type	Description	Guide price
288171	EA LED94x40-ERW	LED Backlight for EA DOGM240-6 Green/Red/White	28,70 €
214779	EA LED36X28-ERW	LED Backlight for DOGS104x-A Green/Red/White	9,22 €

Imagine the situation that if the displayed parameter has value of say 40-80%, then everything is OK. But anything out of this range creates an error status and it's worth to highlight it. Naturally a common way is to use for example buzzers, but it's not always desirable for a device to beep every while, especially at more complex workplaces with a lot of devices when it's very hard to differentiate which device is beeping.

A visual signalisation is optimal for such situations, which can easily be achieved by a simple backlight colour change. In contrast to common character of graphic modules with a fixed backlight, EA DOG series displays from company Electronic Assembly enable to choose a desired combination of display + backlight.



## Hammond 1551 MINI - truly miniature enclosures



**If you have a device of about USB key size but you don't need an USB connector, then the 1551 MINI series is right for you.**



Maybe you've noticed our recent article about miniature Hammond 1551 USB enclosures for USB devices – i.e. enclosures contain a cut-out for a USB

A connector. Indeed, many modern small-sized devices feature USB connectivity

but what if your device doesn't need it?

After success of 1551 USB enclosures and requests for the same sized enclosures but without USB connector cut-out, Hammond brought the 1551 MINI series to the market. Enclosures are available in three sizes and five colours - the same like 1551 USB series. Dimensions, inner design, material and surface structure remain also the same as with 1551 USB series.

Enclosures of this size find their place, for



example, for construction of various sensors and data-loggers with wired or wireless transfer (for example Bluetooth LE).

## Features

- plastic enclosures suitable for miniature devices
- available in 3 sizes
- available in 5 colours
- inner standoffs for PCB mounting
- recessed cover for easy label installation

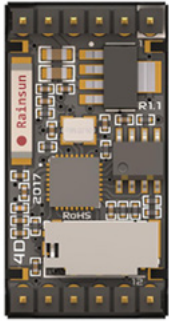
Order no.	Type	Description	Guide price
288958	1551ABK	Enclosure ABS 35x20x15,5mm Black IP54	2,07 €
288975	1551BGY	Enclosure ABS 50x25x15,5mm Grey IP54	2,32 €
288964	1551CBK	Enclosure ABS 65x30x15,5mm Black IP54	2,53 €



# IoD-09 - Internet of Displays for everyone



**Miniature, intelligent, 0.90" RGB TFT display with a WiFi module for immediate use – that's the IoD-09 series.**



Have you been thinking about a small "informative" display capable of displaying various values and graphics,

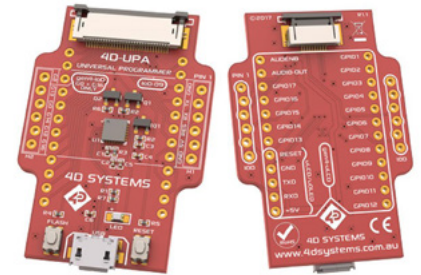
and ideally if it could be „online“. Then the IoD-09 series might be the right choice even for you.

Similarly like all intelligent displays from 4D Systems, even the novelty IoD-09 offers significantly simplified program-

ming in Arduino IDE or Workshop4 IDE (freeware in the basic version). Thanks to the incorporated WiFi module based on the ESP8266 chip, it offers a possibility to create WiFi-enabled displaying and control unit for your device at a great price.

Naturally, 0.9" size and 80x160px resolution are not gigantic at all but even this small display is capable of showing lots of information. Thanks to an inbuilt slot, it's possible to use micro SD card to store data and multimedia files.

4D Systems GFX4dlIoD09 library enables rapid application development thanks to the support of several ba-



sic graphic functions and enhanced graphics via Workshop 4 IDE, SD card support and many other that are integrated into a single library.

As a result, IoD-09 is an ideal component for various data loggers, small process controllers, indicators and so on.

**IoD-09 is available as:**

**IoD-09TH** – in THT version, available directly from our stock.

**IoD-09SM** – in SMT version (with plated-through holes intended to be soldered into a base-board), which will be available in the near future.

## Advantages/ Features of IoD-09

- intelligent TFT module based on the Espressif ESP8266 SoC chip
- built-in WiFi, including the ceramic antenna
- suitable for many IoT applications
- contains microSD card slot

Order no.	Type	Description	Guide price
289314	IoD-09TH	Intelligent Display Module 0,9" 80x160 WiFi THT	0,1370 €
289385	4D-UPA	Universal Programming Adaptor	0,1010 €



## KPTD 2012 - do you know a LED with a dome?

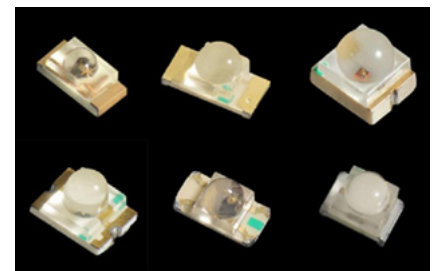
**SMD LED with lens concentrate the light into a smaller space, that's why they're more suitable for some applications than common LEDs.**

Have you ever noticed that many SMT LEDs are also available in a "Dome" (lens) version? As we know, light from a LED chip shines roughly equally in all directions in the half-plane above the given LED ceramic substrate. In other words, viewing angle of a common SMT LED could be 180° even though, because of a package shape and other factors, this angle is usually smaller – for example 120° (for 50% luminance drop).

However, 120° is still relatively wide viewing (distribution) angle, if you need to concentrate light only into one direction. For example, indication SMT LEDs under the front panel covers affect each other less (parasitic light), if they have a lower viewing angle. By concentration of the light into a smaller angle, a much higher luminosity is obtained in that direction.

It is the lens (dome) on SMT packages thanks to which the LED is shining much

**Kingbright**



less "into sides". With the SMT LED series from company Kingbright, it's easy to recognize the "Dome" types by the D letter in the series name, for example KPD, KPHD, KPTD. A look at the spatial distribution picture of KPT versus KPTD types says it all.

The latest addition to the "Dome LEDs" in the Kingbright portfolio and in our stock is the series KPTD-2012 in the "0805" package. Among stock types, four basic colours can be found in our portfolio (red, yellow, green, blue). With a height of only 1.05mm (including the dome) it's possible to easily use it as a direct replacement for common SMT 0805 LED.

Order no.	Type	Description	Guide price
237387	KPTD-2012QBC-D	LED 2x1,25mm Blue 465nm 400mcd/20mA 30° 0805	0,1370 €
237342	KPTD-2012SURCK	LED 2x1,25mm Red 630nm 550mcd/20mA 40° 0805	0,1010 €
237384	KPTD-2012SYCK	LED 2x1,25mm Yellow 590nm 870mcd/20mA 40° 0805	0,1020 €



# Exceptional Products, Professional Support - Meet AAEON

**AAEON**  
an ASUS assoc. co.

One of the top 5 manufacturers on the worldwide embedded industrial market offers a wide range of panel PCs, box PCs, single board computers and many more. SOS electronic became AAEON's official channel partner and offers all AAEON products.



