

Realizing the Popularization of AI: Automated Machine Learning (AutoML)

Written by Kim Jonghyun, CEO of WISEiTECH

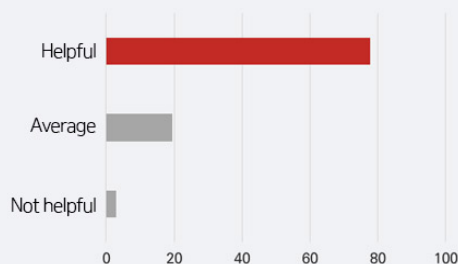
Entry barriers

The Need for AI and Barriers to Entry in the Digital Age

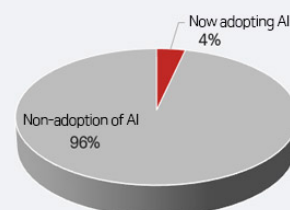
AI is already changing in a direction that affects the entirety of human life. Industries such as manufacturing, education, energy, media, and finance are using AI technology in many ways, such as for developing differentiated services, automating repetitive tasks, and reducing existing costs by using its data for important decision-making.

However, according to the Corporate Awareness and Status Survey on AI conducted by the Korea Development Institute (KDI) in 2020, 77.8% of companies responded that the introduction of AI technology helped their in management and performance, while only 3.6% of the survey participants replied that they had adopted AI technology. Although AI technology has a positive effect on companies, it can be seen that AI technology is being introduced mainly by large enterprises equipped with capital and infrastructure.

The degree to which the introduction of AI technology helps management and performance.



AI technology adopted and in use



Source: KDI, Corporate Awareness and Status Survey on AI

This phenomenon is believed to be due to a lack of manpower to develop and operate AI models. Currently, in order to create AI-based business models, companies need data scientists who will perform each step from data preparation to initial model creation. Because it requires a high level of knowledge and understanding of domains, data, and business, there is a shortage of human resources compared to the needs of companies.

Appearance

Automated Machine Learning (AutoML) to Accelerate the Spread of AI

However, through the advancement and dissemination of automated machine learning (AutoML) technology, systems can take over the role of data scientists, thereby solving the manpower problem and accelerating the adoption of AI in companies.

Automated machine learning refers to automating the time-consuming and repetitive tasks of developing AI models. By systematizing the steps of data collection and processing, machine learning model development, operation, and model optimization, cumbersome coding work can be eliminated and the process can be performed with just a mouse click.

In particular, AutoML automatically extracts important features from the model and provides hyperparameter optimization, so users who have expertise in the business domain but lack knowledge about data and algorithms can easily utilize AI.

The concept of machine learning was born in 1959 when IBM computer engineer Arthur Samuel defined it as "a field of study that gives computers the ability to learn without an explicit program." After a long period of stagnant status, it developed remarkably in the mid-2000s. Google's TensorFlow and AlphaGo are examples of this. Gartner cited AI automation-enabled technologies in its report, "Hype Cycle of Emerging Technologies for 2022." Global companies such as Microsoft and Amazon are also doing their best in the AutoML market.

Versatility and Ease of Model Development for All Industrial Fields

The biggest advantage of automated machine learning is that it has versatility and ease of development, not being a technology limited to a specific industry. Using our AutoML platform, WiseProphet, we also developed over 30 AI models, including water quality prediction, parts demand prediction, curriculum recommendation, and civil complaint consultation guidance.

Among them, water quality prediction is a model that predicts the quality of effluent water by learning various data collected from a sewage treatment plant and inputting inflow water quality and water treatment process data. It is possible to overcome the limitations of the existent water quality monitoring, conducted directly by humans, to manage an optimized sewage treatment process.



Figure 1. Customized Learning Path for AI-Based Education Recommendation Services Operated by the Korea Education and Research Information Service

There is also a personalized learning recommendation service. It recommends necessary lectures to learners by using data such as the learner's learning status and level, mock test scores, and content preference. It also provides specialized functions for employment. It provides a roadmap for employment and supports self-directed career development by utilizing the activity history of graduates with similar interests and a list of completed lectures.

Popularization of AI Through No-Code-Based Automated Machine Learning (AutoML)

Since automated machine-learning is a product that allows users to analyze and visualize data without coding and with only a click of a mouse, it is possible to implement AI even if you are not good at coding, such as Python, and do not fully understand algorithm principles, such as random forest or CNN.

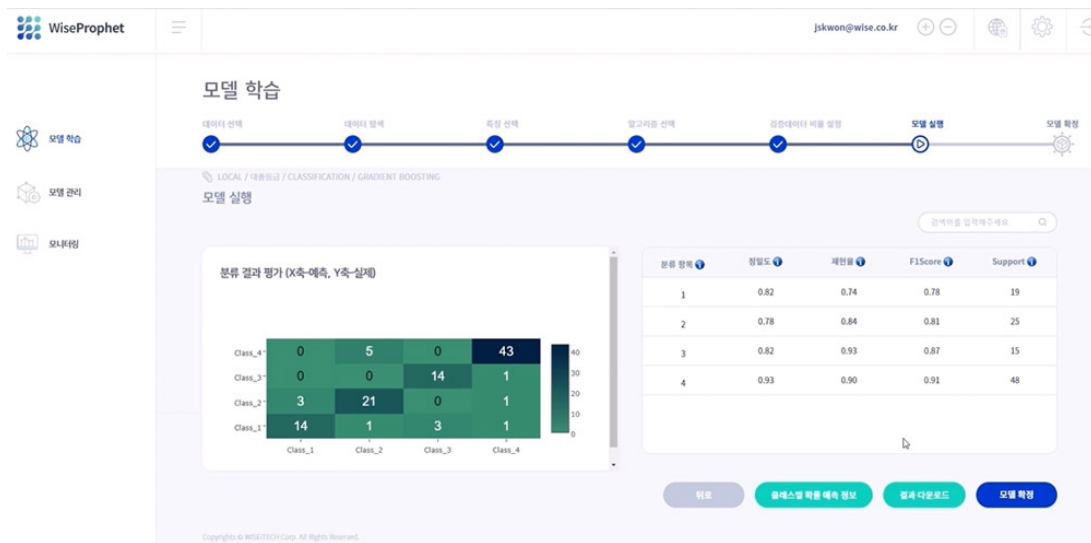


Figure 2. WiseProphet, a Click-Based Automated Machine Learning Platform

In the era of the Fourth Industrial Revolution, the era of digital transformation, and of digital platform government promoted by the current government of Korea, the most important keywords will be “data analysis” and “prediction.” In particular, as the government has been actively promoting, over the past few years, data-based policy planning and decision-making, such as the basic plan for activating data-based administration and the Data 3 Act, Korea is now in the era of AI and big data.

