

Demo Session

Topic: Human & Smart Machine Co-Learning

1. Organizers

- Organizers
 - **Chang-Shing Lee**, National University of Tainan, Taiwan
 - **Naoyuki Kubota**, Tokyo Metropolitan University, Japan
 - **Li-Wei Ko**, National Chiao Tung University, Taiwan
 - **Marek Reformat**, University of Albert, Canada
 - **Giovanni Acampora**, University of Naples Federico II, Italy

2. Short Description

Dynamic assessment with an intelligent agent can differentiate the capabilities and proficiency of students. It can therefore be advocated as an interactive approach to conduct assessments on students in learning systems. Facebook AI Research proposed ELF OpenGo, an open-source reimplement of the AlphaZero algorithm. They also developed Darkforest, which displays the competence and skills of high-level amateur Go players. To enable these open-source AI bots to assist humans at different levels in learning Go, this session demonstrates an intelligent agent for real-world applications in robotic edutainment and humanized co-learning. To achieve this, we successfully constructed an OpenGo Darkforest (OGD) cloud platform using these AI bots and further combined the brain computer interface with the OGD cloud platform to observe the relationship between the brainwaves and win rates of human Go players. The intelligent agent also converted human brainwaves into physiological indices and reflected these in the robot to express human feelings or emotions in real-time. For future educational applications, we also introduced intelligent robot teachers learning together with students in Taiwan and Japan. More than 200 students have been co-learning with intelligent robot teachers in Tainan, Kaohsiung, Taipei, and Tokyo from 2018 to 2019. The learning performance and feedback from students and teachers has been extremely positive, especially from remedial students.

Reference

1. C. S. Lee, M. H. Wang, Y. L. Tsai, L. W. Ko, B. Y. Tsai, P. H. Hung, L. A. Lin, and N. Kubota, "Intelligent agent for real-world applications on robotic edutainment and humanized co-learning," *Journal of Ambient Intelligence and Humanized Computing*, 2019. (DOI: 10.1007/s12652-019-01454-4)
2. C. S. Lee, M. H. Wang, L. W. Ko, Y. Hsiu Lee, H. Ohashi, N. Kubota, Y. Nojima, and S. F. Su, "Human intelligence meets smart machine @ IEEE SMC 2018," *IEEE Systems, Man, and Cybernetics Magazine*, 2019. (Accepted)
3. C. T. Lin, Y. T. Liu, S. L. Wu, Z. Cao, Y. K. Wang, C. S. Huang, J. T. King, S. A. Chen, S. W. Lu, and C. H. Chuang, "EEG-based brain-computer interfaces," *IEEE Systems, Man, and Cybernetics Magazine*, vol. 3, no. 1, pp. 16-26. Oct. 2017.
4. K. P. Thomas and A. P. Vinod, "Toward EEG-based biometric systems," *IEEE Systems, Man, and Cybernetics Magazine*, vol. 3, no. 1, pp. 6-15. Oct. 2017.
5. C. S. Lee, M. H. Wang, L. W. Ko, N. Kubota, L. A. Lin, S. Kitaoka, Y. T. Wang, and S. F. Su, "Human and smart machine co-learning: brain-computer interaction at the 2017 IEEE International Conference on Systems, Man, and Cybernetics," *IEEE Systems, Man, and Cybernetics Magazine*, vol. 4, no. 2, pp. 6-13, Apr. 2018.
6. E. Gibney, "Google secretly tested AI bot: updated version of Google DeepMind's AlphaGo program revealed as mystery online player," *Nature*, vol. 541, pp. 142, Jan. 2017.
7. C. S. Lee, M. H. Wang, C. S. Wang, O. Teytaud, J. L. Liu, S. W. Lin, and P. H. Hung, "PSO-based fuzzy markup language for student learning performance evaluation and educational application," *IEEE Transactions on Fuzzy Systems*, vol. 26, no. 5, pp. 2618-2633, 2018.
8. C. S. Lee, M. H. Wang, T. X. Huang, L. C. Chen, Y. C. Huang, S. C. Yang, C. H. Tseng, P. H. Hung, and N. Kubota, "Ontology-based fuzzy markup language agent for student and robot co-learning," *2018 World Congress on Computational Intelligence (IEEE WCCI 2018)*, Rio de Janeiro, Brazil, Jul. 8-13, 2018.
9. Y. D. Tian and L. Zitnick, "Facebook Open Sources ELF OpenGo," May 2018, [Online] Available: <https://research.fb.com/facebook-open-sources-elf-opengo/>.