Sequence Visualization

Eye Gaze Edition

Roles of Eye-tracking

Commentary on Section 4

Eye Tracking in Human–Computer Interaction and Usability Research: Ready to Deliver the Promises

Robert J. K. Jacob and Keith S. Karn

Introduction

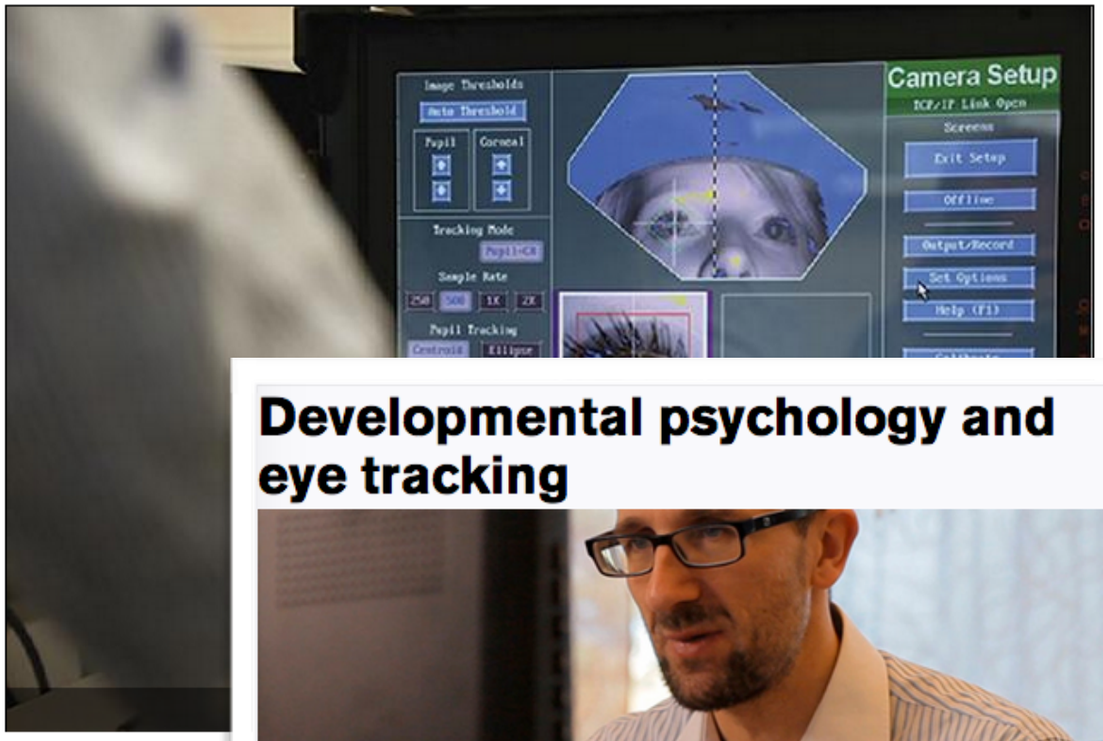
This section considers the application of eye movements to user interf
analyzing interfaces (measuring usability) and as an actual control me
human–computer dialogue. The two areas have generally been reported
this book seeks to tie them together. For usability analysis, the user's e
while using the system are recorded and later analyzed retrospectivel
movements do not affect the interface in real time. As a direct contro
eye movements are obtained and used in real time as an input to the
dialogue. They might be the sole input, typically for disabled users
applications, or they might be used as one of several inputs, combinin
keyboard, sensors, or other devices.

Interestingly, the principal challenges for both retrospective and
tracking in human–computer interaction (HCI) turn out to be analogous. For retrospective analysis, the problem is to find appropriate ways to use and interpret the data; it is not nearly as straightforward as it is with more typical task performance, speed, or error data. For real time use, the problem is to find appropriate ways to respond judiciously to eye movement input, and avoid over-responding; it is not nearly as straightforward as responding to well-defined, intentional mouse or keyboard input. We will see in this chapter how these two problems are closely related.

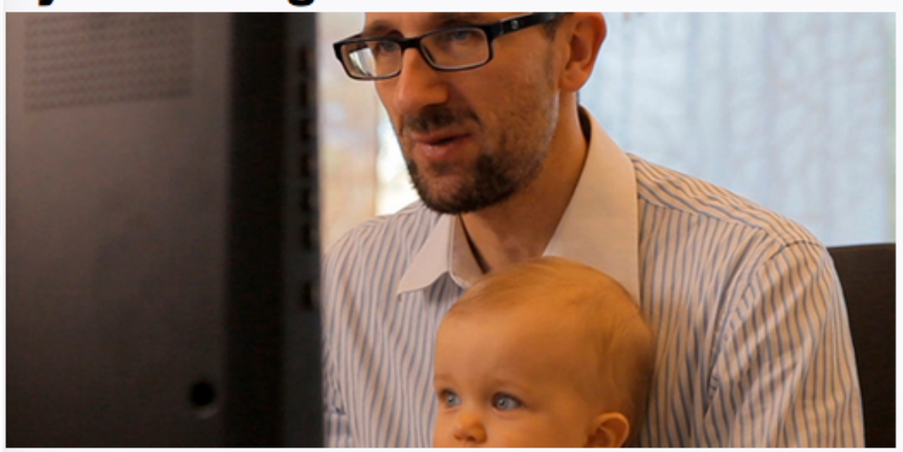
These uses of eye tracking in HCI have been highly promising for many years, but progress in making good use of eye movements in HCI has been slow to date. We see promising research work, but we have not yet seen wide use of these approaches in practice or in the marketplace. We will describe the promises of this technology, its limitations, and the obstacles that must still be overcome. Work presented in this book and elsewhere shows that the field is indeed beginning to flourish.