However, securing the ability to handle all these steps on their own is a huge challenge. Automated machine-learning is going to be a very useful and important best solution at this point in that it can help anyone, even non-data scientists, access and utilize AI without coding.



ICT STATION

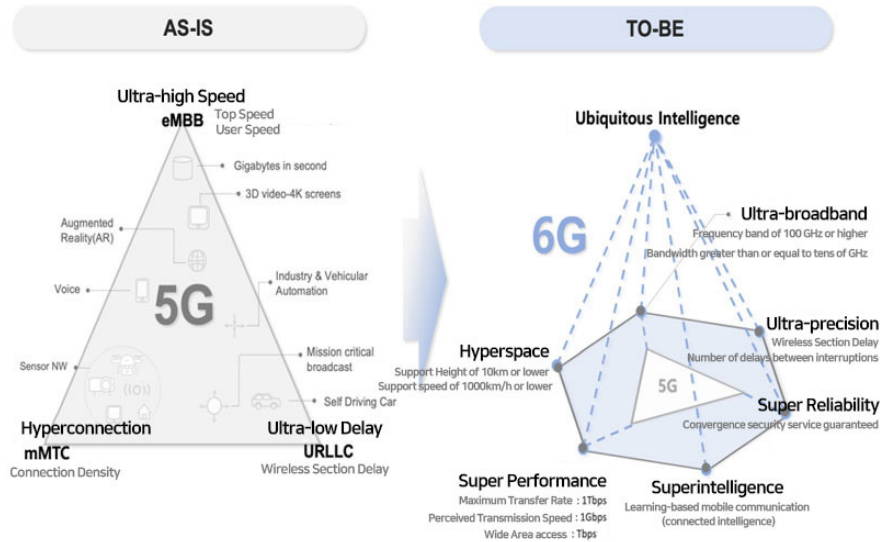
The Key of Next-Generation Communications Technology: Machine Learning

In order to secure the competitiveness of the sixth generation (6G) mobile communication, it was argued that in-depth discussions and related research in the field of machine learning should be actively conducted. Professor Jeffrey Andrews Austin, a professor at the University of Texas and head of the 6G field at 6G@UT, the first 6G research center in North America, argues that "machine learning and networks are the key in 6G" and he stressed that "machine learning theory has developed organically with many closely related signal processing and optimization tools used in the wireless field."

Machine Learning Realizes Functions Such as Human Learning Ability on a Computer

Machine learning is a field of artificial intelligence within computer science that has evolved from the study of pattern recognition and computer learning theory. Machine learning is a technology that studies and builds algorithms and systems that learn based on empirical data, makes predictions, and improves its own performance. Machine learning algorithms do not execute strictly set static program instructions, but rather build a specific model to make predictions or decisions based on input data. Expectations are high on how artificial intelligence will change human life in the future.

Machine Learning and the Key Infrastructure of the New Digital World: Meet 6G



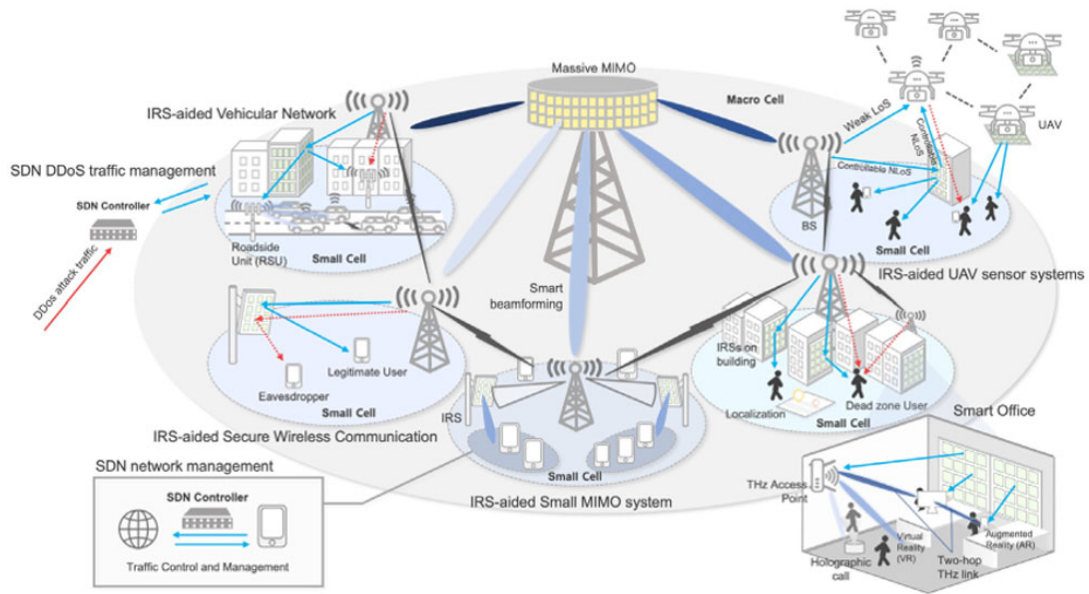
<Sources> Ministry of Science and ICT. Future Mobile Communication R&D Promotion Strategies to Lead the 6G Era (Draft), 2020.

SEP Inside, Standard Essential Patent Magazine. Next-Generation Mobile Communication (6G), No. 30, p. 9, 2020.

5G communication technology is evolving into 6G, which can optimize service quality and resource use efficiency by learning the network environment on its own. 6G provides services such as super-reliability and ultra-precision, super-performance such as 5-sensory holographic communication, hyperspace such as Gbps-class realistic video or air/marine communication, ultra-precision positioning such as within a positioning error of 10 cm, and hyper-connection between humans or machines. It is attracting attention as it will become the core infrastructure of the new digital world. However, if the number of terminals using artificial intelligence increases exponentially in the future and new types of large-capacity and large-scale connection services increase, it is predicted that it will be difficult to make the most of limited wireless communication resources with existing methods. Also, theoretically, even a method that can achieve the highest performance has problems such as a complicated implementation methods, weighting of calculations, and time delay. Recently emerging is wireless communication technology using machine learning that is suitable for solving these problems and optimizing resources. The application of machine learning to optimize the efficiency of network performance and resource utilization has made it possible to build intelligent networks, and advances in machine learning frameworks have made it possible to process large amounts of data quickly and accurately. In addition, machine learning is being researched and developed as a tool for efficient network operation and management.