## Long Term Availability

AAEON uses only components that are long term available, for example Intel processors with embedded options that guarantee availability minimally 7 years since launch date.

## Products with extended range of working temperatures

AAEON offers selected single-board computers and a computer on a module for temperatures between -20 to 70° C (WiTAS 1) and -40 to 85° C (WiTAS 2). Panel PCs, industrial PCs and durable tablets are also available in an extended temperature range. The range depends on the particular model.

## Fanless Cooling

Vast majority of AAEON products use passive fanless cooling. Advantages of fanless configuration are obvious – dust doesn't penetrate into product which makes it more reliable. AAEON



products use low power consumption processors starting with Intel Atom X5-E8000 with TDP=5W, passmark=1605

to high performance Intel Core i7-7700T with TDP=35W, (passmark=9402). This power dissipation requires good designed cooling, such as BOXER-6839.

## Products Certified for In-Vehicle or Railway Application

AAEON offers E13-certified Boxer and AEV in-vehicle computers and VPC series network video recorders. BOXER-6357VS and AEV-6356 are railway EN50155 certified computers.

## Product Customization

AAEON provides customization for free, however, MOQ is applied (minimum order quantity). For embedded solutions, such as single-board computers, MOQ=30-50pcs. Customization services include HW and BIOS/firmware modification of standard products. Customization is the AAEON strength. These products make up to 45% of the sales.

Order no.	Type	Description	Guide price
285726	BOXER-6404-A1-1010	Ultra-slim box PC Intel Celeron J1900 w/o RAM -30...65°C	266,70 €
285481	OMNI-310DHTT-KIT-A2-1011	Panel PC display kit 10,4" 800 x 600 CTP -10...60°C New Mount	396,10 €
264220	OMNI-BT-KIT-A1-1010	Panel PC CPU kit Intel Celeron J1900 w/o RAM -10...55°C	365,20 €



# Do you use embedded computers? You will need this

**ATTEND**  
Connect to Your Success

Attend now offers two interesting MXM Module Sockets. One for SMARC/EDM/APALIS Modules and one for QSeven Modules.

All of these modules are small form-factor computers on modules. They are becoming more and more popular and target a wide range of industrial applications, including: Automotive&Infotainment, Navigation, Industrial Automation, HMLs, Avionics, Robotics, and much more.

## What is MXM?

MXM (Mobile PCI Express Module) is the standard interface between PC systems

## Features

• height - 7,8mm • low profile • temperature range - industrial -40°C to 85°C • SMT Robust, vibration resist • compatible with most of international standard modules

Order no.	Type	Description	Guide price
232572	125A-78C00	Connector MXM 230P for QSeven P0,5 H=7,8mm, Standard Type	4,80 €
237047	125B-78C00	Connector MXM 3.0 314P P0,5 H=7,8mm for SMARC/EDM/APalis Module Application	9,06 €

and graphics subsystems. MXM covers the mechanical, electrical, thermal and software and, of course, a connector.

## 125A-78C00

This connector is for QSeven modules. QSeven provides functional requirements for embedded applications, which include but are not limited to graphics, audio, mass storage, network, etc. The name comes from the dimensions of a

module – 70x70mm (Module with dimensions 70x40mm is called uQSeven). QSeven uses 230 pin edge connector (pitch 0,5mm) to connect all power and signal lines to the motherboard.

## 125B-78C00

This connector is for SMARC (Smart Mobility ARChitecture), EDM and Apalis modules. They use 314 pin card edge connector (pitch 0,5mm). The dimensions of a Full Size Module is 82x80mm. The Short Module has 82x50mm.



# HMO is dead, here comes RT...



The RTC1000, RTM 3000, and RTA 4000 with their move completely erase the history of Hameg's oscilloscopes product line and therefore, we present you the rest of this complete Rohde & Schwarz family. Furthermore, with the possibility to measure serial bus MIL-STD-1553 and ARINC 429.



R&S presents the RTC1000, RTM3000, and RTA 4000 oscilloscopes officially launched on the market on January 16, 2018. In July of 2015, we published the first ever article on the change of the Hameg brand to Rohde & Schwarz. And now, with this step, they're removing the HMO product designation and the only living memory of Hameg. From now on, Hameg will only exist in chronicles.

The RTC1000 series replaces the familiar HMO1002 a HMO1202. In addition to replacing, they complement the X functions as specified by the manufacturer himself. Bandwidth will be available from 50MHz to 300MHz. Memory size is 1Msample per channel.

The RTC1000 will be sold in a 2 channel version with 8 digital channels.

Serial Buses for Military Applications and Air Force MIL-STD-1553 and ARINC 429

The RTM3000 replaces the HMO3000 series. This line will be available in a 2 or 4 channel version with a bandwidth from 100MHz to 1GHz. Memory size 40 Msample per channel. A new addition

is also the inclusion of new serial protocols for decoding and triggering, namely the MIL-STD-1553. Serial Bus is a military standard published in the US. At first it was designed for the US Air Force, and the first Fighter aircraft using this standard is the General Dynamics F-16 Fighting Falcon. Furthermore, ARINC 429 - Aerocutical Radio INC is a technical standard for the data bus for most of the high-end comet and transport aircrafts. RTM 3000 can decode the MIL-STD-1553 and ARINC 429 without any major problems. This can be said about a number of RTA 4000 oscilloscopes.

RTA4000 replaces the RTM2000 Series. In this case, the line will be presented in a 4 channel version with a bandwidth from 200MHz to 1GHz and a memory size of 100 Msample per channel.

Order no.	Type	Description	Guide price
208087	HMO 3034 + FLUKE115	SET HMO 3034 + FLUKE115	3678 €
289145	RTC 1002 (RTC1K-52)	Digital Oscilloscope 2ch. 50MHz 2GSa/s 2MSa	787 €



# Bar TFT - even an industrial display can be wide-angle



The new family of Winstar TFT displays marked with "Bar" has a typical elongated shape as we know it, for example, from character displays.



New "Bar" TFT have an ambition to replace character but mainly graphic displays that are typical for many industrial applications.

Technologically, these are still "common" TFT displays with all the

ir pros and cons, and the only essential difference is in its shape (form factor), as their sides ration isn't 3:2 or so but approx. 2.5:1 to 4:1.

As we know, a comprehensive full-colour graphic display is not only a "trendy" thing but it can really display (and graphically differentiate) required content and if necessary, distinguish various alert messages by colour.

The following picture illustrates the difference between the use of classic (mo-

nochrome) 240x64 px graphic display and a Bar TFT display WF52ATLB.

**Three sizes are currently available:**

- 5.2" **WF52A** (480x128 px)
- 4.6" **WF46A** (800x320 px)
- 3.9" **WF39A** (480x128 px)

WF52A is also available as a „COB" module for an easy migration from graphic to TFT display.

As can be seen, the 4.6" display has the highest resolution and thus also the highest pixels density (DPI) from this series. That's why WF46A is also suitable for applications with high demands on quality (fine details) of the displayed content (pictures, etc.). All three models have 24 bit RGB interface (40 pin FFC connector).