Eye-tracking schizophrenia test wins business award

15 October 2013 By Dominic Lenton



Developmental psychology and eye tracking



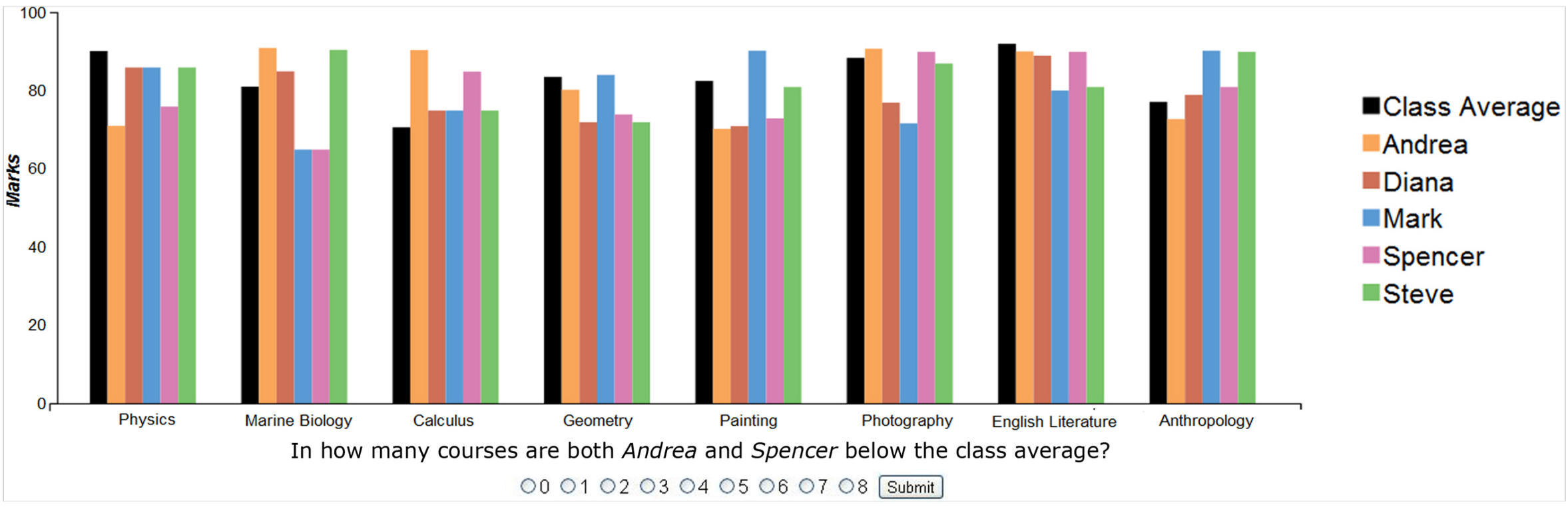
Eye tracking helps developmental researchers to explain growth and transformation in perceptual, cognitive, and social abilities from infancy through young adulthood.

User Experiment

62 participants

80 tasks per participant

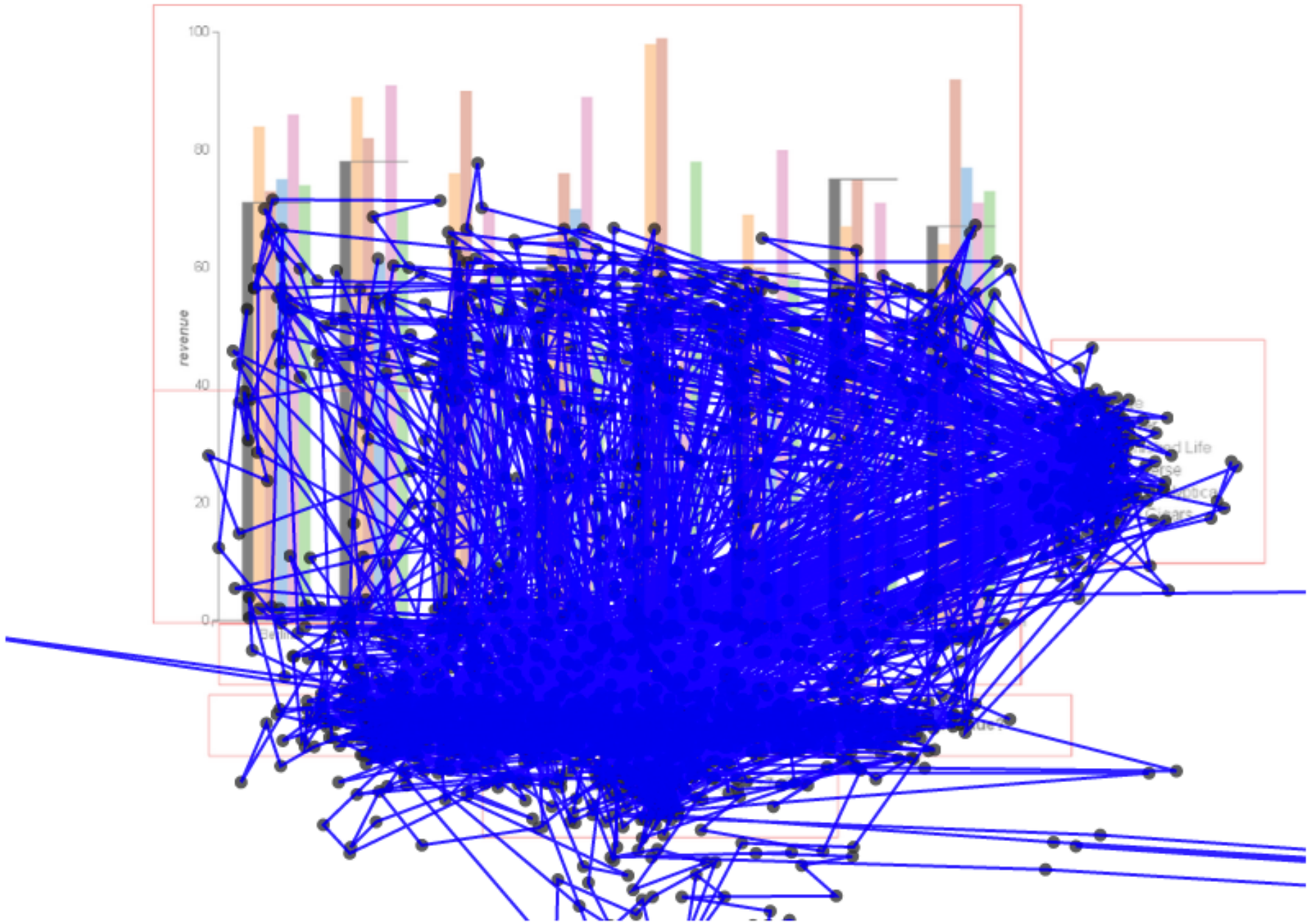
Example:



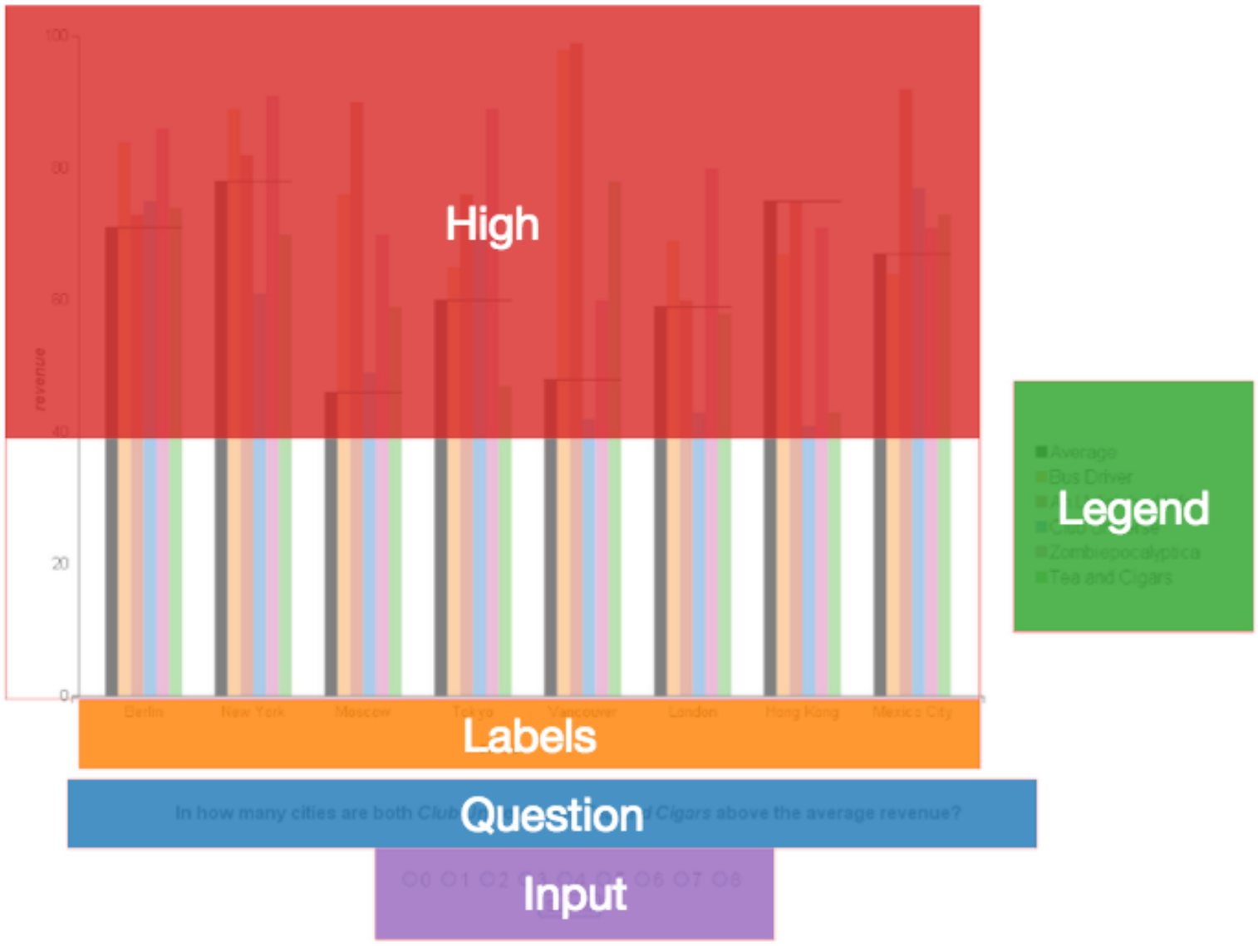
Eye-tracking Data

FixationIndex	Timestamp	FixationDuration	FixationPointX	FixationPointY
1	67	242	548	491
2	309	191	506	467
3	501	250	402	450
4	750	191	514	444
5	942	216	624	504
6	1158	300	773	445
7	1458	267	863	448
8	1725	216	671	465
9	1941	358	635	488
10	2299	258	521	402
11	2558	291	560	93
12	2849	292	695	78
13	3141	225	531	70
14	3365	250	547	424
15	3615	791	650	425
16	4406	358	470	394
17	4764	192	567	417
18	4956	183	497	395
19	5139	258	571	391
20	5397	167	667	406
(thousands more)	…	…	…	…

