An AI-Based System for Supporting Formative Feedback

Currently under development

What is *SkillTree?*

SkillTree will be an AI-assisted tool that creates a visual representation of what your students know and can do in computer science. It is currently under development by researchers at the University of Illinois Chicago.

SkillTree is not a chatbot. Instead, it is a supplementary system that runs in the background of a classroom to provide teachers and students with extra information about what skills students have currently demonstrated on projects, assignments, and everyday tasks. SkillTree can be thought of like the skill trees commonly found in video games that students "level up" nodes on their personal knowledge map as they demonstrate what they've learned. Teachers get a clear, at-a-glance view of every student's progress in real time with *up-to-the-minute* updates to support instructional decisions for personalized learning.

As all educators know, understanding what each student knows at any given moment is one of the most challenging parts of teaching, especially in large classes with limited class time. When a student submits work (like a coding project), *SkillTree* functions as a formative assessment tool by using locally hosted large language models (LLMs) to analyze student work, and identify the skills and concepts represented in that work. It then provides teachers with a concise summary that supports inquiry into student understanding and helps guide instructional decisions about where a student may need support, encouragement, or further challenge.

SkillTree is starting its work in the computer science discipline, but is hoping to expand to other subjects as the prototype is further developed!

What sets *SkillTree* apart from other AI tools?

We are committed to making sure principles of pedagogy and learning align with our use of AI systems. There are several ways SkillTree maintains our commitments to ethical and responsible AI use while centering humans in teaching and learning activities.

Teachers stay in control: humans are centered. The AI does not grade students. A student's SkillTree instead gives both teachers and students a summary of what skills it detected in everyday project work and teachers make all decisions. Teachers can override, correct, or change to any student's *SkillTree* at any time.

***Transparent AI models for maintaining integrity and safety*.** Unlike many AI tools that rely on trusting the decisions of AI systems on their word, *SkillTree* links every decision to a visible student knowledge map and well-established subject standards (e.g., the CSTA Standards for CS). SkillTree shows how every single decision is made by the AI, if a teacher wants to know. You can see why the system identified a particular skill, trace its reasoning path, and verify it. Right now, most AI chatbots are not capable of providing this level of transparency, increasing our trust in AI systems.

Student data stays secure and private. All student data stays within the university's secure systems with AI systems that we run at the university. Student information is never shared with outside companies or third-party AI services.

Aligned with standards. *SkillTree's* knowledge model is built around national and statewide CS standards. The skills students work on reflect the same learning goals that teachers are already teaching to, and every skill in a student's SkillTree is linked directly to standards in CS.

***Built with teachers*.** This project is a collaboration among CS educators, AI experts, ed tech researchers, and measurement specialists. The project is being designed by listening to what teachers actually need through interviews, surveys, and focus groups, and is being built from the ground up based on your input. The project works directly with a team of **Teacher Design Partners** to guide the development of SkillTree.

Our Goal

SkillTree is **NOT** designed to replace educators. It is solely a supportive informational tool for both teachers and students. It is designed to give educators information for providing formative feedback to students in real time so teachers can do what they do best: working directly with students and freeing up time for individual and group instruction. Our goal at SkillTree is to free up teacher time by making student knowledge visible and accessible, so educators can focus on personalized instruction and improving students' learning.

More Information

More information about SkillTree can be found at the UIC TRAILblazer Lab where SkillTree is being developed: www.trailblazerlab.org.

You can also contact the Project Director / Principal Investigator, Dr. Jeremy Riel, at jriel2@uic.edu.