SWISS TURKISH ECONOMIC FORUM 2019

SCHWEIZER HANDELSKAMMER IN DER TÜRKEI
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SWISS CHAMBER OF COMMERCE IN TURKEY

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Since 1984

IMPACT OF ARTIFICIAL INTELLIGENCE ON OUR SOCIETY

GLOBAL TRENDS AND USE CASES FOR TURKEY

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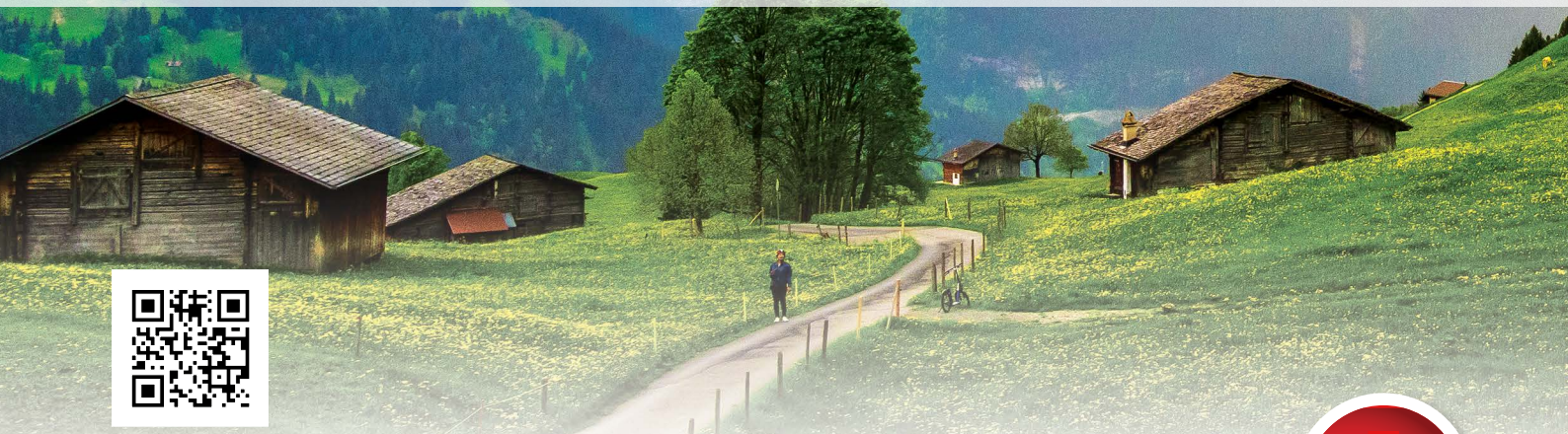
Business network between Turkey and Switzerland

Swiss Chamber of Commerce in Turkey facilitates the integration of Swiss companies with Turkish business world and plays an active role in creating new business opportunities and the emergence of new investments.

**Our association is a non-profit organization, operating in Istanbul since 1984.
Its members and Board of Directors have prominent business relationships in both countries.
We provide professional services in 26 cantons and 81 provinces.**



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METİN UNDER
Director of Optimist Digital Content Agency

USING AI FOR THE BASIC PROBLEMS OF HUMANITY

Swiss Chamber of Commerce in Turkey's traditional "Swiss Turkish Economic Forum- 2019' held in Istanbul with a theme of "Social Impact of Artificial Intelligence: Global Trends and Applications in Turkey". Whilst the application of artificial intelligence is sprawling out and changing all industries al around the world in an unprecedented impetus, the most important developments in this field, discussions, and future projections were evaluated by experts from Switzerland and Turkey.

Switzerland, a leading country in various innovation rankings, is a nest for numerous AI companies. Dalith Steiger and Andy Fitze, co-founders of Swiss Cognitive, shared their comments on the impacts of artificial intelligence in society and business. And Sandra Tobler, founder of Futurae Technologies, another guest from Switzerland, discussed the change prospects in the business models of artificial intelligence applications in finance.

Artificial intelligence is becoming ubiquitous, and science is one of the primary users. Dr. Altan Çakır, a Turkish scientist at CERN, gave us some actual applications of artificial intelligence and data analysis in science. We discussed the bias problem, the main ethical issue of the AI, with Dr. Şebnem Özdemir, the head of the Management Information Systems Department of Istinye University.

The development of artificial intelligence is generally attributed to the global quest for productivity. Swiss Turkish Economic Forum 2019, as the main theme indicates takes the issue from the perspective of social problems resolving. Many Forum lecturers emphasized the significance of AI solutions to social problems in line with the United Nations Sustainable Development Goals. In this context, we believe that our interview with futurist Alex Alden, who has worked in the United Nations, is inspiring.
It is essential to objectively discuss the positive and negative aspects of artificial intelligence, such as the uncertainty of the potential negative effects on unemployment, and to consider ways of how we can use this technology more effectively for the benefit of humanity. This was the main purpose of the Swiss Turkish Forum.

“WE NEED COOPERATION, MAYBE MORE THAN EVER”

We established the 15th Swiss Turkish Economic Forum of Swiss Days on September 2019, where we discuss today’s economic issues and the possible impacts of recent technological developments. It is great to see so many aficionados; a large group of people interested in the continuous advancements in the Silicon and other Valleys...

Switzerland is a relatively small, landlocked country and one can hardly claim that it is blessed with rich natural resources. On the other hand, this scarcity paved the way for investing in “the human mind” and resulted in a strong, competitive economy, which continuously has fostered scientific research, development, education and innovation. According to the annual Global Innovation Index reports, the country has been the most innovative, ranking 1st in the world since 2011. In 2019 report, Turkey also ranks 7th among the 34 upper-middle-income economies. Moreover, the report specifically emphasized that the number of researchers in Turkey has rapidly increased at the rate of 62 percent between 2008 and 2016.

I am a firm believer that both countries will continue to invest in science and technology alongside hosting events, which not only embrace and cherish, but also elaborate on, question and even criticize scientific developments of the day. Today, we aim to accomplish this task again, with the 15th Swiss Turkish Economic Forum. A special thanks goes to our chamber and their President who are skillfully organizing this wonderful event every year.

As some of you may recall, in our 2017 panel, our main topic was “Industry 4.0” and our key speaker, Mr. Paul Donovan had foregrounded the fact that technology should be here to “solve” problems. In 2018 we spoke about blockchain technology, a field that was very new for many of us. Today, for our 2019 event, we focus on artificial intelligence as one of the key components of Industry 4.0. Through Q&A panels and hopefully profound speeches by experts we will challenge the generally acclaimed views both in favor and against AI.

Let me, as a starting point, remind you of a quote from Albert Einstein: “Learn from yesterday, live for today, hope for tomorrow. The important thing is not to stop questioning.” Questioning AI, especially with ethical concerns, is a necessity for substantial development that does not harm humankind. However, we cannot overlook the fact that technological developments in the last 20 years, especially in the realm of AI, has brought about unprecedented results.

According to PwC’s Global Artificial Intelligence Study, AI’s potential contribution to the global economy by 2030 will be 15.7 “trillion” dollars. It is further estimated that by 2030 this technology will boost GDP for local economies by almost 26 percent.

We expect that AI will change health, education, aviation, and defense industries. Nevertheless, it goes beyond changing our current ways of living, to probably re-orienting the history of humanity towards new horizons.

To illustrate the importance of AI today, I would like to give you a summary of the recent developments about it. Microsoft,

H.E. DOMINIQUE PARAVICINI

Ambassador of Switzerland to Turkey

Google, Facebook, Amazon, and other tech giants have been establishing new programs to develop supercomputing hardware to try to achieve machines with the capacity to learn tasks the way human beings do. For the last couple of years, algorithms developed for basic and specific tasks are hardly distinguishable from human interaction. For instance, in 2016, Georgia Tech Professor Ashok Goel used IBM's Watson platform as his teaching assistant during a whole term. While the AI bot named "Jill Watson" successfully handled the high number of questions from students in the online course, students were unaware of the fact that "Jill" was just a code! What is more amazing is that the online course was an AI course, a requirement for computer science students! When even computer science students are unable to tell the difference between a human and a successful algorithm, I doubt whether you and me, and anybody else would be able to do that.

"Fortunately, public and private actors today are working to define regulatory frameworks to come up with a trusted AI ecosystem. A 'Responsible AI', which makes explanations for its predictions and decisions, thus, making life more advanced for people, profitable for companies and secure for nations, is not unattainable."

Did you know that more than 90 percent of the top 50 banks around the world are using advanced analytics today? A U.S. bank used machine learning to inspect the discounts offered "only" to its valuable customers. In the end, the algorithm revealed several unnecessary discount offers and the bank's revenues rose by 8 percent in just a few months, .

Health system is considered as one of the sectors in which AI is going to be implemented. If this technology works as promised, it can democratize healthcare by boosting access for underserved communities and lowering costs. Moreover, since the algorithms for healthcare are going to be developed with the data gathered from thousands of different cases, it is highly possible that it can, in some cases, work "better" than human physicians. But certainly not always.

Our age's prevailing fear is that AI will soon replace humans and the result will be a rise in the unemployment rate. The McKinsey Global Institute reports show that more than 400 million people will lose their jobs by 2030 because of automation. However, there will be even a greater number of new opportunities. It is assumed that universities are currently preparing our students for jobs and technologies that do not even exist yet and 65 percent of tomorrow's workers will have jobs that are not around today.

We will have to accept the fact that AI will overtake some of our responsibilities while creating new lines of business. What we should be doing is to get ready for the future. Nonetheless, the Economist Intelligence Unit's 2018 report shows that very few countries are adapting their education systems

accordingly. Intelligent automation is expected to not only boost the importance of science, technology, engineering, and mathematics education, but also to accentuate so-called soft skills, which allow workers to trade on their uniquely human capabilities.

Education is important, but in the future, we will also be "reskilling" the "stranded workers", who are displaced by the Fourth Industrial Revolution and other factors. One wonders who will pay the bill for this re-education?

Healthcare, education, business life... These are among the vital needs for people, but AI also manifests itself in different realms such as the gaming industry. We estimate that there are approximately 2.2 billion gamers in the world (my 16-year-old son is one of them) and AI, as a "game-changer", might be the new rival. Microsoft invested 1 billion dollars in Open AI for this purpose, and their algorithm has already beaten several human-only teams.

Nevertheless, a possible threat is AI's potential for rewriting embedded prejudices. Some of you will remember Microsoft's AI chatbot Tay, who was just a robot parrot who gets "smarter" as he interacts with people or their tweets. This sadly meant that he started to appreciate Hitler, execrate feminists and advocate the decision to build a wall between the U.S. and Mexico when exposed to such kind of tweets. I will not tell you whose tweets have been used for this experiment...!

"We expect that AI will change health, education, aviation, and defense industries. Nevertheless, it goes beyond changing our current ways of living, to probably re-orienting the history of humanity towards new horizons."

AI in the Defense Industry is a whole other issue which is rising heavy questions regarding accountability and rules of engagement.

Fortunately, public and private actors today are working to define regulatory frameworks to come up with a trusted AI ecosystem. A "Responsible AI", which makes explanations for its predictions and decisions, thus, making life more advanced for people, profitable for companies and secure for nations, is not unattainable.

In light of all these advanced developments with AI today, it is extremely exciting for us even to imagine what the future holds. This social upheaval, or, in fact, "social transformation", confronts us with many challenges of the new era. As societies, we have to rethink and rebuild our healthcare, education, transportation, banking and many other systems. This brings us back to the beginning of my speech. We have to begin "questioning" for example:

-How are we going to prepare our children for the future?
-Are we, "ourselves", ready for the new business models or jobs that we do not even know yet?
-How are we going to struggle with the upcoming challenges such as being a stranded worker because of the unavoidable rise of AI?
-How will the state ensure a safe and adequate regulatory framework for AI?

