

The Taiwan Tech Arena in conjunction with the Taiwan Ministry of Science and Technology supported startup program, strives through the integration of various resources to boost innovative startups by linking them with international accelerators and expanding global reach to create more business opportunities.



TAIWAN TECH ARENA

## EVERY CRISIS IS AN OPPORTUNITY

The times make the man: Model entrepreneurs return to Taiwan as venture capitalists to fully support Taiwan's startups

## TAIWAN'S STARTUPS RISE IN THE POST-PANDEMIC ERA

From the establishment of telemedicine to smart healthcare, Taiwan's startups provide excellent solutions for prevention of epidemic

TAIWAN  
TECH  
ARENA



OCT 2020

05



## MEDICINE X TECH: BLUEPRINT OF THE NEAR FUTURE

The global damage brought by COVID-19 has posed greater challenges to healthcare systems, giving rise to many startups, which are an impetus to the localization and globalization of smart healthcare in Taiwan.

# TAIWANESE STARTUPS SHOT TO FAME WITH INNOVATIVE MEDICAL TECHNOLOGY

While Covid-19 continues to rage worldwide, Taiwan has shot to fame by successfully limiting the spread of the pandemic and demonstrating the power of cooperation between government and citizens. Through the integration of technology and medical care, Taiwanese startups have not only developed the best solutions for pandemic control and precision medicine, but also found a new stage where they can make a splash.

Taiwan has demonstrated outstanding competitiveness in biotechnology and information communications. Our national health insurance system is also one of a kind in the world. In addition, the government has strived to create an ecosystem for startups. One of the examples is MOST's scheme to create a precision medicine industry in four years through cross-sector cooperation. The industry will cover diagnosis, treatment, smart medical care, healthcare, and disease prevention to lay a solid foundation for the future of personalized medicine.

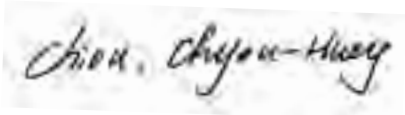
The global outbreak of the pandemic has given Taiwanese startups a good chance as the joint efforts of the government and enterprises as well as the contribution of the national epidemic prevention team has attracted extensive attention. The government's continued support for startups also differentiates itself from other Asian countries. Although physical activities between nations have been suspended, online and remote interaction has become more vigorous than ever. It proves that Taiwan can be so connected to the world and all entrepreneurs need to do is to give it a shot with the courage to overcome adversity.

As international events shift to online platforms, TTA has been devoted to bridging Taiwanese startups with the world while providing creative marketing ideas for individual companies to help them innovate with the resources at hand. At CES 2021, TTA will organize a team of 100 startups to present Taiwanese startups' achievements through the virtual trade show. 🏢



**Chiu Chiu-Hui**

Director of Department of Academia-Industry  
Collaboration and Science Park Affairs



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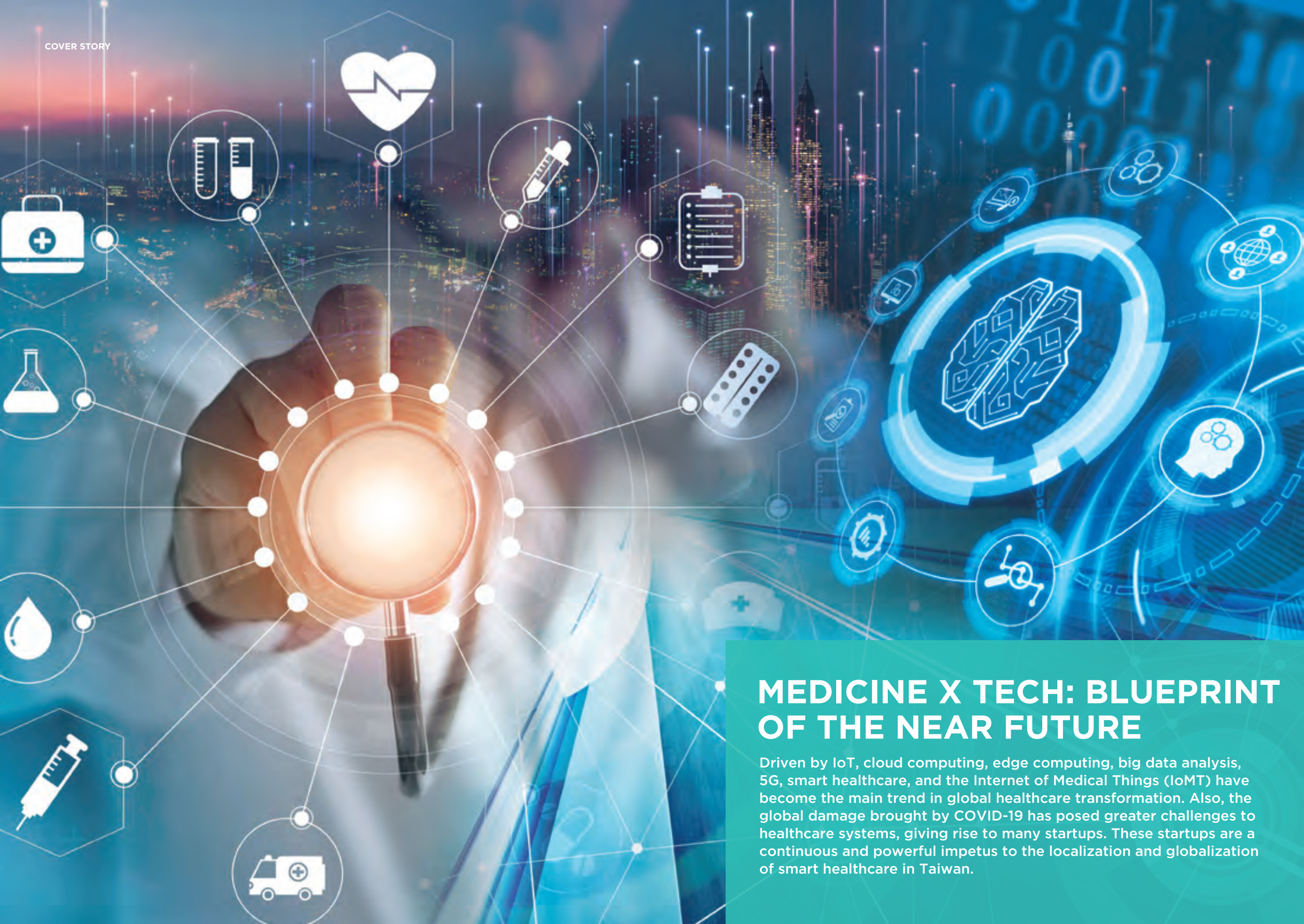
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## MEDICINE X TECH: BLUEPRINT OF THE NEAR FUTURE

Driven by IoT, cloud computing, edge computing, big data analysis, 5G, smart healthcare, and the Internet of Medical Things (IoMT) have become the main trend in global healthcare transformation. Also, the global damage brought by COVID-19 has posed greater challenges to healthcare systems, giving rise to many startups. These startups are a continuous and powerful impetus to the localization and globalization of smart healthcare in Taiwan.



# DEVELOPING A DELIVERY SCIENCE FOR ARTIFICIAL INTELLIGENCE IN HEALTHCARE

Artificial Intelligence (AI) has generated a large amount of excitement in healthcare, mostly driven by the emergence of increasingly accurate machine learning models. However, the promise of AI delivering scalable and sustained value for patient care in the real world setting has yet to be realized. In order to safely and effectively bring AI into use in healthcare, there needs to be a concerted effort around not just the creation, but also the delivery of AI.

Ron C. Li, Steven M. Asch and Nigam H. Shah

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**This AI “delivery science” will require a broader set of tools, such as design thinking, process improvement, and implementation science, as well as a broader definition of what AI will look like in practice, which includes not just machine learning models and their predictions, but also the new systems for care delivery that they enable. The careful design, implementation, and evaluation of these AI enabled systems will be important in the effort to understand how AI can improve healthcare.**

Artificial intelligence (AI) has generated much excitement, but relatively little impact in how healthcare is delivered. While progress has accelerated in using machine learning (ML) to develop prediction and classification models that make up the bulk of current AI methods<sup>1</sup>, efforts to use these models in the real world setting have not taken off at nearly the same pace<sup>2</sup> and typically remain within the realm of “innovation” outside of the core processes that drive care delivery<sup>3</sup>. To address how AI can be leveraged at scale, we need to both broaden and deepen our thinking

around how AI fits into the complexities of healthcare delivery. As the data and computer sciences for developing AI based solutions have matured, we now need a delivery science to bring those solutions into use in healthcare.

