

I, Robot

A new UI course blends science and dance for an inspired creative collaboration.

BY KATHRYN HOWE

Slowly, he rises to his feet and walks away. She reaches out to him and shakes her head from side to side, then brings her hands to her face in despair. They scratch their heads, shrug their shoulders, and blink away the emotions that come as their relationship ends—all to the heartbreaking theme from *Love Story*.

As Alberto and Amanda can attest, breaking up is hard to do. But, in this particular case, Alberto and Amanda are two-foot-tall humanoid robots. And they are performing the dance piece “Robots in Love,” choreographed by a UI student during an innovative new course that ended last semester with a public recital at the Space Place Theater.

In an extraordinary collaboration between the UI Departments of Computer Science and Dance in the College of Liberal Arts and Sciences, the three-credit-hour “Dancing Robots” class presented eight UI students and two instructors with an unusual cross-discipline opportunity. From January through May, they immersed themselves in an interactive project that asked them to unite their scientific and creative expertise toward a shared goal: choreograph a dance for robots and program them to perform it in a final show.

“As soon as I heard ‘robots’ and ‘dancing,’ I said, ‘Count me in,’” explains **Denise Szecsei**, 11MS. A lecturer in computer science and math, and the course’s primary instructor, she was inspired by a premise that required students to stretch beyond their comfort zones, solve complex problems, and learn in a hands-on environment. The setting reminded Szecsei of why she

loves teaching in the first place: to see students actively engage in the learning process and surprise themselves in ways they didn’t think possible. All she had to do was give them the resources, sit back, and watch what they could do.

Those resources came in the form of five programmable robots—Alberto, Christopher, Denise, Daniel, and Amanda—purchased from the Boston-based Aldebaran Robotics company with funds from a 2014 Innovations in Technology Award bestowed by the university’s Academic Technologies Advisory Council. Since 2001, the council has supported innovative new projects that improve instructional computing education for students. For the latest award cycle, computer science professor **Alberto Segre** and associate dance professor **George De La Pena** submitted a proposal that the council simply could not resist.

The title wasn’t fancy. But “Making Algorithmic Thinking Concrete via Collaboration with the Performing Arts” pitched an intriguing concept—one in which students from computer science, electrical engineering, and dance could work in small groups to make robots dance. The course would teach performing arts students about computation and the technical aspects of computer programming; the science-minded undergrads would

develop a more detailed understanding of the creative process and the mechanics of how the human body moves. All would learn how to work respectfully as a team and with people who brought varied strengths to the table—a powerful real-world tool for a successful



PHOTO: TIM SCHOON/UI OFFICE OF STRATEGIC COMMUNICATION

future career. The selection committee deemed the course a perfect example of what classrooms of the future should look like.

As associate professor of dance **Charlotte Adams**, a co-instructor who coached the class on choreography, told the UI’s Iowa Now online news source: “Collaboration is an especially vital skill. The world

needs creative thinkers and scientific thinkers working and learning together.”

Aldebaran Robotics develops the humanoid robots specifically for science, technology, engineering, and math education—widely known as STEM—across all grade levels and learning environments. Flexible shoulder, neck, hip, knee, and ankle joints enable the robots to replicate most human movements. When they fall over, the robots yelp “Ouch!” with surprisingly realistic emotion.

Indeed, these robots can be programmed to express a personality that’s unexpectedly charming. In fact, Aldebaran intends eventually to market them as compassionate, friendly, and responsive in-home companions. If Szecsei’s response is any indication, the company can expect success. By the end of the semester, she affectionately referred to them as her “kids.”

To come to life, each robot must be hooked to a computer loaded with special software for programming voice, behavior, and movement. The UI computer science students’ experience in programming languages like Python, C++, and Java came in handy, while dance students benefited from a simple-to-use graphic software program called Choregraphe that made the world of computer programming accessible and unintimidating.

Throughout the semester, for two-and-a-half hours every Tuesday afternoon, the eight students gathered in MacLean Hall. They started slowly, completing several small assignments to familiarize themselves

with the capabilities of their new friends and the basic functions of Choregraphe. *Let’s make Denise do a plié. Can Christopher do a fist pump? How about a wave from Daniel? What looks natural? What can our robot actually do?* Often, a student would take to the floor to replicate the action himself before returning to the computer.

“I had computer science students dancing,” laughs Szecsei, like she still can’t believe it.

One of those students was her son, Alic, who appreciated the new perspective on human movement. Before the class, he never thought about the details of how his body moved through space when walking or making a gesture. But, thanks to the dance students, he realized the grace and complexity involved. In turn, the dancers began to think about movement in a new way, discovering how to break it down into step-by-step calculations. They brainstormed and debated their solutions in small groups, huddled around a robot and a laptop.

For the final recital, each student choreographed and programmed one piece for the overall program—again with the guidance and input of their classmates. They became so immersed in the process that the hours at MacLean flew by and students often complained when it was time to dismiss. For her part, Szecsei relished the break from giving lectures.

“I never once got the question, ‘Is this going to be on the test?’” she says. “Everything they did was out of pride and passion for the project.”

Out of that passion came pieces like “Robots in Love,” “Evolution of Beyonce,” “I’m Looking at Trisha Brown”—featuring a robot duet with a human dancer—and “Robot Dance Class,” incorporating the Styx hit

“Mr. Roboto.” Eventually, all eight individual feats of choreography came together in “U of iRobot,” one seamless performance complete with an introduction, intermission, robot emcees, and a playbill with robot bios.

Szecsei also took the robots on STEM outreach visits to area K-12 schools, sharing with younger students what hers were able to accomplish—and inspiring them to believe in their own abilities. Because the robots immediately capture the attention and imagination of youngsters, they make a perfect outreach tool. The professor hopes to secure invitations from more schools in the coming academic year, and she’s also developing a robot camp for fifth-grade students next summer.

After the curtain fell on “U of iRobot,” Szecsei began developing this fall’s course. “Robot Theater” will ask students to program robots to convincingly recite Dr. Seuss’ *Green Eggs and Ham*, create a TV commercial, work on a soliloquy, and produce a theatrical play. “Dancing Robots” will come around again next spring, and in the meantime Szecsei is also planning other collaborations. Personally, she really likes the idea of “Robots and Film.” With their funny and dramatic characteristics, she says, the robots could easily star in a fantastic soap opera. It’s an amusing idea—but one with serious intentions to help students discover new ways of learning and working.

As Szecsei says, “You only understand when you do something. Education is not a spectator sport.”

If you live or teach in the Iowa City area and would like Denise Szecsei and the robots to visit your classroom, contact her at denise-szecsei@uiowa.edu.

Watch a video of “Robots in Love”:
www.youtube.com/watch?v=YMe6POOJLi4

Any comments about this article? Email kathryn-howe@uiowa.edu.