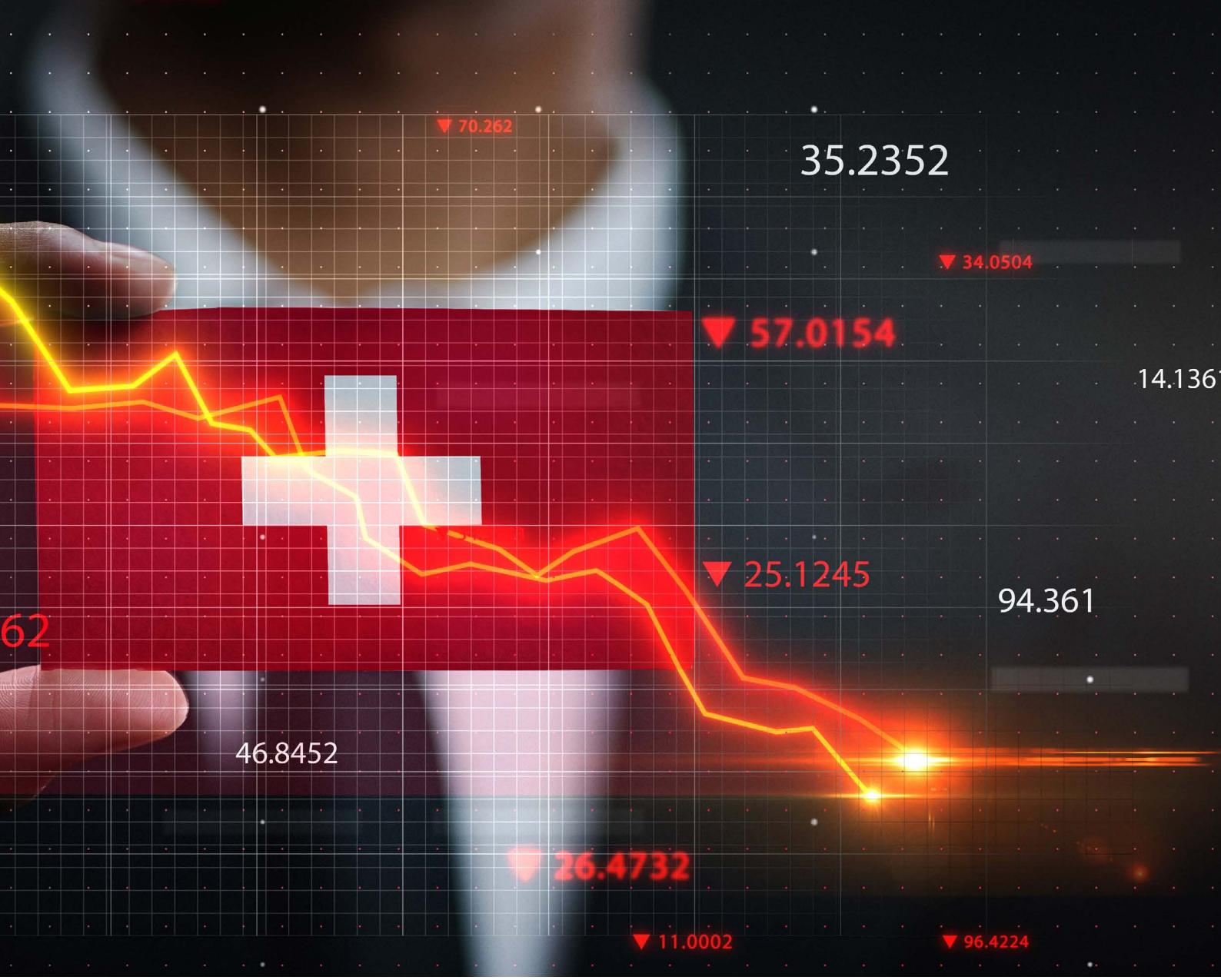
These are a few of the many questions that we need to answer as we reach the second decade of the 21st century.

We are going through a difficult period and we need cooperation, maybe more than ever. Turkey and Switzerland acquired a mutual language through our long-standing strong economic, political and academic relations. Switzerland has been playing a leading role in innovation and is enthusiastic about taking big progressive steps, side by side, with Turkey. Consequently, it gives us a great pleasure to see the 15th Swiss Turkish Economic Forum's preference of Artificial Intelligence as 2019's main topic.

THE SWISS CHAMBER OF COMMERCE IN TURKEY

The Swiss Chamber of Commerce in Turkey (SCCT) is structured in the form of a Turkish non-profit association, carrying out the mission of being a trade connection between business communities in Switzerland and in Turkey. As a 150-member strong organization with a budget approaching 1 million Turkish Lira (TL), the SCCT represents both Swiss and Turkish individuals and corporations, including industrial groups, services and trading companies, scholars, advisors and independent entrepreneurs. The SCCT team consists of two full-time professionals, supported by voluntary board members involved on specific matters relating to their respective areas of expertise.

The SCCT has been part of the Bilateral European Chambers initiative since the very beginning and is a strong supporter of improvements in the investment and trade relationships between Turkish and European countries. Switzerland is a landlocked nation surrounded by four European Union (EU) members, including three of its largest economies: Germany, France, and Italy. The EU plays a preponderant role in Swiss trade flows and policy. For the same reason, Swiss - EU trade relations will continue to occupy a central role. Switzerland is in fact closely integrated with the EU. In economic terms, the EU is Switzerland's most important trading partner, accounting for more than 60 percent of total Swiss exports and almost 80 percent of its imports. In this context, modernizing the EU-Turkey Customs Union (CU) agreement would lead to greater legal certainty and have a positive effect on Switzerland-Turkey trade relations. Close and sustainable relationships between Turkey and the EU are of significant

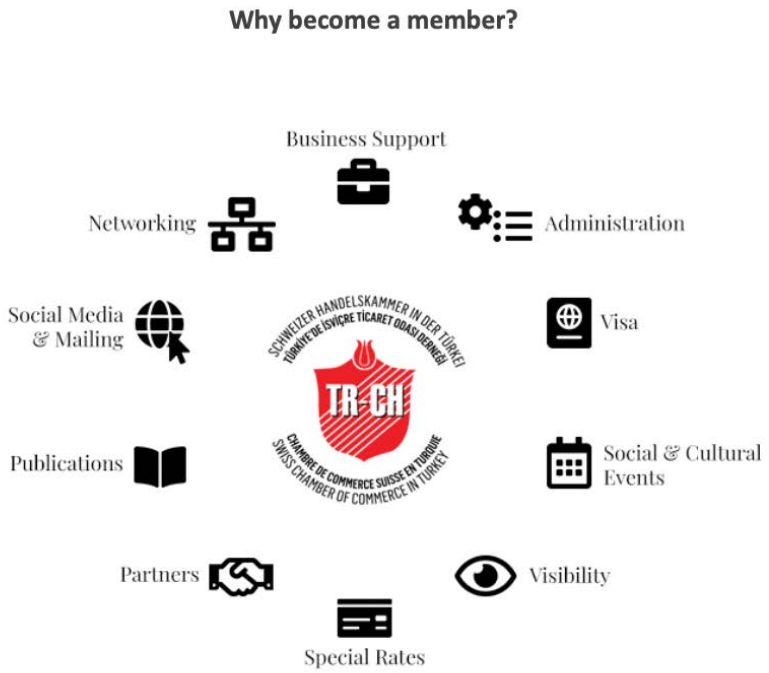


importance for the economic relations between Switzerland and Turkey, which ranks 20th among the most important Swiss trading partners. Accordingly, alignment of the trade frameworks would help avoiding triangulation issues with third countries such as Turkey.

The SCCT plays an important role in the ability to influence and represent commercial activity. Relying on the deeply-rooted Swiss investments made in Turkey across decades (some of them dating back to early 1900s) and on a strong cooperation with Swiss public institutions and Non-Governmental Organizations (NGOs), the SCCT is capable of reaching out to key contacts both in Switzerland and in Turkey that could help creating public opinion support on the initiatives of the Bilateral European Chambers. The SCCT also has capacity to convey key issues in the scope of the yearly Joint Economic Meetings addressing bilateral challenges.

Regular actions are being taken by the SCCT in cooperation with the Switzerland Global Enterprise and business associations in Switzerland to improve the visibility of Turkey as a land of opportunities for international investors. Focus is put on changing the perception of foreign investors and public opinion regarding Turkey in the scope of an objective assessment. The close cooperation of the SCCT with Switzerland Global Enterprise brings the advantage of being able to benefit from the strong networking capacity of this organization in Switzerland and to leverage on its commercial and public affairs capabilities to access influential public and private sector representatives.

SCCT MEMBERSHIP



✓ **Business Contacts**
SCCT shares with its members an extensive database of Swiss companies

✓ **Publication**
SCCT publishes the latest news of its members, events in its bi-monthly Newsletter, makes announcements on its website and send them to its whole database

✓ **Market Entry in Turkey**
SCCT pool of experts in close relationship with the Embassy of Switzerland in Ankara, Consulate General of Switzerland in Istanbul and Swiss Business Hub Turkey. We are always pleased to support new Swiss companies entering the Turkish market safe and professional manner.

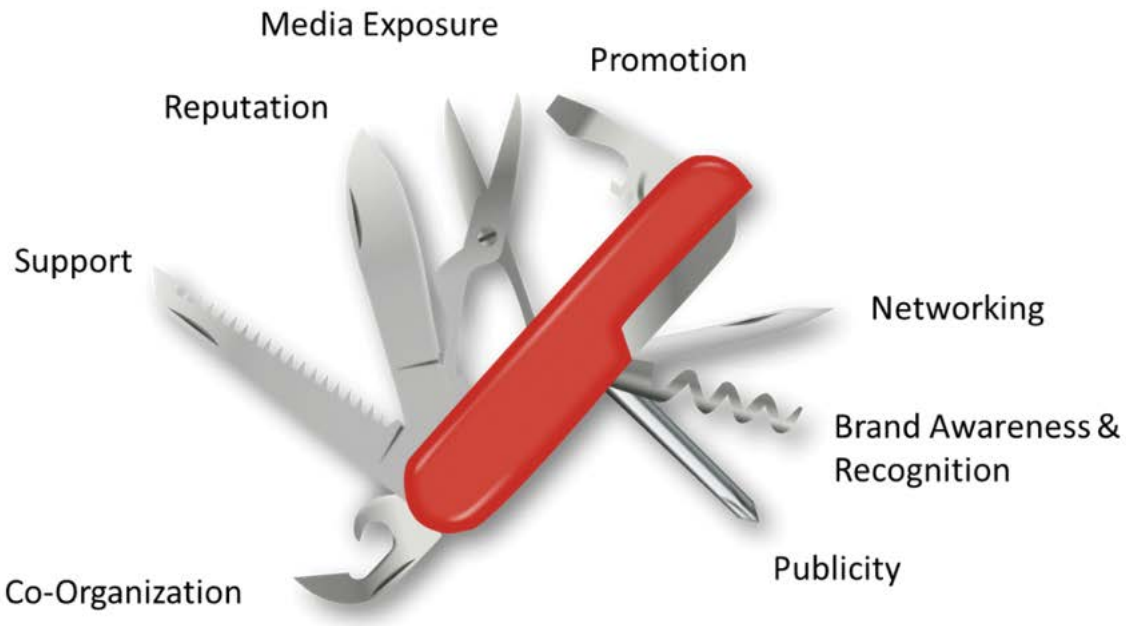
✓ **General Information about Turkey & Switzerland**
It is a pleasure for SCCT to provide the companies with all the essential information they need concerning visa, culture and many more.

Access to SCCT Memberlist

Joining the Swiss Chamber of Commerce gives access to a range of exclusive member benefits. As SCCT members enjoy access to a range of offers and discounts.

More about membership benefits, please click here.

SCCT SPONSORSHIP



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DOĞAN TAŞKENT
Secretary General of Swiss Chamber of Commerce in Turkey

IMPACT OF AI ON OUR SOCIETY

In our last Swiss Turkish Economic Forum we discussed the 4th Industrial Revolution and concluded that unless new technologies, especially the digital ones solve the problems created by the 1st, 2nd and 3rd Industrial Revolutions, there won't be a livable planet for our children.

Artificial Intelligence (AI) will have the highest impact on our lives and looks like the most promising technology to have an impact on our society. The great engineering, economic, financial and political intelligence created 17 global problems over the last century. UNDP rephrased them as Sustainable Development Goals, meaning that in order to have a sustainable life we need to achieve them. It looks like our current intelligence is the reason for global warming, death of millions of earthlings in humongous wild fires, emerging of a new plastic continent in the Pacific Ocean, and many more disasters. No wonder, we have a great hope on artificial intelligence, but obviously ours is not up to the game.

Although as a society we have a great hope on AI, most of this technology is used for marketing, fuelling the consumption economy further. The so-called "Big Tech" companies including Apple, Facebook, Google and Amazon have been hiring some of the greatest minds of academia to analyze our purchasing patterns, like which online or offline shop we visited last or which keyword we searched so that "they can sell us yet another Nissan" as New York University Professor Scott Galloway would say.

We, as a society need to first question our economic and priority assumptions. Are we going to continue to develop technologies based exclusively on financial value, or finally break the capitalist mantra that "the sole responsibility of a company is maximizing shareholder value" and add new value dimensions to our company operations and daily life like pursuing the benefit of the society and nature, protecting our children's future, improving the world's economic value and more?

