



## **Innovation on Tour** Cases and results 2017



# Run Live Truck evolves into SAP Mobile Innovation Lab

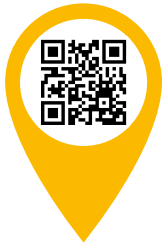
Last year, we produced 18 innovative cases in the [Run Live Truck](#). Customers from all corners of the Netherlands got the chance to transform an idea into a working prototype within one workweek.

Together, our customers and the Run Live Truck Crew demonstrated that innovation can be rapid and that you can learn and adapt while developing new solutions. We proudly present the outcome of five Run Live Truck cases in this e-book.

## **INNOVATION PARTNER**

This year, we're taking our innovative approach to the next level. The Run Live Truck evolved into a true innovation lab. Our SAP Mobile Innovation Lab will bring innovation to the customer's doorstep. In the Lab, we get to do what we love best: being the innovation partner for our customers.

Read all about the BAM, Dura Vermeer, Interpolis, Office Depot, and Rainforest Connection cases in this book. Get inspired by the innovative solutions our crew developed for them. And make sure to check this year's program on [mobileinnovationlab.nl](http://mobileinnovationlab.nl)



*Run Live Truck Overview*



*Mobile Innovation Lab*

CASE: BAM

## A more efficient tender process with Machine Learning

BAM called on the help of the Run Live Truck. Together with a group of young professionals from the youth organization within BAM – Young BAM – they worked on the case: “How can we ensure that we get our tender projects better under control with the help of existing data? The answer: through Machine Learning!

### TENDER MATCHING WITH SAM

BAM works a lot with tender projects. This involves pitching for a project alongside many other building companies. The client then chooses who carries out the project. BAM wants to optimize this process, so it can make more conscious choices around which projects to pitch for. This tender matching process takes quite some time, and costs a lot of money, because lots of small bits of data are spread and saved all over of the different sub-organizations within BAM. It makes things tricky for a tender matcher to filter the right data and maintain an overview.

“**Machine Learning** can actually assist - rather than replace - people in complex trajectories.”

Twan van den Broek, SAP

The ‘Internet of Things’ hype is slowly starting to make way for a new one: Machine Learning. Computers can take on more complex tasks and answer more difficult questions. This is how the suggestion – and the fear – has

come about that machines will take over our jobs; that eventually they will replace people. But in my view, this is a non-issue, because, for example, Machine Learning can actually assist us to follow our gut-feelings better in complex decision trajectories. It reinforces what you already thought, but it also gives you more options to make an even better choice.

## WHAT IS MACHINE LEARNING

Before I delve into this, it's first important to grasp what Machine Learning actually is. Arthur Samuel, who coined the term, gives the following as definition: "A field of study that gives computers the ability to learn without being explicitly programmed." I couldn't say it better myself. Computers observe data and learn by comparing new events with this data (historical events). A computer becomes smarter from this and thinks up a self-learning algorithm – that is, without human intervention.

However, people have a specific and important role in Machine Learning. A machine needs input from people. Without our input, a machine cannot learn. It can't feed itself random data and then do something with it. We indicate what the expected output of data will be and let the machine draw up a model, based on training data. The machine programs itself. After that, we feed the model with 'live' data and check the output. In a feedback loop, we declare whether the result was good or bad. With this information, the machine can make a better model. In addition to this,

## Tender process

*BAM works with tender projects: if a project is interesting, they'll pitch for it. Tender managers decide whether a project is worthwhile pursuing; if it is, they prepare a tender pitch based on the bid guidelines.*

### SEARCH, ANALYSE, MATCH

With application SAM, this tender process is now far more efficient. The tender manager feeds the project bid pitch into the application, which can then search – in historic data (structured and unstructured) – for the best past matches. Via Machine Learning from SAP Leonardo, a model has been developed that can compare new bid pitches with previous tenders. From this point, a dashboard is generated displaying the top 5 best matches, with accompanying diverse KPIs and predictable values for the new tender.

good and relevant data is essential. We don't say "garbage in = garbage out" for nothing: if your data is of poor quality, then your machine will give poor quality output.