Trends in Next-Generation Communication Research Based on Machine Learning

Next-generation communication element technology is being studied in a manner that incorporates machine learning to improve high efficiency, high reliability, and high capacity.



<Source> Written by Sungshin Women's University. Smart Office, IRS-Aided Small MIMO System.
Referenced sections 10 and 12, image reprocessed.

SDN (software-defined networking) refers to a method of controlling and managing network traffic in a software-based controller using an open application programming interface (API) that can efficiently allocate or manage network resources. Massive MIMO is a technology that simultaneously services multiple user equipment (UE) in time and frequency resources based on spatial division multiple access (SDMA), and intelligent MIMO achieves channel state information (CSI) with high accuracy to achieve optimal network performance. In addition, due to the improved coverage area and service quality of the machine learning-based IRS (intelligent reflecting surface), communication services using intelligent UAVs (unmanned aerial vehicles), surreal virtual services, etc. are expected to be distributed throughout daily life and industry.

Problems and Limitations Faced by Intelligent Next-Generation Communication Technologies

Technology up to 5G has been standardized and researched in terms of improving communication performance such as coverage and data speed, and the next-generation wireless communication network that combines machine learning has two major limitations as follows.

1. Ultra-Low Delay and Real-Time Performance

Existing 5G technology aims to achieve ultra-low delay, ultra-high bandwidth, and ultra-precise performance goals by reducing the delay time of the wireless section to a maximum of 1 ms.

However, next-generation communication technology finds it difficult to meet the delay requirements for each application due to the introduction of machine learning. In addition, a machine learning-based system beyond the limited processing power of the BS (base station) or UE apparatus causes memory and energy resource consumption problems in the device, and does not achieve the performance requirements of applications requiring strict real-time. Therefore, research on machine learning-based communication technology to achieve ultra-low delay and real-time performance should be conducted.

2. Feasibility and Commercialization

It is necessary to verify the performance of whether the essential components for implementing an intelligent wireless communication system based on machine learning can be applied to conventional commercial networks and devices. The limited computing power and memory of the actual network environment have limitations in realizing data collection and sophisticated learning in existing machine learning in the physical level, which requires a large capacity. In addition, there is a difference between the simulation setting and the real environment to verify the performance of the machine learning-based solution, so it is necessary to demonstrate applicability. It is believed that performance evaluation in realistic device and network environments for next-generation wireless communication research based on machine learning can be performed to determine whether the reliability and performance goals of next-generation communication element technologies are achievable.

A Prerequisite for 6G Realization!

Machine Learning-Based Communication Technology Research and Development

It would be no exaggeration to say that the key to using characteristics such as super-performance and hyperspace as the basis for innovation lies in the development of artificial intelligence-based communication technology. For the future of 6G mobile communication to change the paradigm of the wireless communication technology that we are currently experiencing, it must be preceded by research and development on machine learning-based next-generation communication technology that meets low-cost, lightweight, and real-time requirements.

Reference

- Weekly ICT Trends, No. 2034 

People in ICT

"I want to be someone that others
always want to work with."

Interview | Noh Sook-jin, 42Maru Data and Product Team Manager



Explaining artificial intelligence (AI) is still challenging for many people, but not for AlphaGo. After AlphaGo, an AI Go [baduk] program created by Google, the interest in AI has increased, the business has grown, and related jobs have also increased.

Manager Noh Sook-jin says that he would like to see more interest in the many roles required to connect AI technology with real services. Let's hear the story of manager Noh, a data scientist at 42Maru who has entered his fifth year as an AI worker.

Q

Hello, please introduce yourself to our readers.

Hello. my name is Noh Sook-jin. I'm a manager who works as a data scientist on the 42Maru's Data and Product Team. This is my fifth year since I joined the company.



What are you in charge of in your company?

I am part of the Data and Product Team, so I work on analyzing and managing the data needed to train models and create services, and I plan the created technology as a product to develop a solution or service. I am in charge of the overall work related to products.



What is the current focus of your work?

So far, we have created solutions tailored to the needs of the project, but now we are concentrating on upgrading to high-quality solutions based on our experience and market response.



Were you interested in this field even before getting the job?

Actually, I had no interest in this field at all before getting the job. I was only exposed to artificial intelligence-related information in school classes. I happened to see a job posting for 42Maru, and the phrase "QA (Question Answering) for finding one true answer" was interesting (I didn't even know what it meant at the time), so I applied.



Could you tell us the top three prides of your company?

These days, many companies use the nickname system as a trend, and it actually helps a lot with the horizontal culture. There is a feeling that being horizontal is equal to each other, but I think we can respect each other more. Also, there is an organization called the Corporate Culture VTF. These days, one-day classes are held on various topics, and there are various meetings, so it is nice to have the opportunity to meet other team members who we are not familiar with.



Q

What is the most memorable accomplishment that you have had at work?

One of the important things when creating artificial intelligence services is how well you can analyze data and melt its value and usefulness. It's also the very first thing to do. There was a difficult case in which the amount of data was too great and there were many different types of data. However, the results came out in the way the customer wanted within the desired time and in the way they wanted, and I was proud when they were satisfied with the results.

Q

What kind of employee are you in the company, or what kind of employee do you want to be?

Most of the work is done on a project basis. Sometimes, I lead a project, sometimes I assist my team members. I want to be someone that others always want to work with.

Q

How did you prepare for employment?

I didn't really do anything that could be called job preparation. I think it's important to develop a self-development attitude, regardless of your field of study or hobbies, so that you can start without hesitation when you have something you want to do.

Q

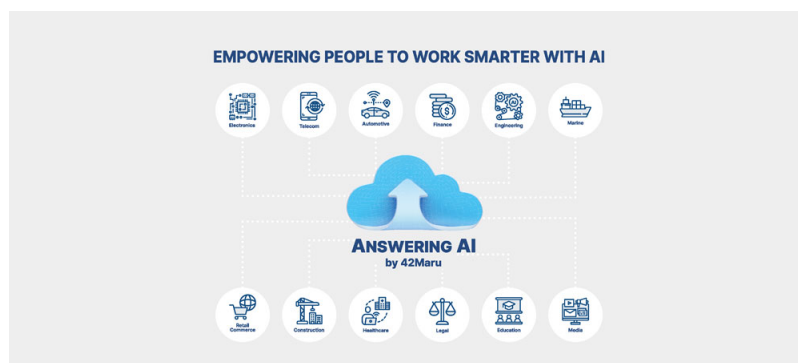
What do you think is the most necessary point in working for a company?