AI is a learning system, it learns from the data sets that are provided by its developer, which means it is biased. And the data that is used to train the system is again a collection of our past behaviour. The system learns fast and efficiently, using multilayer neural network structures and it calculates very fast thanks to the use of GPUs as processors. Learning speed of the system is faster than the famous Moor's law, it doubles its capacity every six months. Again, there is no problem on the technology level, it develops very efficiently. If we think of AI as a very fast learning child, then the essential question to answer is this: Are we raising a hero that can solve the world's problems or a monster that will make global inequality even bigger, and increase consumption and trash accumulation further?

How AI will impact our society is not an engineering problem, but is up to us. The society will be its own executioner in this regard.

“IT IS OUR RESPONSIBILITY TO ENSURE AI’S UNBIASED NATURE”

Will we lose our jobs due to the rise of Artificial Intelligent? Foregrounding the fact that AI should be used as an extension of our human brain and capabilities, Co-Founder and Managing Partner of SwissCognitive Dalith Steiger explains this new technology’s possible impacts in social atmosphere and business life.

What was the motive behind SwissCognitive’s establishment? What did you aim at in the first place?
I was always passionate about technology – how it can help us, contribute to our lives, and augment our human capabilities. It always impressed me what can be achieved when the human and machine work together. Having two daughters only amplified my drive in the industry, as I know, new technologies mean the future, and our children will be highly impacted by them. It is our responsibility today to start paving the path in the future and prepare the coming generations to be able to make the most of the opportunities that cognitive technologies offer. When I met my business partner and co-founder Andy Fitze, it all came into perspective to put my life-dream into reality with someone who is just as driven and passionate for the future possibilities underpinned by AI as I am.

In your opening speech, you mentioned “unbiasing the bias.” Last year, a group of researcher from Stanford University’s History and Computer Science departments managed to develop a machine-learning algorithm to measure changes in gender and ethnic bias since the beginning of the 20th century in the U.S. So, AI, the technology accused of spreading prejudice was used for “unbiasing” in away. Do you think that, especially with the help of prospective collaborations between humanities and the sciences, will it be possible to “unbias” the bias with the AI itself? Will AI be able to solve the problem that is created in the first place?
We must consider AI as a tool, and we recognize that it is the responsibility of the human being to ensure its unbiased nature. These days we started to question ourselves and reflect potentially biased decisions in various processes, where we haven’t had the focus before. Humans can have only a certain amount of knowledge, and by nature they have preferences. Therefore, to avoid biased AI, we do need to work together and ensure that AI is to our advantage –regardless of geographical location, age, race, gender, or anything unique to any one of us. Therefore, it is not the responsibility of AI to “become” unbiased –it is the responsibility of us working together as a team.

Machine learning and the possibility of it to reach superintelligence is quite frightening to many people. Especially the fact that it will be utilized in the defense industry is found problematic due to ethical reasons. For instance, Elon Musk claimed that it is the biggest threat

against humanity... Stephan Hawking also had similar arguments... How do you interpret these concerns? Do you think that there is such a possibility?
This is a fundamental question, and I would like to line out different points: We need to be realistic when it comes to superintelligence. It is certainly not a challenge that we face today or soon. Fear should not keep us back from discovering opportunities and possibilities. Nevertheless, it is essential to be conscious of what we may be able to develop AI into. It is going to be our responsibility to remain in control. We need to ensure that we use AI as an extension of our human brain and capabilities. Considering the ethical aspect and human empathy, algorithms should be programmed in a way that the machine will never give us humans a reason to switch it off. As Prof. Stuart Russell lately said in a podcast: "We can't have machines that care only about their owner and nobody else." Or like Norbert Wiener, 1960, "We had better be quite sure that the purpose put into the machines is the purpose which we desire."

As AI comes forward as "the better worker," the fear of unemployment rises. According to the McKinsey report, until 2030, the jobs of 800 million people will be taken over by the machines. How are we going to manage that?
Jobs and tasks will be redundant, and it is our social responsibility to take care of the people who are at risk. But if we look back in history, all the industrial revolutions were paired with massive changes in the job market. This, however, does not mean that people needed to become jobless. It said that our focus needed to be shifted. This is what is happening today too. We need to ensure that we are a step ahead of technology and re-skill and up-skill in advance so that we will be able to work with technology together. In my opinion, AI should be considered as something that will free from tasks that we are either unable to do, are too dangerous or too dull and most important, where it significantly supports human health. All in all, AI should be viewed as a chance to step into a new level of evolution.

It is claimed that 65 percent of the children in this world,

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will be working for jobs, that do not exist today. How can we get prepared for such a blurred future? How can we get them ready for the jobs that we do not know?
We must raise children that are adaptive to change. Already our generation is not retiring in the job or organization that started in. That is history. Our world is changing with rapid speed, and we need to keep up with it. Continuous self-development, curiosity, and interest in personal growth and driving our world forward need to become our priority. We need to have our eyes and ears open and be able to predict what comes next.

And in which ways you are influential in Switzerland's high rank in the AI ecosystem?
We believe in the power of a "networked-AI". By establishing the missing links between industries, enterprises, institutes, associations, and civil society, we push our country to play on the best out of all "Swiss AI Assets".

"By establishing the missing links between industries, enterprises, institutes, associations, and civil society, we push our country to play on the best out of all 'Swiss AI Assets'."

Could you please give us more detail about your new project CognitiveValley? What is its aim? You can also talk about other, similar projects.
CognitiveValley – "One AI voice for Switzerland" is the first spinoff of SwissCognitive. This movement, while endorsed by the Swiss government, acts independently and involves everyone to establish the missing links between civil society, industries, enterprises, institutes, and associations. It aims to position Switzerland with a strong brand as one of the most vibrating cognitive technology environments globally. By placing Switzerland, CognitiveValley wants to ensure a reliable, healthy and trustworthy ecosystem and sustainable Swiss welfare for the coming generations.

AI and machine learning expertise in on the top of WEF's list. By your own words, what is AI expertise? For an engineer, a doctor, a journalist, etc...
On the technical side I would talk about all-around computer science, which covers quite a lot. But for me, it's not only about the ability to code or write algorithms. To evolve the full potential, we need interdisciplinarity. It's about understanding the knowledge of cognitive technologies. About realizing the uncovered potential of new businesses and new fields by applying the supportive power of AI. For a doctor, for example, to recognize smart opportunities based on his/her experience, daily pitfalls, chances and risks he/she faces, data he/she gathers and facts he/she misses, ways he/she is looking for to be able to treat his/her patients better. For me, an AI expert needs to understand the potential and reach cognitive technologies offers.

There is a strong economic relation between Switzerland and Turkey. Do you see a potential of collaboration in technology, especially for AI?
Yes absolutely. One of my take-aways from the Forum was that the Turkish banking sector, service companies, and state services are well advanced in the digital transformation by international standards. There indeed we can exchange knowledge, introduce start-ups to each other's and build the bridges between enterprises, start-ups, and academia.

“ONLY AI CAN PROCESS THE DATA WE CREATE EACH DAY”

Among Switzerland’s leading technology firms, SwissCognitive is striving to connect the organizations and industries for knowledge and experience exchange in AI. While stating that this technology is the only way to process 2.5 quintillion bytes of data we create, Co-Founder and Managing Partner Andy Fitze cautions that yet it is no silver bullet, emphasizing the importance of strong collaboration between all parties.

As SwissCognitive, what are the projects that you are currently working on? And what are your projections about them?
Since the launch of SwissCognitive, we strive to connect organizations and industries and facilitate an exchange of knowledge and experiences. We know that AI has been used in almost all industries, and to be able to bring it to the next level, the exchange across sectors is critical. This is, therefore, an ongoing project that we work on daily and will continue playing an essential role in the future. Additionally, in September, we launched our first spinoff of SwissCognitive, CognitiveValley – “One AI Voice for Switzerland.” This movement, while being a non-profit foundation and endorsed by the Swiss government, acts independently and involves everyone to establish the missing links between civil society, industries, enterprises, institutes, and associations. This brings our efforts to a whole new level and ensures that collaboration happens on a global scale. Furthermore, we are in the process of onboarding the first Global AI Ambassadors, who positively make a difference by building, sharing, and supporting the exchange of AI knowledge on a global level and in their local communities. This also helps us to reach out to and make an impact on societies where we are not present personally.

It can be said that AI is influential in every aspect of life. There are machines that can diagnose even better than humans in some cases, they can operate surgeries, drive cars, give lectures in universities, and so on... What are your projections about this process? What is it that AI is evolving into?
AI is undoubtedly sneaking into all aspects of our lives. On the one hand, AI can perform tasks that are too complex for the human mind, on the other hand, it can do basic and repetitive tasks that help the human to step away from monotonous duties and engage in tasks that the machines cannot. This is something that is only going to grow in importance – focus on the human qualities there, where devices are not appropriate to use, and allow machines to augment us there, where we know our human mind is not suitable for. If we allow this progress to evolve, we will be able to work hand in hand with machines and find solutions and answers to urging global questions like the SDG, be that in healthcare, agriculture, education, transport, construction,

environment, pharma, food or anything else.

What is your advice to the business owners who would like to enhance their work through AI? What are the ways they can integrate AI into their processes?
Organizations need to realize that AI is not a silver bullet and requires collaboration from all layers of the company. Implementing technology is one thing, but people will need to understand it to value and embrace it. Therefore, it is vital to start processes with the people and help them to know how it can enhance and contribute to their work. Once they understand how they can work hand in hand with AI, it will be easier to bring this new technology into the organization and make the most of it to the benefit of both customers and employees.

As you know, the central theme of the Forum is to investigate and seek the ways we can utilize the AI technology in benefit of the society. What is your take on that? More specifically, how can AI contribute to the United Nations Development Program?
With the power of AI, we can find answers to questions that we face on global levels. It is said that 2.5 quintillion bytes of data is created each day. It is only cognitive technologies that can process such an amount of data and use that to find the best answers and solutions for the good of humanity. With AI as a powerful tool available for us, we hope to be able to put together thousands of years of knowledge, experience and resources we have and contribute to a better life for people around the world. In this sense, the "mission" of AI and UNDP is certainly comparable.

Adapting current workers to a new environment, where they will be working with machines, is quite important to prevent higher unemployment rates. How can one adapt the way he or she works in relation to the machines? Is it up to the governments to change the way we are educated?
This is a question that all layers of society face together, not only governments. We need to work collectively to ensure that we as well as future generations are prepared for the new era. Governments will undoubtedly play a vital role in this, but society will also need to be open for the change. Scientists, researchers, industries, organizations and we, on a personal level, will all need to become aware of the possibilities and opportunities that new technologies offer. Organizations like ours, SwissCognitive, play a crucial role in this. Raising awareness, exploring the options, facilitating knowledge and experience exchange are all important to come to the phase where we realize we are in the same boat together.

"Once people understand how they can work hand in hand with AI, it will be easier to bring this new technology into the organization and make the most of it to the benefit of both customers and employees."

Switzerland is leading in innovation and has been the most innovative country for the last 8 years, according to the Global Innovation Index. What is Switzerland's role in the AI ecosystem?
For me, one of the most critical responsibilities Switzerland should take is with regard to the ethical aspects and the trust in AI.

Which AI services and products do you, as SwissCognitive offer to your clients?
Knowledge is power, but only when it is shared in a transparent and transferable way. To facilitate this, we provide events – CognitiveTank and CognitiveBrain. CognitiveTanks give a practical insight into the world of AI (AI-based use cases) whereas CognitiveBrains are workshops that offer an excellent opportunity to brainstorm and exchange ideas about a specific topic wrapped around the challenges of AI. Besides, both Dalith Steiger and I appear on stages in and outside of Switzerland, giving keynotes and participate in panel discussions concerning digital transformation and cognitive technologies. We also lead workshops in organizations going through change and advise them on a strategic level in the process of digitalization. SwissCognitive also provides a link to a strong network of organizations and individuals in the AI ecosystem, helping organizations to position themselves in Switzerland and even worldwide.

Every year, each sector is becoming more and more digitalized. What opportunities does AI offer in the global business world as well as in Turkey?
We got to a stage where the amount of data, that is being created daily, is impossible to be processed by human beings. We need the assistance of machines to be able to benefit from all the data/knowledge that we have. What opportunities this holds in the business world is hard to define - it is industry-specific. What is certain is that with the help of AI, our processes can become faster and more accurate, our decisions can become more flawless, and our brainpower and human qualities can be chanelled into areas where cognitive technologies cannot reach.