Current efforts to use AI in healthcare often begin with “I have a ML model that can accurately predict or classify X”, but then get stuck at “how do I use it and for whom?”<sup>4</sup> As a result, libraries of ML models remain on the shelf without finding appropriate use cases, or models are implemented but

deemed to not be as valuable as initially imagined<sup>5</sup>. A recently published ML model that predicts acute kidney injury with high accuracy<sup>6</sup> was assumed by the authors to provide valuable information to clinicians, but when implemented in a real clinical environment, did not significantly improve patient care and in fact resulted in additional work for the physicians that was of unclear value<sup>7</sup>. This example highlights the importance of understanding the complexities of care delivery associated with the clinical use case before building the ML model.

**Just focusing on the capability to accurately perform a prediction task is not sufficient for improving care.**

This conundrum is not unique to AI; it frequently affects innovation pipelines for other biomedical technologies. For example, the lengthy and rigorous process required in drug development from preclinical experiments to observed health benefits in the real world illustrate the amount of work needed to translate scientific advances into useful therapies that actually improve care<sup>8</sup>. Much of

the in silico work around training and validating ML models can be compared to the preclinical testing of active ingredients in pharmaceutical research. Just as the active ingredient alone is not sufficient for creating a drug that works in humans, much less a clinical intervention that improves outcomes for a patient population, a ML model alone is unlikely to make significant improvements in healthcare outcomes.

It is time to move from model development in silico to design, implementation, and evaluation of AI enabled solutions in vivo where healthcare delivery happens. We propose a delivery science for AI in healthcare that rests on the following principles: (1) much of healthcare is delivered in complex adaptive systems<sup>9</sup>, so AI must accommodate this complexity, (2) AI should be viewed as not the end product, but rather an enabling component of broader solutions, and (3) solutions enabled by AI are often complex systems of people, processes, and technologies. We need to take a more holistic view of what AI enabled solutions would look like beyond just a set of ML models. Rather, the human and technical components of the end product, such as the workflows, teams, and digital tools made possible by tasks that a ML model can perform, should be designed and implemented together as a system. The effects—beneficial or harmful—of AI enabled solutions on healthcare should also be evaluated at the system level as emergent properties that may be greater than the sum of its individual components. Identifying these emergent properties and characterizing their impact will require the system to be designed and implemented in its entirety in the healthcare environment where it is meant to operate. The task of implementing AI in healthcare, therefore, should not be about deploying a ML model; rather, it should be about how to

design the best possible care delivery system for a given problem, using the ML model as a component in that delivery system.

Our initial experiences with the design, implementation, and evaluation of an AI enabled solution at an academic medical center has revealed the importance of marrying data science with disciplines, such as process improvement, design thinking, and implementation science (Fig. 1). We had previously developed an all-cause mortality prediction model to act as a proxy for who may benefit from palliative care services such as advance care planning<sup>10</sup>. Rather than jumping to a solution of simply showing the model output to physicians, we first leveraged methods from process improvement to derive the sources of process inefficiencies and breakdowns<sup>11</sup>, and design thinking to observe how these processes affected the thoughts, feelings, and experiences of frontline stakeholders<sup>12</sup>. These steps allowed us to first understand the complex system in which advance care planning is currently delivered before designing a solution enabled by our ML model that could improve on that delivery system.

We made a key decision upfront to engage a multidisciplinary group of stakeholders, including frontline nurses, physicians, social workers, and occupational therapists—all who participate in the care of patients with serious illnesses who may benefit from advance care planning—from the beginning of the design process without any preconceived notions of how the ML model would be used. Interviews and process analyses of the current state quickly revealed key barriers to advance care planning that would unlikely be solved by simply showing a model's output to any one group of clinicians. For example, clinical and logistical considerations around the appropriate

timing of advance care planning, what should be discussed, and how should these discussions fit into the broader context of the hospitalization require coordinated, multidisciplinary efforts. Similarly, design thinking tools such as empathy mapping<sup>13</sup> helped us more deeply understand how underlying feelings around role clarity and power structures between physician and non-physician members of the care team affected advance care planning workflow. These insights led us to identify key design goals that otherwise would not have surfaced, such as the need to empower non-physician care team members to identify candidate patients and lead the coordination of advance care planning—a task that was enabled by making transparent to the entire care team the list of candidate patients generated by the mortality prediction model each day and creating a workflow for the physician and non-physician team members to discuss these patients with each other about advance care planning needs. This objective identification of candidate patients by the prediction model allowed for the democratization of responsibility for deciding who needs advance care planning to the non-physician providers such as nurses, social workers, and occupational therapists—all who spend a lot of time with patients and are trained to engage in this topic. The design process also includes analyses to verify that our model's execution and runtime characteristics (such when in the day are predictions available) fit the logistical needs of these new workflows<sup>14</sup>.

**This deeper understanding of current state gaps allowed us to build a system and digital tools enabled by the mortality prediction model.**

Other AI efforts that address the broader sociotechnical components of

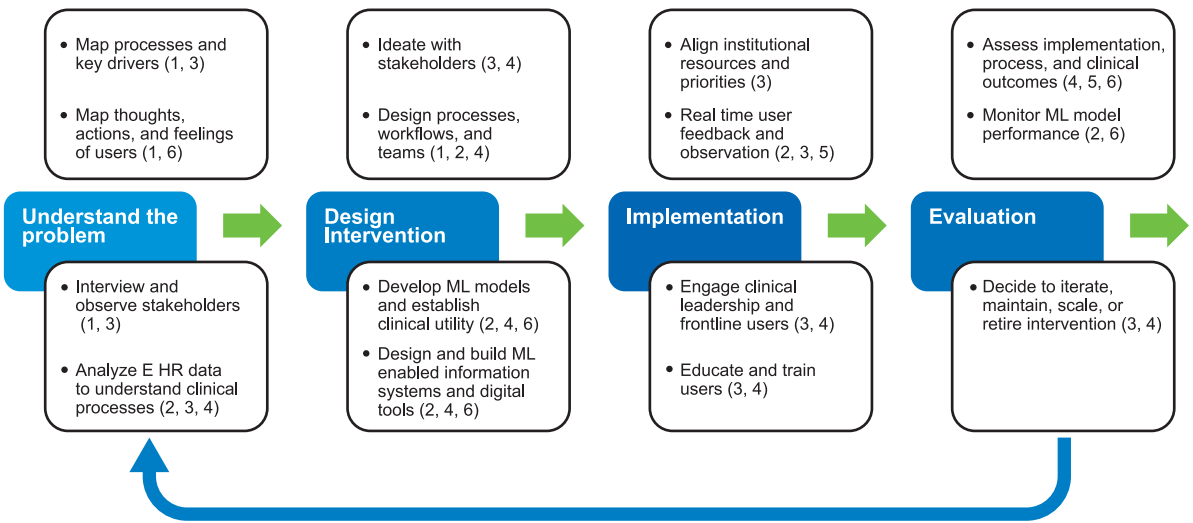


Fig. 1 Multidisciplinary process for creating, implementing, and evaluating an AI enabled system for healthcare. Methods from process improvement, design thinking, data science, information technology, and implementation science are combined into an iterative participatory process to build an AI enabled system for improving advance care planning. The expertise used across the different disciplines are as follows: (1) user experience design, (2) data science, (3) healthcare operations, (4) clinical informatics, (5) evaluation, and (6) ethical integrity assessment.

healthcare beyond just the ML model have offered similar lessons. For example, recent work around using AI to improve the treatment of sepsis committed months to assessing clinical processes and user experiences prior to even training a ML model, which yielded important insights for implementation, such as the need to focus on not just sepsis detection, but a method for standardizing follow up care<sup>15</sup>.

To be most useful, evaluations of AI enabled solutions should not simply ask whether it achieved the desired improvement in clinical process or outcome (e.g., did the frequency or quality of advance care planning improve), but also how well or poorly was the solution implemented. Implementation science and systems engineering tell us that we can use rigorous scientific methods for both effectiveness and implementation questions. Such hybrid evaluations can assess the mechanism(s) by which AI enables the changes that lead to the desired clinical outcome (how did the mortality prediction tasks performed by the ML model mediate the improvement in advance care planning) and the properties of the overall AI enabled systems (what are the

structures, patterns, and processes of the workflows, teams, and technologies that make up the new AI enabled system for delivering advance care planning). Frameworks such as RE-AIM13 (reach, effectiveness, adoption, implementation, and maintenance) can help identify the dimensions by which to assess implementation and subsequent dissemination efforts, and models for sociotechnical systems such as SEIPS14 (Systems Engineering Initiative for Patient Safety) can help assess the complex interactions between people and technologies in a work system.

Naturally, questions about who is responsible for implementing such delivery systems, and quality control of the ML workflows will arise. Aside from existing processes in healthcare systems to design standard operating procedures, additional attention will be needed to implement quality controls on the models itself. Specifically, to monitor a model's calibration over time, it will be important to watch population drifts and ensure timely retraining so that the model's performance remains with in the execution and runtime characteristics required by the AI enabled system. Just as with clinical laboratory instruments, ML models in healthcare will need to be

regularly re-calibrated and tuned. The characteristics of the ML models will also need to be appropriately communicated to clinical users<sup>18</sup>. Fortunately, there is deep experience in the technology sector to draw upon. In-house informatics teams within health systems with expertise in data science, information technology, and clinical operations may be required to own this work. While the nature of these teams may vary across organizations, what is certain is that such a team will need to exist to ensure that AI will be used responsibly and deliver sustained value.