I think it is the ability to find problems. As it is a new field, unexpected problems often occur. It is important to break down the problem from various angles and to find out what the cause is. Fixing is simple once you find the cause.

Q

What are your future goals?

The company is very busy right now, so the goal is to finish the project as soon as possible and go on a refreshing vacation in fall. (If you have worked for three years, you will be given two weeks of vacation!)



Q

Any messages to our ICT Industry Hot Clips readers?

While designing products, I realized that a very important role of a planner is to connect AI technology with actual services. Even if you are not a developer in this field, I hope you will grow more interest in various roles.

ZOOM IN - I

Move Toward the World with Social Value AI Deep Learning Vested with Speech

LIONROCKET, INC. CEO Jeong Seung-hwan



LIONROCKET, INC.

General Status

- **Implementing Agency**
National IT Promotion Agency
- **Business Details**
Building up intelligent information industry infrastructure

Company Status

- **CEO**
Jeong Seung-hwan
- **Business Type**
Software development and supply
- **Year of Establishment**
2019. 3.
- **Homepage**
<https://lionrocket.ai/>

Key Accomplishments

Commercialized globally scarce AI deep learning-based speech and video creation technology.

Digital transformation of video content manufacturing mode including AI bankers and AI announcers.

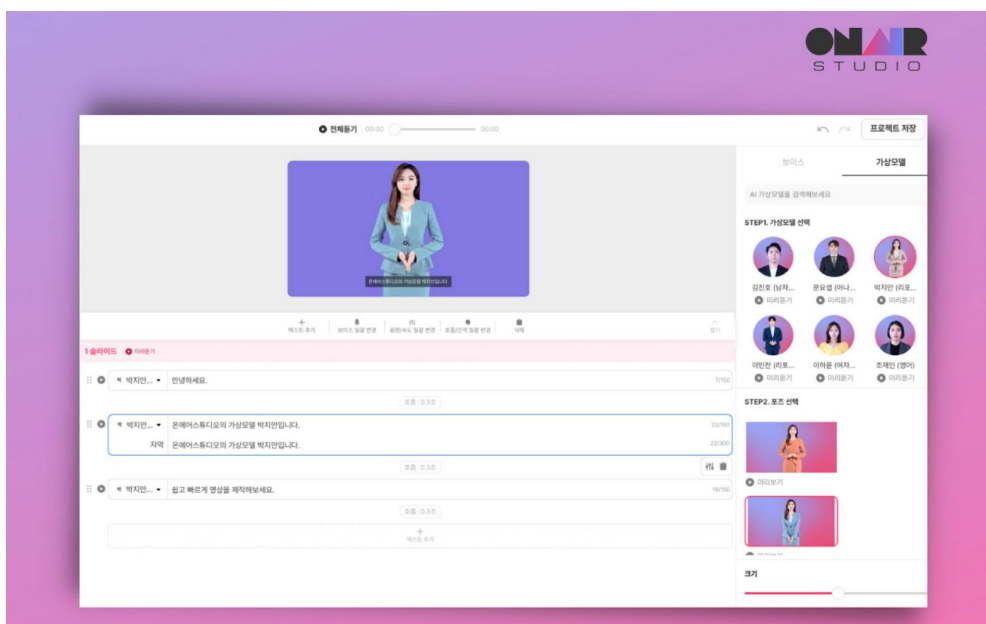
Created over 30 jobs for the youth within three years of establishing a startup as a student.

AI Deep Learning-based Speech Creation Technology Development

LionRocket is a startup to lead the content market paradigm shift through the AI deep learning-based creation technology. Anyone can make his/her desired speech and videos by simply inputting texts, overcoming the existing TTS (text to speech) service limitations, and combining STV (speech to video).

The background of LionRocket can be traced to an audio book project of three university students who met in a startup club when they planned the project for visually impaired people. It seemed lamentable that many books in a library were useless to the visually impaired people. However, too much time and cost are required for audio books production for visually impaired people. LionRocket researched and developed an AI deep learning-based speech creation technology as a solution to overcome it.

The company has matchless technology in the natural lip-shape video creation area. With a small amount of data with 30-min duration, AI model and speech actor/actress actualization as if a real person is talking is possible; hence the high usability in the commercial market. The company is additionally preparing a technology for emotion acting as seen in an audio drama, which is gaining attention. If this function is realized, the virtual AI person expressing limited emotions of humans can be expected to be improved to the level of expressing human's various emotions.



AI Human made with AI Speech and Characters

LionRocket has an ambition of leading the industry covering the B2B and B2C markets with AI deep learning-based speech and video synthesizing technology. If texts are inputted using LionRocket's speech and video synthesizing technology, the content can be made as video content wherein a person or a character speaks with the desired voice. Due to the diverse industrial areas requiring video content production, collaboration with the relevant companies for foreign language conversation education app, financial and public institutions' contactless guide service, advertising marketing, kiosk, and online video lectures is underway.

LionRocket's speech creation technology has achieved the industry's top benchmarking in speech (voice) similarity, creation speed, and AI model learning efficiency by combining state-of-the-art deep learning. With a relatively small amount of data, AI voice and character can be produced. Non-existing, attractive-looking AI human is also offered using facial recognition technology. Through this, LionRocket is currently servicing On Air Studio by which an AI human version of myself can be produced and video content-producing technology can be used.

ICT Technology's Achievements Using AI Voice Synthesizing Technology

Participating in the NIPA-organized AI voucher support project, LionRocket has made efforts to vitalize the industry by developing new market areas with outstanding deep learning speech and video creation technology and proving that AI is a technology benefiting the world. The company actively produced and diffused voice substitute materials for visually impaired people such as the 2021 culture and arts information journal BF for visually impaired people and national substitute material sharing system "Dream." LionRocket also proved that ICT technology can contribute to society by using AI voice synthesizing technology including drug marking for hearing-impaired people as well as official Braille gazette for election.

LionRocket has secured stable sales through the AI voucher support project, employed excellent youth human resources, and expanded the business area. During the project period, 17 young people were newly employed, and jobs consisting of IT area and promising futuristic occupation types such as AI researchers and data scientists were created; hence the company's outstanding achievements in job creation.