“FINANCIAL SERVICE COMPANIES RADICALLY RETHINK THEIR SECURITY”

Targeting especially the finance and insurance sectors, Futurae Technologies offers secure authentication via using a machine learning algorithm. The CEO&Co-Founder of the firm, Sandra Tobler states that collaborations with fintech companies is inevitable for banks pursuing faster new business models.

As Futurae you offer customer trust with secure transactions and logins. How do you do that?
Futurae brings future-proof adaptive security to digital products. We offer user-centric and secure end-user authentication. We are sitting on top of the identity layer without knowing who the user is or processing personal identifiable information. The users’ privacy is key for us, that is why we work with context information of the user. Secure authentication can be achieved via Futurae novel sensor signals technology that inherently uses a machine learning algorithm. In addition, we offer a comprehensive portfolio including a variety of multifactor authentication and transaction signing technologies that can be flexibly combined (online, offline, with and without smartphones). We secure web and mobile logins of digital products like web portals, e-commerce platform, or online banking, to name a few.

What are the sectors you focus on?
All the sectors that need secure logins where a simple user name and password combination are not secure enough. The financial and insurance sectors are key targets, with e-health being a runner-up.

Finance is among the sectors in which AI is utilized and implemented the most. You have been in this sector, and you are also an expert in fintech ecosystems. How does AI’s growth affect and/or contributes to fintech ecosystem?
If I look at IT Security, Machine Learning enables processing of a lot more data to detect anomalies in a timely manner. This is a huge asset for highly exposed organisations like banks.

Alongside “digitalization”, another term that was injected into our lives is cybersecurity. The security of users and institutions is more important in the finance sector, maybe more than it is in any other sector. Can we or should we expect a revolutionary change, even a transformation in digital security in the realm of finance?
The finance sector was comparatively early in validating new

business models and place digital processes online (think of payments to only mention a core one). To enhance and add more and more personalized services also implies collecting more sensitive -or, for cybercriminals, interesting- data. For this reason, financial service companies radically rethink their security. I see that companies are moving away from static software products into new, more adaptive ones: These can keep up with the fast paced security threats that are constantly evolving.

According to a Business Insider report, due to the rise of AI and machine learning, 1.3 million bank workers will be losing their jobs. Moreover, the same report also claims that 50 percent of the finance leaders will also be losing their jobs. What do you predict? Will the benefits of AI surpass the disadvantages of it?
It is important to understand that there will be a lot of new specialists needed to run a highly technical infrastructure. Banking will definitely change and some roles will become redundant. On the other hand, the digitization of the service offering requires a lot of new know-how that will compensate for jobs in other areas. The new jobs are typically in areas where people create value and are customer-facing and the jobs that are removed are typically areas where a lot of manual repetitive labor occurred. Not to mention, in certain roles, machines can work more efficiently (at a lower cost, and with less errors) than humans.

Nowadays, there are lots of fintech startups and counting. Do you think that they will be standing for a long time?
Banks will not be able to develop every business case themselves anymore. A collaboration with know-how from fintech companies can help evaluating faster new business models and embrace existing know-how and talent. Surely there will be a consolidation of fintech players, as there will be a continued consolidation of traditional banks.

Do you think that there is a fintech pressure on the big banks and if so, how are they getting prepared for the upcoming challenges?
As a bank, it is important to have a strategy in place. In my view, it is perfectly fine not to embark on every single digital trend. However, in order to take a decision in this respect the bank needs to have know-how and needs to understand what is at stake in order to actively decide. Not doing it only due to a lack of understanding, or fear of what the future is bringing -burying one's head in the sand- is really not an option.

"Financial service companies are moving away from static software products into new, more adaptive ones: These can keep up with the fast paced security threats that are constantly evolving."

We are in a process of change, digitalization and automation. To ensure that this process will bring about positive results for society, who do you think should be the leading actor?
It is very important that academia works closely with the industry and policy makers. There needs to be an ecosystem with a diversity of players and the best talent, including startups, which have agility and are capable of fast adoption of trends, multi-nationals, which have the power to create standards, as well as small and medium enterprises, that diversify the market.

You are the ambassador of Swiss Finance Startups. Moreover, you are on the board Startupticker. Could you please elaborate on these?
Swiss Finance Startups is a great plaform for innovators in the financial services field to connect, join forces, and build strong partnerships within the financial sector. Startupticker.ch is the online news platform that increases the visibility of young Swiss companies and serves to highlight the diverse and vibrant Swiss start-up scene in Switzerland and abroad. The news portal provides daily information on company results, launch of innovations, growth, financing, exits, support services, events and award tenders.

Is there any startup in Switzerland that you find successful, if so, why?
There is a large variety of successful startups. Switzerland is very known for successful biotech or medtech exits. More and more, however, Swiss IT companies become internationally famous. Cybersecurity is increasingly a growing area of international interest.

Do you think that there is a potential for a new bridge among fintech ecosystems in Turkey and Switzerland?
The Swiss Days as well as the Swiss Turkish Economic Forum have always been a great platform in creating visibility about the variety of innovative players. The stepping stone is placed to build strong partnerships across borders.

A DIFFERENT ECONOMIC PARADIGM IN A WORLD OF AI

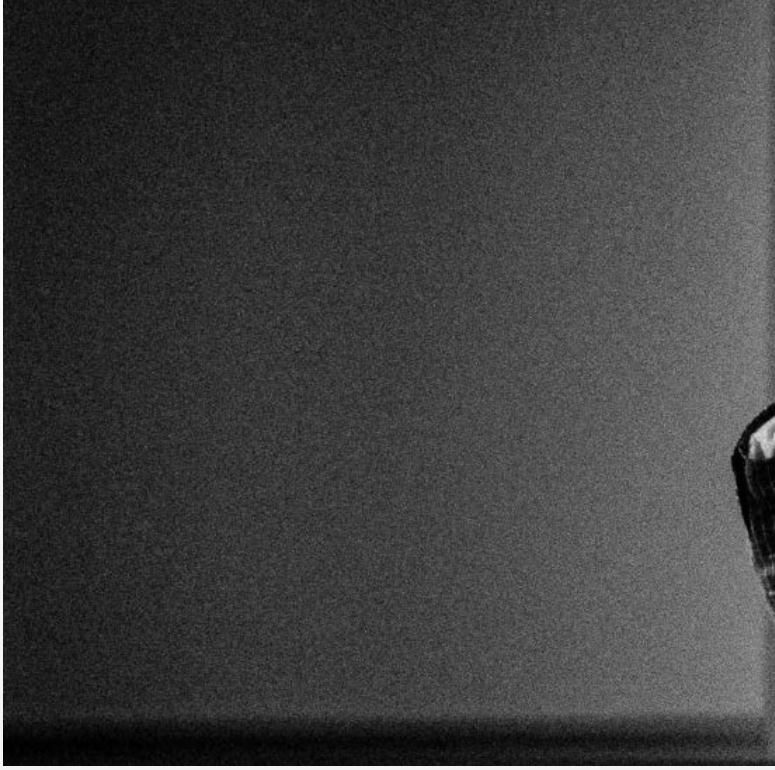
Indy Johar is the co-founder of Project00.cc and most recently Dark Matter, a field laboratory focused on radically redesigning the bureaucratic & institutional infrastructure of our cities, regions and towns for a more democratic, distributed great transition. He joined the Swiss Turkish Business Economic Forum and interpreted AI's social aspects and what it does for human, nature, and SDGs. He wrote an article for the Forum Magazine.

One, when we look at the automation, sort of revolution that we are seeing, I think it's really critical that we think of it not just as a kind of technology but actually a foundational leap in the nature of work and the nature of human contribution. And I don't think this is about making humans redundant. Lets stop there. I think the kind of AI revolution that we are in the midst of is actually about the foundational revolution in human contribution to society.

In a way, as machines in the first industrial revolution, which we able to travel faster, move faster, carry more load faster than humans, didn't make humans redundant; I would argue that artificial intelligence does not make humans redundant but changes the nature of our contribution. And this requires us to think about the foundations of the nature of human contribution and more critically of the nature of our industrial revolution.

I think it is no surprise that if you look back to industrial revolution as machines were being developed, we simultaneously developed new schools, places for people to learn. Because you recognize that human contribution is going to have to evolve, will become highly cognitive in response to the nature of machines and in what contribution they can provide. This was a symbiotic revolution. And this is really critical.

When we look back to the history of technological revolutions, there has been a relation between the birth of technology and the institutions that we make with it. And AI revolution is a similar type of revolution that requires us to reimagine what human development looks like in the 21st century. At



the same time as technology unleashes us form some of the burdens that we have. Also foundationally I think AI, machine learning and I would argue that some of the automations that we are seeing, are fundamentally operating at different scale of human intelligence.

And I think this is also will get superbly critical but also interesting. So if we were to first concrete out this conversation I think when we talk about AI revolution we have to simultaneously talk about human development revolution.

Now this is where it gets I think not just the simple idea of the human revolution, after getting really the cognitive capabilities of it. So in places like Stockholm where I'm working it is becoming increasingly apparent that mental health and mental wellbeing is probably going to be the foundational goal of 21st century societies. Places that can actually support the high performance cognitive capabilities of human beings are going to be the foundational goal.

Now what is the environment, what is the human context, what is the nature of culture that supports the human development? I think it is really critical. So if we want to build societies where AI and humans, AI and economies are symbiotic with the next wave of human development we're going to have to build societies where mental health and mental wellbeing is foundational goal.

That's' not just about dealing with more treatment with the mental health issues. It's not even about preventing mental health issues. It's about foundationally exponentially changing the quality of mental health capabilities in a way that we have never done. And in a way, I would argue, actually many of our capabilities has been undermined. Similarly, IQ is dropping in human existence, not increasing.

And there are really shocking statistics about the role of nutrition. Nutrition quality is declining and we're talking about cognitive stuff increasing. So when you start to put these factors together you start to think. And not just that. I can add air quality. Air quality is massively degrading and that impacts our cognitive performance. We know microbiomes are fundamentally affecting the nature and the capability of us and also environment affects microbiomes which fundamentally affects our cognitive performance.

So in a way... I have not even talked about emotional stress and actually kind of emotional violence and its impact on cognitive performance. And in history, epigenetics, we know these impacts pass through. So we know already that these things are actually cumulative and have a fundamental effect on human development.

So if we are genuinely talking about automation economy and AI economy, we are going to have to fundamentally reform the capabilities, the condition of human development in a really radical way.

And in a way I bring one more point into the species which is that as we move into this other economy we also have to really configure the nature of this economy. There is a lot of talk on AI and collective intelligence and other models. We know that actually there is a face shift appearing in society in terms of actual capabilities. But also what is important to recognize and this is where it gets I think very critically interesting is, is this face shift foundationally different economy? We often think of AI as a kind of autonomous thing on that little machine but AI and machine learning capabilities are fundamentally product of data and learning capacities of many data points and human behaviors and other things. They are also predictive but they are predictive to certain context, in contiguous learning mechanism and adaptive mechanism.

Bu into that story we also have to understand that there are perhaps foundationally different products. There are products with whom AI is perhaps indivisible form the data that breeds it. And like humans are an emergent form of nature, maybe AI is an emergent form of data infrastructure of which they come

from and indivisible from it.

I have to ask a very foundationally question, which is are we moving into a new economic paradigm. Industrial revolution was based on rivalrous market mechanisms. Will the AI data infrastructure economy and collective intelligence economy forces us to move into non-rivalrous economic paradigm.

So the reason why I say this is that we all know that data becomes influently more powerful. As the more connectivity the more data points the more infrastructure overlaps, you get more capabilities. Scaling actually means that monopolies of data or where the value lies. They are naturel monopolies. Data infrastructure engines are more powerful as the more powerful the more data points are connected to it. They tend to act as natural monopolies. Which is why we have a growth in powerful economies and growth in infrastructures.

So in this thesis, I think it is one of the paradigm leaps that, are we moving into post rivalrous economies and how do we operate in a post rivalrous economies? Increasingly we are seeing, apart from economies, reducing the nature of kind of market forces as a mechanism or market structures as a mechanism for optimization to perhaps a different modal.

So I think the other thing we have to think about is, in a world of AI and data driven economy, are we moving into a different economic paradigm? What does that paradigm mean and how does it operate?

I think, when we talk about the AI revolution, it is really critical that we talk beyond the techno infrastructure. It is also really important that most of the data we're seeing this world is actually from regressive analysis, it's the historic data that we are extrapolating the future. And that's perfect except that you know that neither the history nor the future are linear. So the ability to see the future of the AI machines will be clouded and limited by actually predictive capabilities based on past, history. And yes this is a big challenge in lots of different ways. But we have to recognize there are certain capabilities in it. But at the same time we know that when we go for tacit form for mechanisms, societal tacit for mechanisms to explicits, from tacit to explicits, actually we become better, we become more conscious of these moves.