It is time to move AI research out from in silico model development into real world design, implementation, and evaluation for improving healthcare delivery. We will likely see that ML models will be necessary, but not sufficient components of broader AI enabled solutions. The delivery science of AI will need to address how such systems are designed, implemented, and evaluated, and how their emergent properties can be captured and utilized to transform healthcare. ■

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COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

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# EVERY CRISIS IS AN OPPORTUNITY

The times make the man: Model entrepreneurs return to Taiwan as venture capitalists to support Taiwan's startups. We believe their experience and success model from starting a business, facing bankruptcy, being acquired, to IPO will have a positive influence on Taiwan's startups.



Hive is a venture capital company founded last year by three Taiwanese entrepreneurs—Yan Lee, Will Wang, and John Chen—who have been doing business overseas for more than a decade. They have achieved remarkable success regarded as entrepreneurial models in Taiwan. With their hearts set on “paying it forward to Taiwan’s startups,” the three of them returned to Taiwan to start “venture accompaniment” (Hive-style venture capital: starting the business together following investment) and founded Hive.

In this article, we interviewed Hive's founding partner, Yan Lee. He shared his journey on returning to Taiwan and establishing a venture capital firm. He also shared his insights on the current situation and future of Taiwan's startups amidst and following the pandemic.

**Q: Why did you return to Taiwan to invest in startups? Is it because you saw different business opportunities in the country?**

A: Sentimentally speaking, we were deeply moved by the financial article “Taiwan is a desert for entrepreneurs.” We were indignant and disagreed with the article; we wanted to “do something for startups in Taiwan.” It stirred the passion in our hearts to go back to Taiwan and help the startups.

When bShare was at its lowest and most desperate, industry mentors from Taiwan, including HOLA, Dongfeng Yulon, and Far Eastern Happy Go, helped us when we needed it and became partners we worked closely with. We left Taiwan in 2007 and returned in 2019. We went through more than eleven years of starting a business from scratch, IPO, to post-IPO overseas. We got past every hurdle and gained a wealth of experience. It was time to return and pay it forward to startups at home. Analytically speaking, for the

longest time, compared to Singapore and Hong Kong, we rarely see or hear about Taiwan's startups in the international scene. Through extensive research, we found that Taiwan's talent pool and supply in STEM (science, technology, engineering, and mathematics) are among the top in Asia. There are 86,000 new bachelor's to post-doctoral talents of STEM each year, same as Japan, which has five times our population. There are many success stories in our world-renowned semiconductor industry. Besides software and hardware, we can also discuss whether Taiwan lacks in the AI department. We can work together on shaping Taiwan into Asia's leading cradle of technology startups.

**Q: Why do you think Taiwan's startups have never really made a mark on the global stage? Do you have any suggestions?**

A: Although a magazine has previously dubbed Taiwan the desert for entrepreneurs, we have made two surprising discoveries. First, there are as many as 600 to 700 AI, IoT, and software startups counseled by Hive on average each year. This again shows that there is a strong startup momentum in Taiwan.

Second, the Taiwanese government highly values innovation. Amidst the present pandemic, most countries around the world have relief packages







for small and medium enterprises. However, in Asia, only the government of Taiwan has offered relief packages for startups.

Taiwan has not had strong ties with the global community. Therefore, the visibility of Taiwan's startups overseas has been low. Startups often cannot find the right channels to the government's abundant resources. They also lack the courage to reach out to the global market. It is a great pity that Taiwan has outstanding technical expertise, but when it comes to storytelling and packaging, we have a lot to work on, unlike Singaporeans who were educated in oral speech and presentation growing up.

#### Q: Which areas of innovation do Hive target?

A: The big data technology driven by IoT has brought about insightful smart decision-making and various smart applications. It is also an important element in the rise of deep learning technology, sparking a third wave in AI development. AI has suddenly become a panacea for advancement in all industries. Our main targets are AI and IoT software startups with special advantages in data management, analysis and application. We focus on smart economy such as smart city, smart retail, smart manufacturing, and smart enterprise. As for smart healthcare, since

AI/ML/DL has brought more powerful and unlimited interdisciplinary inspiration to this new wave, and biomedicine and ICT are highly developed in Taiwan, there are many startups in this area that we are also in touch with.

#### Q: Which startups have you invested in so far? Can you share with us your high-profile cases?

A: So far, we have invested in six startups in Taiwan, including Canner, a digital twin startup incubated from TTA SparkLabs accelerator. Canner's solutions can shorten the data integration time from the cloud, ground, to edge from six months to six minutes.

Another one is a machine learning platform provider committed to the transformation of the manufacturing industry. It can help corporate scientists and IT technicians optimize and solve various operational issues by analyzing sensor-collected data, facilitating transition to Industry 3.0 and even 4.0.

The next one is PicSee, a URL shortener and Social Analytics Platform. PicSee has the greatest amount of consumer and social data in Taiwan. Seventy percent of the data are from Southeast Asia (Taiwan only accounts for 30%), which is why PicSee has the potential and skills to break into the Southeast Asian market.

Also, ROEHL is a startup that uses consumer AIoT technology to provide subscription services for rent-only smart appliances, achieving the circular economy business model. Lastly, there is Botrista that provides RPA services for restaurant automation, and a startup that provides an online coding education platform.

#### Q: Have you found any new business opportunities in the integration of technology and healthcare as well as noteworthy startups in Taiwan?

A: Current AI healthcare applications include medical imaging, character and semantic recognition, and molecular bioassay. These applications conduct analysis through collecting various big data. Because of the pandemic, the foremost development in the integration of technology and healthcare is rapid screening and genetic diagnosis for specific diseases. Combined with Taiwan's exceptional clinical healthcare and industrial manufacturing expertise, Taiwan was able to carve a niche in the medical device department. Furthermore, we are one of the fastest-aging economies in the world, which gives us an advantage in developing a comprehensive system for long-term care. Taiwan is a good testing ground; we can then expand our success model to the adjacent Japanese market.

#### Q: How has the pandemic affected Hive's venture capital/venture accompaniment business? Which trends do you think will emerge in the post-pandemic era?

A: This is what we think about the pandemic: First, top-tier companies such as Facebook, Taobao, JD, and DiDi all rose to the fore during the Great Recession from 2008 to 2009. Also, TV and online shopping in Taiwan burgeoned during the SARS epidemic. This shows that economic crisis may actually stimulate the growth of startups. Second, amidst the lowest tide where the global economy is nearly at a standstill, business and economic activities in Taiwan remain relatively unaffected by the pandemic, which gives startups an opportunity of a lifetime.

In addition, Taiwan's anti-pandemic measures and mask diplomacy have put Taiwan on the map, including Taiwan's medical technology startups. This has attracted many enterprises, venture capitalists, and startups to Taiwan, which encourages technological innovation in Taiwan. Lastly, many face-to-face business interactions must take place online now where there are no border and distance constraints, making it easier for Taiwan's startups to connect with the world, bringing in new opportunities.

I believe social distancing will become a habit post-pandemic, which will bring about completely different products or business opportunities. For example, we have heard about possible future foot- or voice-activated elevators for avoiding contact with the source of infection.

Also, e-commerce, delivery, and logistics business models will, without a doubt, thrive everywhere.