## **MACHINE LEARNING IN THE RUN LIVE TRUCK**

To demonstrate the importance of people when it comes to Machine Learning, let me give you a simple example. At the start of the second season of the Run Live Truck we implemented Machine Learning at BAM. The Business Innovation department at BAM wanted to optimize its tender process and called on the Run Live Truck to help out. BAM works primarily with tender projects. They compete, alongside other building companies, for projects they really want to work on. Then, the client decides, according to various indicators, who may take on the project. This process is called tendering and BAM has a number of tender managers on staff.

The process is labor intensive and costly. Whenever a new bid comes in, the tender manager has to search for similar bid pitches from the past, from a huge pile of data. Then, the data has to be filtered, links need to be made and subsequent advice must be given: acquire, yes or no. According to a group of young professionals within BAM – Young BAM – the process can be faster and better. An application was developed in the Run Live Truck, with Machine Learning at its core.

## **APPLICATION SAM**

We uploaded different BAM terms and important documents (historic guidelines) into the application and then asked the computer to make a model based on this input. If a new bid comes through, the tender manager will feed the bid guidelines in and the computer will automatically pass this input through the designed model. Based on all this it will show a top 5 of the most appropriate tenders – matched with the new pitch – from the tender manager's past. We also created a link with KPIs, such as customer satisfaction, risk profile, won or lost, financial details, and so on. The tender manager no longer has to manually conduct this search him/herself; the search will be immediately displayed on a dashboard. The tender manager can then analyze and decide whether the project is worth taking on, or not. Hence the adjusted name: SAM: Search, Analyze, Match.

The role of people and their gut feeling  
What's the role of the tender manager– and therefore of people – in all this? They help with the 'learning' part. For BAM, this means that in the next phase the tender manager tells the machine if a tender does not belong in the top 5. The machine saves this information and does something with it: it learns from the person and makes its analyses smarter and in doing so, makes the person smarter.

And so, I close off where this blog started: Machine Learning reinforces people's gut feelings. The tender manager has to assess what s/he's going to do with the new tender. Based on his/her experience and earlier successes, s/he will surely have some idea. S/he can manually continue searching, or s/he can use the Machine Learning application, SAM, to get a top 5. And that way his/her choice can be reinforced with an external yes or no. The choice is more convincing, because it's been based on and upheld by diverse KPIs. And to answer the question "will Machine Learning replace people?" I say: "[Machine Learning](#) supports people with important decisions and makes the work process far more efficient!"



*Machine Learning*





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E TRUCK

#RunLiveTruck

## Contribute more actively to sustainability thanks to technological innovation

How do you stimulate local residents to separate their garbage better and make waste processing easier for municipal councils? The crew from the Run Live Truck worked on a smart garbage chute and the Fleur app to give residents feedback on their waste separation behavior.

### **FLEUR**

Use persuasive technology to make citizens aware of their waste separation behavior and ensure that they separate their garbage better: that's what Dura Vermeer can achieve with Fleur, an application linked to a smart garbage chute. A camera in the chute measures what residents throw away and sends that through to the app. This shows, real-time, how much waste someone produces and how high the separation percentage is. The app is a game changer in the area of waste separation and sustainability.

The app allows residents to get a direct insight into their waste separation behavior and the app also gives feedback on how to do it better. "Once the trigger is personalized, residents will contribute more actively to the environment. It really encourages a change in behavior," says Ruben Verbaan from Dura Vermeer. He is proud of the result. "The developers of Next View and SAP have not only helped us to get a working prototype off the ground, they've given Fleur just the right look and feel. It looks fresh and appealing - and the name brightens up your day!"

[Internet of Things \(IoT\)](#) is an ideal tool to check how sustainably you live. Smart thermostats make you conscious about your energy use and with

a handy app you can measure exactly how much gas you are using. Separating your garbage also contributes to a better world. But how do you know if you're doing it right? In this blog, I'll tell you how technology can also help do this. And how not just you, but local councils can increase their percentages of waste-separating residents with the use of IoT. And that's a win-win situation, right?

### **THINKING AHEAD ABOUT YOUR IMPACT ON THE ENVIRONMENT**

Plastic, PMD, aluminum cans, glass, paper, organic waste and garbage: some consumers cannot make their way through the maze of options. People have good intentions to separate all these elements, but how do they know if their truly being 'green'? And, those who think they're doing the right thing might need a little help to separate their garbage even better.

To create awareness, councils are doing things like executing general marketing campaigns in local papers. But changing a person's behavior works better at a personal level, preferably in real-time, so that a consumer will start to think ahead about the impact he or she is making on the environment, with all that domestic waste.