"I think this revolution brings us a new scale of consciousness and going form the tacit models of comprehension and biases that we all create, to achieve a new explicit model which at least allows us to face our worst capabilities and contributions."

So I think this revolution brings us a new scale of consciousness and going form the tacit models of comprehension and biases that we all create, to achieve a new explicit model which at least allows us to face our worst capabilities and contributions.

So I suppose my contribution to this very important discussion that you're all having is that I think we have to look to AI not just as a technological issue but from the lens of society. As well as a lens of a paradigm leap of the nature of human development, also simultaneously being a paradigm leap perhaps in the nature of the economies. And I think it's no surprise that in places like China and large autocracies and nationalist economies which are centrally driven, are taking a massive leap forward to data driven economies. Because they are able to create post rivalrous economies to build units of data that were historically not possible.

How does democracy look like in that future? The nature of democracy in that future is fundamentally in question and I think we have to, this is what I mean, we have to jump from the paradigm of a rivalrous, diversive, confrontational democratic model to a new post rivalrous model. I think that is a macroeconomic social foundation deep into the history, deep into our theory of what change and progress are build of. Simultaneously also deep into the nature of what human development looks like.

CAN WE SAVE AI BY BUILDING EMPATHY INTO ALGORITHMS?

"Artificial Intelligence can turn into an integrative technology from a disruptive one," says Strategic Designer and Futurist Alexandra Alden. But in order to smooth the bias curve, we have to build it on love and empathy.

Should you have done a quick research about Artificial Intelligence (AI), you would find a great number of sources to benefit from. However, it is a striking fact that the majority of those comes from a computer science perspective, even though the social impact and design perspective of this technology are equally important given the current ethical concerns arising from it. As a Strategic Designer and Futurist, Alexandra Alden has over seven years of experience in leading strategic design for social impact. Holding an MA degree in International Development from UC Berkeley, Alexandra Alden is also an Acumen Fellow and President of SINGA Spain, where the power of design is used to build social cohesion. While AI is the key in her current and many other projects, Ms. Alden foregrounds the importance of it by saying, "Whether it is co-leading the launch of the Building Blocks, blockchain for humanitarian assistance, project at World Food Programme's Innovation Accelerator or imagining innovation in migration with Glovo, AI always has a role to play."

You are more focused on AI's social impact and design perspectives. Do you think that enough professionals are focusing on this particular realm or do you think the people from computer science heavily outbalance them?
No, I don't think there are enough professionals focusing on the social impact of AI. We have key players in the sphere, including Elon Musk, saying that we need standards and we need to regulate AI, but we move forward with the design building because we can build. This rightly scares people. The public knows unintended (or intended) consequences are not

being taken into account. If we want to get a positive impact from AI, we need to envision a future we want and design AI as a tool to achieve that future. Short-term thinking and market-driven applications will not get us closer to that future. Right now tech companies are driving the march forward on AI, and are coming at it from a "what can we do" and "what will make money" approach, which will lead to results that fill market gaps which, with the current economic system we have, tend to drive inequality. There are two roles for designers in this ecosystem -we can be the ones that make AI something people will play with, making it feel nice and acceptable and even desirable through clever service and product design and beautiful UX. For any technology to take off, you need it to connect with the people and designers are great at that. Tech companies know that Google has some of the world's best designers in their team. That's not enough though. In his book, Ruined by Design, Mike Monteiro claims that the world isn't broken and actually, it is working exactly as it was designed to work. However, since it is designed by ourselves, every single problem it has is actually correlated to us. To me, this is a technology with as much potential for positive and negative impact. Designers need to be more vocal, we need to be organizing summits, facilitating creative processes of speculative design to create space for a better future. We also need to bring together diverse (not just in terms of your skin colour, but your life experience as well -a refugee from Sudan should have as much of a seat at the table as a white executive from Silicon Valley) actors to tackle what we mean by ethics of AI. The questions to ask are many: Who defines the ethics? How do we make sure the biases and prejudices codified into our modern societies don't become codified into AI? Designers, in this case, should not be creating virtually attractive interfaces, but creating the spaces and processes to bring together disparate ideas into a cohesive manifest based on a plurality of opinions.

Artificial intelligence is identified as a disruptive technology to lead to new market segmentation trends. Do you think the disruptive impact of AI may go beyond segmentation trends? How do you evaluate the current situation in Silicon Valley?
Artificial Intelligence is what we call a "transformative technology", so that means it will follow the transformative technology adoption curve, a similar adoption curve to that of the internet. What that means is that it starts by substituting

"Instead of looking at artificial intelligence as a 'disruptive technology', which sounds inherently aggressive and scary, how can we look at it as an 'integrative technology' that brings together the disparate pieces of our world in new and amazing ways."

current business models. Think about how the internet disrupted traditional business models, Amazon replacing bookstores, Netflix replacing video stores. However, in the beginning, they more or less imitate the models they are replacing. This is happening with AI as you see it being implemented as a backbone to many of our existing digital models to make them more accurate, efficient, etc. When it gets interesting, and what we are all afraid of and excited for is when we get to the transformative part of the curve. For now, those applications are largely conjecture-based. We don't know what AI will look like as the use cases evolve. We have competing narratives, from them being our AI overlords to completely integrated with our bodies allowing us to be real-life superheroes, but we don't really know. Again, we need to put the work in to imagine the world that we want to be able to harness the potential of AI to create it. The future world we need is one built on love and empathy. Not just love for our things, but love for each other and love for our planet. We live in scary times where AI has been used to divide people, manipulate political opinions and drive fear. Operating from a frame of fear will always beget net negative outcomes. What if we reframe what AI can and should be? How can Artificial Intelligence be a tool to better understand the interconnected world we move through so that we can exist as a synergetic part of it? How could we build empathy into algorithms so that instead of optimizing they build community and collaboration? Instead of looking at artificial intelligence as a "disruptive" technology", which sounds inherently aggressive and scary, how can we look at it as an "integrative technology" that brings together the disparate pieces of our world in new and amazing ways.

It is known that AI revolutionizes many sectors such as defence, health, finance, production and even education. However, many do not know when to become suspicious about this technology. What is the turning point or red flag in AI that we should start worrying about the future?
We should not come at AI from a place of fear. Fear does not help us, it paralyzes us. Ideally, we should sit down and think through every new technology we create and where we want to

get with it, but historically we haven't. Robert Oppenheimer, the creator of the atomic bomb famously quoted the Hindu text, the Bhagavad-Gita, upon seeing the first explosion: 'Now I am become Death, the destroyer of worlds.' He also famously became an anti-nuclear activist and even was stripped of his security clearance by the CIA in the wake of seeing the effect of the bomb on Japan. In the fever pitch of scientific breakthrough, ethics are put aside. We cannot continue with history's mistakes if we don't want to repeat history's tragedies. Silicon Valley has already been getting blowback for not having done this in the past. Just look at the number of tech companies that have been called before governments in the US and EU in the past year, asking them to be held responsible for what their tech has done to politics. We shouldn't be doing that as a reaction, we should be doing that as a part of the planning process. The EU has recently said it plans on regulating AI, and holding tech companies responsible, which is a strong step in the right direction. The red flag has already been raised. We all are aware that AI could go horribly wrong. We cannot wait for that to happen to then work retroactively and reactively. We need to imagine, introduce and design for narratives of what AI looks like when it goes 'right'. Designers, in general, have a role to play here. We have not only an opportunity, but also a duty to be the ones to facilitate these processes to define what we want AI to do.

Many confirm that it is quite hard to unbias the algorithm developed on data with already embedded bias. Do you think that it is possible to design a stereotype-free, "ethical" AI that does not discriminate individuals, especially the minorities?

I am not sure if it is possible with the current state of data and society. We are feeding Artificial Intelligence the data we have for it to learn, and this data is biased because racism is so inherently codified into so many societies. For example, look at one of the current use cases of AI, as a tool to predict recidivism of prisoners in the U.S court system. The algorithm analyzes a certain set of variables, but many of these variables are not causation but correlation variables, meaning they are associated with the outcome but not the "reason" for the outcome. An example is a variable of being lower-income. Indeed, lower-income people are more likely to be incarcerated with a report from the Brookings Institute finding that: "... boys born into households in the bottom 10 percent of earners are 20 times more likely to be in prison on a given day in their early 30s than children born into the top 10 percent." The AI is not inaccurate, poverty is associated with incarceration. Then you have to look at the dimensions of poverty, and at this point, "history" comes into play. In the United States, slavery, followed by segregation underlaid by continuous and current systemic racism means that African Americans have a poverty rate of 22 percent versus 9 percent in their white counterparts. Therefore, using lower income as a variable will result in inherently racially biased results, which are not inaccurate, but they are not taking into account the various systemic variables at play. This is not a far-off scary future of AI. These algorithms are currently being used in the court system with real consequences. In May last year, a stunning report claimed that a computer program used by a US court for risk assessment was biased against black prisoners. The program, Correctional Offender Management Profiling for Alternative Sanctions (Compas)

"I think the potential for AI in general, and with the SDGs is to be able to take in more data and make more sense of that data in a way that humans are not so good at. AI can help us take a more systemic view of problems, analyze those problems and their interconnected nature and design interventions that take on multiple key causal factors."

was much more prone to mistakenly label black defendants as likely to re-offend – wrongly flagging them at almost twice the rate as white people (45 percent to 24 percent), according to the investigative journalism organisation ProPublica. People's lives are being ruined. First, we need better, unbiased data, which calls for an open, transparent process of what variables are being chosen in algorithmic analysis and why. Cathy O'Neil, author of Weapons of Math Destruction calls for transparent auditing of the algorithm's code, which oftentimes are not revealed or not evaluated by anyone who actually knows what they mean. For me, this is a new profession. We should be cultivating AI ethics auditors who are technical experts tasked with reviewing code for bias. However, how do we make sure the auditors themselves are unbiased? How do we assure the coders are unbiased? All of us have inherent biases, there is no perfect human in that respect. The only way I can see to make AI truly unbiased is to have such a diverse set of people auditing/coding that the sample size is large enough to smooth out the bias curve. If you have black, white, poor, rich, queer, straight, Asian, African, Arab etc. all writing and auditing code in the same proportions, eventually the biases will cancel each other out and hopefully we could get at the true essence of humanity. We also need to code for love. One of the best things we can do as humans is to put ourselves in someone else's shoes, try to understand where they are coming from and work with them to create a positive impact. We should not seek to outsource this to AI. Artificial intelligence can feed us the numbers, show us the trends, but at the end of the day, we need to look at each other with love and seek to help lift each other up. With the case of recidivism, yes, you can throw that person in prison for longer based on a set of risk variables, but what if AI could help us see the bright spots in a person? What if it showed us that even though he/she was applying it to selling drugs, he/she has a head for project management and high ability to communicate? In this case, instead of throwing them back into a system that will most likely drive further crime, AI would have helped us to plan a tailored treatment plan for them that would help lift them out of poverty and crime. AI has the power to do that, too. We just have to choose to use it that way.

As a former United Nations employee/contributor, could you please tell us if there are any use cases of AI among UN's Sustainable Development Goals?
One of my issues with the SDGs is that these goals are treated as discrete problems that can be solved separately. However, they are so inextricably linked. Look at the current hunger crisis in Yemen, which is generally agreed to be man-made through policy interventions by the U.S. and Saudi Arabia, and fuelled by the ongoing conflict in the region. Syria's conflict began with a drought, fuelled by climate change. None of these are discrete problems. I think the potential for AI in general, and with the SDGs is to be able to take in more data and make more sense of that data in a way that humans are not so good at. AI can help us take a more systemic view of problems, analyze those problems and their interconnected nature and design interventions that take on multiple key causal factors. I hope, having data demonstrating the interconnectedness of these problems and drive donors and institutions to put away mandates and work together in a capabilities approach to really solve these wicked problems.

Lastly, do you have an "AI dream"? Like, one day you will see AI solving an important problem, one that is threatening human lives or other species on earth? What is your "dream" potential use case for AI?
I dream of AI as a way to connect us - a way to act as a collective consciousness that allows us to understand the world around us and each other in a more profound way. I think we should stop looking at artificial intelligence as something that we will create separately from us and start thinking about how we could use it as part of us. If we designed it correctly, and at our fingertips, we could categorize and synthesize huge amounts of complex data. Think of where we could go as humans! However, we must design it from a place of love. We must design AI to build empathy for each other and our planet. The only way we do good things as a species is when we personally care about the problem. We haven't solved climate change not because we couldn't, but because we don't care about the effects yet. How could AI accelerate understanding and caring to avoid disasters and, beyond that, to develop positive solutions that benefit us all? That's my dream for AI. It's not impossible, we just need to be intentional.