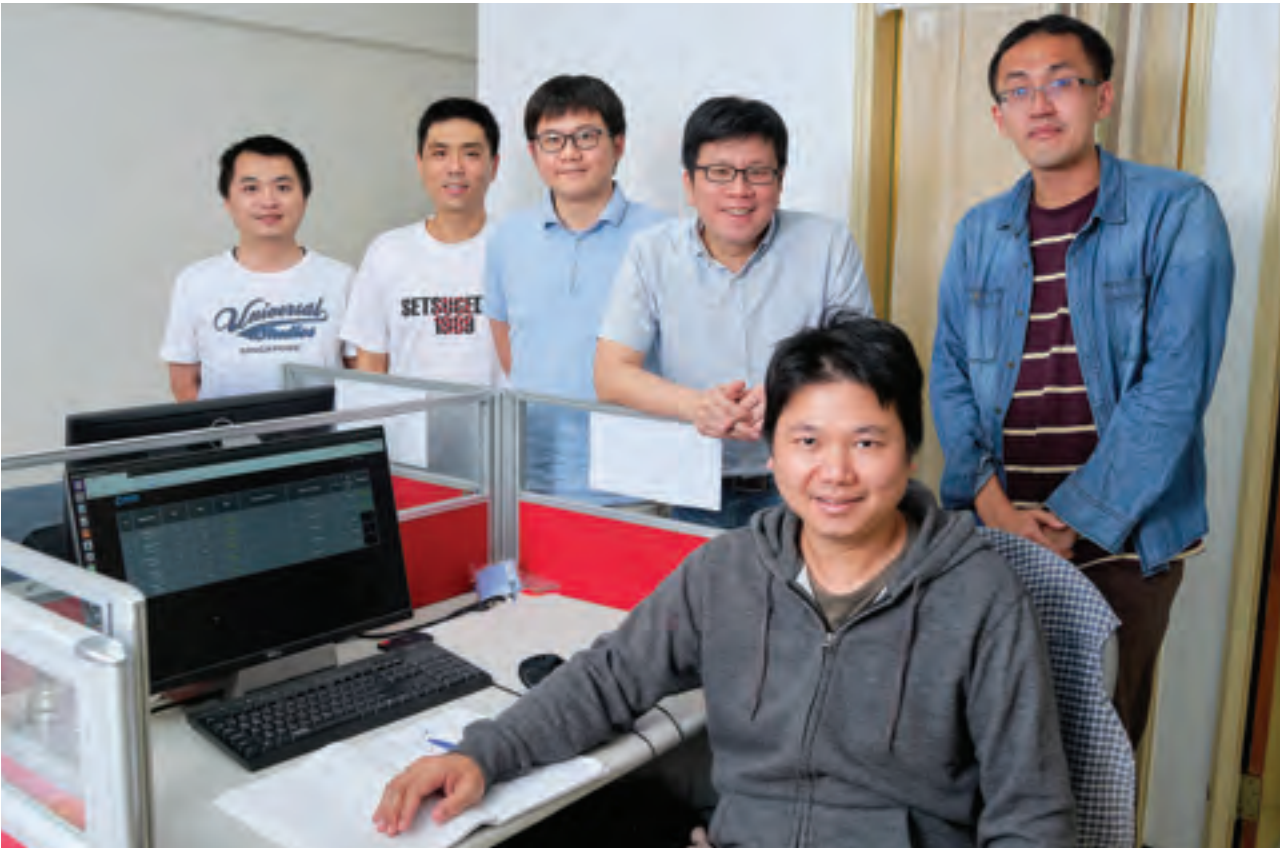
Moreover, we will see people redefining jobs and workplaces. Remote working may become the norm, which will push collaboration tools to their peak. This is shown by the passion economy that has gained popularity in the United States. After losing their jobs, many people pursued a more flexible and independent job that they are passionate about, such as music, writing, and live streaming. This is not a new trend but contingency plans that have continued on post-pandemic. Startups in this area have sprung up during the pandemic and will increase post-pandemic to meet the demand of the "new norm" that was once temporary. 📺





# TAIWAN’S STARTUPS RISE IN THE POST-PANDEMIC ERA

With the effect of COVID-19, it is foreseeable that the application of digital technology and AI will be ubiquitous. From the establishment of telemedicine to smart healthcare, Taiwan’s startups fully integrate the application of technology and medicine, providing excellent solutions for prevention of epidemic.



## ARMED WITH U.S. AND TAIWAN FDA CLEARANCES

Deep01 dives into the currently most sought-after SaMD market with an enormous fund of US\$ 3.4 million

As AI/ML technology shifts towards the medical industry, “Software as Medical Device” (SaMD) has become a new digital health concept promoted by the FDA (Food and Drug Administration). It has also become a new medical care model heavily embraced and developed by AI healthcare startups and resources.

Founded in 2016, Deep01 developed its own CT image AI detection system and is also a SaMD service provider. It is the first AI healthcare startup in Asia-Pacific to obtain US FDA clearance, and the first to have both US FDA Class II medical device and TFDA (Taiwan Food and Drug Administration, MoHW) clearances in the world.

**Intracranial hemorrhage detection is ten times faster than foreign startups.**

The “DeepCT” intracranial hemorrhage detection platform is a tour de force that has made Deep01 stand out among AI healthcare startups and SaMD service providers. It is also why medical institutions of all scales favor Deep01. The platform can detect intracranial hemorrhage in around 30 seconds, with an accuracy of 95%. Once intracranial hemorrhage is determined, it will immediately notify the emergency physician for further actions.

DeepCT’s accuracy is comparable to those of global competitors, but it

is nine times faster than the Israel’s AI healthcare startups which take 4.5 minutes. DeepCT is highly beneficial in seizing the golden hour of treatment, reducing the burden on medical resources and physicians, and increasing medical efficiency and quality. David Chou, the founder and CEO of Deep01, pointed out: “With DeepCT, Deep01 has become the first AI healthcare startup in Asia-Pacific to obtain US FDA clearance. Several overseas agents are talking with us about selling DeepCT in their countries.

Furthermore, Deep01 has continued to launch the “AI Quantitative Calculation of Midline Shift” function. This function can proactively provide



clinicians with an indicator on whether to perform a craniotomy, effectively shorten past decision-making process for surgery, speed up providing appropriate patient management, and improve prognosis and its quality. With innovative technology and FDA clearances, Deep01 possesses the global competitive advantage that many startups could only dream of. This advantage has sped up the commercialization of Deep01’s AI medical products and services as well as the progress of AI technology implementation.

Applicable to hospitals across the board, Deep01 fully implements and universalizes AI healthcare

In the beginning, the medical community was doubtful about the integration of AI and healthcare and had reservations about the possibility of being replaced by AI. However, the community has come to recognize that AI can provide substantive assistance to healthcare and physicians. When

selecting AI medical solutions, besides FDA clearances and validation papers that ensure product quality, medical institutions are even more concerned about how to integrate company solutions with internal workflow.

David Chou mentioned: “Our other advantage is that we work closely with one-third of the medical centers in Taiwan. The interplay between clinical experience and domain know-how allowed us to deeply integrate AI technology into hospital workflow.” This helps with data integration and streaming between small and medium-sized hospitals and large medical centers. It can also effectively speed up and improve the emergency/referral process and efficiency." More importantly, one of the co-founders of Deep01 is a clinician at NTUH. And, lots of doctors in the US and China also work closely with Deep01 to share their clinical experience. This make Deep01 capable of deciding their strategy and development from the view of global market.

Moreover, DeepCT implementation is quick and easy. Each hospital may wish to integrate different systems, so customization requirements are slightly different. However, product installation only takes one hour in average and even as fast as thirty minutes. Agents can also complete the installation quickly through Deep01’s SOP interface. Doctors do not need to study or operate any interface and buttons. In the event of an error or emergency, a message will be clearly displayed on the system interface of the existing emergency procedure.

With the dual FDA approved technology, deep customized integration with hospital workflow, and swift product installation, Deep01 fits hospitals across the board. Deep01’s products can be used in hospitals of all sizes. The company has overcome past limitations in which AI healthcare products were only applicable to medical centers. David Chou believes that this is one of the keys to the universalization and implementation of AI healthcare.

There are already 9 hospitals in Taiwan that have implemented DeepCT so far, including medical centers and medium-small size hospitals. There are more in negotiation for product installation.

Technology, regulations, funds, and marketing are coming along—The synergy between fundraising and development

In terms of market expansion overseas, besides Japan, Deep01 will target Southeast Asia, from Singapore to Thailand, Vietnam, and the Philippines. David Chou revealed that Deep01



The "DeepCT" intracranial hemorrhage detection platform can detect intracranial hemorrhage in around 30 seconds, with an accuracy of 95%.



With the dual FDA approved technology, deep customized integration with hospital workflow, and swift product installation, Deep01 fits hospitals across the board.

has already docked its solution to the system of the largest PACS medical imaging company in the Philippines. Deep01 has also signed a letter of intent with large businesses in Japan and medical device agents in Singapore.

Since startups face a relatively limited workforce and fund, they will initially devote themselves and the resources

on the iterative development of their own products and technologies as well as the primary market. Fortunately, Deep01 works with many accelerators. For example, through BE Accelerator’s matchmaking, Deep01 has gained access to more biomedical resources. Show Chwan Memorial Hospital, which Deep01 is working closely with on several projects, was introduced

to Deep01 through BE Accelerator. Furthermore, with the help of Microsoft Accelerator, many clients of Microsoft Cloud have indirectly become potential clients of Deep01.

It is worth mentioning that after obtaining TFDA clearance in this February, Deep01 immediately received an order of US\$ 700,000 in April and another US\$ 2.7 million fund in late June. The lead investor of this round of funding was ASUS, and the co-investors were the Digital Economy Fund (co-founded by the ITRI and the Institute for Information Industry) and BE Accelerator. The strength of ASUS is hardware while Deep01’s advantage is software. Combing both, the collaboration is promising and not limited to healthcare. With both funds, Deep01 now has a preemptive advantage to further its expansion in the global market and a strong foundation to compete for more global resources, energy, markets, and platforms. 🇹🇼

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Class II medical device software flourishes—SaMD becomes the core of the trillion-dollar biomedical technology industry

In 2018, the US FDA approved IDx-DR, the first AI retinal diagnostic software. Since then, SaMD has become a burgeoning healthcare concept and service heavily supported by the FDA and AI healthcare industry. SaMD will become a battleground between the technology and AI healthcare industry in the future. The key to the success of the emerging SaMD industry is the intellectualization of medical imaging. It has drastically reduced potential errors in timeliness, precision, and judgment from the manual interpretation of a large number of medical images in the past. The annotation of a multitude of pathology images allows AI modules to be trained and AI healthcare algorithms that are faster and more precise to be developed. The most popular AI healthcare application today is AI medical imaging. According to reports, the output value of AI imaging will grow from the current US \$500 million to US \$2.5 billion by 2024. Currently, the most promising applications of AI medical imaging are screening, lesion annotation, and 3D organ imaging.