LionRocket was selected as an outstanding job creation company by NIPA and given an SMEs and Startups Minister's Commendation in the young entrepreneur category for meritorious deed of venture business startups. LionRocket was able to attract KRW 6.5 billion worth of Series A investment from 5 investment firms in December 2021, thanks to the high evaluation of possibility of AI speech and video synthesizing solution.



Desired Entry into Global Markets Through Outstanding Technological Competence and Services

LionRocket started to show positive changes in all areas including team size, securing HR, technology maturity, and new investment attraction through the ICT fund project. The onboarding process for newly joining team members was established, and a new in-house culture such as All Hands Meeting and Communication Day for communication due to the increase of team members has been in place.

LionRocket plans to develop new services in more areas that can use the AI speech and video creation technology so that anyone can use them. The company promises to strive to become a company that presents the sensation of immersion and happiness that people have never experienced through AI technology along with the existing On Air Studio service. Here is a message of support for the future of LionRocket, which wishes to enter the global markets through excellent technological competence and services.

TIME LINE

- 
- 2019. 03.**
Established LionRocket, Inc.
 - 2019. 08.**
Attracted seed investment (MeshUp Angels), TIPS selected
 - 2019. 11.**
Won first place at the KDB Startup Competition
 - 2020. 04.**
Adopted AI caster for MBC general election ballot count broadcasting
 - 2020. 09.**
Lee Byung-hun and Han Ji-min AI TTS produced and donated to the Cultural Heritage Administration
 - 2020. 10.**
Attracted Pre-A investment (Kiwoom, T Investment)
 - 2021. 05.**
Selected as one of the 2021 Forbes 30 Under 30 in Asia
 - 2021. 08.**
Selected as one of the UK Futurology.life top Korean machine learning startups 101
 - 2021. 11.**
Chosen as a Korean regional panel for 2021 GTC (NVIDIA Global Conference)
 - 2021. 12.**
Attracted Series A Investment (KRW 6.5 billion)

ZOOM IN - II

A Strong Firm in the VR Interactive Market Grows into a Content Platform Company

BARUNSON CO., LTD. CEO Kang Shin-beom

Barunson

BARUNSON CO., LTD.

General Status

- **Implementing Agency**
Korea Internet & Security Agency
- **Business Details**
Laying the foundation for blockchain utilization

Company Status

- **CEO**
Kang Shin-beom
- **Business Type**
Movie production, game software development and supply
- **Year of Establishment**
1985.
- **Homepage**
<https://www.barunson.co.kr/>

Key Accomplishments

VR interactive content production and distribution using 5G-based network
Distribution of contents through VR and blockchain solutions domestically and internationally
Construction of a win-win eco-system through discovery of new directors and creators

Technological Capabilities Actualizing 4K at Low Specification

A familiar name in stationery and fancy goods, Barunson is a major brand for small goods in Korea. It's now transitioning as an expert content platform company poised to lead the trend in the industry. Barunson is making quite a contribution to Korea's cultural content ecosystem in digital culture content manufacture, investment, and distribution by opening a new chapter in the digital cultural contents, which include movies and games.

The competitiveness of Barunson as a digital cultural company is its differentiated content that incorporates the cutting-edge new technology, VR. The company has developed its own player to diffuse VR cinema genre since 2016; has enabled 4K movie / video to smoothly play with low specification devices; and has developed and operated 8K hyper- picture quality realizing technology through upscale technology using deep learning.

Barunson is establishing a goal to have VR market's exclusive status, while steadily accumulating expertise depending on metaverse trend. Particularly, as the only expert Korean VR content distributor, Barunson is attracting attention from domestic and foreign customers keen to do market expansion. The company is steadily planning new contents with VR features based on its knowledge and experience, producing many feature films using the VR technology. Therefore, the market share of Barunson is projected to be more visible, and a new value is slated to be created through blockchain.

360° Cutting-edge VR Meets 5G



Barunson is preparing for an interactive mode of VR movie "The Horizon" through overseas co-production to preemptively respond to a new market. To develop a new market, higher quality color contents are necessary, but it is difficult to expect enough sales because the market is not developed yet. Consequently, Barunson has actively participated in the ICT Fund project, since the company thought fund procurement is needed for corporate growth.

Barunson signed an agreement with an interactive content distributor, namely Wales Interactive, through the participation in the ICT Fund project, and is preparing for screening in general cinemas. The company is setting its goals on presenting original VR version to various film festivals.

Catching Two Birds with One Stone: Production and Development with the ICT Fund

Barunson saw an opportunity to take off in quality and quantity through participation in the ICT Fund project. As for VR interactive movie, the movie and game parts need to be all combined in the production process. However, most producers had limitations in simultaneously carrying out the two things in reality. That being said, Barunson can produce high quality contents by smoothly performing collaboration between its movie production team and game development team through the ICT Fund.

What is remarkable is its qualitative development. The richness of interactive modes and completeness in the VFX field has been enhanced compared to before, which is gaining attention in overseas markets. By resolving the existing VR content's weakness like high price and short play time, a good response is expected to be received from users. Barunson confidently says that it can operate business more enterprisingly by participating in the ICT Fund project.

ICT Fund Helps Barunson Challenge the Blue Ocean




Barunson plans to share the achievement –player solution and interactive tool - obtained through the ICT Fund project with general producers. The company decided to share the expertise so that digital content manufacturers, developers, and general movie producers can actively use the tool developed by Barunson. This seems to become a model case that an ICT Fund-benefited company diffuses the benefit to other genre of industry in addition to VR.

Barunson is determined to strive to develop new markets. The company plans blockchain-linked new business in addition to VR and interactive mode, and is also scheduled to devote itself to the technology development. Barunson plans to continuously produce contents, expecting the VR and interactive market to continually expand. The company regards blockchain as a new business sector, and the company is coming up with the blockchain technology and service that can give a positive change to the market.

The company plans to make it an opportunity to take off through blockchain in the content market as well as growth of services developed through blockchain regulatory-free zone linkage business supported by KISA. Although Barunson frequently missed investment timing due to difficulty in raising funds, despite sufficient technological capabilities, the ICT Fund has become an opportunity for Barunson to regain confidence and challenging spirits. Barunson's performance in the VR content market and blockchain area is expected.

