Able to distinguish expertise at an 88% accuracy by analyzing input event stream.

DATA
Collected corpus of data from input stream during image editing tasks using an image manipulation program.

Captured mouse movements and all menu interactions.

STUDY DESIGN
Participants completed two image manipulation tasks. Each task consisted of 7 trials, containing 10 menu selections. Participants became expert users by performing the same task multiple times. Participants were given instructions on for each selection, but were not told where items were located.

FEATURES TO PREDICT EXPERTISE
We designed our performance features so they were generic and could be used in any application and without a task model.

TIME TO SELECT MENU ITEM
How long was the menu open?
Was a menu selection made?
How deep was the selection?
How many submenus were opened to make selection?
How many times did the mouse velocity change?
What was the min/max mouse velocity?
Time spent dwelling on item before selection
How many times did they dwell on the same menu item?
How long was the submenu open and the mouse still?

Features were extracted from input event stream. All analysis is of a single menu selection that starts with the user opening the menu (right click with mouse) and ends with the user closing the menu or making a selection (left click).

PROJECT OVERVIEW
If applications were able to detect user’s expertise, they could automatically assist them through tailored intelligent help and customizations or optimizations of the graphical user interface.

Detecting a user’s expertise level is difficult because it is dynamic and differs across applications, so it should be continuously collected. Additionally, most techniques to detect expertise require a detailed model of a user’s task, which makes them non generalizable and application specific.

We are building a system that is able to detect expertise by building statistical models from user’s input event streams.

We have collected a corpus of mouse and menu interactions from users of varying expertise in an image manipulation application.

Features from the input event stream were used to build statistical models to classify mouse movements and menu selections by expertise.

RESULTS
Defined novice behavior as the first trial of a task, and expert as the last trial.

Collected corpus of data from 25 users and gathered about 1000 menu interactions.

Statistically significant differences in performance across trials.

Learning curve begins to taper off after the second trial.

Able to distinguish novice from expert use at an 88% accuracy using a decision tree classifier.

FUTURE WORK
Design and prototype automatic adaptations learn how features are affected over time apply techniques to real world applications.

FUNDING
NSF-ITR IIS 0511895, IIS 0121560, IIS 0325351
Amy Hurst’s NSF Graduate research Fellowship

COLLABORATORS
University of Pittsburgh
Daniel Zinzow
Jenny Hwang