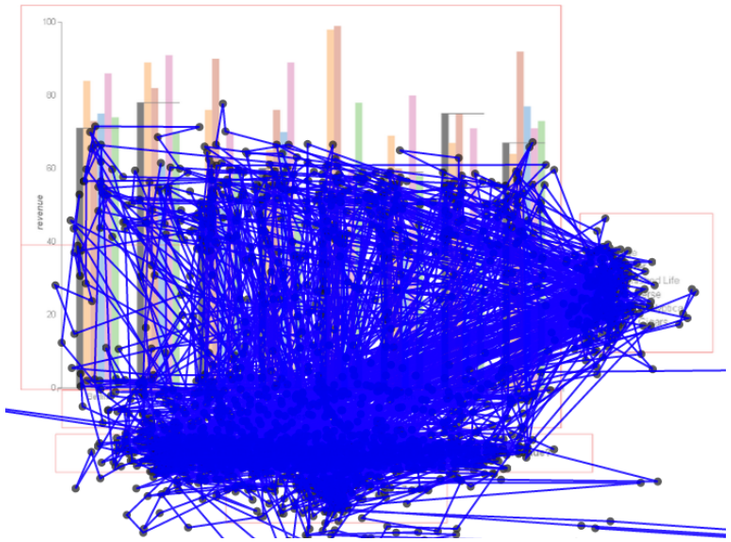
Eye-tracking Data

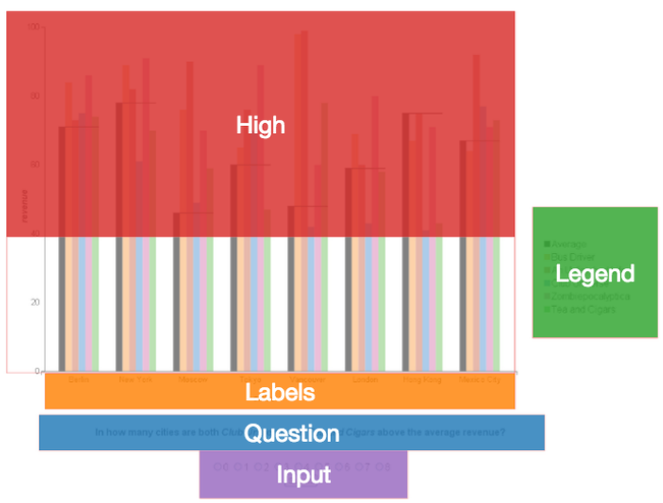


Areas of Interest



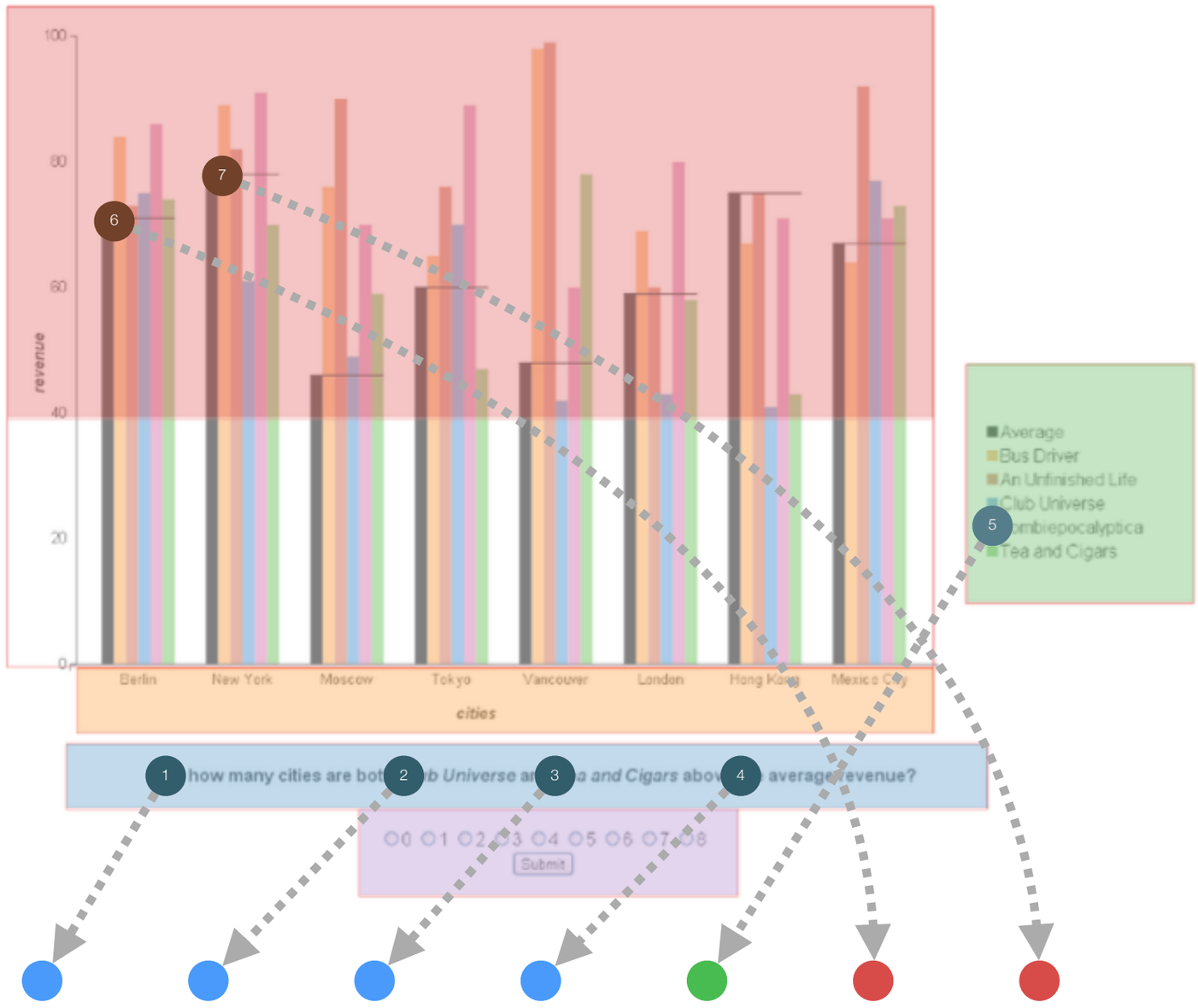
Data Aggregation





AOI Visits

AOI Visits

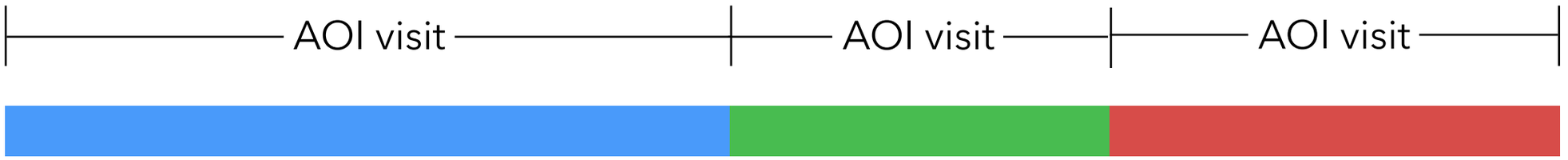


7 fixations colour-coded by AOI.

