Our research goal is to automatically evaluate and design graphical representation based on human cognitive model. And we will summarize the work in the following three parts.

User Study: To understand how human read line and bar charts, we designed eye tracking experiments and did case studies on several users. We can extract the movement of gaze point when users read the graphs.

Cognitive model: we developed the cognitive model in ACT-R cognitive architecture. We can simulate the basic pattern how people read line chart and bar chart. The cognitive model can process three types of queries: point reading, comparisons, and trends. Point-reading questions refer to a single data point. Comparison questions refer to a pair of adjacent data points. Trend questions refer to a range of successive data points. And we can simulate the loss of procedural memory by selecting productions on the basis of their utilities.

Architecture: We employed the SIMCog framework(a solution allowing models to interact with web browser based software) to connect web charts and cognitive model. The server is built within the Java ACT-R task environment. We use d3.js library to generate graphs in the client. Then the server interprets JSON-RPC messages from the client about the current status and relays them to ACT-R model we developed in Lisp.