Relatively higher brightness (350-500 Cd/m<sup>2</sup>) contributes to a universal use. WF52A is available without a touch panel and also with a resistive or capacitive touch panel.

## Features

- wide-angle "BAR" TFT displays
- full-colour alternative for monochrome graphic displays
- operating temperatures range -20 ... +70°C
- available in 3.9"/ 4.6"/ 5.2" sizes

Order no.	Type	Description	Guide price
226888	WF39ATIASDNN0	TFT-LCD Module 3,9" 480x128 8Bit	34,93 €
229074	WF46ATIATDNN0	TFT-LCD Module 4,6" 800x320 8Bit	51,83 €
229075	WF52ATLASDNN0	TFT-LCD Module 5,2" 480x128 8Bit	36,70 €
229078	WF52QTLBSDBNO	TFT-LCD Module 5,2" 480x128 Control Board	50,30 €





# Schurter TA45, One Switch with Thermal Breaker, 2900 variants

**TA45 switch combined with thermal breaker in one housing not only saves place in your equipment, it offers much more.**

On the first sight TA45 looks like a classic pushbutton or rocker switch. The switch turns on by pressing green button or switching cradle.

**There are more options to turn it off:**

- manually – all versions.
- at overload, thermal protection – all versions.

- at undervoltage – versions with undervoltage protection.
- remotely – versions with remote trip release.

The basic version of pushbutton (2P) or rocker (2R) switch is DPST (Double Pole Single Throw) switch and thermal breaker which responds to overloading of

one or both contacts.

By adding another contact, a three-pole switch with three SPST contacts (3P, 3R) is created, while the third contact is not protected.

Double pole and three pole switches can be extended by auxiliary single pole changeover (SPDT) switch (2PA, 2RA, 3PA, and 3RA), undervoltage protection/remote release/mechanical lock-out latch (2PU, 2RU, 3PU, 3RU) or both (2PAU, 2RAU, 3PAU, 3RAU). 3xxx versions are also available with illuminated button.

Mounting of TA45 switch is simple. Simply slide it inward into the precisely cut-out hole (snap-in mount) or fasten it from rear side with the AZZ05 cover (flange mount).

TA45 series also includes accessories such as covers for IP 54 or IP 65, rear cover, locking device, flat gaskets etc.



## Features

- UL, VDE, CCC approvals
- rated Voltage AC 240 V, DC 60V for 2xxx versions, AC 400V for 3xxx versions
- rated current range 0.05 - 20 A for 2xxx versions, AC 0.05 - 12 A for 3xxx versions
- typical endurance 50 000 switching cycles at rated AC or DC current
- overload: AC: min. 40trips at 6 x rated current, DC: min. 50trips at 4 x rated current
- quick connect terminal 6.3 x 0.8 mm or screw clamp terminal M3.5 x 6 mm (lineside P1, P2)
- ambient temperature range -10 to 55°C

Order no.	Type	Description	Guide price
71117	4430.2580 TA45-ABNTP100C0	Thermal Circuit Breaker 10A 2Pole	15,30 €
75347	TA45 A326L040U2-AZM01 (4430.2609)	Thermal circuit breaker 4A + Cover	29,10 €

## Which heatsink surface treatment to choose?

**Do you know that a surface treatment of an aluminium enclosure has a significant influence on its efficiency depending on conditions in which it's used?**

Abbreviations like "Natural Al", "Natural elox" and "Black elox" marking various surface treatments of components made of aluminium alloys are probably familiar to you. However, is it only a "cosmetic" or aesthetic matter or is it a parameter, which has to be considered also from technical point of view?

The answer is simple – it is a key parameter for majority of applications. Surface treatment has a significant influence mainly on these three features:

**1) Abrasion resistance** – surface of common aluminium alloys (whether enclosures or heatsinks) has a typical "aluminium" colour (natural Al). After wiping with, for example a bare hand, usually you'll find a dark mark on your hand. It is in fact a micro-layer of aluminium (and its oxides), which you've just removed from its surface. Aluminium is a relatively soft

metal and thus it features low abrasion resistance (in a basic – untreated status). Much better from this point of view are electrolytically oxidized (anodized/elox) surfaces, where an oxide layer is much thicker than it would arise at common conditions. Deposited Al<sub>2</sub>O<sub>3</sub> is a very hard material (Corundum) and therefore, this layer is very resistant to abrasion.

**2) Chemical resistance** – as we know, aluminium alloys can be categorized within "corrosion-resistant" materials - at common conditions and in a clean and dry environment. Aluminium itself, however, easily reacts with various acids and alkali and many times even a fingerprint is enough to be "baked in" after some time (if not removed on time). Even in this respect, an anodized surface is much more resistant and elox is effectively protecting aluminium surface even in harsh conditions.

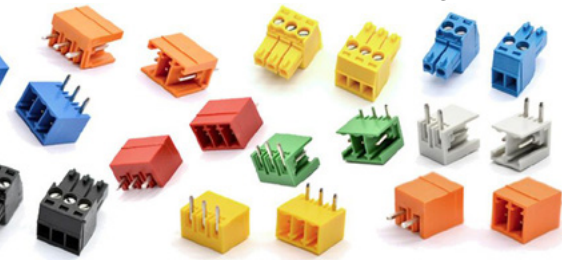


**3) Cooling efficiency** – at the end, perhaps the most important parameter. Untreated natural aluminium with a glossy surface features extremely low emissivity – simply said, a parameter defining heat radiation ability of a given surface.

# 7 COLOURS of Terminal Blocks



Green, grey, black, blue, red, yellow and orange - using Euroclamp coloured terminal blocks radically reduces the possibility of incorrect connecting of the cables.



RAL1016  
RAL2008  
RAL3031  
RAL5012  
RAL6032  
RAL7035  
RAL9005

It is quite common that multi-conductor cables have the insulation of each conductor in different colour. The connecting of such a cable is much easier and faster. But, it is quite common that the outer jacket of these cables is only black or grey. And it co-

uld also be advantageous to easily and quickly identify from where, respectively, where the cable leads.. Especially in complex devices with many inputs and outputs.

That is why we have decided to update our offer of coloured plug-in connectors from Euroclamp in pitch of 3,5mm. Besides standard, green terminal blocks, you have an easy access to grey, black, blue, red, yellow and orange ones. The work with these coloured terminal blocks can be easily handled even by the beginners.

From production of Euroclamp we have

chosen plug-in connectors (terminal blocks) SHxx-3,5-COLOUR Series . We keep 2 and 3-pole versions in our stock.

