

(s|qu)eries

Visual Regular Expressions for Querying and Exploring Event Sequences

Emanuel Zraggen
Steven M. Drucker
Danyel Fisher
Robert DeLine

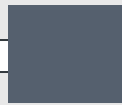
Physical

Headache Headache

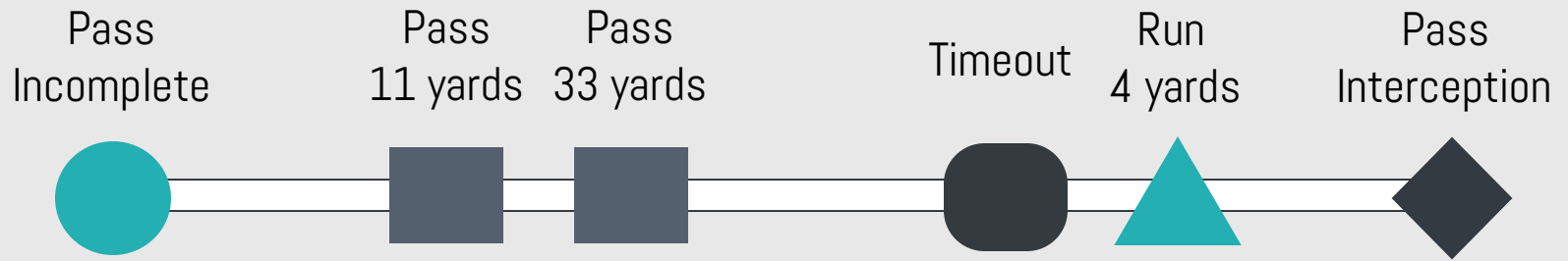
Stroke

Drug X

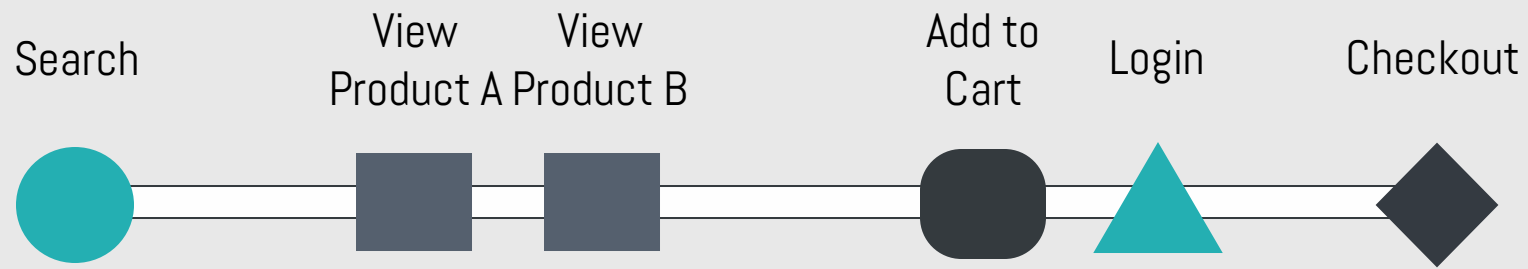
Treatment Y



electronic health records



sports: play-by-play



telemetry / logs

Today's Deals >



\$577.12

Mountain-400-W Red, 42

This bike delivers a high-level of performance on a budget. It is responsive and...



\$1364.50

HL Mountain Frame - Red, 42

Each frame is hand-crafted in our...



\$44.54

LL Mountain Handlebars

All-purpose bar for on or off-road.



\$539.99

Road-750 Black, 52

Entry level adult bike; offers a...



\$229.49

HL Fork

High-performance carbon road fork...

Accessories >



\$120.00

Hitch Rack - 4-Bike

Carries 4 bikes securely; steel construction, fits 2" receiver hitch.



\$4.99

Water Bottle - 30 oz.

AWC logo water bottle - holds 30 oz;...



\$9.99

Mountain Bottle Cage

Tough aluminum cage holds bottle...



\$159.00

All-Purpose Bike Stand

Perfect all-purpose bike stand for...



\$8.99

Road Bottle Cage

Aluminum cage is lighter than our...