### **PREVENTION IS BETTER THAN THE CURE**

We really can solve existing environmental problems with technology. Think about the student, Boyan Slat, who made world news with his algorithm-based design, The Ocean

**489 kg**

*annual waste is what the average Dutch resident produces.*

**53%**

*of this is delivered separated.*

**47%**

*disappears into standard garbage. Of this 60% still has to be separated.*

Urbanization delivers many benefits, but problems as well. Certainly when it comes to waste. Dura Vermeer doesn't just help build cities, but also takes into account its social responsibility. With the Fleur app and the smart garbage disposal chute it aims to stimulate consumers to improve how they separate their garbage and limit waste. The recycling of household waste saves energy, natural resources and money as well. In this way, every household can contribute to a more sustainable world.

Cleanup (TOC). He wants to fish out and recycle the world's oceans' plastic soup within ten years.

You can also get technology to work for you preventatively. I would prefer to see the plastic soup to be prevented in future, by us being smarter about the trash we make today. The Fleur app is based on this principle, and was developed in the Run Live Truck for CentralNed, a part of Dura Vermeer – in collaboration with Next View. It convinces consumers to improve their garbage separation behavior with what we call 'persuasive technology'.

“ **A sustainable world:**  
a little of yourself and a little of  
technological innovation. ”

Frank Basten, SAP

In the mobile innovation lab, a smart garbage chute was developed at the same time. The disposal chute will be available for use in Underground Garbage Transport systems in the future, which you see already in Arnhem and Almere. On top of that it's also suitable for the underground waste containers that you normally see near apartment buildings. Fleur works in combination with the smart garbage chute. You can open it with your smartphone, but you can also see, straight away on your phone, what you've just thrown into the smart chute.

### **SEPARATE GARBAGE BETTER THANKS TO TECHNOLOGY**

Isn't it an interesting concept; stimulate residents to get better at separating their garbage using technology. But how does it work exactly?

Currently there are several garbage chutes for all the different varieties of garbage (making it an incredibly expensive infrastructure), but that's not the case with this prototype. Even if in future even more garbage types are defined, that won't be an obstacle for this smart chute. In the garbage

container there's a camera with color detection. Household waste will be separated into colored bags. In a red bag there will be standard garbage. The camera will recognize the color and bring up the garbage flow linked to the user of the app. This way you can look at the garbage and separation percentage per person, in real-time.

But other more general details are available: how do you rate with this specific waste, your neighborhood or even your municipality? What is your garbage behavior in comparison to residents elsewhere in the country? But don't worry, your privacy and that of your neighbors are of course protected - you cannot compare your behavior with a random neighbor.

### **HOW GREEN ARE YOU REALLY?**

The app collects all kinds of statistics and that's how the application can direct the behavior of the user. Are you doing it right? Then you'll get the code green. Can you do it better? Orange. And if you are doing it really badly, then you get code red.

Fleur doesn't just give insight into your behavior, you get tips on how you can be even greener at what you're doing. So, you'll also find general information on garbage collection in your municipality and you can receive push messages if say your garbage chute is out of order.

Contribute more actively to the environment through personal triggers  
It's not just councils that find garbage separation important. Big companies like Dura Vermeer throw down the gauntlet when it comes to sustainability. The organization sees it as a social responsibility not only to build and construct, but to address problems that come along with urbanization. This way, Dura Vermeer helps councils with reaching their objectives. Because fair is fair: with a growing population, the mountain of refuse is only going to get higher.

Ruben Verbaan from Dura Vermeer is pleased with the result: "Thanks to the app, councils can communicate more directly with residents. Once the trigger is personalized, residents want to contribute more actively to the (improvement of the) environment. It results in a change in behavior."

## **SUSTAINABILITY BEGINS WITH YOU**

A better environment begins with you. It sounds a little preachy, like a public policy slogan from the nineties. But thanks to technological developments like the Fleur app and the smart garbage chute, you can get an immediate insight into your own behavior with hard numbers, and you can make adjustments to your habits based on that. Or even better – to keep that slogan analogy – sustainability: a little of yourself and a little of technological innovation.



*Internet of Things*

SAP

Mobile Innovation

LEONARDO

CONVERSATIONAL UI

APP

UI

- 1 WHAT
- 2 WHO?
- 3 WHAT?
- 4 HOW?