And as counterparts to the PCB, we keep all available versions:

- Vertical mating parts, closed, can be placed anywhere on PCB - Series PVxx-3,5-V-P-COLOUR
- Vertical mating parts, open, stackable to multicolour blocks, can be placed anywhere on PCB - Series PVxx-3,5-V-COLOUR
- Horizontal mating parts, closed, can be placed at the edge of PCB - Series PVxx-3,5-H-P-COLOUR
- Horizontal mating parts, open, stackable to multicolour blocks at the edge of PCB - Series PVxx-3,5-H-COLOUR

## Features

- pitch: 3,5mm (available in 3,81mm upon request) • max. voltage: 160V • max. current: 8A • max. wire cross section: 1,5mm<sup>2</sup> • temperature range: -40°C to +130°C • colours: green RAL 6032, grey RAL 7035, black RAL 9005, blue RAL 5012, red RAL 3031, yellow RAL 1016, orange RAL 2008

# Fluke TiS 45 Flexible Manual Focus? Sure thing!

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High-quality, sharp thermoshots from the TiS and at a reasonable price. Ideal compromise.

The Fluke TiS 45 is nothing new on the market but this very successful product is appreciated even after several months or years.

Many of you are still looking for an ideal way to measure the temperature distribution of your application. In order to select the thermal camera correctly, you need to think carefully about the measured application. An important factor and parameter is the temperature range for the given application and the resolution of the capture chip.

The difference is in the measurement of heating or distribution of heat in the home or the measurement of PCBs

with SMD components. For both applications, we can move around the temperature range in a very similar range, for example: from 0°C to 100°C, but the difference occurs in the resolution. For the above-mentioned heat distribution, a resolution of 80x60pix. is sufficient and for a PCB measurement, a resolution of 160x120pix. or more is sufficient. 80x60 pixels thermal imagers usually have a fixed focus that moves around to a value of 45cm; in order to get the image correctly and of high quality, we have to stick to this value. If you measure from short distance, you will see the shifting of the image on the thermal camera and you will have an insufficient result.



Fluke TiS45 can handle all your tasks for your satisfaction

Combination of 160x120pix. with Fluke TiS45 manual focus can meet your PCB concepts. By focusing manually, you can adjust the focus to 15cm, which is necessary for measuring on smaller objects so that the result of the image is good and can be further processed in SmartView for complete analysis. Fluke TiS45 can be found in our standard stock option.

## The Fluke TiS 45 offers

- temperature range: -20 + 350°C • resolution: 120x160pixels • accuracy: 2% or + 2°C • standard pallets: 7 • software: SmartView® software for complete analysis
- protection: IP54

Order no.	Type	Description	Guide price
260800	Fluke TiS45 9Hz	Infrared Camera -20...+350°C 160x120 pix	1540 €

We can 100% feel your hard work. However, we think that when working really hard, you shouldn't forget that we're only people with emotions and we want to have a good mood. Good mood makes the work way better. Articles in this column are about real components but they are written differently, in funnier way. And so, let's not forget: The more we smile, the nicer our lives will be.

# Goldfinder

About James Bond and relays. (Fiction)



It is generally known that Sean Connery has an electro-technical education. He even owns Weller's WS81 soldering station (a little bit old fashioned without display, but let's not forget that Sean is already 87 years old). His passion for relays is less known.

In 1963, he even tried to convince Ian Fleming to shoot movie with James Bond, in which his life would depend on the closing of contacts of relay series

60 (Italians were already working on it at that time, mass production began in 1966).

The idea was to use the relay 60.13.8.240.0040, which would switch the motor for the sliding gate. It was shortly after Britain decided to unify the mains electricity voltage to 240Vac / 50Hz. (The British moved towards the European harmonized 230V after 1993). Thus, 240V - no problem for Italian - relay located in socket 90.03 for DIN rail behind the door.

Connery wanted to dramatize the situation by using the timer module 86.00.0.240.0000 (using his "on-delay" function, but the module at the time of shooting was not yet available).

Connery didn't want to use the coil indication module



99.02.0.230.98 with green LED on purpose because he wanted the device to be as inconspicuous as possible (typical Bond). But the fact that he didn't want to use the metal retaining clip 090.33, which holds the relay in socket, was quite surprising, since the whole buildings are shaking in Bond's action scenes. He probably forgot (unusual Bond).

He also came up with the movie name – GOLDFINDER.

Fleming agreed, but when the idea got to the public, the proud English (Connery as a Scot and Fleming even though being an English, but Connery's fan, had no problem) had finally convinced Fleming to miss the scene with the Italian relay. It was too late to completely change the name, so the name GOLDFINGER was finally created.

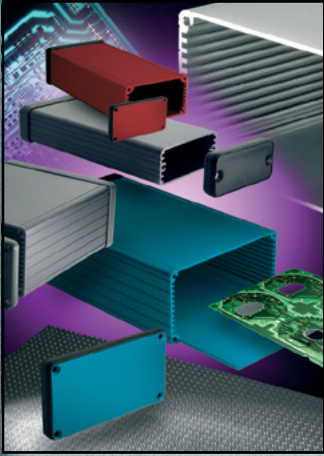
The film was premiered in 1964, but it is not one of the most successful Bond movies. We know that Connery played it disgusted with the rejection of his idea and in the end, there is no mention of the Finder, even of any relay in the whole movie.

The fact that Connery had a good feeling for the relay was confirmed, because the 60 series is still a stock type in the classical round version of the socket.

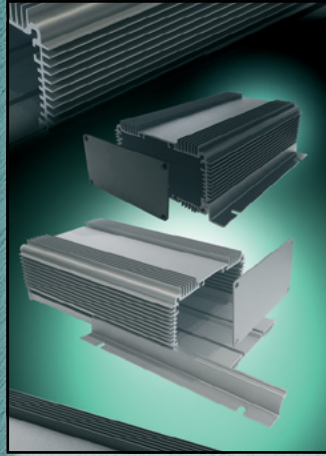


Order no.	Type	Description	Guide price
47952	60.13.8.240.0040	General purpose relay 24VDC 10A 3c 445R Plug-in	8,25 €
51887	99.02.0.230.98	LED green+varistor module 110-240VAC/DC	2,36 €
47954	90.03	Screw terminal socket for 60.13, for module 99.02	3,91 €
64206	090.33	Metal retaining clip for socket 90.03	0,20 €





