## Future research plans

If I am accepted as a researcher of Osaka Central Advanced Mathematical Institute, I would like to pursue the following research project:

1. Studying universal rulesets
   As mentioned above, universal rulesets have recently attracted considerable attention of researchers on CGT. Among them, I have obtained significant results like solving open problems. Universality can be viewed as a form of algebraic complexity, which is analogous in several ways to computational complexity, particularly in proof techniques. Thus, I expect that by improving studies on universal rulesets, we may obtain results that clarify and deepen its connection to the theory of algorithms.
2. Studying extension of the theory of Sprague-Grundy values
   The theory of Sprague-Grundy values is one of the most central concepts in CGT and many extensions of this theory are considered. Recently, Sprague-Grundy values for games with carry-on moves were introduced. I combined this extension with one for loopy games and showed that, by subdividing the equivalence classes, the Sprague–Grundy theory can be generalized to these rulesets. In such an extension, there is not only the well-known construction of non-negative integers and XOR operator, but also the max operator and absorbing elements are required for the analysis. Therefore, I think this kind of study is also important for a concrete example of algebraic theory.
3. Studying Sevens
   Sevens is a well-known suited card game. Prof. Hironori Kiya, who I would like to be my host professor, and I have studied this game since some years ago. We consider this game has a unique winning convention. That is, if one player has run out their card, then the player becomes the winner. However, if a player has cards and they cannot play, then the player becomes the loser. This is a kind of mixed convention of normal convention (the player who cannot make a move is the loser) and misère convention (the player who cannot make a move is the winner). Thus, we expect that by studying sevens, we will find further relationship between winning convention and mathematical structure of games. I would like to accelerate this study with Prof. Kiya.

In order to succeed in these studies, I have to conduct joint works with not only Prof. Kiya but also various researchers. Fortunately, I have already worked with top researchers on CGT, like Prof. Richard Nowakowski, Prof. Carlos Santos, and Prof. Urban Larsson. Also, I have had joint works with many researchers in Japan, like Prof. Shun-ichi Kimura in Hiroshima University, Prof. Hirotaka Ono in Nagoya University, and Prof. Tomoaki Abuku in Gifu University. Therefore, I believe I am well prepared for these projects.