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d8850733-a83b-4bb8-a574,154,NE,08/10/2014 03:07:37,action=ViewProduct,product=Blue Bike
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demo

cs.brown.edu/~ez for video

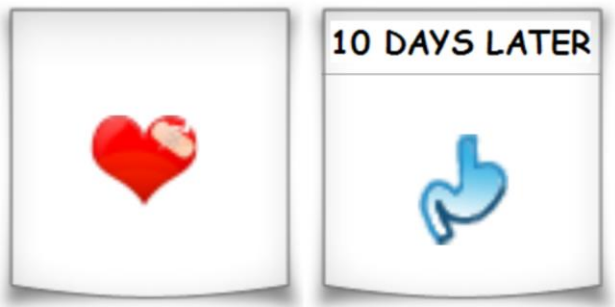
query languages

visualizations

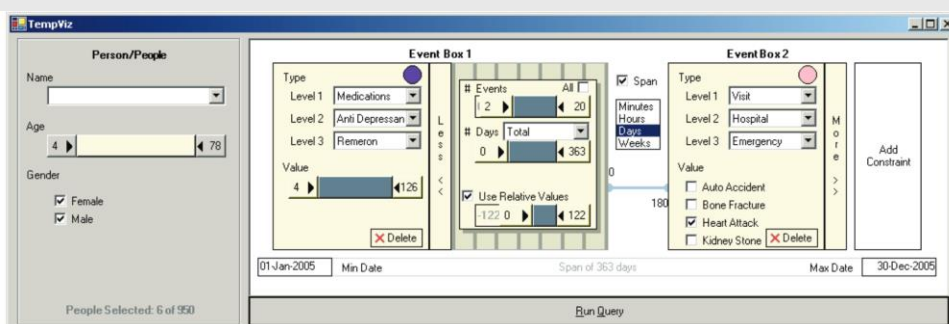
query languages

visualizations

Querymarvel
[Jin et al., 2009]



[Monroe et al., 2013]
[Fails et al., 2006]

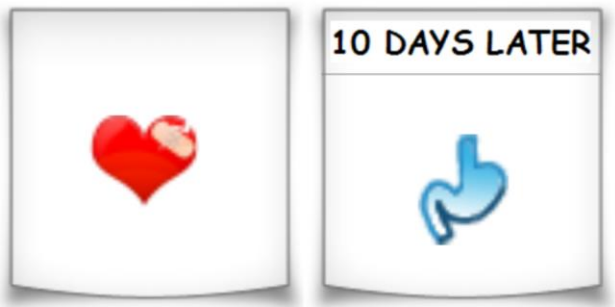


query languages

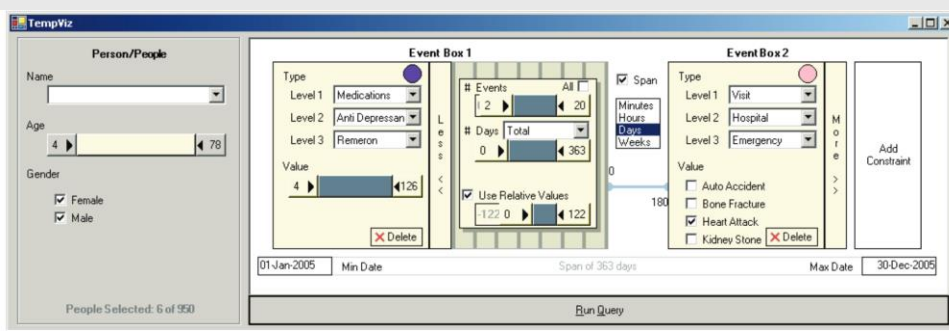
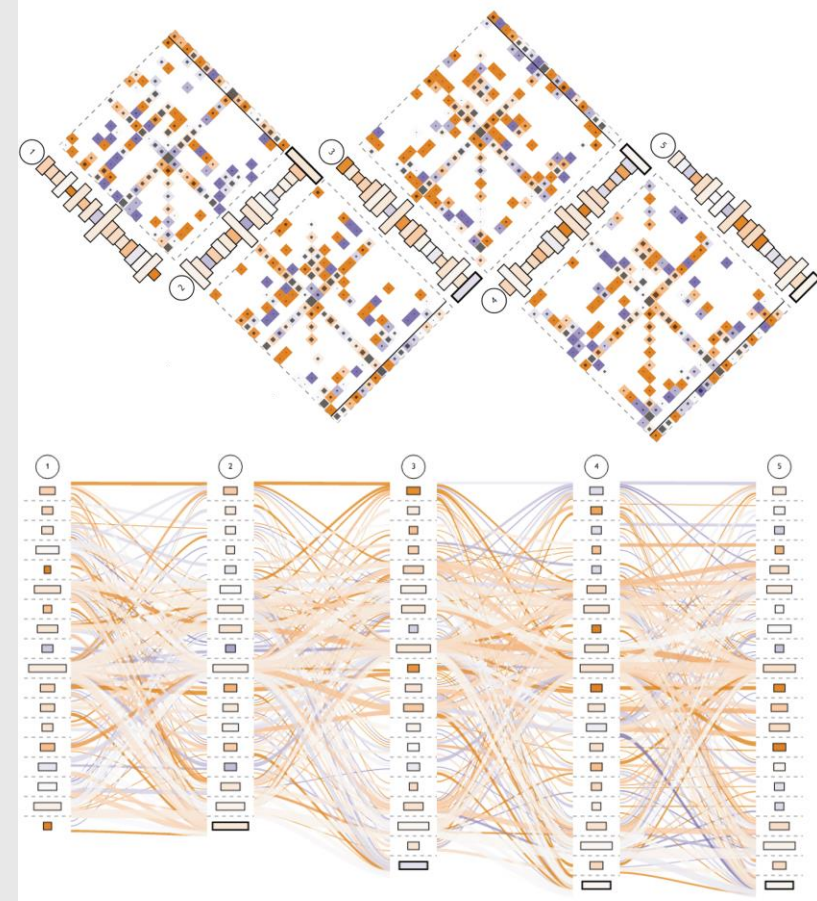
visualizations

