



Case Study

AI-powered Aesthetic Surgery Recommendation System for Beauty Clinics and Spas





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Abstract

Plastics surgery is now one of the most popular medical treatments in the healthcare industry, with more than 23 million surgical and nonsurgical procedures performed in 2018, according to International Society of Aesthetic Plastic Surgery (ISAPS)⁽¹⁾. Even in the pandemic, the need for beauty augmentation is still growing and booming, as revealed by Bloomberg⁽²⁾. While this increasing demand is such a good news for beauty clinics, it also puts them under the huge pressure of employing aesthetic experts, those are well-known for high pay and scarcity.

The adoption of AI to reduce the reliance on human professionals, therefore, is not only a cure to the situation, but also promises further improvement and achievement for this increasingly popular medical service. This case study presents how FPT Software leverages AI to develop an aesthetic surgery recommendation system for a beauty clinic in Japan.



The Urge for Smart Assistance

Being one of the largest medical spas in Japan with 85 domestic and overseas branches, our client offers a full service of regenerative and rejuvenation treatment, along with a wide range of plastic surgeries. The clinic has been trusted by thousands of customers since establishment thanks to its outstanding services delivered by world-renowned cosmetic surgeons.

Unlike other medical treatment, in aesthetic surgery, the treated areas still function properly and it is the patient who decides whether a surgery shall be conducted or not. The sense of beauty also varies from geographical areas and sometimes follows either local or global fashion trends. The consultation of experienced doctors, therefore, is extremely important to avoid unnecessary treatment that could lead to negative impacts on patients' health. This heavy reliance on professionals causes two major issues for the clinic:

- In a country like Japan where the population aging has long been a severe problem, **the shortage of high-skill workforce** in aesthetics surgery is inevitable. This in turn significantly boosts the labor cost, reduces profitability, worsens customer experiences and makes the service less affordable.
- Even with the most competent experts in the field, there are challenging cases requiring more careful examination and consideration. For these patients, final recommendation would take much longer time if being conducted by traditional examination methods. **The need for an assisting tool that could accelerate doctor's decision-making process**, hence, understandably arises.



With the vision and objectives to bring state-of-the-art services for its customers, our client sought for the help of FPT Software, hoping to harness the power of technology to create an aesthetic surgery recommendation system that could improve the situation.

Actualizing the Vision

Although aesthetic surgery can be performed on all areas of the head, neck, and body, our focused areas in this project are the facial area with two popular aesthetic surgeries: rejuvenation treatment and eye double-fold surgery. The idea is to build a deep learning system capable of predicting the perfection of aesthetic surgery, just based on original photos of patient's eyes. The model is trained based on the dataset of before and after surgery images capturing the eye area of the same person.