## Road safety with the digital driving coach

Rear-end collisions make up 34% of all serious traffic accidents in the Netherlands. The Run Live Truck team and Interpolis designed a prototype of the driving coach app, which can prevent this sort of car crash. During your drive, the driving coach gives you verbal feedback on your driving behavior.

### THE DRIVING COACH

Up to 80% of rear-end collision are caused by a too short following distance. Do you create enough distance and do you get briefly distracted? Then the chances of a fender bender are high. But you don't need a Tesla with autopilot function for a safe trip. By making use of the standard functionalities of your smartphone, the driving coach app can transform your car into a smart vehicle. The application warns you immediately if your following distance from other road users is too short.

**Rear-end collisions?** Prevent them with your smartphone!

Frank Basten, SAP

Thanks to Image Recognition, the driving coach can differentiate cars and pedestrians from other objects. Your smartphone's gps system determines how fast you are going and the driving coach can precisely assess the distance to the car in front, via your camera. This way, the app gives real-time feedback on your driving behavior. That's how you get safely from A to B.

For two years in a row now, the number of traffic accidents and the number of road fatalities has risen. Approximately 30% of car crashes is a rear-end collision. But up to 80% of this sort of accident is the result of a following distance that is too short. It's time to turn things on their head for improved road safety. How? With your smartphone, in fact. Texting at the wheel is of course a no-no, but you can also use your smartphone in a useful way in the car. Even better, it can save lives.

## **THE NUMBER OF ROAD ACCIDENTS IS INCREASING**

Some cold hard facts and figures: the time when the Netherlands topped the European lists of road safety is a thing of the past. Now we are in ninth place, and countries such as Spain and the Czech Republic have overtaken us.

Compared with 2014, the number of traffic accidents increased by 9% in 2015. According to the Stichting Wetenschappelijk Onderzoek Verkeersveiligheid - SWOV (Association of Scientific Research into Traffic Safety), there were 502,000 accidents that year.

## **COMBAT REAR-END COLLISIONS WITH AN APP**

The decline in traffic safety in the Netherlands is owed to many different causes, many of which are beyond our control. But, some things are within our power to change. Certainly, when it comes to rear-end collisions and the role that distraction plays there.

# 502,000

*traffic accidents occurred in 2015.*

# 34%

*of serious traffic accidents involve a rear-end collision.*

# 25%

*of all fatal accidents are rear-end collisions.*

# 80%

*of the rear-end collisions are caused by too short a following distance.*

## **IMAGE RECOGNITION FOR A SAFE CAR JOURNEY**

Wouldn't we all want a driving coach that gives verbal feedback, so you can drive safely from A to B? Yes, you can! Thanks to Image Recognition the driving coach can recognize cars and pedestrians. By linking this smart technology to the standard functionalities of your smartphone, the driving coach will give you advice on your driving behavior, during and after your journey.

That's why the Run Live Truck stopped by the Interpolis offices in Tilburg. The insurer has a portfolio of almost 900,000 car insurance policies. With help from its SlimOpWeg (SmartOnTheRoad) program, Interpolis wants to make sure that the number of accidents is reduced by 25% by 2020. A collaboration with the Run Live Truck was obvious.

In the truck, in just one week, Interpolis developed a prototype of the driving coach app that prevents these sorts of accidents. So, what was at the crux of it? Fighting one of the biggest culprits: the short following distance, also known as 'following time'. How? By applying object recognition and detection!

### **A DRIVING COACH FOR EVERYONE**

We've all seen the viral video of Tesla on the A2 (highway) that recognized a crash just before it happened. The automatic pilot turned the car off and the passengers remained unharmed. That's smart technology that can save lives, but it costs a pretty penny.

Not everyone can afford a Tesla, but I have good news for you. You too can hit the road safely thanks to the driving coach app! By making use of smartphone functionalities, you can conjure your 2006 Opel Corsa or nineties Ford Mondeo into a smart car. The only thing you have to do is put your telephone in the holder and activate the driving coach. It will warn you if you get too close to the car in front and will give you advice during and after the journey.

### **MEASURING THE FOLLOWING DISTANCE WITH GPS AND CAMERA**

Your smartphone functions as a sensor for the driving coach. Thanks to object recognition and detection this can distinguish between cars and people, and specific alerts will go off accordingly. To realize this technology the RunLiveTruck team worked closely with experts of partner Extra Reality.