# ESTABLISH MICRO PREVENTION NETWORKS

**AdvMeds builds a system that can take body temperature quickly and collect data automatically can help prevent the spread of COVID-19**

With the sudden outbreak of the pandemic, how informatized medical services are will be the key to controlling the first stage of the pandemic. AdvMeds, a startup company, is committed to effectively integrating systematic screening data into the cloud. From the basic quick temperature check to mass data collection and tracking, AdvMeds' goal is to establish micro prevention networks through business units.

Although healthcare services in Taiwan are advanced, there are still a lot of clinical data that are difficult to manage and employ. For example, when COVID-19 broke out violently this year, people knew that they must wear

masks in crowded and enclosed areas. However, they were not aware of whom around them may have been abroad or are asymptotically infected, causing fear and panic buying.

Managing early-stage mild cases systematically and using smart platforms for triage and announcement may help quell unnecessary panic amidst the pandemic, which is the vision of AdvMeds. During the pandemic, one thermographic camera costs NT\$200 000 to 300 000. The disadvantage of thermographic cameras is that they are easily affected by ambient temperature. One may not have a fever but will trigger the alarm when passing through the machine, so the temperature would

still need to be taken manually with a forehead thermometer.

Furthermore, thermographic cameras can only detect the temperature but cannot collect data. It cannot gather valuable continuous data that can be tracked and used. To this end, AdvMeds developed the mPHR HealthGo for businesses, school campuses, factories, and other institutions. mPHR HealthGo integrates measurement, tracking, management, and name-based personnel roster. It can read the NHI card, employee badge, or EasyCard of anyone entering or exiting and index the data automatically. The institution can then monitor the health status of anyone passing through.

AdvMeds stated that there are currently more than three hundred locations equipped with mPHR HealthGo in Taiwan. More than one hundred businesses in the three export processing zones in Kaohsiung, including Kaohsiung EPZ, Nanzih EPZ, and Linkuang EPZ, will install mPHR HealthGo. By collecting the temperature of people entering and exiting every day and sending a questionnaire automatically, the system can pick out problematic cases and notify the proprietor for further actions. The goal is to build a micro prevention network in one business first and then link all other businesses to form a regional defense web.

Sixty-nine percent of medical service providers around the world still rely on traditional paperwork and stand-alone file management, which have low efficiency and may not be able to fully collect the files. AdvMeds stated that by installing two to three mPHR HealthGo in a plant with 800 to 900 people, the temperature of 200 to 300 people can be taken and recorded in ten minutes. These data do not need to be processed manually because mPHR HealthGo will record and upload them to the cloud automatically.

With the accumulated data, institutions can use the shared drive module for



Managing early-stage mild cases systematically and using smart platforms for triage and announcement may help quell unnecessary panic amidst the pandemic.

triage and case management. For example, the institution can create a group chat for those who have recently entered or exited the country and send out prevention instructions, physiological measurement procedure, scale survey, or telemedicine to the target group.

Since the cost of mPHR HealthGo is one-tenth that of thermographic cameras, the export market is huge. Hospitals and health institutions in Thailand, Malaysia, and other countries

have installed the system for screening services. AdvMeds mentioned that if the system were to be mass produced, the electronics industry chain would need to be integrated first. Only then can access to this low-energy, low-cost, and high-performance healthcare information system be expanded, which will improve the productivity and effectiveness of healthcare services.

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## WHO defines smart healthcare as the application of ICT in the medical industry

Since smart healthcare integrates interdisciplinary expertise and technologies, it opens the door to unlimited business opportunities. According to Deloitte's research report, by 2020, global healthcare expenditures will reach US\$8.7 trillion. The output value of IoMT applications by 2022 will rise to US\$158.1 billion. Such prospects and opportunities show that smart healthcare has become a major target market across industries. Global Information's market survey projects that the SaMD market will grow from US\$ 18.488 billion in 2019 to US\$ 86.45162 billion by 2027.





# THE BEST MEDICAL ASSISTANCE ON THE FRONTLINE

Heroic Faith Medical’s AI breath analysis core technology is used in anti-pandemic auscultation around the world

Taiwan’s outstanding response to the pandemic in healthcare, protective equipment, and prevention technology has received worldwide acclaim. The national anti-pandemic team has also been recognized around the world.

Heroic Faith Medical, a startup which committed to developing AI healthcare applications in Taiwan, has recently raised US\$4 million in series A funding. With its AI breath analysis core technology used for non-intubation anesthesia surgery and examination, TFDA has approved Heroic Faith’s technology, and Heroic Faith will complete the registration documents and submit the technology to the US FDA this season.

Collect over 500,000 clinical breathing sounds data for comparison and analysis

Heroic Faith’s AI breath analysis core technology can identify inhalation, exhalation, and abnormal breath sounds such as wheeze, stridor, and crackle. It can further indicate respiratory diseases such as tachypnea, bradypnea, apnea, chronic obstructive pulmonary disease, asthma, pneumonia, and pulmonary edema. This technology has been used in more than five hundred cases of non-intubated surgical anesthesia as well as respiratory care and ICU. In the past six months, Heroic Faith collected more than 500,000 clinical breathing sounds data for comparison and analysis.

The company strives to improve AI continuous respiratory detection and expand AI auxiliary applications.

Besides software, Heroic Faith is also devoted to hardware devices. The company has improved the stethoscope, which has not changed much since its invention. The stethoscope is limited by its materials; it relies on metals for sound insulation so vibrations in the body can be heard. However, Heroic Faith has developed a miniature stethoscope patch that uses medical-grade wire, sound insulation materials, and amplifier (microphone). Attached to the patient, the patch can isolate noise for clear, continuous auscultation.



With Heroic Faith’s AI continuous respiratory monitoring system, doctors can diagnose COVID-19 patients remotely. The system can also be used for sleep anesthesia or non-intubated surgical anesthesia.

Heroic Faith’s major breakthrough is turning “breath diagnostics” into data that can be recorded continuously, supported by AI judgment and alerts. This technology can be applied to non-intubated surgical anesthesia for esophagogastroduodenoscopy, colonoscopy, facial surgery, pediatrics, pedodontics, etc.

Doctor Hsu Fushun, one of the founders of Heroic Faith, mentioned: “Heroic Faith has developed a stand-alone application for mobile phones. It can be used in respiratory monitoring for anesthesia, apnea detection, continuous respiratory detection at ICU, isolation wards, and even at home. The initial results prove that the application can detect life-threatening symptoms more than one minute earlier than traditional monitoring methods.

Heroic Faith’s AI system has become a huge addition to telemedicine

As COVID-19 wreaks havoc around the

world, the AI continuous auscultation monitoring system, meant for reducing the risk of surgical anesthesia, has become the best anti-pandemic tool on the frontlines. Medical staff require close-fitting protective gown, but they need to closely monitor COVID-19 symptoms such as coughing, shortness of breath, and fever. How can medical staff wearing thick isolation gowns use a stethoscope? With Heroic Faith’s device and the AI system derived from it, doctors can monitor the patients through a flat screen in their offices, which is a huge addition to telemedicine.

Furthermore, the Ministry of Science and Technology has recently selected Heroic Faith as one of the ten coolest startups. Heroic Faith also won the best innovative tech award at the “AWS Innovator Alliance 2 Demo Day.” At the beginning of this year, Heroic Faith participated in the 2020 CES Smart Healthcare Star Team Exhibition at the West Coast of the United States and received recognition. Currently,

the company is still working with the Stanford Sleep Medicine Center on sleep medicine research. Arthur Chen, the executive director of Heroic Faith’s investor BE Capital, said: “Heroic Faith’s AI healthcare products cater to an array of clinical demands. Heroic Faith is one of the few smart healthcare device companies in the world centered on ‘breath sounds.’ With its AI continuous respiratory monitoring system, doctors can diagnose COVID-19 patients remotely. The system can also be used for sleep anesthesia or non-intubated surgical anesthesia. It can effectively reduce the risks of respiratory compromise due to indiscreet monitoring.”

