



The Woori Lounge at Yonsei's Severance Hospital



Medical School, Severance Hospital and Yonsei Cancer Center.



The 2019 Yonsei Biomedical Data Science Workshop.

CUTTING THROUGH MEDICAL PROBLEMS

Artificial intelligence and big data could help overcome some of medicine's biggest challenges, say researchers at **SOUTH KOREA'S YONSEI UNIVERSITY**.

"When used together, big data and artificial intelligence form the Swiss army knife of healthcare," says Yonsei University professor, Jae-Ho Cheong, chair of the Department of Biomedical Systems Informatics. Yonsei, a top-tier, progressive Korean institution with an illustrious history, is throwing its weight behind the development of AI and big data tools that make use of vast amounts of information to provide medical insights beyond human capability.

Yonsei's roots stretch back to 1885, when its predecessor, Gwanghyewon, became South Korea's first hospital to practice Western medicine. Today,

Yonsei is one of the top three most prestigious universities in South Korea, known as the 'SKY universities:' an acronym made from the initials of the three institutions. Yonsei is now inviting talented scientists trained in genomics, medical informatics, or artificial intelligence to join its ranks in pursuit of research excellence.

Big data for big challenges

Yonsei University Medical College's research teams boast a portfolio of big data research that may one day significantly improve the lives of people afflicted by disease. Researchers in the Department of Nuclear Medicine, led by Hae-Jeong

Park, are characterizing brain networks to better identify and treat neurodegenerative disease. The same team are taking healthcare beyond hospital walls by developing tools to detect a child's risk of cognitive impairment, or emotional problems, based on their interactions with computer games.

In other labs, researchers are tackling cancer. Hyun-Seok Kim, a professor at Yonsei's Severance Biomedical Science Institute, and his collaborators recently analyzed the interactions between 200,000 chemicals and a testbed of cancer cell models, leading to the discovery of 171 potential

diagnostic markers or targets for new drugs. Meanwhile, Department of Radiology researchers showed the capability of machine learning to automatically recognize breast cancer from mammograms. Recently, a team led by Jae-Ho Cheong from the College of Medicine developed the world's first genetic analysis to predict patient response to chemotherapy following surgery, which could save patients from unnecessary suffering and cost.

"Big data can be used to further patient diagnosis, develop new, more effective treatments, and discover new medical breakthroughs, from existing clinical information," says Cheong.

Laying the foundations

These clinical insights don't always come easy. Some of the greatest obstacles are found in the data collection stage, where standardization and database-building requires significant personnel investment. To overcome this and lay the foundations for more streamlined studies, Yonsei has invested heavily in developing data collection and data processing infrastructure, and in AI learning servers that integrate with databases to simplify researcher workflow as much as possible.

Another explanation for Yonsei's creative portfolio of data-driven research is a focus on inspiring new ideas. To further develop this, their Department of Medicine's Graduate School started an 'Introduction to Artificial Intelligence in Medicine' course, which gives doctors an opportunity to learn the basic concepts of AI and think of potential uses for the technology. Some of these ideas,

says Cheong, are already leading to research projects.

The introductory AI course is just one aspect of Yonsei that demonstrates its desire to attract and develop well-rounded academics who are confident in using the latest innovations to tackle complex medical problems. Cheong and his colleagues hope that this attitude will help attract top minds to the university.

BIG DATA WILL SHAPE THE FUTURE OF DIAGNOSTIC AND TREATMENT METHODS WITH REDUCED MEDICAL COSTS.

A prestigious academic hub

Yonsei fosters an environment conducive to discovery, which makes it an attractive destination for aspiring scientists. New policies maximize the faculty's time

dedicated to research, while simplifying their administrative tasks. Academic staff are given the opportunity to train at world-leading institutions, to gain new skills, knowledge, and international perspectives. Professors newly employed by Yonsei are eligible for a 150 million Won (\$US130,000-plus) grant as a research settlement.

Cheong predicts that big data will soon develop to the point where infectious disease outbreaks can be predicted and averted. Governments will be able to predict the need for specific health policies depending on their population's demographics. And the future of diagnostic and treatment methodologies will be highly streamlined, with reduced medical costs. To help realize these goals, Yonsei will host the 2019 Avison Symposium on May 31st and June 1st 2019. Titled 'Data Driven Medicine - Exploration and Exploitation,' the event will bring together scientists from around the world to discuss cutting-edge research

and techniques at the frontiers of biomedical science.

Beyond the symposium, Yonsei has ambitious plans: by 2024, the university hopes to open a global center for highly-multidisciplinary research and a new clinical research facility at its campus within Songdo International Business District, a 'smart city' southwest of Seoul. The goal, says Cheong, is to develop a comprehensive infrastructure of clinical and academic excellence. By coupling next-generation tools such as AI and big data with a progressive attitude towards discovery, he hopes that a growing faculty of Yonsei researchers will be equipped to solve even the most intricate and pressing medical challenges. ■



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