TIME LINE

- 
- 1985.**
Established Barunson Co., Ltd.
 - 1994.**
Listed on KOSDAQ
 - 2005.**
Launched Barunson Movie Production Department
 - 2007.**
Produced a movie Hansel and Gretel (Won Best Film Award at the the Fantasporto International Film Festival)
 - 2008.**
Produced a movie The Good, the Bad, the Weird (Won the Best Film Award at the Blue Dragon Film Awards)
 - 2009.**
Produced a movie Mother (Invited to the 62nd Cannes Film Festival. Received the Best Film Award at the Blue Dragon Film Awards)
 - 2010.**
Produced a movie The Servant (Won the Best Costume Design Award at the 47th Daejong Film Awards)
 - 2014.**
Produced a movie Coin Locker Girl (Invited to the 68th Cannes Film Festival. Awarded the Best New Director Award at the 52nd Baeksang Arts Awards)
 - 2016.**
Launched Barunson VR Game Business Division Launched VR theme park "VR Park"
 - 2017.**
Operated VR Cinema in Busan International Film Festival at the 22nd BIFF (2017~2019)
 - 2018.**
Organized KT Link on Award (VR games and movies)
 - 2019.**
Invested in the movie Parasite Set up Barunson Beauty Business Division



2020.

VR movie Attack on Daddy was invited to the 19th Tribeca Film Festival, the 73rd Cannes Film Festival, and received Nexon Computer Museum SKT Jump VR Award

2021.

Produced a VR interactive movie "The Horizon" supported by the Korea Communications Agency Launched a blockchain OTT platform "Rofler" and a blockchain fund management tool "Cradle" supported by the Korea Internet & Security Agency

Advancement of AI Sleep Technology through Construction of Sleep Datasets and Algorithms

OUAR LAB INC. CEO Shin Hyun-woo



OUAR LAB INC.

General Status

- **Implementing Agency**
National Information Society Agency
- **Business Details**
Building up intelligent information industry infrastructure

Company Status

- **CEO**
Shin Hyun-woo
- **Business Type**
Health care
- **Year of Establishment**
2018. 4.
- **Homepage**
<http://ouarlab.com/>

Key Accomplishments

Secured a source technology to construct good quality sleep datasets that can be used throughout the sleep industry and to additionally expand datasets.

Developed AI algorithms applicable to sleep disease medical devices such as a mandibular device and continuous positive airway pressure (CPAP) using the constructed sleep dataset.

Developed AI algorithms predicting abnormal behaviors during sleep using an infrared sleep video dataset.

Spearheading Polysomnography (PSG) Data Construction




Sleep occupies up to 1/3 of human life span and is an important factor playing an essential role in maintaining a healthy life. Polysomnography (PSG) is intended to measure sleep quality and detect sleep disease or disorder. OUaR LaB has experienced first-hand the importance of diverse biometrics, developing new conceptual medical devices collecting and using bio- signals, and knows well the need of PSG sophisticatedly measured by various medical institutions.

However, PSGdata is medical data collected from hospitals, and it is difficult to access it because personal information is included and it is time and cost-consuming to construct the dataset. Notably, it is difficult to find open examples in foreign countries, since atypia is very strong unlike general data.


In this situation, state-level support was necessary to construct large-scale sleep data. Coincidentally, an infrared sleep video data construction support project was proposed for sleep quality data and sleep disorder diagnosis as part of the Digital New Deal, from which, plenty of support was offered and cooperation with other research centers can be promoted, so OUaR LaB has applied for the ICT Fund project, since this is viewed as an essential project.

Development of the World's First Sleep Posture Sensitive CPAP, Oxleep™

적외선 수면 영상




MP4 파일



MP4 파일

얼굴, 문신 등 개인을 식별할 수 있는 부분 비식별화



비식별화

어노테이션 파일

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: 검사에 대한 기본 정보

Report
: 검사 결과 요약

Video Info
: 비디오의 시간 동기화 정보

Event
: 판독된 수면 관련 이벤트 레이블

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OuAR LaB is a startup for sleep healthcare. The firm researches algorithms for sleep field diagnosis and treatment, and develops new medical devices. Our company successfully received industry approval of the world's first sleep posture sensitive CPAP that we developed, called TM, from the Ministry of Food and Drug Safety (MFDS), and is currently in the process of U.S. FDA approval. OuAR LaB CEO, Professor Shin Hyun-woo, has treated many sleep apnea syndrome patients when working as a professor of Otolaryngology at Seoul National University. Meanwhile, he established a startup to supplement the shortcomings that existing sleep apnea syndrome treatment instruments have.

The Oxleep™ is a treatment instrument for snoring/sleep apnea syndrome, and includes the technology to store and analyze sleep postures, use duration, and movements. Our company has been developing diverse technologies to collect and analyze a range of biometrics including the sleep quality (or sleep phase). In the process of developing our products, we understand the need and importance of various bio-signals and readable data related to sleep. Thus, OuAR LaB participated in the ICT Fund project in 2020 and 2021, performing the sleep quality data construction project and the infrared sleep video data construction project, respectively, for sleep disorder diagnoses. Consequently, our company has emerged anew as a sleep big data-specialized company that has established the world's largest scale sleep field AI learning dataset. Using the outcomes from these two separate projects, OuAR LaB is committed to developing medical devices and healthcare instruments based on sleep big data and providing solutions for overall sleep-related problems.

Construction of Sleep Video Data Set and Development of Sleep Disorder Reading/ Deciphering AI Model

OUaR LaB managed and supervised the infrared sleep video data construction project in the infrared sleep video and voice data project using AI technology of the ICT Fund project in 2021. If a patient's sleep disorder can be diagnosed with only infrared sleep video, examinations can be undertaken without using a contact sensor, while development can be performed in a direction of remote examination. Therefore sleep on a daily basis can be monitored for long periods of time.

OUaR LaB has developed an AI model that can automatically identify patient's sleep status by constructing an infrared sleep video dataset through the project. As a result, 1,000 level 1 PSG results and the synchronized video dataset of 6,950 hours of infrared sleep were constructed. Consequently, the foundation was formed to develop an AI model that can diagnose basic sleep disorders with only infrared sleep video footages and automatically read or decipher them. The sleep status evaluation AI model is expected to produce a ripple effect, shifting to a new paradigm at the forefront of the healthcare industry. Notably, in a situation where demand for more remote and non-face-to-face healthcare is rapidly increasing due to an aging society and COVID-19, the technology through which continuous monitoring of sleep status is possible using infrared sleep video platforms is forecasted to gain more traction at home and in convalescent hospitals. In tandem with quickly developing wearable devices and IoT technology, the popularization of contactless sleep status monitoring and digital treatment drugs are predicted to be readily available.