AOI Visits

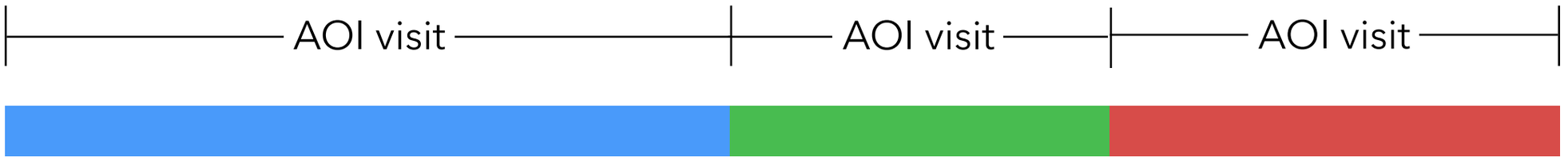
Encode fixation duration in the *x* axis.

AOI Visits



Connect successive fixations in the same AOI to form AOI visits.

AOI Visits

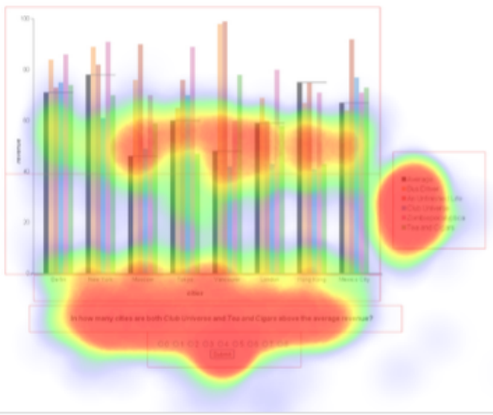


Project Goal

Visualization to **explore** sequences of AOI visits.