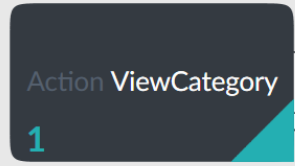
Querymarvel
[Jin et al., 2009]

MatrixWave
[Zhao et al., 2015]

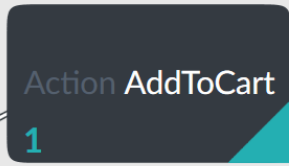


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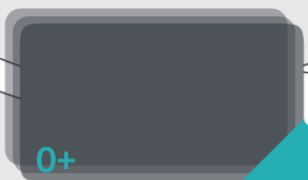
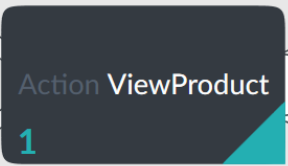




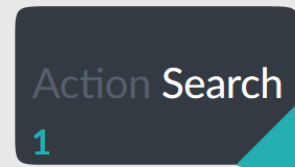
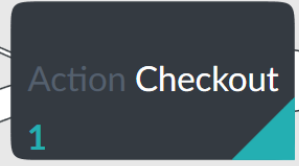
6.2% Sessions
9.1% Users



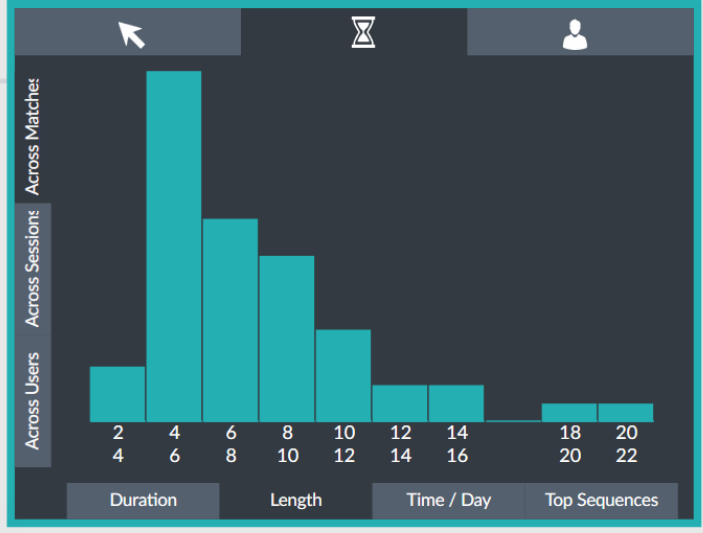
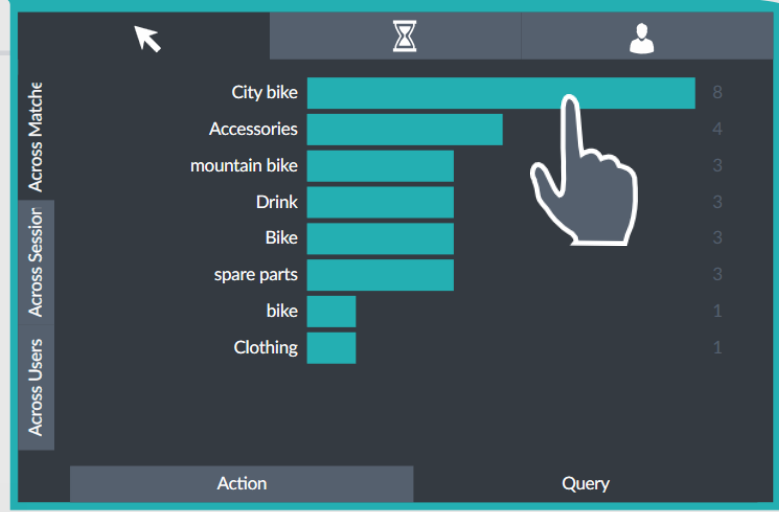
0.8% Sessions
1.8% Users