Based on object size, your smartphone's camera can measure the distance to your car. With your telephone's gps system the driving coach measures how fast you are traveling. These two values are linked, and that's how the following time of the car in front is calculated. Is it too short? Then

you'll get voice feedback. The app also gives advice on your route. Are you approaching a highway that is renowned for rear-end collisions? Then the driving coach will tell you to take care.

The verbal advice that the driving coach gives is another smart trick to ensure road safety. The last thing that the makers want is for drivers to get distracted by looking at their telephone for alerts. To convince you to drive more safely, you can even get your kids to record their voices in the app. If it's your son's voice yelling at you to keep sufficient distance, that will of course have more impact than the cold voice of the TomTom lady.

### **SAFELY ON THE ROAD THANKS TO MACHINE LEARNING**

Picture this: you don't need to have a self-learning, ultra-modern Tesla to feel safe on the road. With just a smartphone and smart technology you can easily avoid rear-end collisions. The best thing about this app? It's fed by [Machine Learning](#). That means that the driving coach will only get smarter and give even better advice as more data sources are added. Think – weather conditions and data from dangerous junctions and intersections.

As for the ambition of the SlimOpWeg (SmartOnTheRoad) program to ensure that 25% fewer accidents occur in 2020? I'm absolutely sure that we can achieve this with the use of smart technology!



*Machine Learning*

## Chatbot Vicky is at the service of Office Depot, 24/7!

Office Depot asked help from the Run Live Truck to improve their customer experience. Chatbot Vicky is the result: she is available to 'her' customers 24/7, to answer order and product related questions.

### CHATBOT VICKY IS AT YOUR SERVICE 24/7

For Vikingdirect.nl, part of office supply giant Office Depot, we developed chatbot Vicky. The reason? Office Depot noticed that many customers contacted customer service by phone just after having visited the website. It seemed that they couldn't find the information they were looking for. Chatbot Vicky will change all this: she is available 24/7 and can help you with questions like 'What is my order status?' and 'Which cartridge does my printer need?' You can type in your question or speak to Vicky personally.

**Chatbots increase customer experience** while maintaining customer intimacy. Really.

Henk-Jan Hulshof, SAP

Vicky can help you with your order status even if you don't have the order number at your fingertips. Using your name, she can show you your entire list of previous orders. On top of that she knows precisely which cartridge you need for your printer type. In the future, more scenarios can be added to chatbot Vicky. She can even recognize your voice and let you know in advance that your cartridges will need replacing in two weeks' time - and she might ask you if you'd like her to order them for you.

They're sprouting up everywhere like mushrooms: chatbots. You can hardly visit a website without being addressed by a completely automated conversation partner – can he or she help at all? This is mostly the case in the B2C market. But in the B2B world, chatbots can also offer many options. Mainly in the area of improving customer experience. What is of particular interest is that the improvement of customer experience with automatization and simultaneously maintaining customer intimacy – your personal relationship with the customer. The real question is: how do you do that?

### **AUTOMIZATION VS THE HUMAN TOUCH**

Many companies are afraid of losing personal contact with their customers through technology, and for this very reason choose not to implement a chatbot in their website. That's because they believe in the personal touch that people offer, particularly in the area of service, which something that a robot will never be able to do – or in any case, not right away. But it's exactly on this fine point that chatbots can help open doors to delivering better service and personal contact!

In fact, chatbots relieve you of burden. They are more accessible than picking up the phone and talking to someone at customer service. That often takes more time and effort. A chatbot gives a direct answer to your customer's question, raising user friendliness. And, if the customer has tried to contact a customer service center, there's

OBJECTIVES WITH  
CURRENT (OLD)  
SITUATION

**70,000**

*calls per year to  
customer service in  
Germany.*

**55%**

*-have placed an order 3  
days previously  
-have a question that  
has not been answered  
online.*

OBJECTIVES WITH  
CHATBOT VICKY

**20%**

*fewer calls from people  
who have just visited the  
website.*

**25%**

*fewer total calls to  
customer service.*

**10%**

*more traffic online via  
contact chatbot Vicky.*

the chance that the customer might be put on hold for a long time. This would never happen with a chatbot. If your chatbot solves the first 'easy' question, this increases the service productivity of your customer service. Customer service will only get the questions that really matter, like customer complaints and questions that cannot be solved easily online. By correctly installing chatbots you increase both your customer experience and customer relations!