Sequence Visualization Eye Gaze Edition

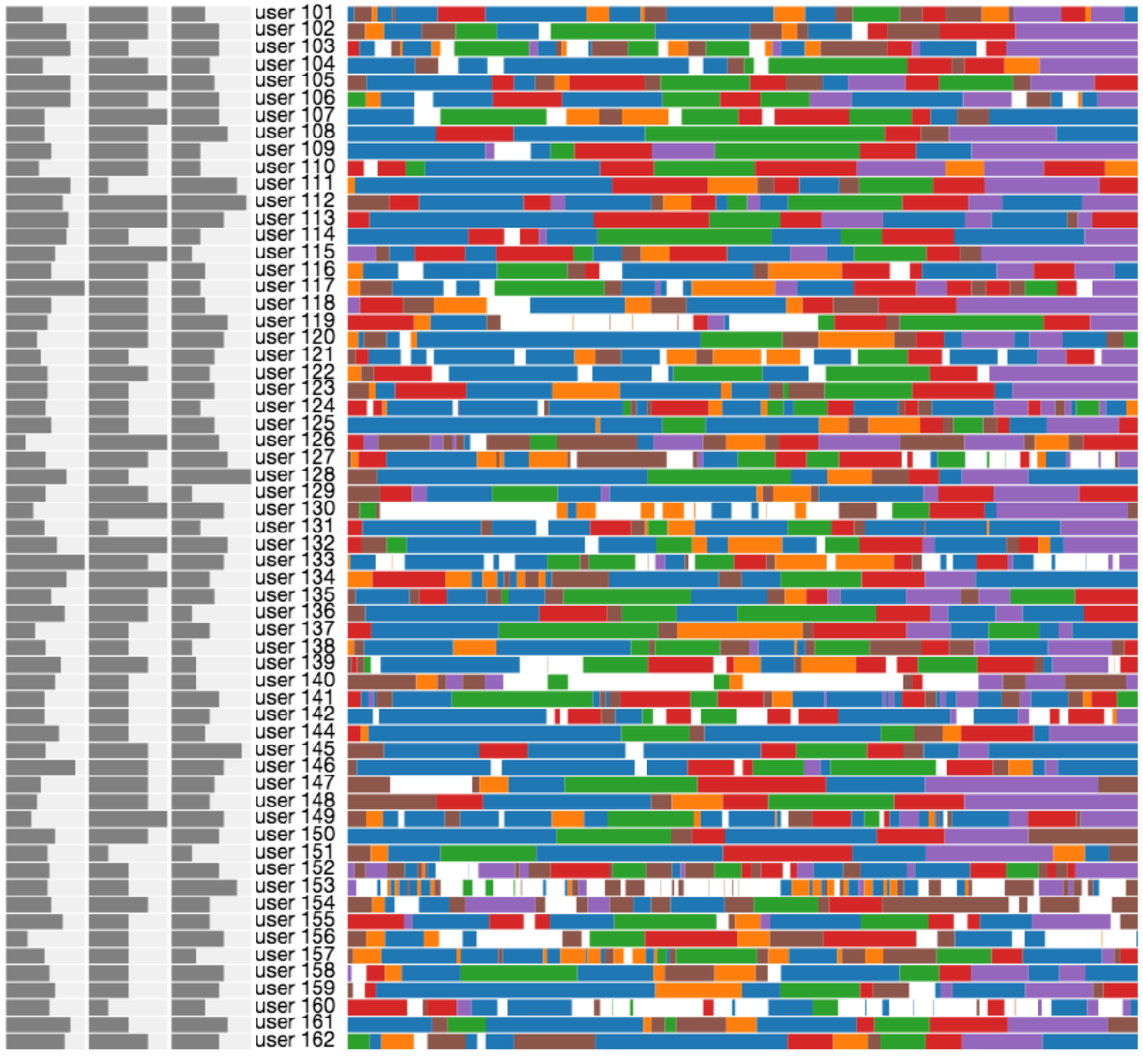
Heatmap Show

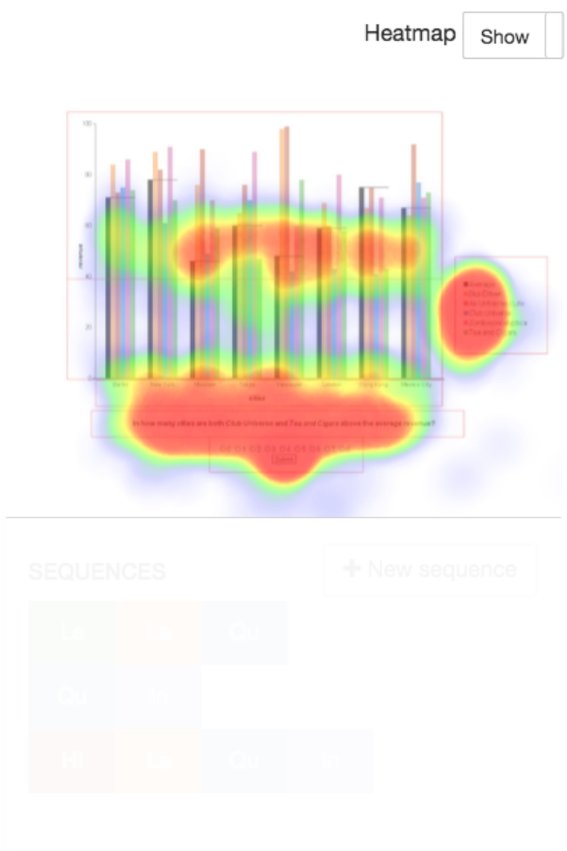


SEQUENCES + New sequence

Le	La	Qu	
Qu	In		
Hi	La	Qu	In

Question Labels Legend High Input Relative





Heat map

overview of gaze distribution

Visual stimulus

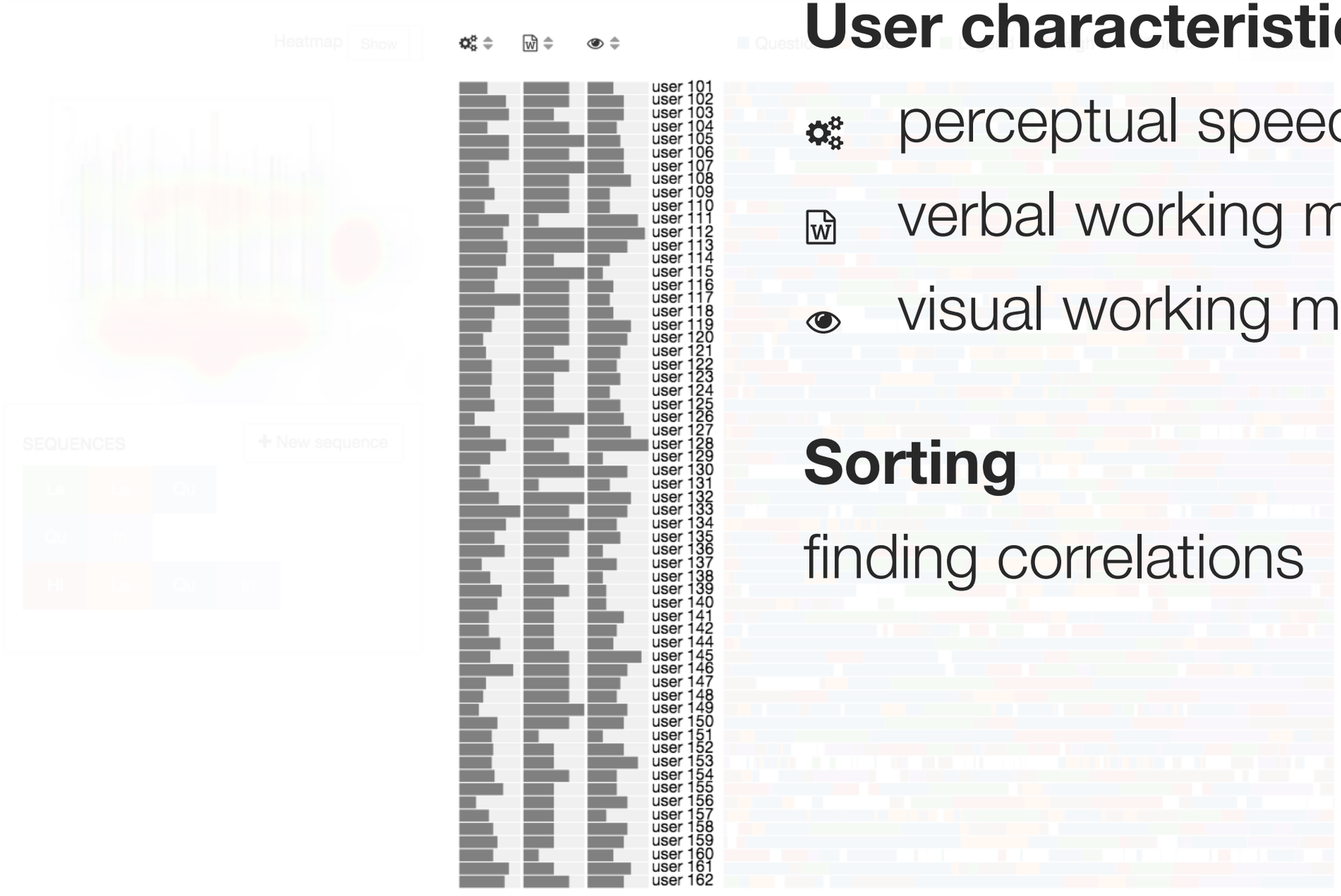
context for reference

Fixations and saccades

plot of individual data points

AOIs

visualize the areas



User characteristics

perceptual speed

verbal working memory