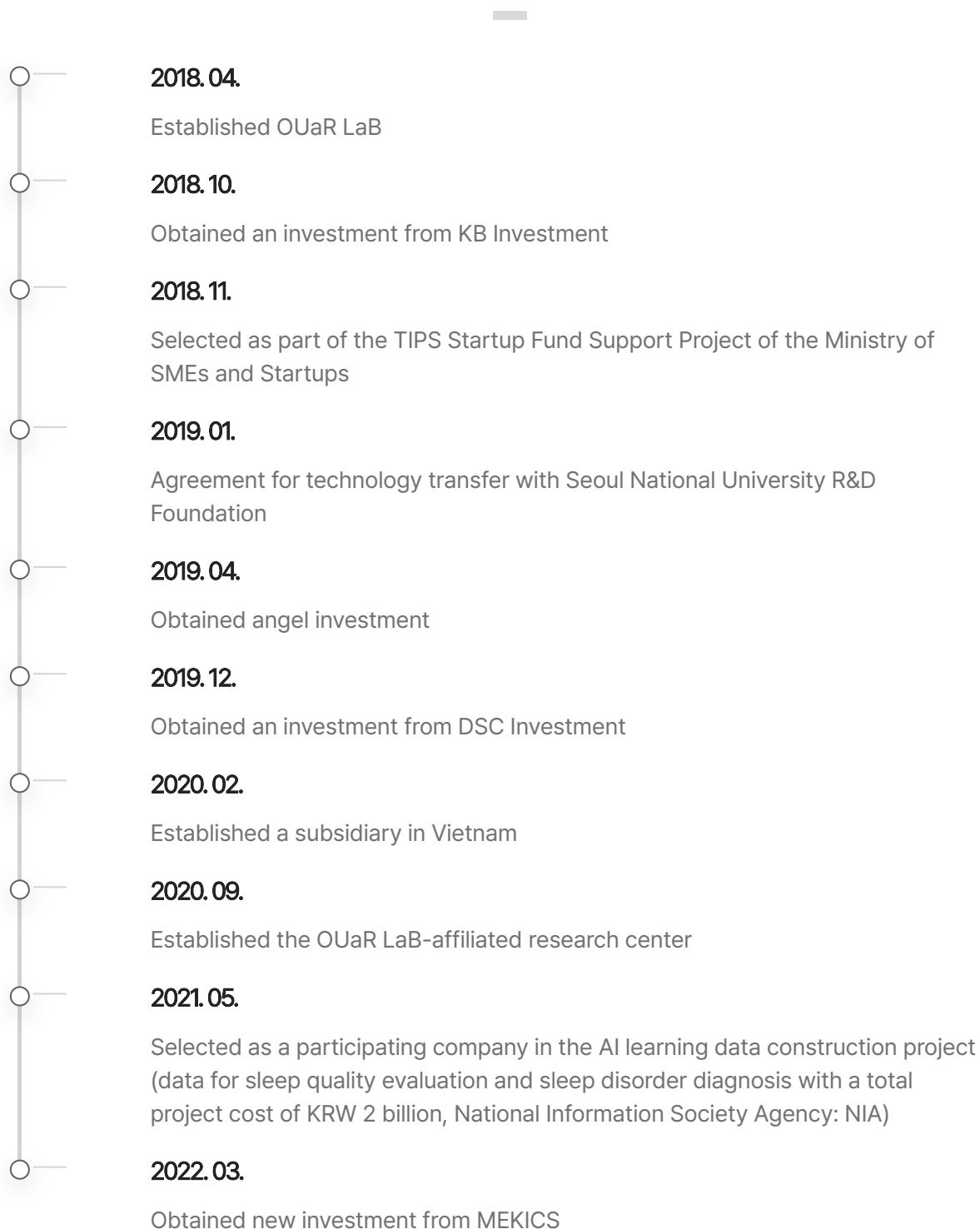
Massive Usability of PSG Data Set Created with the Support of the ICT Fund Support



The PSG bio-signal dataset of over 10,000 cases constructed in 2020 and the infrared sleep video dataset constructed in 2021 with the support from the ICT Fund project are the world's largest PSG datasets, and their utility is enormous, along with their prospects of greatly contributing to recently-hailed sleep technology development. OUaR LaB is focusing on AI algorithm development that can be applied to medical devices for sleep disease using the constructed sleep datasets. The company obtained an investment from MEKICS, Korea's only CPAP developer, owing to the sleep quality dataset constructed in 2020, and is performing a project improving CPAP actuator algorithms.

Our company plans to present papers showing the excellence of algorithms drawn on the basis of the world's largest PSG dataset and the world's first sleep infrared video dataset made in collaboration with SNU Hospital medical personnel, numerous sleep-specializing hospitals, and data experts. An OUaR LaB official said, "The ICT Fund project represents an opportunity to broaden the understanding of sleep field bio-signals and obtain big data construction experience and technology," adding that, "We will keep striving to grow hand-in-hand with relevant Korean companies and achieve world-class competitiveness using our sleep data and algorithms."

TIME LINE

- 
- 2018. 04.**
Established OUaR LaB
 - 2018. 10.**
Obtained an investment from KB Investment
 - 2018. 11.**
Selected as part of the TIPS Startup Fund Support Project of the Ministry of SMEs and Startups
 - 2019. 01.**
Agreement for technology transfer with Seoul National University R&D Foundation
 - 2019. 04.**
Obtained angel investment
 - 2019. 12.**
Obtained an investment from DSC Investment
 - 2020. 02.**
Established a subsidiary in Vietnam
 - 2020. 09.**
Established the OUaR LaB-affiliated research center
 - 2021. 05.**
Selected as a participating company in the AI learning data construction project (data for sleep quality evaluation and sleep disorder diagnosis with a total project cost of KRW 2 billion, National Information Society Agency: NIA)
 - 2022. 03.**
Obtained new investment from MEKICS

ZOOM IN - IV

The Easiest Way to Reduce Energy Consumption

NINEWATT CO., LTD. CEO Kim Young-rok



NINEWATT CO., LTD.