In March of this year, Heroic Faith initiated a US\$4 million funding plan and has reached its goal. The investment was led by the Integral Group, a financial services company that is focused on high growth startups. The round also saw investment from AmTRAN, a world leader in LCD manufacturing, Top Taiwan Venture Capital, one of the largest VC firm in Taiwan and TAYA Venture Capital, the venture arm of the TAYA Electric Wire & Cable Group. In the future, the company will focus on these three areas: continuous respiratory monitoring for anesthesia, multi-channel continuous respiratory monitoring, and breath sounds identification platform. Heroic Faith will further maximize its cross-disciplinary advantages in AI, deep learning, and software/hardware integration. It will also continue to provide the best support against COVID-19.





# TAKING CARE OF PATIENTS BY ANALYZING HEAT

AIPHAS creates bespoke, big data-based platforms tailored to hospitals’ and patients’ needs

The AIPHAS team has recently developed an innovative, AI-based thermal image analysis system that eases medical staffs’ workload and delivers in-depth, real-time status updates on patients’ biometric data by re-conceptualizing the idea of heat. AIPHAS’ system monitors the heat emitted from the human body and updates the medical staff on the patients’ movement and fluctuations in body temperature. This information, combined with each individual patient’s daily schedule as well as body posture analysis, empowers AIPHAS’ platform to be a comprehensive, turnkey solution that ensures the safety of both patients and hospital rooms alike.

## Thermal image analysis guarantees the safety of patients and hospital rooms

According to the AIPHAS team, the AIPHAS thermal image analysis system is installed on the hospital rooms’ ceilings, giving it coverage over the entire room and enabling it to detect changes ranging from the patients’ body temperature and movement to temperatures of electric appliances in the hospital rooms.

By leveraging heat as a data point, all manners of variables, such as whether the patient is having a fever, whether they have been staying still on their bed, or whether they roll or fall more

often than is normal, can be collected and analyzed. Conventionally, these variables have been detected using sensors installed on the hospital beds or in their vicinity, but this immediacy, though accurate, comes at a cost. First of all, because of the sensors’ close proximity to the patient, they were prone to being accidentally hit, thus registering false alarms and in turn resulting in unneeded room visits from the medical staff. Secondly, if a single integrated system, as in the case of AIPHAS, can take care of an entire hospital room’s monitoring needs more effectively than a multi-sensor solution currently does, then it makes economic, administrative, and logistic sense to adopt such a system instead.

Patient monitoring solutions that involve wearable devices or the installation of bedside sensors do not typically fare well with patients themselves, who consider them either an annoyance or even an invasion of privacy. Some patients have been observed to remove wearable monitoring devices to avoid checkups from the medical staff, while others intentionally avoid sensors when going about their business. This creates many blind spots over which the medical staff has no control. AIPHAS’ solution is non-invasive, non-disruptive, and non-patient-interruptible. These characteristics perfectly address the pain points of hospitals employing traditional, multi-sensor based solutions. Furthermore, as all personally identifiable information AIPHAS collects on patients is anonymized, the issue of privacy and confidentiality becomes a nonfactor when using AIPHAS.

The AIPHAS smart ward system is capable of monitoring the security of patients and rooms alike. The system offers real-time detection and warning of instances of abnormal temperature, whether they’re caused by prohibited items, such as high-wattage electronic items including electric blankets or heaters, or by electrical fires. Needless to say, preventing fire hazards before they take place is an extremely valuable benefit that AIPHAS can provide to both hospitals and patients alike.

## Addressing hospital pain points by network infrastructure and system integration

The AIPHAS team prides itself on actively listening to the needs of each hospital, which allowed it to create

innovative solutions integrating various AI and IoT components on a system-level that the hospitals consider acceptable. The combination of thermal image analysis AI and digital whiteboard allows the nursing staff to keep tabs on patient and ward statuses in real time. On the other hand, hospitals are generally averse to undertaking renovation projects, as patients need to move around, and the potential cross-contamination can become a major concern. By connecting to various devices, such as nurse call buttons, via WiFi, AIPHAS’ digital whiteboard sidesteps this problem and removes the patients’ need to physically reach the medical staff. When integrated into the hospitals’ existing NIS (nursing information system), the digital whiteboard can streamline and visualize various digital data.

AIPHAS also offers a comprehensive network diagnostic and design service in conjunction with its smart ward system. This two-pronged approach allows AIPHAS to establish a proper foundation on top of which hospitals can easily add IoT devices should the need arise going forward. At the moment, AIPHAS is in talks with various hospitals regarding possible proof of concept test runs.

## Thermal imaging serves as an effective tool for location-based pandemic management post-COVID-19 eruption

One of the most prevalent measures Taiwan has taken against the pandemic is mandatory temperature-checking at public places, which is where AIPHAS’ solutions come in. In locations without stringent requirements for individual

temperature-taking, such as hotels or office buildings, AIPHAS thermal image sensors placed in entrances are capable of taking body temperatures at the rate of one person per second, making the sensors extremely handy for crowded spaces.

AIPHAS’ goal in the short term is to promote its solutions to various hospitals via proof of concept and subsequently build health information management platforms tailored to each hospital’s unique needs. Although AIPHAS was established merely six months ago, medical centers including the NTUH and Taipei Municipal Wanfang Hospital have already begun using AIPHAS’ solutions. If everything goes according to plan, once leading hospitals begin pioneering big data in health information management, then the general public will likely become more receptive to the idea of health information as big data. Once the practice becomes commonplace, hospitals will then be encouraged to undertake more cutting-edge digital transformation efforts, leading to a positive feedback loop.

AIPHAS is currently aiming to establish a strong presence in Taiwan by offering its solutions to the 2-3% of hospitals that are relatively receptive to new ideas and rich in resources. The company plans to integrate its thermal image analysis, digital whiteboard, and smart ward solutions into 10,000 hospital beds within the next five years, after which AIPHAS will expand to the home hospice and long-term care markets. ■■



# THE INNOVATION OF PRECISION MEDICINE

## MedFluid transforms biotechnology with the industry’s first personalized antibiotic precision medicine platform

The microfluidic chip is a highly competitive market. However, MedFluid, a new startup founded at the NTHU Garage in May of last year, broke through the market with its “Personalized Antibiotic Screening Platform – fAST” based on pneumatic microfluidic technology. MedFluid rolled out the industry’s first personalized antibiotic combination precision medicine device and services that will transform the biomedical testing and precision medicine market.

Bon Lee, the founder and CEO of MedFluid, pointed out that compared to conventional large medical devices, the advantages of the microfluidic chip include miniaturization, portability,

accessibility, fast response, low cost, and higher simultaneous detection volume. With semiconductor fabrication and plastic injection molding, the microfluidic chip and devices can be mass produced, which is why the cost can be kept low. Today, the cost of one NGS genetic test can go as high as US\$ 10 thousand. But with the microfluidic chip technology, the cost of the same test items can be kept within US\$ 350.

### MedFluid comes to the fore and fights against antibiotic resistance

The COVID-19 pandemic has spurred a fervent demand for telemedicine

worldwide and propelled the microfluidic chip technology to its peak. Specimens do not have to be sent to a central laboratory, which significantly reduces the time and labor of traveling. This also reduces the risk of infection for anti-pandemic personnel performing manual operations. Currently, there are different types of microfluidic chip devices applicable to clinics and at-home tests. They can also be anti-pandemic tools for airports and ships.

Drug-resistant diseases have become an unavoidable major health issue, with antibiotic resistance the most serious and urgent. MedFluid was founded to join in the fight against this problem. “My father died of antibiotic resistance

caused by sepsis, and my mother died of drug resistance that she developed during cancer treatment,” Bon Lee said gently. He turned his grief from losing loved ones into a strong motivation to solve antibiotic resistance and established MedFluid.

Drug resistance is becoming one of the biggest threats to health and even our lives. This shows that “achieving rapid testing and precision medicine simultaneously” has long been a conundrum that the medical community aims to solve. These issues were the research focus of Bon Lee’s doctoral dissertation at NTHU’s Power Mechanical Engineering Department. He participated in the startup contest held by Yonglin Foundation’s H. Spectrum Health Tech Accelerator with his research topic. This was where he met the three co-founders (Chief Medical Officer Bill Tsai, Chief Operating Officer Phillip Lai, and Chief Technology Officer Orion Lu). Following award recognition, topic optimization, and business model

improvement, MedFluid was founded in May of last year.

### A race of speed and precision between humans and bacterial infection

As MedFluid strives for commercialization, the medical community is struggling with two pressing issues. One is that existing tests are all too slow to address the urgency of the problem. The other is that doctors mostly rely on physical signs and empiric therapy for judgment in drug administration. This results in the danger of imprecise administration and even treatment delays.

“Currently, large testing machines in hospitals take 2–3 days to provide screening results. But sepsis can lead to antibiotic-resistant bacteria attacking the body’s organs in as soon as one day, so this is too slow.” Bon Lee pointed out: “Once sepsis triggers antibiotic resistance, every hour of delay in administration will increase the chance

of septic shock or even death by 8%.”

This again shows that in the face of antibiotic resistance, we must be ahead of the bacterial infection and, more importantly, administer medication precisely. To this end, MedFluid can determine whether the specimen is infected in as soon as eight hours. It can also help doctors make the most effective judgment for administration. In terms of precision medicine, MedFluid can formulate compounded drugs for cocktail therapy, achieving the benefits of precision medicine.