**1455**



**1455 heat sink**



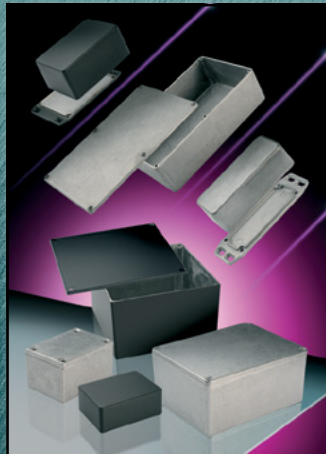
**1551**



**1553**



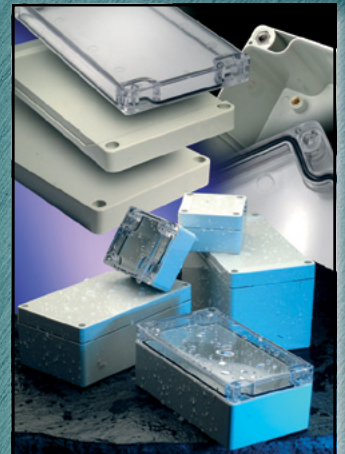
**1553 watertight**



**1550 / 1590**



**1550Z / 1590Z IP66**



**1554 / 1555 IP66**



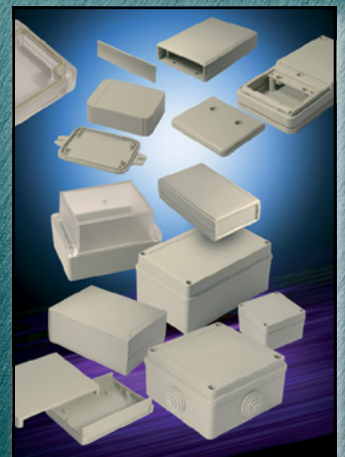
**1590 TRP-STP**



**1591 / 1591XX**



**1599 Tablet and 1553T**



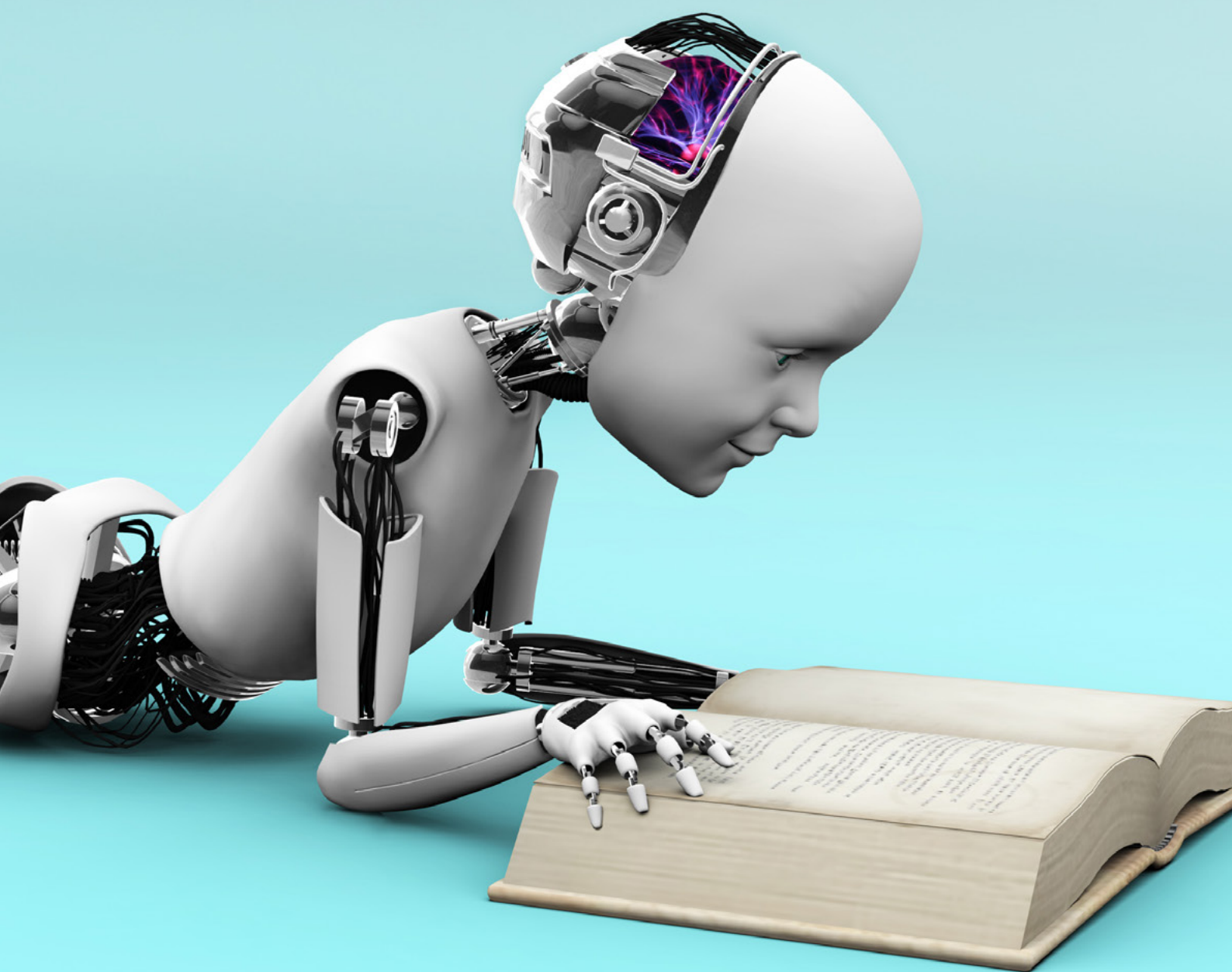
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# ***Learning Machines***

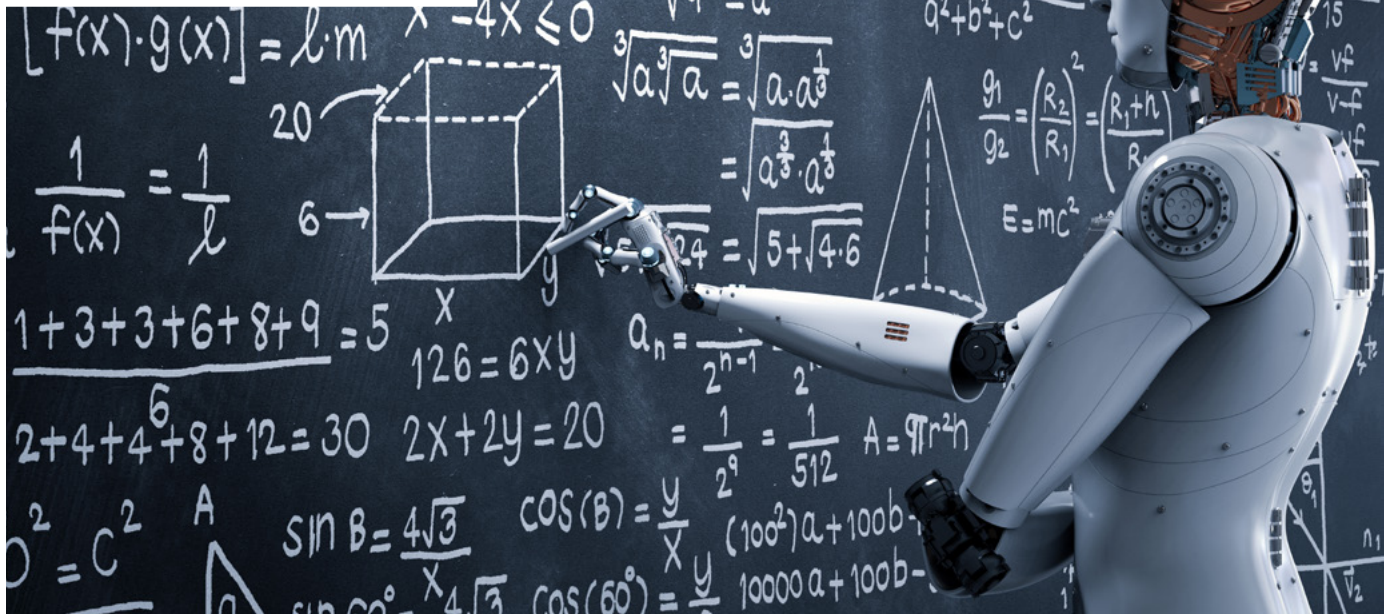
**Sci-fi or real part  
of our lives?**



***Why leave it to the machines  
and their intelligence?***

# Learning Machines

## Sci-fi or real part of our lives?



### Do you like sci-fi?

If you do, let's look into our not-so-distant future together. Future, where "learning and thinking machines" make it easier for us to do our work, or perform it completely for us.

