

# Validating Predictive Models of Extreme Expertise in Complex Cognitive-Motor Skills

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## Abstract

Modeling masterful performance is an essential component of skill acquisition research. Several models of high-level or extreme expertise exist for a variety of tasks, from surgical performance to the video game Tetris, yet assessing whether these computational models accurately represent real-world expertise remains challenging. Empirical validation is uniquely difficult because of limitations intrinsic to models of expertise, namely the inherently small sample sizes of experts which increase the cost of partitioning data into test and training sets, and the detailed domain knowledge often required to interpret model results. This paper presents multiple novel approaches to validating models of extreme expertise, using strategies such as generative pseudo-interventions and retroactive longitudinal case studies. The results of these validation methods align very closely with interpretations given by domain experts, demonstrating great promise for both the validation itself as well as our currently proposed models of predicting real-world performance outcomes in complex skills.