“IF THE CHANGE IS INEVITABLE BE A PART OF THAT FUTURE”

A researcher at CERN, and an associated professor at Istanbul Technical University, Dr. Altan Çakır, explains the application of artificial intelligence and data analysis in science and how these technologies change our future.

Dr. Altan Çakır, an associate professor at Istanbul Technical University (ITU), has a high degree at Ege University and studied theoretical physics and mathematics at a theoretical physics institute in Italy. Dr. Çakır received his Ph.D. at Karlsruhe Institute of Technology (KIT) in Germany and conducted researches at the famed CERN laboratory in Switzerland. Being granted a post-doctoral researcher scholarship, Dr. Çakır carried out post-doctoral researches by the Nuclear Research Center (Deutsche Elektronen Synchrotron -DESY) in Hamburg, Germany, until 2016. The same year he joints to the academia of ITU. The following year, he was a visiting lecturer at Fermilab, an accelerator center of the USA. As an active research participant in the experiments with the Large Hadron Collider (LHC), Dr. Çakır explained the applications of artificial intelligence and data analysis in CERN. He shared his prediction on AI too...

What kind of studies did you do in the LHC experiment in Cern?

I am an experimental particle physicist. Although the experimental definition is very broad, I can explain it briefly as follows: I gained expertise in data analysis revealed as a result of proton-proton collisions at the detector and in the validation of scientific hypothesis. So I might be called a data scientist or data engineer who is looking for answers to the basic questions of physics by managing and analyzing data flows. We were looking for answers to questions such as "what is the black matter?", "what are structures such as the Higgs Boson?", "How can they be measured?", or "whether the physics theories or experimental data match?" In the context of basic sciences, finding answers to these questions need extensive application data science. We were also carrying out related tasks such as development, maintenance, and update if necessary experimental types of equipment for taking records of the data of proton-proton collisions detectors.

Data science is considered generally as a business application. But you apply it to science. Can you explain the application data analysis in science by giving examples from CERN?

We need to understand CERN well. This is a prominent interdisciplinary research institute open to researchers from many fields such as engineering, physics, mathematics, basic science, and chemical engineering. The detector in the CERN is as huge as a five-story building. Measuring 22 meters by 15 meters, the monstrous detector generates constant electronic signals with about 150 million electronic devices. These are the first and the most extreme applications of the process we call the Fourth Industrial Revolution today. Since it is difficult to save the data collected, new technologies are introduced within CERN. What CERN does in scientific processes is asking very basic questions: What are the building blocks of matter in the universe? In simple terms, as far we know, there are four basic interactions (forces) in physics: Gravitational interaction, strong interaction, weak interaction, and electromagnetic interaction. The theory of the last three interactions is based on quantum theory. Quantum theory was developed in the 1900s, but it has become more feasible and measurable with the software, hardware, and knowledge we have reached today. Now we can, for instance, measure interactions of very small particles (up to 10-20 meters) thanks

to state of art instruments. The whole experimental process at CERN has begun with this question: Can we understand these interactions? CERN is a research institute that applies all engineering practices.

How many different experiments are done in CERN?
CERN has a net of tunnels for experiments. But the four of the most important experiments take place in a 27 km tunnel, named Large Hadron Collider (LHC). There are other experiment groups too. I'm one of the representatives of ITU in The Compact Muon Solenoid (CMS) group. ATLAS is another important experiment group. Another one is called Large Hadron Collider Beauty (LHCb). And the last one is called ALICE. Each group is looking for answers to different questions. One is trying to understand how the universe came into shape after the big bang, others formed to examine the interactions of Higgs particle, etc. The mission of the Large Hadron Collider is to speed up the protons in a controlled environment and to collide them within detectors.

So tunnels are designed according to different experimental needs of groups then?
Yes. Each one is designed to make qualified measurements in depth. The CMS that I took part in and the ATLAS are large multipurpose experiments. Great tools that can perform many measurements, such as the Higgs Boson, black matter, sensitivity measurements, and the accuracy of quantum theory. So these two experiments are relatively larger than others. The whole design, integrating all detector electronics is an electrical electronics engineering problem. Gathering all the data flow in one place requires a computer engineering setup. Then the data should be processed intelligently. So what is intelligent processing? Let me explain with an example: In 2008 and 2009, while conducting experiments which was resulted in the discovery of Higgs Boson, we have made various classifications with artificial intelligence algorithms and made theoretical predictions about the movements and energy level of these particles. And then, when the experimental data started to flow, by using these setups (classification, clustering, etc.) we were tried and achieved to match the theoretical inputs we expected. Furthermore, we apply predictive maintenance technology which is now popular in the business world, to the detector. For example, consider the detector is constantly exposed to radiation. We need to know when the various sensitive materials inside this detector will deteriorate. Because these detectors are very large, they cannot be maintained or opened frequently, and of course you would like to receive data when they start working. Hence Ph.D. students and post-doctorate researchers at CERN have long been working on predictive maintenance or similar structures.

In other words, the data is critical in experiments at CERN...
CERN is a pioneering research institution, and it has many sub-segments. CERN is home to discussion on everything

"People share the data very generously in Turkey. Companies do not have 'know-how' or any plan for data protection."

from engineering branches to basic science, or even in some cases to phenomenological philosophy. Because it is very difficult to evaluate the validation of the answers to the questions you ask. For example, let's ask a question like, "Does the human brains' thinking process look like an electrical signal?" To find the answer, you got to get into the brain and calculate. This is the case in the quantum's four interactions theory too. If you want to understand gravitation, you have to get into the macroscopic universe. There is no quantum theory of the universe that we can study at a macroscopic scale -at least we do not know. When we say quantum theory, we are talking about a very small particle. So the main concern should be to compute in a very microscopic universe. This capability is directly related to the capacity of engineering, computer, and technical hardware infrastructure. In other words, any limitation -yes, still there is- an intercommunication of processors and electronic devices, draws the borderlines of your playground. The next limit is the processing capacity of your analytic tools. The detector produces 600 billion collisions per second or about

"While the AI is changing the future, should we stay outside of it or try to harmonious it with society? I may go with the second option. It is better to be aware of new technologies and use them to create social value. So I am not afraid of the future."

109 terabytes of unfiltered data. But of course, electronic devices can't handle them all, so your system permits only 100 terabytes of data flow per second. This is a huge challenge in itself. Because if you can only process 100 terabytes per second, you need about six to twelve months to analyze simple Higgs Boson graphics or interaction. So you need to label each interaction and wait for weeks if not months, to process it. And then you can check the data produced by all interactions in the detector. In fact what you are looking for is just a dot among 10 billion others. You need to navigate over 10 billion points to have an idea on Higgs Boson. Statistically, I should have at least five or 10 points so I can develop a hypothesis. The experiment is not over yet. I have to work with 50 billion points to get the fifth point. Since the data is immense, the application of big data and artificial intelligence is a must.

Can you share your predictions on how will artificial intelligence evolve soon...

Artificial intelligence applications have emerged in the 70s and debates have never ended since then. But we had to wait until 2008 or 2009 for the development of feasible AI applications. Today's artificial intelligence application can do anything that needs expertise including image processing, cybersecurity, quality control, stock control, etc. But which tasks or jobs are more feasible or difficult to apply AI? This question remains unanswered. Robots surgeons can perform precise operations but healthcare cannot tolerate the tiniest error. These are very complex processes. On the other hand, AI can help business processes, including elaborating financial statements, shift schedules, and budgets. Artificial intelligence can be used in roughly every sector, especially in science. Artificial intelligence is an imitation of humans by machines. For example, no one can hold thousands of lines of numerical value in his head. Currently, artificial intelligence technologies and software-hardware technologies can quickly process a million-line file and make a decision. It's very desirable today since decisions can be made very quickly and accurately based on very complex data. You can also make the right decision without using a very complex algorithm which

can be also labeled as artificial intelligence since it helps in thrive the business. Or, you can make a quick and objective decision and make the right move through too many datasets, as if you are getting the opinion of a lot of people about a very difficult subject. This is also a matter of artificial intelligence.

What do you think about the bias problem of the AI?
Many people say that data is the new gold. So data is at the center of the issue. The second issue is about objectives: How was the data collected and is going to be used for which purposes? This is the top issue now. For example, AI produces personalized advertisements; by collecting data from the mobile phone, online surfing, and purchasing habits and tries to identifies the user (White collar, revenue level, interests etc.) and offers relevant goods and services. But is this data collecting method legal? Or what kind of data is subject to the consent of the users? How should we regulate the data collection? These are the core questions in debates on AI all around the world. Understandably voice recording tools and algorithms or artificial intelligence that can profile the user by their voice, are worrisome many of us. Therefore, it is necessary to categorize data collection processes according to each case. People in Turkey, I believe, are extremely lax in data protection. People share their data very generously with everyone. Even those who own a company, they have neither a "know-how" nor an experience to protect their data. They do not demand any data safety and do not conduct R&D studies. The use of general data should be legally regulated. I believe that jurists should work with experts to learn about what can be done with data and how it is collected, and then to establish legal data collection procedures. Europe has already concluded the procedures. General Data Protection Regulation (GDPR) has come into effect in 2016. Technically they had been working on this regulation for many years. But in Turkey, these processes have not been well defined and so the data protection field is a little bit messy.

"The future will be bright for certain communities while it will be somber for others. And those communities which were not evolved into being an information society remained to be a cheap labor country, will never be able to use opportunities for this future."

Does AI threaten the future of the human race? What do you think about this concern?
I think, in any case, artificial intelligence will change the future. The main argument is going around one a basic question: While the AI is changing the future, should we stay outside of it or try to harmonious it with society? I may go with the second option. It is better to be aware of new technologies and use them to create social value. So I am not afraid of the future. But of course, being concerned about technology is not developed within the country is partly accurate, because that leaves us behind a bit in that race. We are akin to the mouse in the cat and mouse game. Therefore, we need to improve our infrastructure and the competencies of our scientific community accordingly. I am worried about the future but in a different way. An international initiative called "The Future Planet" looking for answers to a fundamental question: What will be the future of the world we live in? Since climate change knows no borders, related problems concern all of us. There are anomalies in the weather and we have to develop solutions as soon as possible. If climate change life, before artificial intelligence can do, we have to check the priorities.

So we may counter the danger of extinction before artificial intelligence...
Yes. There is a danger of extinction. We have to deal with earthquakes or other disasters first. There is another initiative called "Future of Us". While opponents of artificial intelligence focus entirely on killer robots, this initiative focuses on the danger of designer humans. Today it is possible to create perfect humans or "Transhumans" by intelligent processing of human genetics. Therefore that technology cast a bigger risk than artificial intelligence can do to human existence. There is even a philosophical discussion these days. Our children are probably the last generation who opened their eyes to the world with natural birth. Generations of the next decade will be born with manipulated genetic sequels. So the question is: Will the manipulated genetic structures be superior? We do not know whether they will be better or worse at applying artificial intelligence techniques because they will be the outcomes of an unnatural process. Then there is another discussion around "The future of technology". This is about the time required for the maturation of technologies. In other words, how fast the hardware, the software, the

processors, or any other component that makes the robot a robot, can be maturated? In the past that would take 10 years but now 5 years is probably enough. However, I wonder, for instance, if the technologies that I need are going to be ready in two years. Some pundits say "Before 2030, nothing will be sophisticated as much as you imagine". This is entirely due to the fact that hardware technology still does not respond as quick as anticipated. But many hopes that 5G technology will bring about substantial changes. And the other discussion is "Making the Future". A future of smart objects, phones, smart crystals, or structures that can absorb energy may be becoming. Or a future where we won't spend so much time producing energy since 100 percent electric cars without gas pedal or exhaust pipe will be on the streets. A future of "hyperloop" which reduces air traffic... All these technologies can be realized thanks to smart materials. For example, the thinnest layer of these intelligent materials may turn tank armors to indestructible walls. Or that would make them invisible: Covering with these materials may reduce the heat, and the tank may appear as a small vehicle in the infrared cameras. This old imaging technology seems to be obsolete soon. The most interesting discussion for me is on the "far future". Now we can send probes to Mars but not astronauts. Because a round trip to Mars would take roughly 4 years. Can we travel inter planets in a shorter time, by changing the fuel technology of launching systems? Or can I set up "solar planets" or space colonies? The future will be bright for certain communities while it will be somber for others. And those communities which were not evolved into being an information society remained to be a cheap labor country, will never be able to use opportunities for this future. This is a sociological problem and I'm not a sociologist, but this what I see for the future. Let's take a factory where a simple camera system can reduce the necessary staff from 50 to 40 people. That would reduce the cost significantly. Or imagine a completely integrated factory system where no people work. Then the quality of the air, of lighting or workplace safety in there would be no more a matter since production processes automated entirely. This is what Tesla or Uber is trying to do. If the change of the future is inevitable, I think we have to be a part of that future. Fear is the enemy of success. All these themes should be examined within the framework of law, human psychology, sociology, and medical sciences by taking into consideration of possible outcomes.