This article will be interesting for you even if you don't really like sci-fi. After reading it you will realize that we already are commonly in touch with artificial intelligence

And maybe you will find here some inspirations on how to integrate Machine learning into your electronic devices and thus get a significant competitive advantage.

### Artificial intelligence is nothing new...

Do you think artificial intelligence and learning machines is hot news? The **Deeplearning** technique, which machines use to learn on the basis of past experience and without explicit programming, was already applied in 1955 by Arthur Samuel. He had a great challenge ahead of him, he wan-

ted to teach the computer to play and win the Draughts. But how to teach something that is exactly acting play the Draughts better than he does? He simply let two computers play against each other, and in the end, the computer managed to defeat the champions in this game in the 70s.

The problem at that time was, however, the computing performance of



computers. Deep learning, as one of the most commonly used methods for learning machines, requires sufficient amount of data. Thus, the more data and repetitions it has (trial-error), the more accurate the learning is. Certainly Samuel's computers would not learn to win the Draughts after 10 or 100 games. However, **we now have technology and computers with sufficient computing power to use the Deep learning algorithm**. And the speed of learning will be exponential!

of various pictures. Person confirms/denies that there is a table on the picture. Based on these evaluations, the machine will modify its table recognition algorithm. And after several iterations, the service program can be accurate enough.

The difference between traditional programming and machine learning is best illustrated by the following scheme:

ligence) is definitely Google. Do you remember how imperfect was their translator in the beginning when it explicitly translated the text word by word? Today, the whole translation is a result of machine learning and you have the option to edit this translation directly in the translation result. This way, you give their machine a further incentive to modify the program and thereby improve it. And this is happening without human programmer intervention. Or would you be able to imagine explicitly programming an intuitive web search? If Google search engine was not now based on A.I., believe me, you would not want to use it anymore. It would not be able to give you relevant content to what you were looking for. Today we do not write 1-2 words in the search bar, but the whole sentence and questions. :-)

## Forget the explicit programming

Many of the devices you develop and produce or use are based on traditional explicit programming (IF-THEN-ELSE). So, "if such a condition is fulfilled, then do this, otherwise do this". That's all right, but we want to move more complex and complex tasks to machines, for which it's almost impossible to program the service software explicitly.

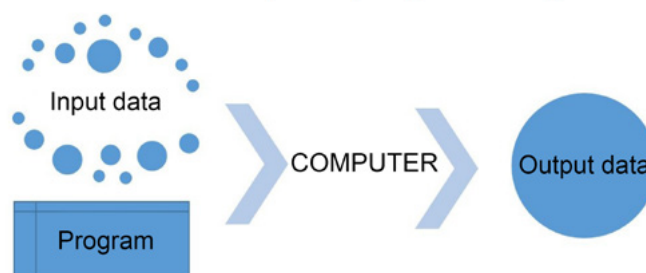
The best example is recognizing images. We want to teach the machine to recognize a simple object, for example a table.

### 1. With explicit programming

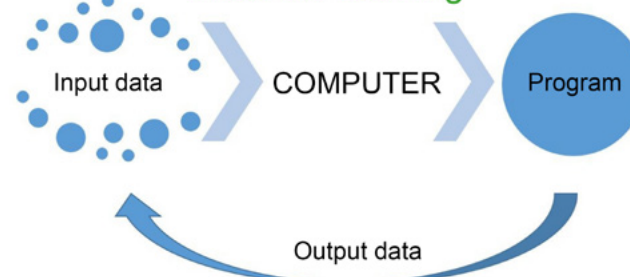
we would write a script where we define: "if it is a rectangular object and has four legs, it is a table." But what if the table is round? OK, we will add this condition to the script ... And what if it is a table with only one big leg in the middle? OK, we'll add this condition to the script as well ... And what if it's an oval coffee table without legs?

**2. Machine learning** uses a totally different approach. It uses mathematical models that search for similar characters in data. At the beginning, person helps the machine in learning. S/he marks a few pictures of the table. On the basis of similar features, the machine tries to sort out a certain group of pictures with a table from a large number

## Traditional explicit programming



## Machine learning



## And why leave it to the machines and their intelligence?

We have already written about this in the article about Industry 4.0. The goal of the 4th Industrial Revolution is to personalize and customize individual requirements. In today's world, we all want to feel comfortably as individualities, but there are so many of us in the world. And so without **personalization** and **"customization"** it will not happen. It is not in the human power to adapt the processes to billions of individuals in the world. But machines with A.I. could do it.

So far, we have been writing programs that generated output data based on inputs. The output of machine learning is the program itself, which improves itself on the basis of output data.

And yet we still face challenges such as recognizing obstacles for autonomous means of transport, translation and interpretation, proper diagnostics in medicine, ... Can you even imagine how to write a service program with traditional explicit programming? How would you explicitly write software that recognizes a pedestrian from a tree? Almost impossible!

The first practical pioneer of the A.I. (artificial intelligence - artificial intel-

Machines with A.I. do not forget and therefore, on the basis of history, they can better predict the future. Machines with A.I. do not have prejudices, they can put emotions aside and they evaluate people based on their behaviour and not based on the general assumptions (age, gender, or survey results). Why are most of the ads and car offerings for men, when more than 60% of mobile phone se-

arches are made by women? A. I. can prepare an individual offer for each individual based on their interest presented by their behaviour. We, people, many times do not know what we want. And the machines might know, in the future, based on our behaviour. I believe that Artificial Intelligence will help men to understand women and tell them how to respond appropriately to the situation (and of course, women to understand men) :-)

## I want to try it with A.I. How?

If you think the time has come to implement the artificial intelligence elements in your apps and devices, it's good to divide it into 3 parts.

### 1. Learning - how and on what data?

Try to base your approach on eliminating the explicit programming. You might be surprised, but at the moment, the technologies built on Machinelearning are available for free. Various opensource platforms and frameworks are available in the world. Do you know these for example?

#### TensorFlow

<https://www.tensorflow.org/>

#### Torch

<http://torch.ch/>

#### Caffe

<http://caffe.berkeleyvision.org/>

**AML** (Amazon Machine Learning), Apache Mahout

<http://mahout.apache.org/>

etc.

Many cloud solutions (such as Google Cloud, Microsoft Azure, or Amazon AWS) directly contain these frameworks.

