Our mission: We aim to connect behavioral and computational sciences in graduate training with the goal of preparing scientists to tackle critical pure and applied research challenges in the 21st century. We are interested in helping educators develop and exploit new teaching technologies; inventing tools for making sense of masses of crowd-sourced data; understanding how people learn in laboratory and real-world contexts; and developing strategies for human-machine collaboration.

In the first year, project teams focus on a basic research question connecting some elements of human learning, data science, machine learning, human-machine interaction, or education. The goal is to learn cross-disciplinary concepts and communicate while completing publishable work in the first year.

In this example, students from engineering and educational psychology collaborate to understand how undergraduate chemistry students perceive diagrams of molecular structures. Students judge perceptual similarities in (1) and adaptive algorithms efficiently compute the latent structure governing judgments, shown in (2). Sparse optimization methods are applied to learn which diagram features in (3) are most important for generating the perception of similarity. Comparing features used by experts and novices can illuminate how these groups differ and provide targets for instructional interventions from teachers and intelligent tutoring systems.

Try it yourself! See laptop display for instructions and results.

In year 2 or 3, project teams work on a project suggested by one of our non-academic partners (NAPs) in industry, government, and non-profit sectors. Faculty consult with partners to find projects with real-world application that require new behavioral and/or computational research and innovation. Trainees carry out the research, communicate with NAPs as it unfolds, and present results at the partner institution. The goal is to promote both translational research and a diversity of career paths for LUCID scientists.

In this example, the cartoon editor for the New Yorker is swamped with thousands of entries for the magazine’s caption contest each week. How can he find the funniest captions? Interns can make good judgments, but slowly. Computers have no sense of humor, but can make efficient use of human judgments to quickly rule out bad captions. Our project team developed new science and technology that allows the magazine to rapidly find funny captions, and so to expand the contest internationally.

Try it yourself! http://nextxml.org/captioncontest

Watch one here! https://youtu.be/n_dGXIU2k1Q

And of course we have...

- Weekly cross-disciplinary seminars with an online library of video talks in development
- Summer boot camps and tutorial workshops so get scientists quickly up and running on new tools
- A yearly conference and retreat to share completed work, meet with non-academic partners, and plan new projects.

It wouldn’t be possible without...

- Project-focused prof-and-peer mentoring
- Core approach: To promote cross-disciplinary learning without requiring extensive additional training, trainees work in small cross-department groups to tackle a specific basic or applied research question. Groups include new LUCID trainees, senior graduate mentors, and at least two faculty. Trainees acquire new expertise outside their domain by working with other students on specific problems under faculty guidance. The team above is working to develop new approaches to arithmetic education, by connecting cognitive models of human learning and memory and machine learning approaches to search. Given a model of the learner, efficient search algorithms are used to discover a practice regimen that optimizes speed of learning and breadth of transfer.

With each project, teams will create short videos, tutorials, and blog posts explaining the work for a lay audience. These documents will promote broader awareness of the science and its implications, and will provide important background information to new students entering the program.