10.6% Sessions
10.2% Users



5.2% Sessions
11.4% Users



"Climate change can no longer be denied—or ignored." —President Obama <http://ofa.bo/d4PC> #ActOnClimate

WATCH: In the weekly address, President Obama talks about his commitment to #ActOnClimate. <http://ofa.bo/e4NL>

ICYMI: Check out the full video from the #ObamaTownHall on equal pay, child care, and more. <http://ofa.bo/a4Qe>

This article debunks six big myths on climate change: <http://ofa.bo/s4nl> (h/t @goodhousemag) #ActOnClimate

"We shouldn't have to choose between rewarding work and raising a family." —President Obama

"Anything that holds women back holds back the entire country." —President Obama #EqualPayNow

"Ensuring equal pay for women is a no-brainer." —President Obama #EqualPayNow

"Because our workplaces have changed, we have to change with them." —President Obama #EqualPayNow

"I believe in broad-based economic growth ... that's why we call it middle-class economics." —President Obama

"We all have a part to play to make sure that everybody's got a fair shot in this society." —President Obama

find hashtags in tweets

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#\S+

Regular Expression

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event 1

action=startApp
referral=bing.com

event 2

action=search
query=spare parts

event 3

action=search
query=bike

event 4

action=search
query=bike

event 5

action=appClose



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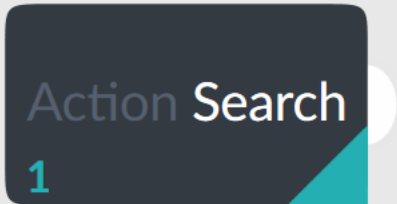