It is important to know exactly what I want to teach these machines and what data to supply them. Because Machinelearning itself, without sufficient amount of data, is useless. You can start with something simple, just for testing. For example, one crazy idea for all: If you have a dining room in the company, you could put together data from the meal card with the amount of unconsumed food and leave it on the A.I. to suggest a meal menu in the future :-)

### The technologies built on Machinelearning are available for free

### 2. Design and building a solution - on what technologies (HW, SW) and how will the structure of the solution look?

Maybe you won't be surprised that today everything is in the cloud. Servers, repositories, data, and computing power are centralized into cloud centres to multiply our capabilities. We centralize to increase the efficiency. Having your own IT infrastructure right in the company today is very costly, so the cost of running high-quality IT services in the cloud is spreading to a number of companies like mine. We talk about so-called shared economy.

**Why use cloud solutions** in your devices? The easiest way to do this is to look at the Amazon product example. Do you know their "smart box" Echo Dot with Alexa? It's a small device



that responds to a human voice, answering your questions. And you can really ask anything ... If they integrated this intelligence into the device itself, it would require high performance, and it would cost hundreds if not thousands of dollars. But it costs \$ 30-40. And do you know why? In fact, it's just a "primitive" device with a microphone, a speaker, and an Internet connection. It uploads your question and sends it to the cloud server. There is the heart and the head of the whole solution that transforms speech into text, searches through the Internet, translate the result into the speech of your "assistant" Alexa and sends the recording to the device. The device itself will only play the recording. You do not need to have a computer with computational power and sophisticated service software right in your device. That's why you can sell it for \$ 30. You sell a lot of them, so the cost of a central solution in the cloud will spread to all the devices you sell. And we go in the shared economy even further... Amazon not only uses the heart of a cloud solution for their devices, but they offer this service to anyone who wants to implement it on their own devices for certain fee. And so, the cost of the heart of the solution is shared with other third-party devices. Are you still hesitating about connecting the cloud into your products?

### 3. Benefit - What benefit and advantages will the given solution have?

Do you improve someone's life comfort with your solution with the AI? Or could you even save lives with A.I. because you eliminate the human labour limitations? For all we will try to give some real examples:

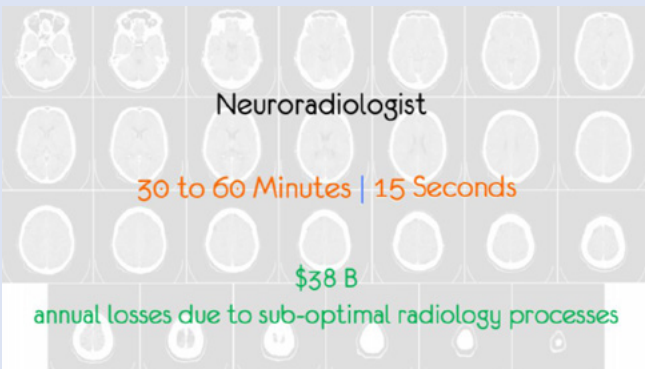
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**A.I. can now diagnose a cerebral vascular accident within 15 seconds**



amounts of historical data in the form of CT images with conclusions

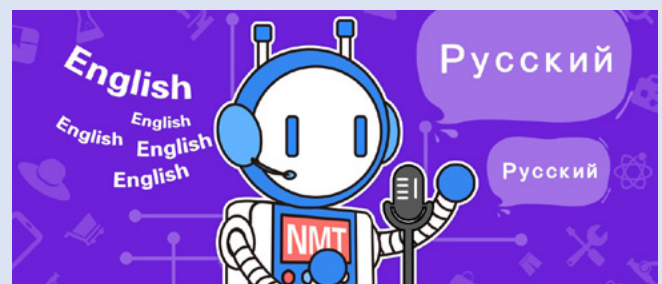
whether it was or was not a stroke, **can now diagnose a cerebral vascular accident within 15 seconds!**

Another team with the help of A.I. again, based on a large number of historical images of tumours and surrounding cells, can identify early cancer tumour in advance, even if a person is not able to see it in the picture.

In the US, artificial intelligence has begun to diagnose a stroke. Even a very good neuroradiologist needs 30-60 minutes on average to identify, based on CT pictures, if the patient has a stroke. The problem is that after 12 minutes the first damage to the brain begins. The system, into which gathered huge

One has limits in his memory. A. I. doesn't and at the same time, it is able to work with it much faster!

Today's A.I. systems can translate **your speech into a foreign language**. And we do not talk about ordinary simultaneous interpretation. A deeplearning system can learn how to modulate your voice and basically speak in a foreign language with your own voice. Of course, it is still not perfect, but the ground is given and the systems will learn at exponential speed.

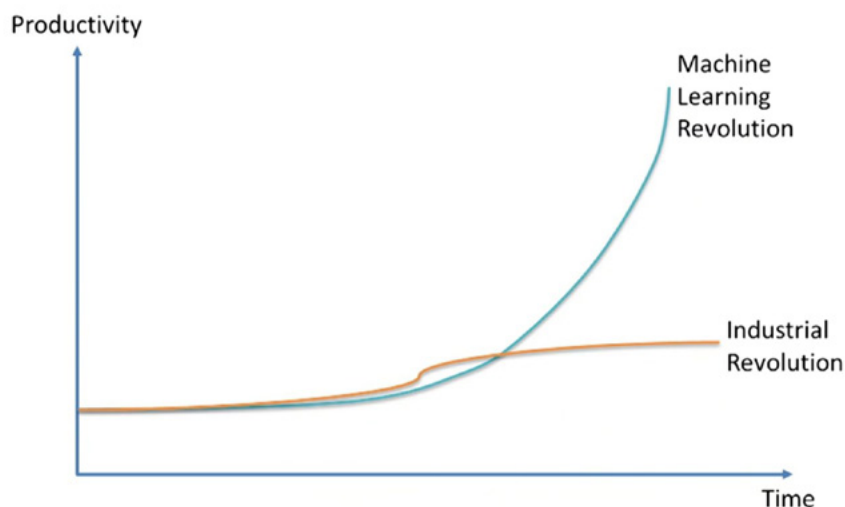
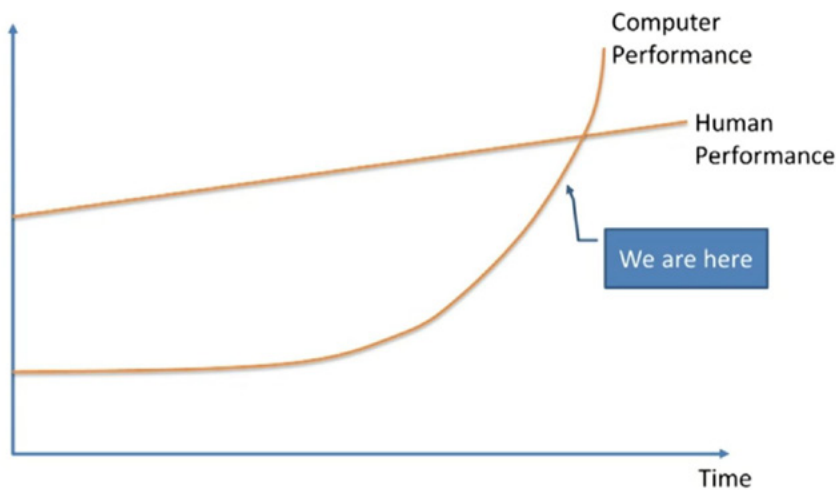


