**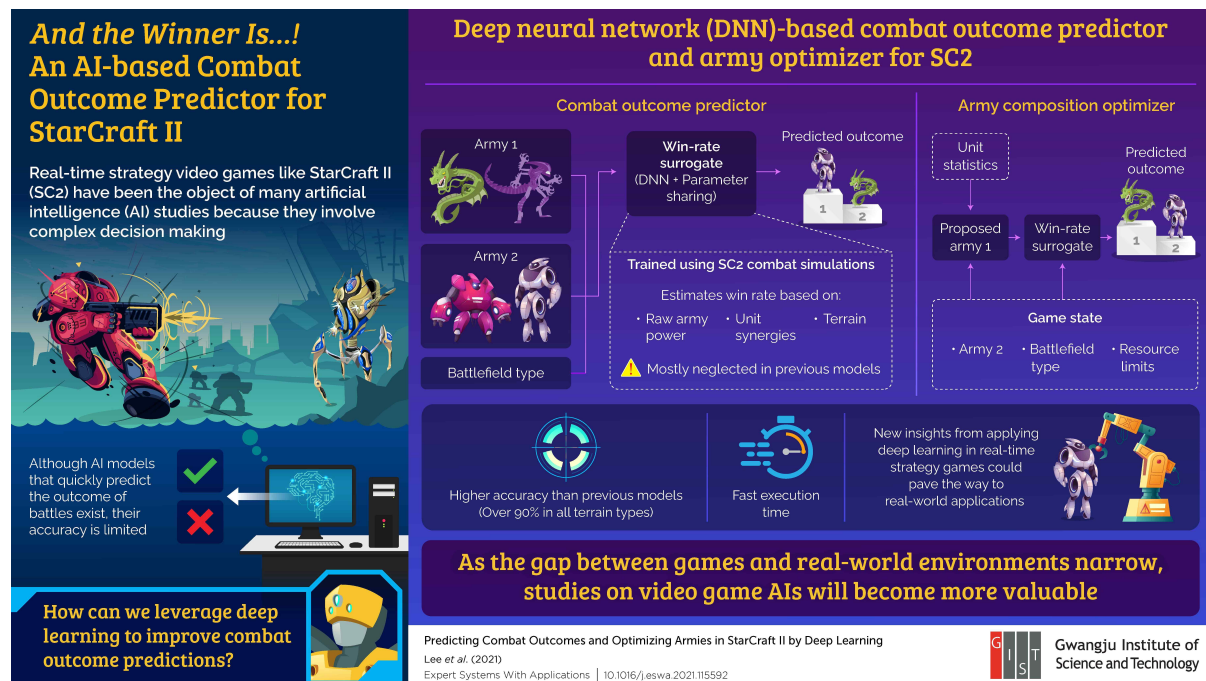Gwangju Institute of Science and Technology Researchers Develop Terrain-Aware AI for Predicting Battle Outcomes in *StarCraft 2***

*The proposed model leverages deep-learning techniques to consider many complex in-game factors simultaneously and make accurate predictions*

**StarCraft 2 (SC2), one of the world's most popular real-time strategy video games, has been studied extensively in the field of AI. However, it is difficult to realize AI systems with good decision-making skills due to the many factors involved in in-game battles. Now, scientists have developed an AI model that can predict outcomes of SC2 battles by considering army compositions and battlefield terrain simultaneously, paving the way for AIs that can correctly assess complex situations.**



Predicting Combat Outcomes and Optimizing Armies in StarCraft II by Deep Learning
Lee *et al.* (2021)
Expert Systems With Applications | 10.1016/j.eswa.2021.115592

Gwangju Institute of Science and Technology

As the need for more sophisticated artificial intelligences (AIs) grows, the challenges that they must face along the way have to evolve accordingly. Real-time strategy (RTS) video games, unlike turn-based board games such as chess, can serve as a vast playground for pushing the limits of AI. In particular, *StarCraft II* (SC2), one of the world's most popular and skill-demanding RTS games, has already been the object of a few groundbreaking AI-related studies.

In SC2 matches, each player has to build up and command an army of varied units to defeat their opponent using wit and grit. While AI-based systems can excel at many aspects of the game, improving their decision-making regarding when their units should be sent to or relocated during a battle is remarkably difficult. This is because armies can be composed of virtually endless combinations of different units that synergize depending on various factors.

In addition, the characteristics of the battlefield ('terrain') where the combat takes place can have a decisive impact on the outcome. So far, no study has focused on both of these aspects simultaneously for making AI-based combat outcome predictions—an essential skill for any SC2 player.

In a recent study, a team of scientists from the Gwangju Institute of Science and Technology (GIST) in Korea tackled this issue using a deep learning-based approach. By building and training a deep neural network (DNN) model, the researchers developed a system that could predict the outcome of an SC2 battle by simultaneously considering the detailed composition of the opposing armies and the type of terrain they would fight at. Their paper was made available online on July 24, 2021, and was published in Volume 185 of *Expert Systems With Applications* on December 15, 2021.

The proposed DNN model leveraged a technique called 'parameter sharing,' which allowed it to effectively and precisely analyze the circumstances of the battlefield in a very short time. "*Our AI was capable of taking numerous complex factors into consideration to predict the overall combat result. When implemented, such a model would help an AI player make proper decisions with regards to its offensive and defensive strategies,*" highlights Professor Chang Wook Ahn, who led the study.

Perfecting the way an AI makes decisions in a complex video game like SC2 will eventually lead to AI-based systems that can assess and correctly tackle difficult situations in the real world. As Prof. Ahn explains: "*We believe that the AIs used in gaming and in industry are not that different and that more AI applications will soon become tangible in our daily life. Thus, our continued study in this topic could become one of the cornerstones of the global endeavor to develop AIs that can perceive situations and behave logically.*"

It's very likely that studies on video game AI systems will become increasingly valuable as the gap between games and real-world environments narrows, so keep an eye out for further advances in this field!

**Reference**

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|---|---|
| Authors: | Donghyeon Lee, Man-Je Kim, Chang Wook Ahn |
| Title of original paper: | Predicting combat outcomes and optimizing armies in StarCraft II by deep learning |
| Journal: | *Expert Systems With Applications* |
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**About the Gwangju Institute of Science and Technology (GIST)**

The Gwangju Institute of Science and Technology (GIST) is a research-oriented university situated in Gwangju, South Korea. Founded in 1993, GIST has become one of the most prestigious schools in South Korea. The university aims to create a strong research environment to spur advancements in science and technology and to promote collaboration between international and domestic research programs. With its motto of "A Proud Creator of Future Science and Technology," GIST has consistently received one of the highest university rankings in Korea.

Website: http://www.gist.ac.kr/

**About Professor Chang Wook Ahn**
Chang Wook Ahn is a Professor at the AI Graduate School of the Gwangju Institute of Science and Technology (GIST). His research group is developing various approaches for real-time strategy games by means of evolutionary deep reinforcement learning. Additionally, his group is researching a variety of future AI techniques, such as quantum machine learning and evolving neural networks. In 2016, his research group developed 'EvoM,' the first AI composer in Korea. Moreover, he is currently undertaking the role of CEO at CreativeMind Inc.