General Status

- **Implementing Agency**
National Information Society Agency
- **Business Details**
Cloud computing industry nurturing

Company Status

- **CEO**
Kim Young-rok
- **Business Type**
Information and communication business
- **Year of Establishment**
2019. 2.
- **Homepage**
<https://ninematt.com/>

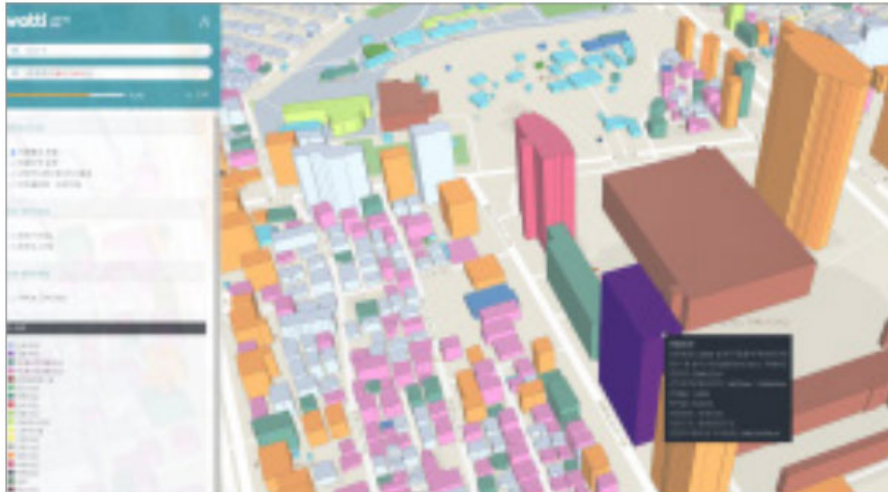
Key Accomplishments

Each city's building energy diagnosis platform as a smart city platform.

Contactless building energy diagnosis and selection through data collection, analysis, processing, and AI algorithms.

Data analysis for 91,000 buildings based on factories – 94.4% analysis accuracy.

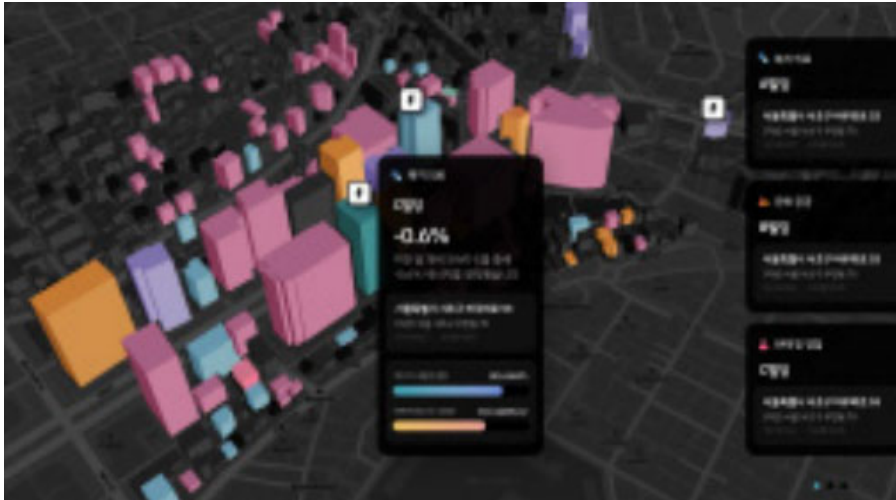
The Easiest Way to Enhance Energy Efficiency



Ninewatt develops a system to save building energy. Through energy diagnosis based on each city, the company is making and servicing EnergyMap to find buildings with severe energy waste or great energy reduction. The background of Ninewatt is seeking a value that can solve hidden problems in cities by analyzing various data.

The slogan of Ninewatt is "The easiest way to reduce energy consumption." Aiming at finding methods to enhance energy efficiency by analyzing the use environment and pattern without replacing physical facilities through data and AI, the company is developing various technologies. Ninewatt's leading technologies include city energy saving solution and system software development, big data collection and analysis, and cloud-based energy diagnosis and saving solution "EnergyMap."

Presenting Safe and Effective Energy Efficiency



In Korea, a measure to accomplish 40% of carbon emissions reduction by 2030 is currently needed earnestly. Green remodeling of 200,000 buildings of public institutions should be performed by 2025~2030, and diagnosis of all buildings for green remodeling needs to be carried out essentially. However, the current building energy diagnosis is very inefficient due to the limitation of experts diagnosing each building by visiting. The technology and solution to address difficulties in changing diagnosis/analysis time (costing KRW 10 million or more per building through personnel), investment cost, and alternative are required.

Ninewatt has the advantage of being able to resolve difficulties in adjusting the time for diagnosis/ analysis and investment cost through the AI-based building energy diagnosis platform EnergyMap that supplements the problems generated in the market. Through this, unnecessary or excessive facility investments can be prevented, maximum energy vs cost can be saved, and carbon emissions reduction effect can be obtained. Aside from presenting energy- saving solutions suitable for buildings, uncertainties of investments can also be improved through the diagnosis technology predicting actual investment vs effect. Thus, Ninewatt's technology is safe and efficient.

Tomorrow to Respond Preemptively to Green Remodeling

Ninewatt is a company with three years' business history, and its sales are steadily increasing; therefore, the company has grown into a startup with approximately 20 employees. Ninewatt is growing based on its belief that practice is more important than plans and planning and plan are more important than development in the process of enduring difficult times. The company plans to respond preemptively to green remodeling executed from 2025 as well as green smart school executed from 2022 by applying its solution to Incheon City's educational facilities (kindergartens, schools, libraries) and educational facility safety certification to be acquired mandatorily by 2025.

With the emerging importance of ESG (environmental, social, and governance), Ninewatt is planning a consulting project to improve the firm's lack of eco- friendly management. The company believes that eco- friendly corporate management can improve corporate value, and that the consulting project will position itself as a project to prevent huge losses nationally.

Frontrunner Moving Ahead as an Eco-friendly Company



Ninewatt cites the following as key to success: persistent participation in competitions and exhibitions to obtain some portion of sales and network through which the company can let the world know about its technology as a factor to supplement the lacking resources. To distribute and use limited time efficiently, a source of Ninewatt said that coping with some expenditure is important. According to him, use of countermeasure manpower and paid software, outsourcing management, and balanced selection of completeness and time are necessary.

Performing an energy investment-linked AI platform EnergyMap enhancement project that provides map-based energy diagnosis/analysis service for green remodeling, Ninewatt plans to enter the new energy market through its energy diagnosis/ analysis technology. Ninewatt is performing user UI/ UX design reorganization and service infrastructure advancement for service commercialization so that consumers can easily access the expert-oriented energy saving system that is difficult to understand for consumers by constructing the cloud and SaaS-based platform WATTI in the process of developing the AI- based building energy diagnosis platform EnergyMap. Ninewatt is expected to become a frontrunner in the eco-friendly area in the future.

TIME LINE