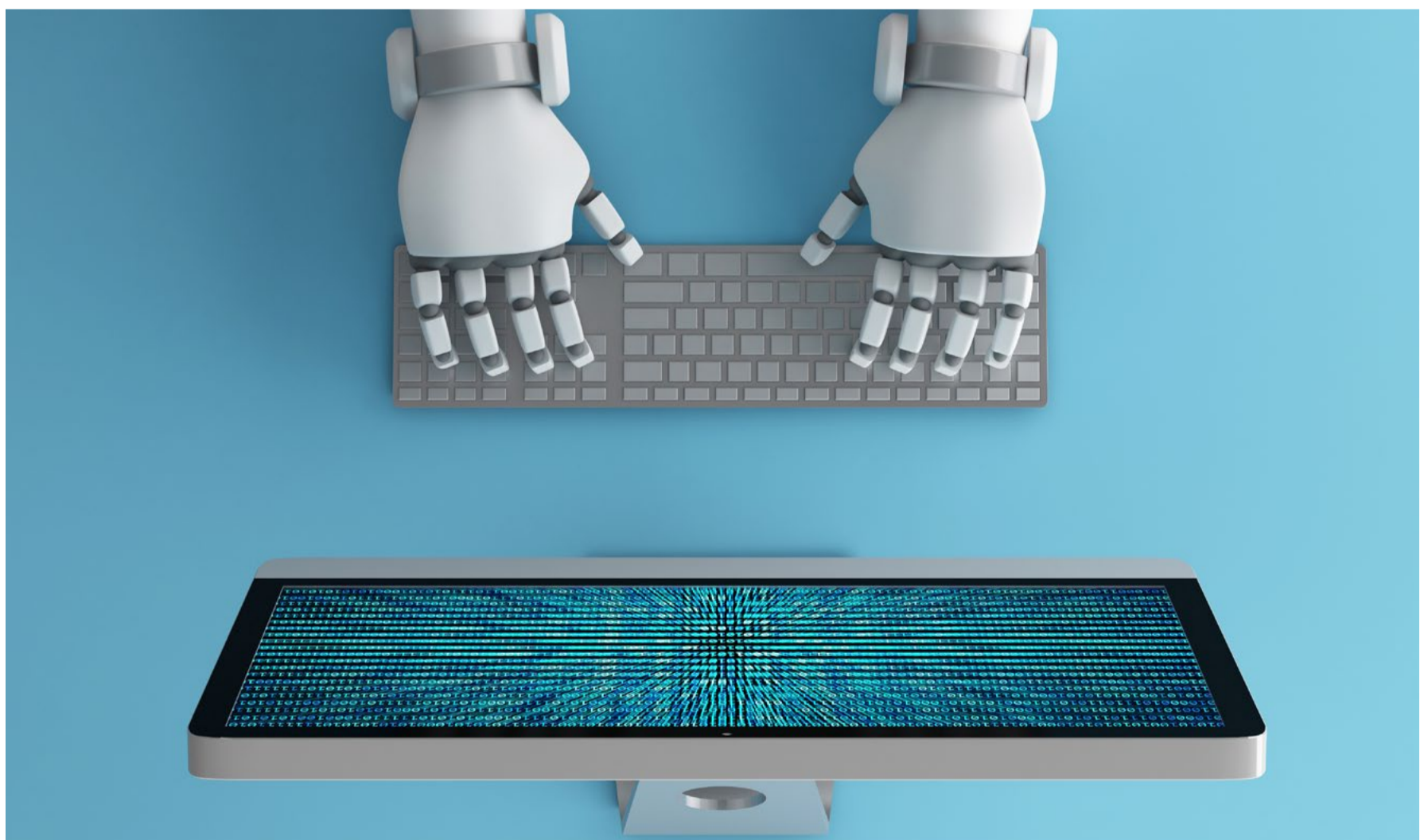
Original



Outcome

Firstly, a convolutional auto-encoder is trained by eye images captured from various angles provided by the clinic. The encoder then learns to extract generic eye features.

Secondly, all “after” images are assumed as perfect, leveraging the know-how of aesthetic surgeons, so that the encoder can be further trained to predict the probability of perfection if treatment is conducted. Based on this score, the system would suggest whether specific aesthetic surgeries, including rejuvenation treatment and eye double-fold surgery, should be performed or not.





The Results and Further Development

The model shows encouraging results with **88.9%** and **93.1%** accuracy on rejuvenation treatment and eye double-fold surgery, respectively.

Surgeons and patients are now provided with a reference decision, just simply based on the photo of eye area. This does not only reduce the workload for medical professionals, but also relieves the clinic from the burden caused by the shortage of high-skill workforce. Risks of subjective decisions, mistakes, unethical behaviors can also be lowered with the participation of this AI-powered expert in the process of diagnosis and examination.

Moreover, the solution allows users to keep valuable knowledge of experienced doctors to consult the patient in aesthetic surgery, while its continuous learning capability facilitates the self-update of newly fashionable know-how in this field, given a set of rich training data.

With the initial success on rejuvenation treatment and eye double-fold surgery, FPT Software and the client are now working to expand the capability of the system, make it able to deal with more kinds of treatments, thereby upgrading and diversifying the services.



References

[1] ISAPS (2018). International Survey on Aesthetic/Cosmetic Procedures performed in 2018. [\[Link\]](#)

[2] Bloomberg (2020). The Pandemic has caused a boom in plastic surgery. [\[Link\]](#)



FPT Software is part of FPT Corporation, a technology and IT services provider headquartered in Vietnam with nearly US\$1.2 billion in revenue and 28,000 employees. Being a pioneer in digital transformation, the company delivers world-class services in Smart factory, Digital platforms, RPA, AI, IoT, Mobility, Cloud, Managed Services, Testing, more. FPT Software has served over 700 customers worldwide, 83 of which are Fortune 500 companies in the industries of Aerospace & Aviation, Automotive, Banking and Finance, Communications, Media and Services, Logistics & Transportation, Utilities, Consumer Packaged Goods, Healthcare, Manufacturing, Public sector, Technology and so on.

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