## **THE FUTURE OF THE CHATBOT**

But what is more interesting is the endless possibilities that the chatbot brings with it. If you add [Machine Learning](#), the capacity for the bot to self-learn continues to grow. Then you can do almost anything you want with the chatbot. A chatbot that you don't have to type anything into anymore but what you can ask verbally anything personally. These chatbots already exist, but what if the chatbot recognized your voice? And if it knows who you are, linked to a complete customer history? Or a chatbot that knows when your product needs to be re-ordered and contacts you two weeks in advance to let you know about it. Imagine that it asks you if it's all right with you to order that specific product so that in two weeks' time you don't realize too late you've run out! With Machine Learning the chatbot gets more intelligent. And it can also upsell!

Of course, it's no secret that the human aspect will disappear, but: because you know your customer better and can have a clearer idea of his or her needs, the customer feels more at ease. Now that's a service! If you know, for example, that person A always likes to receive their products within one hour and the chatbot already indicates during the order that "all your products will be delivered within one hour", that creates an experience. For user friendliness. Customer intimacy only gets better, because you have given your customer precisely what he or she expects or requests.

## **VICKY IS AT YOUR SERVICE 24/7**

This is of course the ideal, but to start with you'd have a simpler version of the chatbot. An example is the chatbot we developed in the Run Live Truck for Vikingdirect.nl, part of the office supply giant Office Depot. The chatbot is delivered in two prototypes: one for on the website and one for when you



visit the website via your smartphone. In the latter, a voice chat function was added: you ask your question to the chatbot and it types what you say so you can check if he (or she, because it's called Vicky after all) has correctly understood what you asked. And if so, s/he can answer your question immediately.

The improvement of Office Depot customer experience was at the core of all this. To make a start, we worked with a number of Office Depot customers wishes. These were: quickly seeing the order (status) and finding the right product. In the chatbot it is now very easy to see the order status, even if you don't know the order number. The chatbot brings up your personal details, then your historical data, and then you can select the right order.

Office Depot customers also often look for cartridges for printers and they don't know which one is which. The chatbot knows which printer type requires which cartridge. In the future Office Depot wants to convert Vicky into a personal shopping assistant and add more scenarios.

## **PERSONAL CONTACT**

In terms of contact with the customer, Office Depot wants to solve as much as it can for its customer with quick and easy help to questions that they can solve themselves, via chatbot Vicky. This way customer service has time to work on customer loyalty – customer intimacy. In the future, a chatbot will be developed for Office Depot itself: Conny. Conny and Vicky ... it practically feels like you're having personal contact with actual Office Depot staff members!



*Machine Learning*

## Save the rainforests with real-time data

Deforestation is the second greatest cause of climate change. Rainforest Connection joined forces with the Run Live Truck crew by getting Machine Learning to predict where and when illegal logging would occur.

### SAVING THE RAINFORESTS WITH YOUR OLD SMARTPHONE

How do you and a bunch of nature conservationists prevent the deforestation of the expansive and often inaccessible rainforests of the world? By turning recycled telephones into Forest Guardians, which continuously listen to what is happening in the jungle. Thanks to Machine Learning these can recognize the sound of a chainsaw, but they can also – based on animal noises – predict when and where illegal logging is going to happen.

“Saving the world with **Machine Learning**.”

Ronald Kleijn, SAP

There's no doubt that global warming is reaching dire proportions. Deforestation causes more greenhouse gases in the atmosphere than all the planes, trucks, trains, cars, and ships put together. So, what is the place of technology in the fight against climate change? Machine Learning might not be the first idea that springs to mind. But it might just make all the difference.

### MATCH MADE IN HEAVEN: TECHNOLOGY AND IDEALISM

'In the next 24 hours, deforestation will release as much CO2 into the

atmosphere as eight million people flying from London to New York. Stopping loggers is the fastest and cheapest solution to climate change'. This was published by the British newspaper, The Independent, back in 2007.

Therefore, fighting deforestation is an important factor in preventing global warming. How do you find and stop the illegal logging of thousands of square miles in often inaccessible, tropical rainforests? Conservation Technologist Topher White from San Francisco linked technology with idealism and launched the start-up Rainforest Connection to save the rainforests.