### The perfect marriage between fast response and decision-making and interdisciplinary skills

Compared to other microfluidic products on the market, MedFluid’s “Personalized Antibiotic Screening Platform – fAST” uses medical-grade circuit board compatible with fully-automated bioassay procedure. It also uses MedFluid’s pneumatic microfluidic technology to perform complex and meticulous procedures that others cannot achieve.

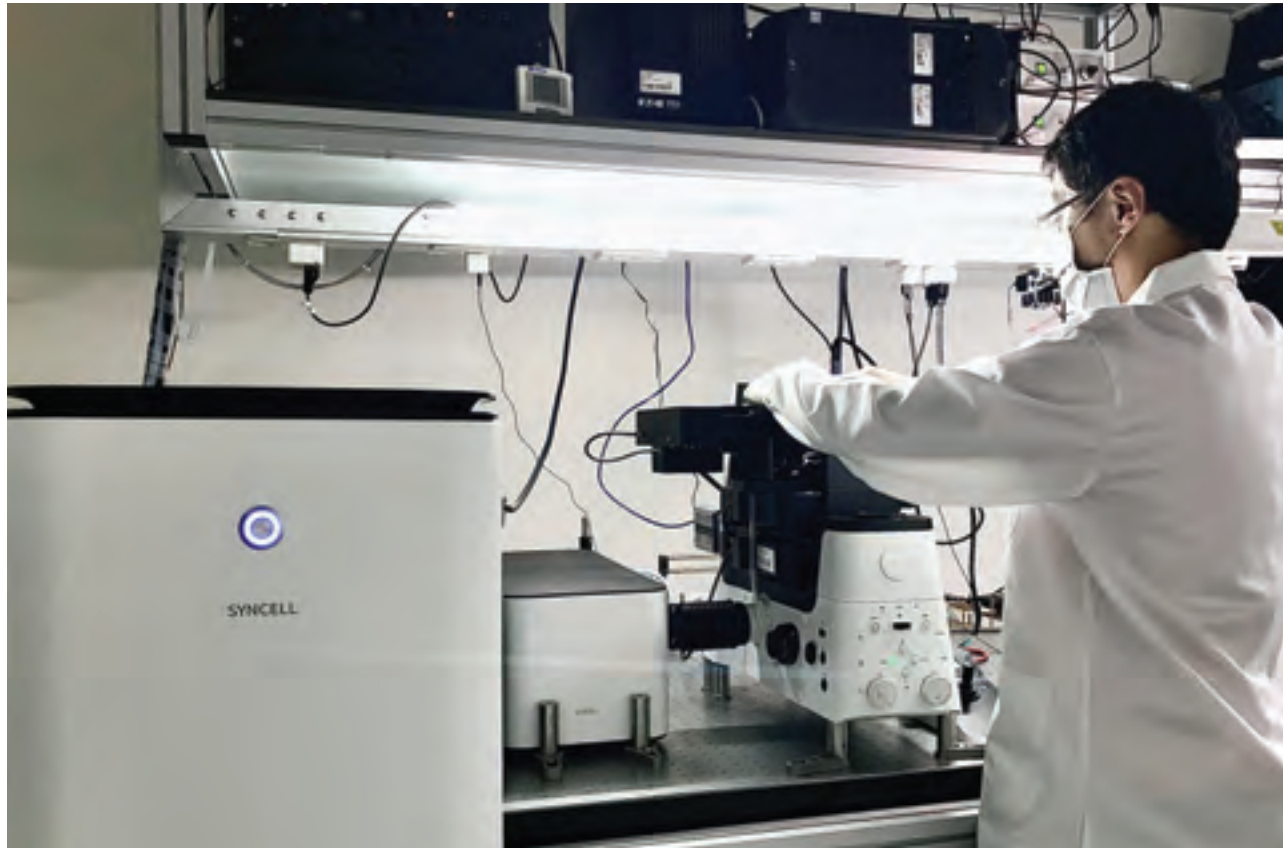
MedFluid’s target customers are infectious disease doctors and medical laboratory scientists. Currently, MedFluid’s main target markets are the United States and China. MedFluid carries out market development and layout through pharmaceutical factories and retailers. The company advances according to the established product roadmap and is gradually moving towards IPO. 📈

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MedFluid can determine whether the specimen is infected in as soon as eight hours. It can also help doctors make the most effective judgment for administration.





# SYNCELL UNVEILS INNOVATIVE OPTOPROTEOMICS

If microscopes are windows to the world of the cell, then optoproteomics is the door to this world

Microscopes provide a window for us to probe into the secrets of cells. However, due to technological restrictions, microscopes only allow us to observe details inside cells; we cannot capture the region of interest for further research to learn more about the cells. Fortunately, startup SYNCELL has developed optoproteomics technology capable of achieving this goal

SYNCELL is a startup formed by members from the Institute of Atomic and Molecular Sciences, Academia Sinica. All of the 13 members and 2 consultants are the best of the best in their own fields. Founder Dr. Jung-Chi Liao said SYNCELL might

have the biggest cross-industry team ever due to the wide variety of technology used in optoproteomics. With positive interaction, everyone utilized their specialty and respected each other's opinions to bring out the optoproteomics.

Optoproteomics can solve a wide range of problems. Through the integration of optics, mechatronics, photochemistry, proteomics, and AI, optoproteomics enables researchers to see and capture what they want. When they find something interesting during observation, they can capture the substance in large quantity for analysis to better understand the role of the substance in a certain processes.

Interestingly, the idea of this revolutionary optoproteomics came from an insignificant experience when Dr. Jung-Chi Liao was still an assistant professor at Columbia University. One day when he went to the dentist, the blue curing light used to harden dental fillings inspired him. He thought the blue curing light might be used to catch protein.

Dr. Liao was not sure if this idea would work, but he was certain that if it did, the entire biological industry will benefit from the technology. Therefore, the next year after he returned to Taiwan, Dr. Liao launched research in collaboration with Elliot Chen and Gabriel Chang who specialized in

optics and chemistry individually. Three years later, the team initiated experiments on optoproteomics and developed a prototype in five years.

Dr. Liao said he was going to publish the research results in a paper initially, but as the research went on, he realized the technology, if put into practice, could make a difference. That was why he set up SYNCELL. This year, SYNCELL has participated in the BIO Asia International Conference and RESI Conference, placing the company under the international spotlight. SYNCELL also takes part in TechCrunch's conference to present its optoproteomics to more people.

## Turning unpredictable experiments into reality

Scientists have been extremely curious about the function of protein, such as the protein in the individual region of the midbody during cell division, the immune synapse formed when T cells attack tumor cells, the protein-binding partners of different cortex layers in a brain tissue, or the stress granule that appears when the cell is under stress. However, scientists were unable to find correct answers to their questions until now.

It takes only seconds for SYNCELL's optoproteomics to take pictures, analyze images with AI, and complete photo-labeling. In a workplace that operates eight hours a day, the optoproteomics can capture sufficient proteins for mass spectrometry-based proteomics in three days. Furthermore, the capture is highly accurate as SYNCELL's testing shows the mass spectrometry can achieve specificity of

86% in capturing nuclei.

The optoproteomics can solve researchers' long-standing questions. According to Dr. Liao, optoproteomics has long-term potential in biological research and understanding pathogenicity and molecular interaction. Currently, no other Taiwanese companies have developed similar devices. While foreign companies such as Nanostring, Akoya, IONpath, and Fluidigm have been engaged in spatial proteomics, SYNCELL's optoproteomics is the only technology that aims at capturing protein, also one of the few technologies capable of getting a large amount of protein without labeling.

As a startup established in 2020, SYNCELL's short-term goal is to achieve its fundraising target while recruiting more talent to help the company expand into the global market. In the events that SYNCELL participated in, many Taiwanese professors have already showed great interest in the optoproteomics. Therefore, SYNCELL is very confident in the potential of the optoproteomics and hopes to go public eventually in the US.

## Taiwanese startups must be brave to expand internationally

Dr. Lao gives the credit for the establishment of SYNCELL to various sources. Besides the hardworking team, especially the most dedicated members Elliot Chen and Gabriel Chang, SYNCELL has conducted MOST's Industrial Value Creation Program and In-house R&D, Production, and Self-Use Program

for Advanced Analytical Instruments, as well as Academia Sinica's Grand Challenge Seed Program. These programs have benefited SYNCELL a lot. When the optoproteomics was still an idea, Mei-Yin Chou, the then Director of Institute of Atomic and Molecular Sciences, Academia Sinica (now Vice President of Academia Sinica) had offered significant support. Besides providing financial support, she also consulted many experts for the team. The entire project would not have happened without her assistance.

This is also the suggestion that Dr. Liao gives to other startups that have just started. Dr. Liao points out that a number of platforms are available to help startups grow nowadays such as TTA supported by MOST. Startups can utilize these platforms and resources to expand their business.