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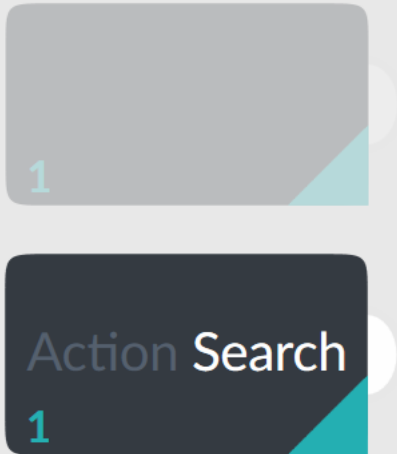
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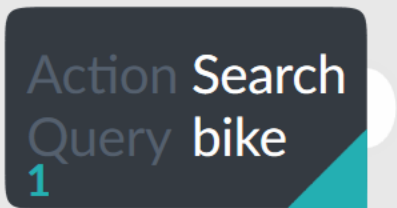
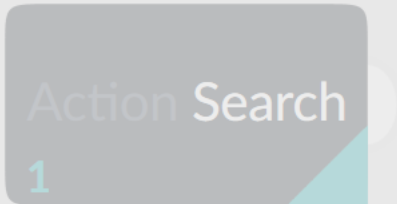
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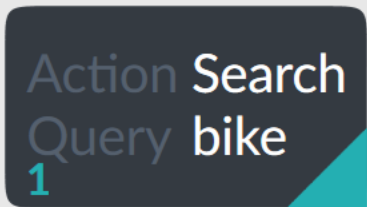
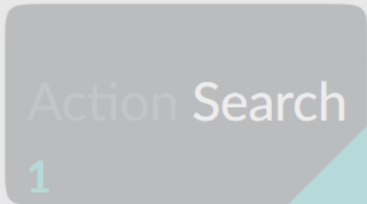
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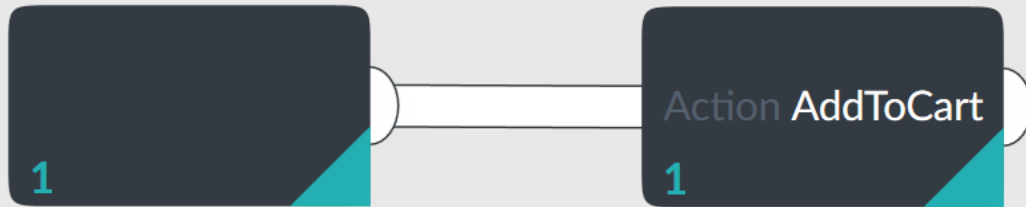
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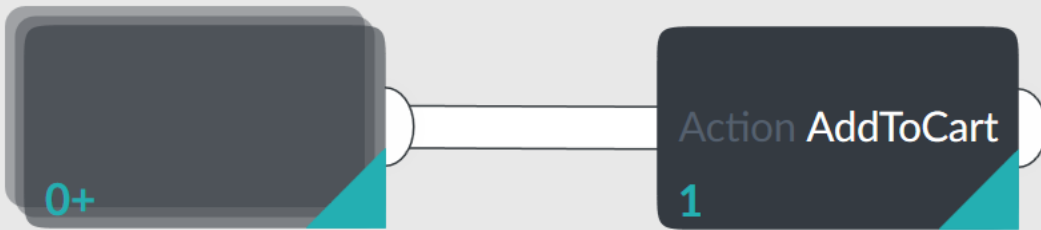
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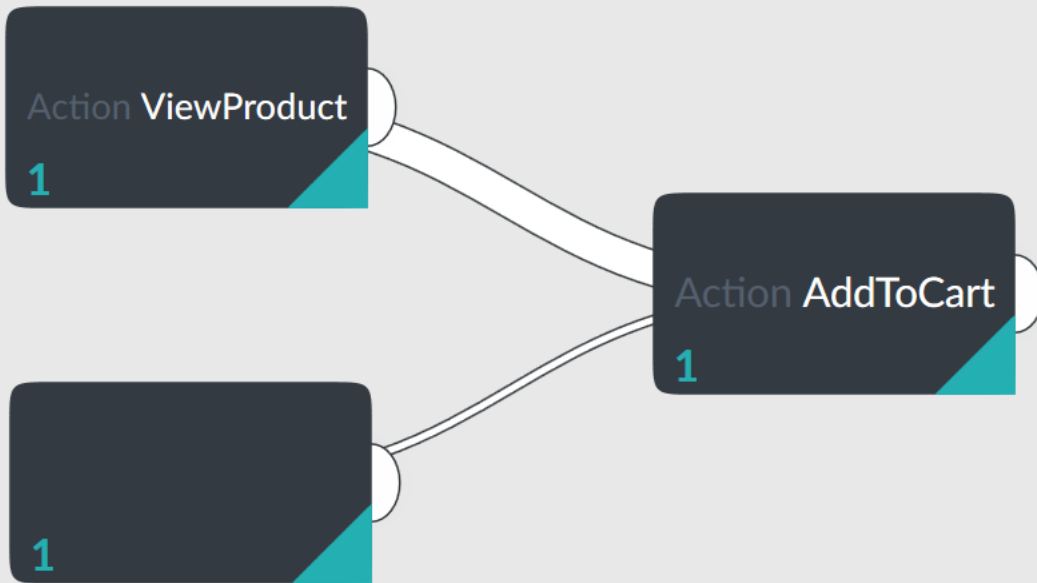
action=appClose



concatenation



quantifiers



alternation



back
reference

Alice	Product Manager	Online productivity app 1	R Python SQL	Test coverage
Brigitte Charlie	Product Manager Developer	Online productivity app 2	R Python SQL Excel	Reproducing crashes
Dorinda Eric	Data Scientists	Online source control repository	SQL Dashboards	End-to-end usage Justifying business cases
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Gabriella	Product Manager	Web analytics platform	C# homegrown tools	Exploring navigation confusion

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what happens before undo?

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that's a weird error!

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we should unbundle these features!

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