“TURKEY NEEDS TO DEFINE PROTOCOLS FOR AI AGAINST ANY BIAS”

Şebnem Özdemir is the Chairperson of the Management Information Systems Department of Istinye University, and a research collaborator at the Massachusetts Institute of Technology’s (MIT) Computer Science and Artificial Intelligence Lab (CSAIL). With the new machine learning model, Özdemir has received the “Human Development Research Award” by Koç University’s UNESCO Chair on Gender Equality and Sustainable Development. Özdemir shared her comments with us on the applications of artificial intelligence in education, the bias problem, and her predictions of this technology.

Can you tell us about your AI studies at MIT?
MIT has several core laboratories. The first and most popular one is Media Lab due to its outstanding open to the public outputs. The second one, the Step Laboratory is mainly focused on education and it is as popular as Madia Lab. Computer Science and Artificial Intelligence Laboratory (CSAIL) is the least popular one but it is home to significant breakthroughs. I took part in two projects at CSAILL. The first one was about lecture-free colleges and turning academic institutions into research-centric, innovative, and creative centers where questions are asked and projects are carried out. We have plenty of data and we analyze them to build digital peers of common profiles. So it will be possible to transform the course contents and create a better learning environment.

And the second project?
It is about the acceptance and inclusion of robots in lives. For instance, there are certain tasks, and robots are used to carry out them. But do you want a robot in your kitchen or in your room even their tasks and functions are clearly defined? What kind of robot do you want? To find answers, in the experiments, we have deliberately driven the robots to make mistakes or to act both quickly and slowly. Meanwhile we have been monitoring the pulse of the subjects with wearable electronics. My main task is to analyze these data and to check if the subject develops negative behaviors. And if yes, I’m sending them to the right unit for an in-depth analysis. In other words, I must determine the causes of these negative behaviors, whether it is psychological, social, or just a result of a technical failure (the robot might be too fast or make mistakes). If the cause is technical, technicians; if it is social or psychological, psychologists are taking the case over. The main objective here was to create an ideal environment for humans and robots can live together in harmony.

Have you received any results?
That project will continue until the end of 2020 and may be extended.

We have been developing artificial intelligence to ensure objectivity and fair conditions for all. And so the clientelism or nepotism can be avoided. In the end, if we will face the same problems, why are we developing artificial intelligence?

Artificial intelligence, artificial narrow intelligence, artificial superintelligence...These are newly proposed concepts for AI. Can you describe them?

The artificial intelligence has long been a dream for humankind. The ultimate goal has always been developing artificial intelligence that can speak, think, perceive, and make decisions like a human. All we have and applied on, such as, autonomous cars or smart cancer diagnosis tools (which are more precise than physicians in finding tumors) can be classified as "artificial narrow intelligence" though their capabilities surprise us. These can be called "artificial weak intelligence" as well since artificial intelligence makes decisions by contracting patterns from data sets. We are not talking about decision-making processes as humans have, but about data-driven decision making. In the next stage, "artificial general intelligence" will be developed but it would take between 10 and 70 years. Artificial general intelligence will serve to the same objective: A human-level artificial intelligence that can think, understand and decides like a human. Once "Artificial General Intelligence" developed, the emergence of ""Artificial Super Intelligence", an artificial intelligence smarter than the most intelligent person, won't take more than 6 years. So is the reason for the subdivision. A new argument, claiming that the ultimate goal in artificial intelligence is utopian, has sparked over the past few months. Why it is utopian? The quantum computer infrastructure has been developing and if that process accelerates we will have the opportunity to develop artificial general intelligence. Today's level of artificial intelligence was dreamed before the '70s but the internet networks and technology infrastructure at that time were painfully insufficient. Right now we have that technology, but a problem remains: We haven't wholly explained the mechanism of thinking, learning, and deciding mechanisms of human beings yet. And without a clear explanation, mathematicians cannot formulate them. Artificial general intelligence is about modeling, mimicking the connections between nerves in the human brain. So industry experts propose a new target. "Let's not set a very distant target like artificial general intelligence, it's quite utopian. Instead, let's first target artificial intelligence at the level of the mouse brain, than of a cat brain and finally of a human brain", they say. This has been discussed for several months. But ultimately, the goal is to produce a small copy of the human mind.

You have been awarded for your Ph.D. thesis on the use of machine learning applications in education. Can we get more details?

Of course! It was a thesis about analyzing education data and producing outputs by using machine learning technology. I worked on experimental modeling of students' academic success and failures by using data on final exam scores. Then I used that learning model for forecasting the drop-out risks. I put forward the behavior change of the model against a different target. We can say that the newly developed version of the model in the thesis received an award. I was acknowledged Koç University and UNESCO chair's award, designed by Çiğdem Kağıtçıbaşı, in 2016.

How education is changing with machine learning?

The change is in process in some aspects of education. The first is about improving learning processes. That would include improving in-class learning processes, increasing the motivation of students or trainees, and evaluating the quality of exams. For instance, regarding the evaluation of exam results, instructors generally check the wrong answers and advise students to revise the relevant topic and to take more tests. However that is a static response. The real causes of errors would not be known without checking other factors (Omission, inattention, negligence, oblivion, etc). Therefore, deep learning technology can be used for ameliorating in-class learning processes as well as assessment and evaluation functions. Artificial intelligence can also help educational management by taking off the burden of repetitive jobs from administrative staff and instructors. In an experiment carried out in a secondary school in the USA in 2019, artificial intelligence was applied in all educational processes from assessment and evaluation to educational management. And a post-survey conducted with parents, school administration and students, proved that artificial intelligence can be a valuable catalyst in many fields; firstly in assessment and evaluation, than in improving classroom motivation, in updating the learning environment, and finally managing the educational environment.

What are the main problematic points in artificial intelligence technology?

The main concern in this field is that artificial intelligence may reproduce biases and reflects them to society. The second is the lack of clarity in the legal accountability of

AI applications. For instance who will be held responsible if Uber's autonomous vehicle involved in a crash? Or take the credit applications most of which are examined by a kind of AI: Banks cannot say, "Your application is rejected because artificial intelligence said so" to customers who demand, under the right to information act, an explanation for credit denial. The reply should be in detail. Similarly in any harm caused by artificial intelligence, the addressee(s) should be identified before filing to the court. Therefore, legal accountability is one of the main issues in this field since we have been developing artificial intelligence to ensure objectivity and fair conditions for all. And so the clientelism or nepotism can be avoided. In the end, if we will face the same problems, why are we developing artificial intelligence?

Is the bias problem the biggest challenge in the progress of artificial intelligence?
It is now. Because if an AI application causes unfairness in society, people will not forget it. So, I believe, removing bias is one of the biggest problems right now. This matter is not new: Artificial intelligence studies interrupted twice before the 1990s (One in 1976, and the other in the 80s). The first chatbot was developed before the 70s. And despite that dynamism, work has ended abruptly. We call that period as the "winter of artificial intelligence". One may ask, "We have very advanced technologically now. Maybe people were not ready for artificial intelligence at that time but today they are. So could the efforts be paused again?" Yes, it could. Why is that? First, we still don't know how artificial general intelligence will perceive and learn humanity. Secondly we still do not know how to overcome bias problems. Artificial intelligence endeavors will not end up, but they can turn to be unpopular due to deficiencies in the present artificial narrow intelligence. Works can be over, if we can't get rid of the bias problem. Because nobody would like to deal with a biased output.

From the perspective of individuals, nobody would approve of the exploitation of personal data on their mobile phones. But from the entrepreneurship perspective, better services and products at a good profit margin can be obtained by processing that data. So I will either let the artificial intelligence world discover me end to end and sacrifice my privacy, or I will be exposed to decisions and services in a world where I kept myself out of the game. If federated learning can be taken into effect, both my rights and privacy may be protected while businesses can access rich resources.

Well, do you think the bias problem can be overcome?
Solutions may differ for the aspect of the problem. The biases caused by technical errors can surely be eliminated. Similarly if it is a product of any fault in data collection, and if a certain social environment is appropriate, the bias can be removed as well. But if the approach of formulating the problem is biased, so we will have trouble. Therefore, our approach should be ultimately inclusive while formulating the problems and building system solutions. Let's say by using AI, you want to design an ergonomic dentist chair, comfortable for both patient and the physician. But if you portray to the dentist to AI as a male, formulations of measurements will be accordingly and the seat will not be suitable for a female dentist. Therefore, AI developers must have a wide perspective. Society prejudices should be taken into consideration. For example, an AI in the USA, called "Compass", developed for criminal risk assessment, classifies black people riskier, even if they commit fewer crimes than others. The reason lies in the history of USA: Since COMPAS or other criminal risk assessment tools are using historical criminal data and since black people involved many violent incidences during civil rights movements in the past, their risk scores (of being a potential criminal) seems higher than whites. But if stick into historical data though the generational

change, or if these criminal records still, dominate the data, and if you don't update data with improvements, progresses or behavioral changes, artificial intelligence would produce biased outputs. Or let's take Turkey: If we still think that men are better in mathematics or if we believe that men will do better computer engineering, our prejudices will resonate in artificial intelligence. The technical faults can be corrected, the data side may be improved, but if the bias of the main provider of data does not change, there will always be a glitch in the data set. Narrow artificial intelligence also reflects what he has learned from this biased perspective.

So you think a large data set should be built for detecting bias in Turkey? Why do you believe it is particularly important?

The USA has vast resources, so when AI is found to be socially biased, they can say, "We took necessary lessons" and put the app aside. But our resources are relatively limited in Turkey, so we have to put on target developing a bias-free artificial intelligence. So you can't make it up as you go along this time. Because it may be too late to notice any bias after building up an artificial intelligence which was believed to be bias-free. For instance, bias on Amazon's AI could be noticed a year later. They spent 6 months to fix it but still couldn't.

Biases that may have negative effects on artificial intelligence, I believe, should be cataloged in Turkey. Americans have obtained it by trial and error method. We do not have it, so we do have a comprehensive knowledge of bias that may impact on that artificial intelligence applications. Therefore, we need to conduct a detailed study here, even set some standards, and establish control mechanisms. If we do not do this, and instead, choose to import it from Europe or the USA, AI applications will always produce false results until

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we comprehend the culture and the habits of the people here. Errors would occur in school drafts, in online credit, or driving license applications.

Imposing regulation on AI is a worldwide debate. What are the reservations in this regard?

Regulations are for protecting both the individual rights and developers. They protect developers against any extortion of right on the process. But we do not know whether regulations would interfere the innovation, creativity, and skills. Because the regulations may hinder using critical data, I think a very detailed analysis should be done here. Yes, some data is very valuable and sensitive. And processing certain data may cause headaches. But in the global competition, one should keep in mind that someone is always ready to process such data. So I believe that multiple parties should be involved in formulating regulations.

The opinion of developers needs certainly to be taken into consideration since the intentions are especially decisive. Privacy is under legal protection in all around the world. Personal Data Protection Laws introduced in many countries, and others should follow them. However, every strict rule, imposed to remove any possible gray zone, brings along enormous drawbacks for the developers. For this reason, I believe, instead of being too strict, incidence / intent-based judgment should be preferred. After all, we are faced with an unknown and unpredictable phenomenon, at least for now. At this point, I believe that Federated Learning, which was presented in 2018 for the protection of personal data, will provide an important advantage. From the perspective of individuals, nobody would approve of the exploitation of personal data on their mobile phones. But from the entrepreneurship perspective, better services and products at a good profit margin can be obtained by processing that data. So I will either let the artificial intelligence world discover me end to end and sacrifice my privacy, or I will be exposed to decisions and services in a world where I kept myself out of the game. If federated learning can be taken into effect, both my rights and privacy may be protected while businesses can access rich resources.