visual working memory

Sorting

finding correlations

Timeline

overview of AOI visits

Data inspection

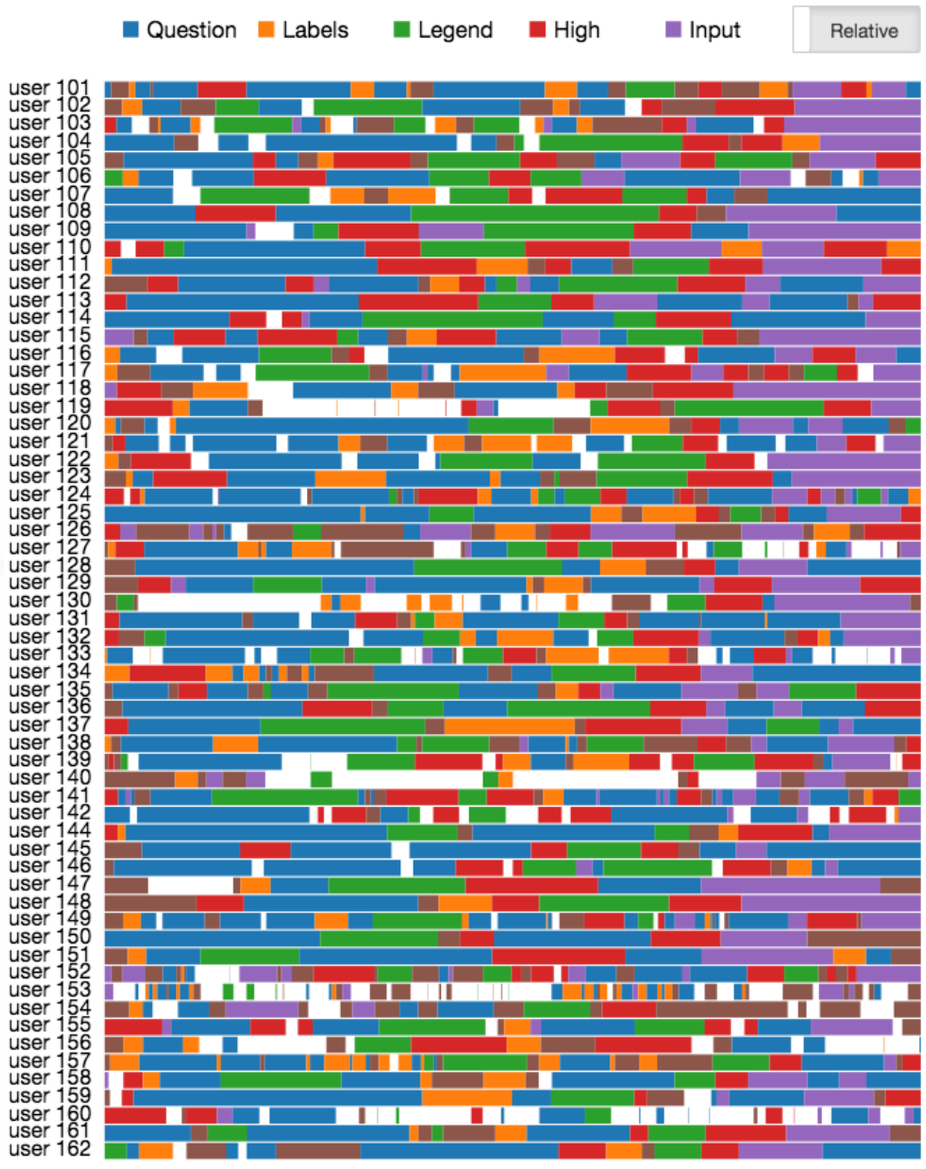
finding gaps, trends

Time scales

convert between absolute time and relative time

Legend

understand colour coding



Sequence tool

create and explore sequence patterns

User defined sequences

click the “new sequence” button

Sequence length

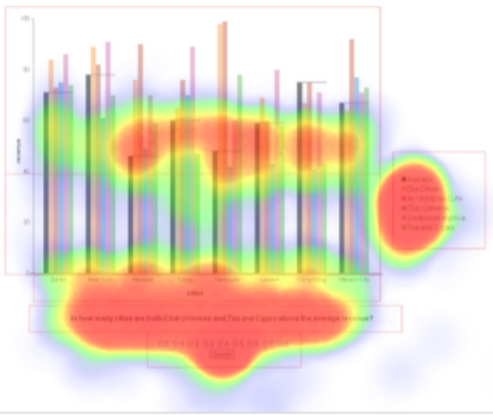
up to 5 AOI-visits long

Same colour coding