Furthermore, Dr. Liao says Taiwanese startups must consider international expansion and seize every chance to take part in international meetings while interacting with people from different countries, rather than engaging in price wars since price competition will not attract investors. Taiwanese startups should think about whether their products can meet global needs and what they should do to expand internationally in order to achieve a win-win situation for themselves and their investors.

"Taiwanese startups should be more ambitious. We might not succeed in the end, but we should dare to dream and never be afraid of failure." ■



20 EMQ Has Raised US\$ 20 Million in Series B Funding Led by WI Harper Group

EMQ focuses on building a flexible infrastructure that can handle e-commerce, merchant settlement, procurement, remittance and payroll in different countries, solving the major headaches of cross-border financial transactions. EMQ now expects business-to-business transactions to account for half of its gross transaction volume in 2021, and will focus on expanding its business in China, followed by India and Japan. EMQ's technology has been used for business payments in 80 countries/regions.



Nuka Raised over US\$ 200,000 for Eternal Notebook on Zeczec

A waterproof and rewritable notebook, Nuka's Eternal Notebook can transmit written content to the cloud. You can write on the notebook with a pencil, ball-point pen, or Nuka's magnetic pen which can control the thickness of the lines. Besides writing on blank pages, you can also scan data or schedules in the to-do list and calendar to your phone via the Nuka App.



4 Heroic-Faith Raised US\$ 4 Million to Deal with the Unprecedented Need against COVID-19

Heroic-Faith uses deep learning and other forms of AI to develop algorithms that breaks the limits of the traditional stethoscope, for continuous, remote, and smart lung sound monitoring. The multichannel continuous respiratory monitoring system designed by Heroic-Faith has been used on patients with COVID-19, in a bid to eliminate the traditional method of auscultation that is rendered challenging due to PPE, isolation protocols and the increased burden of infection that is placed on medical personnel.



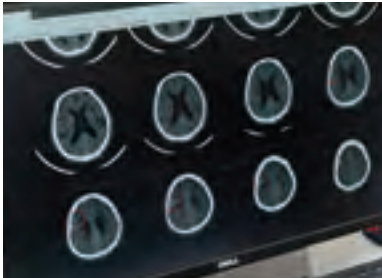
Kiipo Works with Wearable Device Brand Garmin

Amid the COVID-19 outbreak, Kiipo has developed NEO, a free at-home health monitoring platform for COVID-19, while working with Garmin to help families monitor their health in real time. By encouraging users to share their data on the platform, Kiipo has not only accelerated studies on COVID-19 but also revolutionized healthcare research.



2.7 Deep01 Raises US\$ 2.7 Million for its AI-Based Medical Imaging Software

Deep01's product has obtained clearance from both Taiwan and the United States' Food and Drug Administrations, and the company received its first purchase order, worth about US\$ 700,000. Deep01's AI product can detect acute intracerebral hemorrhage (ICH) in the A&E department. With an accuracy of 93-95% and 30 seconds per case, the performance exceeds the other competitors in the market. Besides technology, regulatory certification plays a critical role in the medical industry.



iWEECARE Extends US\$ 2.4 Million Pre-Series A Financing

iWEECARE, the developer of the world's smallest continuous temperature monitoring product, Temp Pal, announced that it raised US\$ 2.4 million in extended pre-series A financing. Spurred on by the need for remote patient monitoring, notably in fever detection, the Taiwan-based company plans to address the demand and achieve higher levels of public safety.



Czech Senate President Visits TTA and Calls on Both Countries to Cooperate

During his visit at TTA (Taiwan Tech Arena), Czech Senate President Miloš Vystrčil said the Czech Republic and Taiwan will cooperate in IoT, AI, green economy, startup, automobile, aerospace, and ICT, while strengthening the tie between startups in both countries to create a better business environment. Global accelerators located in TTA such as BE Capital, IAPS, MOX, SparkLabs Taipei, and Techstars also shared their missions and duties during the meeting.



Executive Yuan Premier Calls for Formation of Taiwanese Tech Startup Team

While visiting TTA to learn about the achievements of its partner accelerators, Executive Yuan Premier Su Tseng-chang called on YouTube founder Steve Chen and iStaging founder Johnny Lee to help Taiwanese startups connect to the world with their entrepreneur experience in Silicon Valley. Su emphasized that the government should provide more technology, application, legislation, and matching support to improve Taiwanese startups' global presence.



MoST Invites Outstanding Entrepreneurial Investors from Silicon Valley to Join TTA for the First Time

Due to the recent global pandemic, many industries are facing challenges. In this wave of changes, a group of Taiwanese entrepreneurs from Silicon Valley saw Taiwan's technological strength, startups' vitality and opportunities, so they returned to Taiwan for further development; including YouTube's co-founder Steve Chen, Mochi Media's founder Jameson Hsu, the founder of video game Guitar Hero Kai Huang, Race Capital's partner Phil Chen, the promoter of Warner Bros game Steven Chiang.



ELECLEAN has been listed as one of the innovative technologies for fighting COVID-19 by WHO

ELECLEAN disinfectant spray using nano-catalysis electrochemical technology manufactures disinfectant within 15 minutes. Water is the only reagent and directly transformed into ROS (Reactive Oxygen Species) that effectively destroys viruses and bacteria by oxidizing method. It is featured with safety (no harmful preservatives), powerful effect against viruses and bacteria, saving energy and convenience (easy to use and carry).



# TAIWAN TECH ARENA

Event Summary

## Techstars Startup Weekend

To combat the impact of the coronavirus, Taiwan Tech Arena (TTA) worked with Techstars and hosted the first ever virtual Startup Weekend in Taiwan. In the 54-hour hackathon, 133 participants came together and formed 39 projects to tackle various challenges posed by the COVID-19 pandemic. The event attracted participants from all walks of life and from all over the world, including Taiwan, the US, Australia, Japan, Belgium, and New Zealand.



## SparkLabs Taipei X Taiwan Mafia: MASTERCLASS

With high hope for Taiwan's technological development and startup ecosystem, YouTube founder Steve Chen led a group of entrepreneurs of Taiwanese descent based in Silicon Valley, including Jameson Hsu, Kai Huang, Phil Chen, and Steven Chiang, to form Taiwan Mafia.

Invited by TTA and its partner accelerator SparkLabs Taipei, Taiwan Mafia has organized a Masterclass specially designed for startups and entrepreneurs. Hear from these Silicon Valley tech giants who all have experience building and scaling global startups that have existed for a combined value more than US\$ 1 billion.

On the topic of "Startup Scaling", presenters at the first Masterclass shared their knowledge and experience on how to expand in the global market and overcome challenges during the initial stage of the business other than product development.

Besides presentation topics such as building an international brand, global fundraising, developing customer-focused products/services, expanding business, and scaling mindset, small group breakout sessions were also provided where participants shared their experience, exchange ideas, and engaged in intimate discussions.

Tsung-Tsong Wu, Minister of Ministry of Science and Technology, also encouraged participants on the event not to be afraid of failure when starting a business because any lessons learned from setbacks were critical nutrients for future success.



## Getting more Insight at TTA-CXO Breakfast

The TTA CXO Breakfast Meetup on the fourth Friday of every month is one of the most long-standing events at TTA. Just like last year, this event serves as a sharing platform where Line, Audi, Microsoft, and many other enterprises have been invited to exchange ideas with startups while discussing cooperation models and potential possibilities to shape the future with technology. A series of supply chain and one-on-one consultation services are also launched to provide suggestions and services for startups based on their needs.

## Fun with Friends-Community Event

Held on special occasions, the Community Event is a critical activity at TTA that brings its members and partners together. This year, TTA's startup team organized several featured activities such as the handmade soap workshop on Mother's Day. The egg-standing competition, also the highlight of the year, brought a once-in-a-lifetime experience to international members. TTA hopes the Community Event will give members and partners more opportunities to exchange ideas while having fun, thereby fostering a strong startup community.



## SparkLabs Taipei Investor Series

TTA's partner accelerator SparkLabs Taipei has held three venture capital events since May 2020, which focused on the topics of angel investment, startup valuation, and exit strategies. The events received overwhelming feedback and attracted hundreds of visitors from different countries. Through interacting with venture capitals face to face, startups were able to gain a deeper understanding of how venture capitals think and how to demonstrate their competitive edges. The free exchange of ideas also sparked inspiration among the startups.

## IAPS/BE Accelerator Demo Day

The Demo Day events held by TTA's partner accelerators IAPS and BE Accelerator in July set new milestones through cross-industry cooperation. IAPS joined hands with Taiwan Sport Industry Expo 2020 for the first time, bringing startups face to face with leading brands such as Decathlon Taiwan and professional baseball teams to transform the sports industry with innovative technology. BE Accelerator collaborated with Show Chwan Hospital and Taipei Medical University Hospital to address clinical staff' pain points and complete the first-stage certification, helping them boost their global presence.





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