“PROUD TO BE PIONEERING IN AIRPORT 5.0”

Following advances in artificial intelligence, outstanding start-ups emerge and draw attention in Turkey too. One of these innovative ventures, ArgosAI, develops artificial intelligence and image processing-based products for airport ground handling automation. CEO Ümit Yaşar Karadeniz opened up on his company’s services and shared his overview of AI start-ups in Turkey.

How did the story begin for ArgosAI?

ArgosAI is a technology company, worldwide pioneering in developing artificial intelligence and image processing based products for airport ground services automation. The company was established in METU Technopolis, Ankara in 2015 to develop solutions for “Foreign Object Debris” (FOD)*, one of the most significant challenges of the aviation industry. The initial idea was put forward by our founding partner Merih Alphan Karadeniz, who had witnessed in 2013, 50-60 soldiers carrying out FOD control before a test flight by wandering on the 3 kilometers runway of Hürkuş. He contemplated that that control could be automated with artificial intelligence and computer vision. We were already aware that FOD caused Concord accident in 2000, and though being an extremely critical issue for flight safety, those objects have had been controlling manually in all around the world. After finding out that FODs cost the aviation industry over $10 billion per year, we started to work as four founding partners in 2014 and founded the company in 2015.

How was your flagship product, the camera system A-FOD, that detects any article or substance on the runways at airports developed?

The A-FOD, developed by ArgosAI, is the first system in the global aviation industry detecting any substances on the runway in real-time, by using artificial intelligence-deep learning technology. Endeavored 3 years to perfect A-FOD in the detection of FODs, we also developed snow/ice detection, wildlife tracking, and on-track anomaly detection modules and added these features to the system. Last year, we also introduced the Apron Analytical, a brand new product that tracks the ground services on the apron. The Apron Analytical

system automatically tracks the arrival and departure of the aircraft, the movements of ground vehicles (such as the trunk car and push back), the refueling process, and the blowers. The system even checks if aircrafts' doors open out properly.

Did ArgosAI profit from the incentive opportunities in the entrepreneurial ecosystem?

Enjoying the unique status in the industry in Turkey, and being among few other companies at a global level, ArgosAI, in early business life, has been granted incentives of TUBITAK, Scientific and Technological Research Council of Turkey, and of KOSGEB, Small and Medium Industry Development Organization. Later, it became one of the few companies in the world that can detect any substance on the runways with artificial intelligence. ArgosAI, has also been granted incentives by Ankara Development Agency and the achieved to be 13th company granted by H2020 SMA Phase-1. Our A-FOD product is laureate of Turkey's most prestigious technology awards in 2018. ArgosAI approved to be a contractor of the Turkish Armed Forces in 2020. One advisory board member, who is also a shareholder, dedicated to moving ArgosAI forward to be an international company. Two are CEOs and CTOs in the US's most established technology companies, and the other is CEO of a rapidly growing company in Europe. The know-how they have and the network they have accessed have brought a huge impetus to ArgosAI.

How does the A-FOD system work?

Basically A-FOD is a system that understands what it actually sees as a human. We have developed, for that purpose, artificial intelligence-based algorithms using deep learning techniques and we have obtained a worldwide patent. The A-FOD identifies anything (Aircraft, people, vehicles, birds,

***FOD (Foreign Object Debris)** is any alien objects that are broken off from the fuselage of the aircraft during landing departures or that may occur on the runway for different reasons and cause damage to the aircraft. FOD has a wide range of materials, including aircraft hardware, asphalt parts, food supplies, building materials, rocks, sand, luggage parts, birds, and wildlife.

We have been developing artificial intelligence to ensure objectivity and fair conditions for all. And so the clientelism or nepotism can be avoided. In the end, if we will face the same problems, why are we developing artificial intelligence?

Figure 1: A FOD installed system representation

Figure 2: A-FOD Gazi Paşa Alanya

etc.) 7/24 and in any weather conditions, even in a highly dynamic environment such as runway and apron. It reports unwanted substances to the tower operators instantly. The system does not only detect objects but can also identify whether it is a screw, a piece of rubber, or a bird. A-FOD has two versions: A-FOD Runway and A-FOD Apron. A-FOD Runway analyzes images from cameras on the towers installed parallel to the runways. Installed in every 250 meters and located 170 meters away from the runway, the towers are 5 meters high. Depending on the length of the runway, 10 to 17 towers are connected to central computers with fiber optic cables. A-FOD Apron is installed on the existing gantry in the apron. The tower staff examines immediately when an alarm occurs, and if the detected FOD cast a risk to flight safety, the required action is performed through A-FOD. Teams on the ground can be oriented by A-FOD Mobile, a mobile application can be installed any portable device, and which locates FODs on the map. And therefore, the risks of flight safety would be eliminated as quickly as possible. (Figure 1)

At which airports A-FOD is in operation?

The earliest A-FOD Runway was installed at Alanya Gazipaşa International Airport in 2018. Started with Gazipaşa Airport, our product became ready to use at any point in the airport, with the capability of real-time deep learning processes, and this made A-FOD unique in the world. World's leading aviation groups, such as IAG and BA, sent experts to Alanya for carrying daylong tests, and A-FOD was approved to be very successful. Three of them told us that they had tested apron FOD detection tools of 15 companies all around the world but none of them has achieved satisfactory results. They were very happy with the capability of A-FOD. Trusting in

our team, they asked us to set up AI and deep learning-based A-FOD for aprons, one of the most complex work areas at the airports. Then, in 2019, we installed the A-FOD Apron at the London Heathrow Airport, an iconic brand in the global airport industry. This was the first automated FOD detection system installed on an apron in the world. Advised the success of A-FOD, London Gatwick Airport, the second busiest airport in the UK also got in touch with us and we completed the first installation in February 2020. We are currently in negotiations with different customers from Southeast Asia, Australia, the USA, the Gulf, and European markets (Figure 2).

Do you have domestic or international competitors in the field?

We have no domestic but 3 or 4 international competitors. They use microwave radar technologies instead of cameras as sensors. Radars are expensive and underperform compare to A-FOD. Radar is a more limited technology than an electro-optic system and it can generate numerous false alarms. Due to the low price-performance ratio, competitors' products are not very popular in the aviation industry, and were not adopted extensively in the market though many of them were introduced 10 years ago. While competitors only offer the FOD solution for runways, A-FOD is the only multifunctional system in the world that can provide superior service in all open areas of the airport, especially the runways and taxiways and the apron.

Can A-FOD or your similar products be used in any other ground except airports?

ArgosAI has been focused on the aviation industry since the foundation. However, requests from different industries are highly welcomed. One concrete example outside the aviation industry would be our ready to go projects for the Naval Forces. A-FOD technology can basically be adapted to many fields such as the defense industry, mining, textile, and manufacturing.

"While others still discussing Airport 4.0, we are one of the rare companies in the world that introduced Airport 5.0 as of 2020."

What are the basic economic benefits of A-FOD for airports or the aviation industry as a whole?

The most important benefit is the prevention of fatal accidents at airports. According to a significant study published in 2019, COD's direct and indirect damages cost more than 14 billion dollars every year. Factors including increasing air traffic and ongoing airport constructions are driving these numbers to new heights. As ArgosAI, our priorities are not limited to eliminating FOD-related damages at airports, but also crafting systems that can improve airport capabilities including efficient and dense slots letting more landing and take-offs. Global air traffic is estimated to be doubled by 2035. However, the number of airports and runways will not increase in the same ratio. For that reason, automation of ground operations

with artificial intelligence and image processing technologies will be imperative. With the automation, airports will be able to cope with the increasing air traffic, make ground operations more efficient, and ensure flight safety. While discussions are far from over on Airport 4.0, and very few examples have been in operation, I can say that we are one of the rare companies in the world that introduced Airport 5.0 as of 2020.

What is the cost of installing such a system for the airport?
A-FOD and Apron Analytical systems of ArgosAI can be installed in any required areas at the airports. It may be misleading to give a clear figure since scales differ from airport to airport in terms of length of runways, taxiways, or area of apron. I just want to state that; the return on investment (ROI) for a full capacity setup is between 1 and 1.5 years, considering the flight density at the airport and business activities of the stakeholders such as airlines and ground services. For a small comparison our international competitors ask for more than $ 5 million per runway. So A-FOD is much more advantageous in terms of cost and functionality.

Can you give me information about your team? How many people are employed in your company? What is the ratio of women and men?
The majority of our staff consists of engineers with a master's or doctorate degree. Our extended team exceeds 20 people, including 12 full-time employees, 3 advisory body members, and representatives. And as we are in a dynamic business environment and adding new customers, those numbers change every day. Females constitute 30 percent of the staff, and we would like to employ more women engineers competent with Computer Vision, Deep Learning technologies, and testing processes especially.

Are there any other artificial intelligence systems that ArgosAI is working on?
The entire airport ground service operations will most probably be automated in 20 years. And in this process, ArgosAI wants to be the world leader with the technologies it has developed based on image processing and artificial intelligence. So our tagline is "AI-based Airport Ground Services Automation". In 2020, we are focused on introducing ourselves and our excellent FOD detection system to further airport authorities. We are dedicated to improve and to extend the capabilities of Apron Analitik, which monitors the operations on the apron with video analysis, and we want to increase the number of its international users.

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What are ArgosAI's short term targets?
Our principal goal is to put A-FOD in operation (at least for test purposes) at 20 busiest airports in the world, especially at major airports in our country.

What is the future of image processing technology for your opinion?
Image processing technologies are developing rapidly in parallel with the improvements in artificial intelligence and big data, the spread of mobile devices such as mobile phones, and the increase in the performance of graphic processors. I believe that the application of automation solutions based on image processing and artificial intelligence will be increased in the future, especially in essential industries such as the defense industry, aviation, manufacturing, and security. Thanks to these solutions, currently manually done tasks will be carried out flawlessly at much lower costs. Research and development efforts in image processing and artificial intelligence are intensified in all around the world. I think a revolution has already started and we are on the brink of a new era that artificial intelligence will change from the production and consumption processes in all industries to the entire life.

How do you comment on the progress of AI start-ups in Turkey?
There is a great interest in artificial intelligence in our country. Artificial intelligence is always mentioned in every technology event. I hope this interest will result in significant initiatives in the future. Fortunately there are already local AI Start-ups who could succeed in turning their work into a product and have many customers, but they are not numerous. Turkey has competitive advantages in a number of industries, including construction, tourism, defense, banking, aviation, and telecommunication, and I believe that Turkish AI companies developing artificial intelligence solutions for these key industries will be also successful in the global markets.

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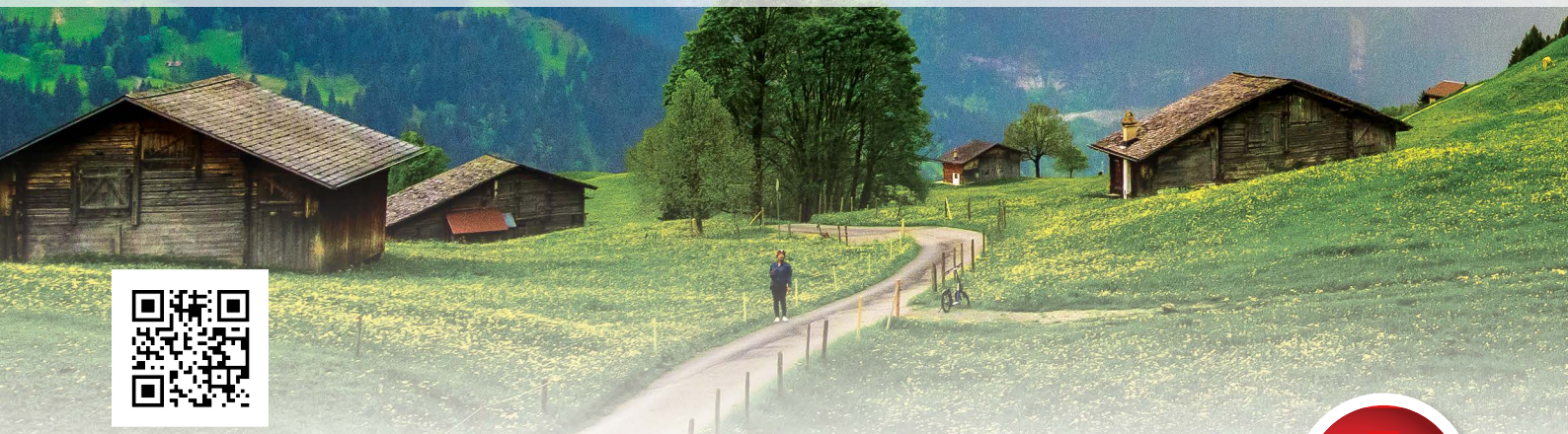

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