consistency, recognizability

Sequence Visualization Eye Gaze Edition

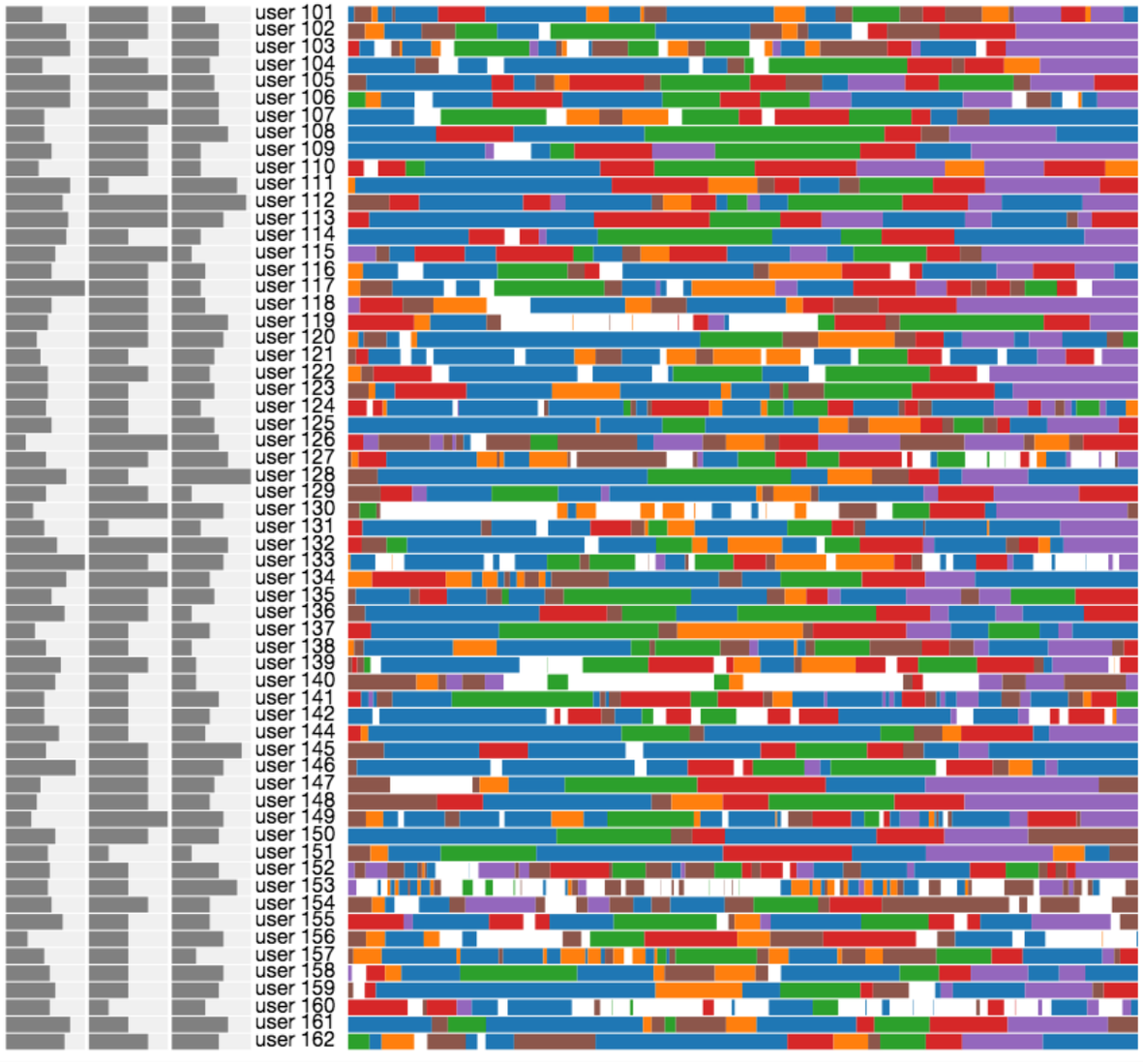
Heatmap Show



SEQUENCES + New sequence

Le	La	Qu	
Qu	In		
Hi	La	Qu	In

Question Labels Legend High Input Relative



Demo

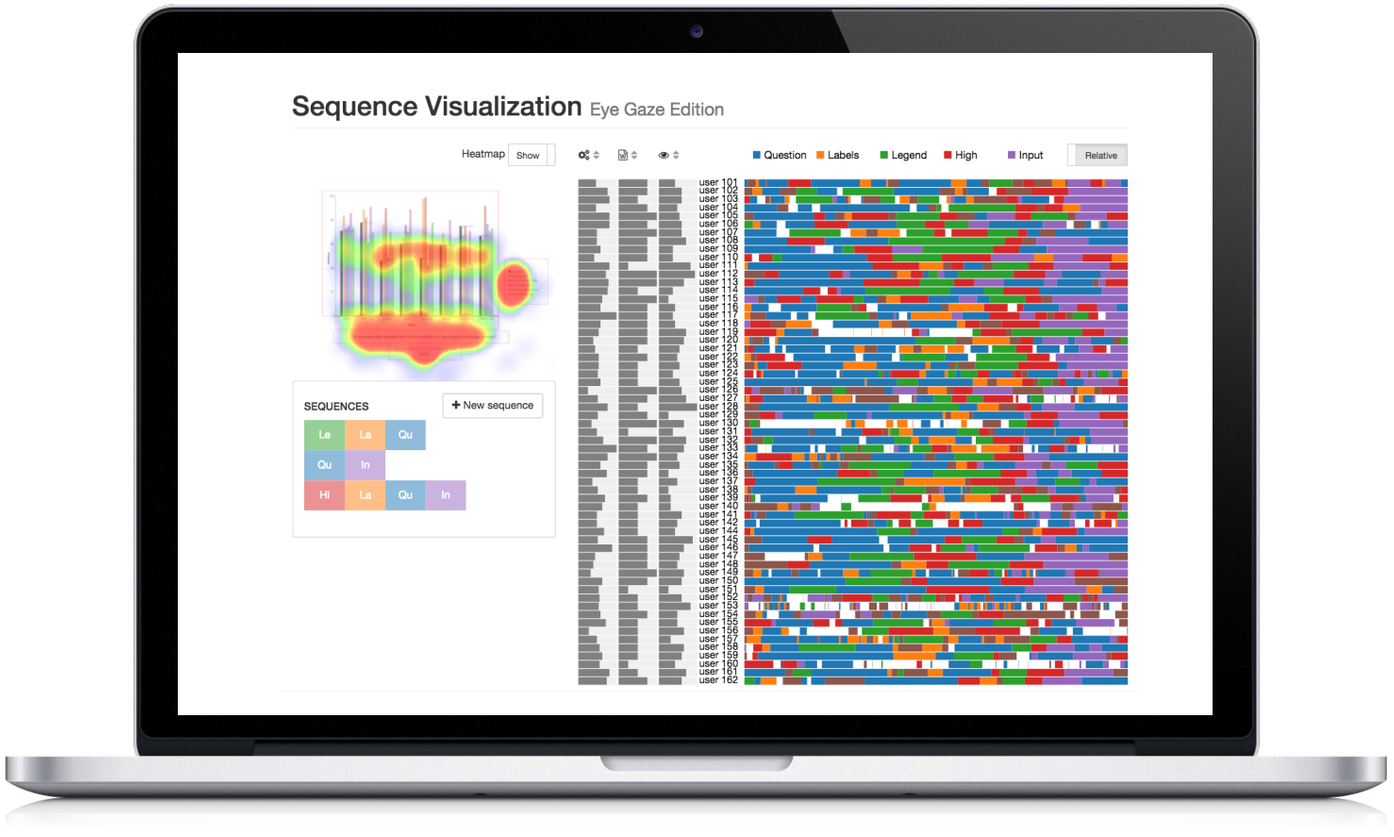
Summary

Sequence analysis of eye tracking data.

Timeline for overview, hover for details.

Create and explore sequences of interest.

Fast and responsive user interface.



Thank you.

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