## LISTENING TO THE RAINFOREST

At Rainforest Connection, everything is about sustainability. "Use what you already have, use what's already there", repeated White several times during his keynote at knowledge event Connect to innovate, in October. To fight illegal tree felling, Rainforest Connection made use of discarded smartphones. "Fantastic little computers", White calls them. They are recycled into independently operating sound recorders that run on solar energy. These 'Forest Guardians' listen, in real-time, to forest noises. They record, for example, birdsong, but also the call of the chainsaw.

What do rainforest sounds have to do with Machine Learning, I hear you thinking. The Forest Guardians don't record all sounds; thanks to a self-learning Machine Learning model they automatically recognize which

**32 million**

*acres of forests are lost every year.*

**19%**

*of all CO2 emissions are caused by deforestation.*

**90%**

*of all logging in tropical rainforests happen illegally.*

## ONE MAN'S TRASH IS ANOTHER MAN'S TREASURE!

150 million smartphones are thrown away each year in the United States. Rainforest Connection converts them into Forest Guardians: smart sound recorders that become the ears of the rainforest. Sustainability is at the heart of this start-up from San Francisco. Hidden in the jungle canopy, the Forest Guardians run on only solar energy. They also send all the data to the cloud via existing networks.

sounds they hear. The smart computer system generates thousands of hours of data, which is continually analyzed in the cloud. The system itself searches links, recognizes patterns and ‘knows’ exactly when a chainsaw starts up in the jungle. At that precise moment, a real-time alert is sent via the cloud to local rangers who immediately can intervene on the unauthorized logging job.

## **PREDICTING ILLEGAL LOGGING WITH MACHINE LEARNING**

A fantastic invention, right? According to White it could be even better. What if the Forest Guardians could predict, in the foreseeable future, whether a chainsaw will make contact with a tree, simply based on rainforest sounds? Through mutual contacts, Rainforest Connection got in touch with SAP to research if SAP Leonardo-technology could lend a hand in all this. During Connect to innovate, within just five days, in the Run Live Truck, a predictive Machine Learning model was developed that could predict illegal rainforest logging using details provided by Rainforest Connection. An associated app was also designed.

Can we detect, using only jungle sounds, whether a chainsaw will make an appearance? That was the question we asked ourselves in the Run Live Truck. Imagine that a person is walking through the forest with a saw. Would the animals react to that? In the Veluwe (a nature area in the Netherlands), for example, there is a bird that makes extra noise if a human invades its territory. We analyzed hours of data from the nature reservation Cerro Blanco in Ecuador and discovered a bird there that responds to chainsaws. This beautiful macaw, also called an ara, becomes as quiet and still as a mouse if it spots a saw.

## **THE MORE DATA AND VARIATION, THE MORE PRECISE THE PREDICTION**

The quieter the aras get, the more likely it is that there is someone going about felling trees where they shouldn't be. How did we get to the bottom of this? Obviously, we didn't listen to the rainforest for hours on end ourselves. We wouldn't have been able to tell the difference between the different birds. But Machine Learning made it possible for the computer system of Rainforest Connection to do this. All the details appear directly on an SAP

platform in real-time. In another Machine Learning model, we entered the most important indicators so that the system learns to recognize patterns. The generated algorithm predicts the likelihood that illegal logging will take place. This sort of identification model based on Machine Learning is incredibly powerful. And the best thing? As you enter more data, and the more variation there is in that information, the more accurately we can predict the chance of illegal logging. The prediction model now gives two minutes notice. In the future that could be as much as ten minutes as the system can detect even more animal sounds that could serve as indicators.

The reporting part is also important. We want to know in particular which choices a logger makes and how he moves through the forest. That can also be an important factor to predict logging.

## **PRO-ACTIVELY PROTECTING THE FOREST THANKS TO MACHINE LEARNING**

Real-time predictions are hardly of any use without immediate action. By linking Forest Guardians via the Rainforest Connection and SAP Cloud Platform to the developed app, rangers receive a warning and see where they need to be. Nature conservationists can also tap into the app live, and listen to the jungle and its noises. And on top of that they can use augmented reality to see where logging will happen, or has happened, in the forest.

The better we can predict the chance of chainsaws, the more pro-actively rangers can combat deforestation. Machine Learning is often viewed as a threat that will render people redundant. Rainforest Connection proves this to be the reverse. Because of its technology, combined with the discoveries we made in the Run Live Truck we now have a powerful tool to prevent global warming. That's [Machine Learning](#) to save the world and its people!





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