

# Game-If-AI

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2022 - Current

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## Background

Artificial Intelligence (AI) is increasingly critical to the civilian workforce and modern military operations. However, shortages in the number of AI professors and trainers mean that growing AI competencies is not simply a matter of putting learners in classrooms, and despite progress in areas such as mathematics, AI-adaptive tutoring for learning AI competencies has not been fully realized.

The goal of Game-If-AI is to leverage AI learning technology to train competencies to build, interact with, or manage artificial intelligence systems. This work leverages earlier research such as PAL3 (Personalized Assistant for Life-Long Learning), a general pedagogical AI framework for personalized adaptive learning on mobile devices, which provides on-the-job training, ongoing assessment and life-long learning support. It also uses customizable interactive content, including intelligent tutoring dialogs (OpenTutor), virtual mentors (MentorPal), and interactive tutoring when coding in Python notebooks.

## Objectives

To use AI and gamification techniques to train AI skills, the Game-If-AI team seeks to collaborate with both civilian and military providers of AI education. Concepts trained by Game-If-AI have been adapted from USC's Information Technology Program (ITP) and Army learning programs (e.g., autonomous systems and ethics topics developed by cadets from the Military Academy at West Point). Based on this material, guides, quizzes and dialog-based tutoring lessons were developed for an initial set of topics including neural networks and natural language processing.

Game-If-AI supports hands-on activities using tutored Python notebooks where learners build and evaluate AI models. Based on the learner's code and AI system performance, an intelligent tutoring system guides the learner in making revisions using personalized hints and feedback. Programming activities focus on practical examples, to support transferring skills to real-life problems and understanding key concepts (e.g., pros and cons of different AI tools).

## Results

The first prototype of the system was piloted in the Spring 2023 semester as an optional assignment in the USC

Basics of Artificial Intelligence course (ITP 259). In a post-survey, students rated the system strongly positively, reporting that it increased their learning (92% of respondents, mean 4.62 out of 6) and that the system was a good idea overall (83%, 4.63 out of 6). Based on learner performance measures, 68% of students mastered one or more topics in the Game-If-AI system even though it was optional. These results indicate that significant benefits should be possible for AI learning by leveraging AI tools, and informing the next steps to improve the system (e.g., providing a web-app version to make programming activities easier to review).

## Next Steps

The system is expanding to a larger library and completing larger user studies each academic semester. In Fall 2023, learners will study in a new web-based version of PAL3 or in the mobile app. Game-If-AI capabilities are growing through two projects: TACTAIC-RL (Team-Adaptive Coach for Training Artificial Intelligence Competencies using Reinforcement Learning) and AI-UP (AI-Upskilling with AI Tools). As part of TACTAIC-RL, reinforcement learning will be applied to the currently collected PAL3 data sets to optimize the personalized recommendations given by Game-If-AI. In addition to these enhancements, we will expand Game-If-AI to further civilian and military institutions, leading up to a public release of the Game-If-AI app for learning AI skills.

Published academic research papers are available from <https://ict.usc.edu/research/publications>  
(Search engine keyword: USC ICT Publications)

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