**With the current global agricultural land, we could produce 5 times more meals while reducing water and pesticide use by 90%**



Many opportunities for the use of artificial intelligence machines are in agriculture. The HW developer has developed a device that is attached to the tractor as a "trailer". This device has learned, via deeplearning method, all about how a perfect healthy crop should look like, how does weed or other signs of pests or plant diseases look. Within 1 minute, 5000 plants are scanned to evaluate whether water needs to be sprayed on the crop or any

chemical spraying. Irrigation or spraying is not thus applied to the whole field, but locally for each plant individually. One device can go through 20 hectares per day and treat 2.5 trillion of plants per year. And the benefit for humanity? With the current global agricultural land, we could produce **5 times more meals while reducing water and pesticide use by 90%!**



**Epilogue or does it have any “but”...?**

Let's have look at what artificial intelligence machines can already do today. They can read and write, listen and talk, search for things, gather and integrate knowledge. Maybe they cannot do it as good as a human being in some cases, but we have given them a way to learn and constantly improve it. Exponentially!

80% of people in modern developed countries work in services where they get paid for what we teach machines to do (for example, manage public transport, prepare meals, diagnose diseases, etc.). Are we ready for **80% of people to lose their jobs?** Not even two years ago, when we wrote about automation within Industry 4.0, we assumed that human work would move more to data-handling. Unfortunately, that's not true anymore, either. We have shown machines how they can learn to work with data,

analyze and evaluate them. It is now said that people will remain in the so-called "takingactions", i.e. decision making and algorithm creation. But is it really like that?

**80% of people working in services could be replaced by A.I.**

Is not it now the time to start discussing the new social and economic structures of our society? What will be the meaning of life for many people, if not work?

This Industrial Revolution (Industry 4.0) is different from the previous ones. After every industrial revolution there was a huge increase in productivity, but it was also followed by stabilization. Now we are talking about a revolution in machinelearning, and here we expect exponential growth, which will probably not be followed

by stabilization.

Last but not least, there is an increasing interest in **security**. To what extent can we guarantee that a certain interest group of people does not abuse A.I. and use the gained data in their favour? Artificially intelligent machines are like little children, they mirror their parents (people). And maybe 80% of the unemployed should be progressively directed to this area of security. Because all the great inventions were created with the first good and noble intention...

**What does A.I. mean for you and us?**

Today, it is certainly not a question of whether there is a space for A.I. in your apps and devices. The question is whether we will be among the first technological leaders in the industry and benefit from it or we'll just run after the outgoing train.

We have a voluntary homework for you :-). Try to have a brainstorming session in your company on how you can embed A.I. into your devices. Maybe you'll look out the window and you say, "no way, artificial intelligence and here?" But to have such a vision and be a pioneer in the market - it is a guaranteed competitive advantage and success!

We will be happy to assist you with our components in the HW section. And we'll be even happier to tell you about A.I. options during our **unique workshops that we're preparing with Microsoft**. We will try to build a model device where we'll combine our HW knowledge with Microsoft's SW knowledge and make it cloud-based with the use of artificial intelligence.

Get more detailed information soon!

**Rastislav Talárovič**  
Head of Marketing Department  
& Google Partners Trainer



# Machine Learning

## from students point of view

### **What does Machine learning mean for a layman?**

Maybe you already heard about it, maybe not or maybe you just do not understand it completely and you would welcome another view on it without feeling that you are reading scripts full of theory and unknown. Hopefully this article will be of interest to you.

Machine learning belongs to the study field of Artificial Intelligence. Focuses on creating a program that is capable of gradual improvement in a specific activity based on data. The more data can be provided, the better the program can learn. The whole benefit of machine learning is that it can learn without being taught by anyone.

What can we imagine when we say "teach a program"? Classical programming works by typing a set of rules that the program should follow on the "if-then" principle. If something comes to the entry and the program does not recognize it (or what the programmer forgets about), it cannot move further.

Machine learning, however, is different. It passes through all the data, and finds a similarity or a template that makes it easy to memorize and learn. This is a huge advantage over classical programming. When there are many variables, one is not able to think of all of them and set the program taking everything into consideration. Also, the more variables we have, the more robust the program becomes

and more exacting for a hardware demands or maintenance.

### **What are the methods of Machine learning?**

There are many of them but I will only describe a selected for a better understanding of this Machine Learning trend.

#### **1. Supervised vs. Unsupervised learning**

The difference between them can be beautifully explained by the example. Imagine having a younger brother and wanting to teach him letters. You will show him the letter D and tell him that he will recognize the "D" by its specific "belly" shape. If he then points to another letter, such as "P",

and tries to apply the rule he learned (if the letter has a "belly" then it's D), then the teacher has to come in and correct him.

But what does that mean in machine learning? In supervised learning the program is given a set of data where we know the inputs and outputs. By outputs we mean historical data (what, why and what was the result) and hence the program based on the principle of similarity can predict of what will happen. It can be compared to a human expert who has been working for many years in a specific field, and who, based on his experience, can tell what's going to happen.

Another question that popped up immediately after this was: Is not then the teaching with the te-



acher always better? Not so completely. Sometimes we do not have the output data; sometimes we can have too broad and abstract problem, where it is impossible to say what the result is.

## 2. Reinforcement learning

This is the learning I personally work with as part of my bachelor thesis and that is why I am close to it. It works by way of reinforcement for a good decision and a way of punishment for a wrong one. Simply put, we have several different options that we can do (as many as 100 options).

Reinforcement learning make a lot of decisions and go through all the options (so called iterations/

epochs) and thanks to a lot of experiments it will learn or find the best possible combination and sequence of steps based on how many times it was reinforced and punished.

### What are the options of use of machine learning?

Those are countless. I think the only thing that can possibly limit us is our imagination.

When we recognize the strengths and weaknesses of machine learning, finding the right focus is

then just a piece of cake. I will only mention a few that are actually being used or are interesting from an information or financial point of view.

### Personalization of a person on the Internet

Collecting data about the customers, which products they are viewing, which articles interest them - all of this can be used to deduce what they want to solve, what problem they have and based on the data from other users with similar problems the program can advise and suggest products which could be of help.

Google or Facebook work on the same principle. They, on the basis of the so-called Cookies, collect the data about the person and give them the most relevant results.

### Online customer line

So far, people have always done it. Many companies offer phone contact throu-

gh customer hotline service. High utilisation of people, frequent repetition of the same questions resulted in the use of machine learning along with so-called chatbots (a program that replies on human questions in real time). You might think that no computer could advise you correctly, or that as a person you could know the difference immediately. But the well-known Turing Test has already convinced us several times that artificial intelligence may be indistinguishable from humans.

These are just some of the many uses of machine learning and the principle of its functioning.

**Tomáš Lichanec**

Student

Technical university of Košice

Faculty of electrical Engineering and informatics, Intelligent systems Machine learning