

# GaRSIVis: Improving the Predicting of Self-Interruption during Reading using Gaze Data

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[cs.ubc.ca/labs/imager/tr/2018/garsivis](http://cs.ubc.ca/labs/imager/tr/2018/garsivis)  
[github.com/Hirse/GaRSIVis](https://github.com/Hirse/GaRSIVis)



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# Introduction

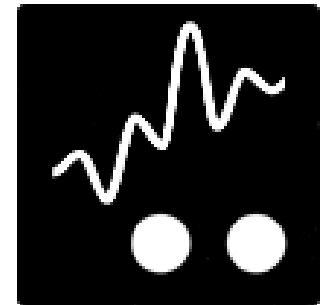
Our Vision:

Preventing self-interruptions during reading by analyzing gaze data.

- Self-interruptions
  - Reader initiated task switches, non reading related
  - Account for half of all interruptions and are more disruptive  
*Czerwinski et al. 2004, González and Mark 2004*
- Prevention
  - Self-interruptions are more disruptive than other interruptions  
*Katidioti et al. 2016*

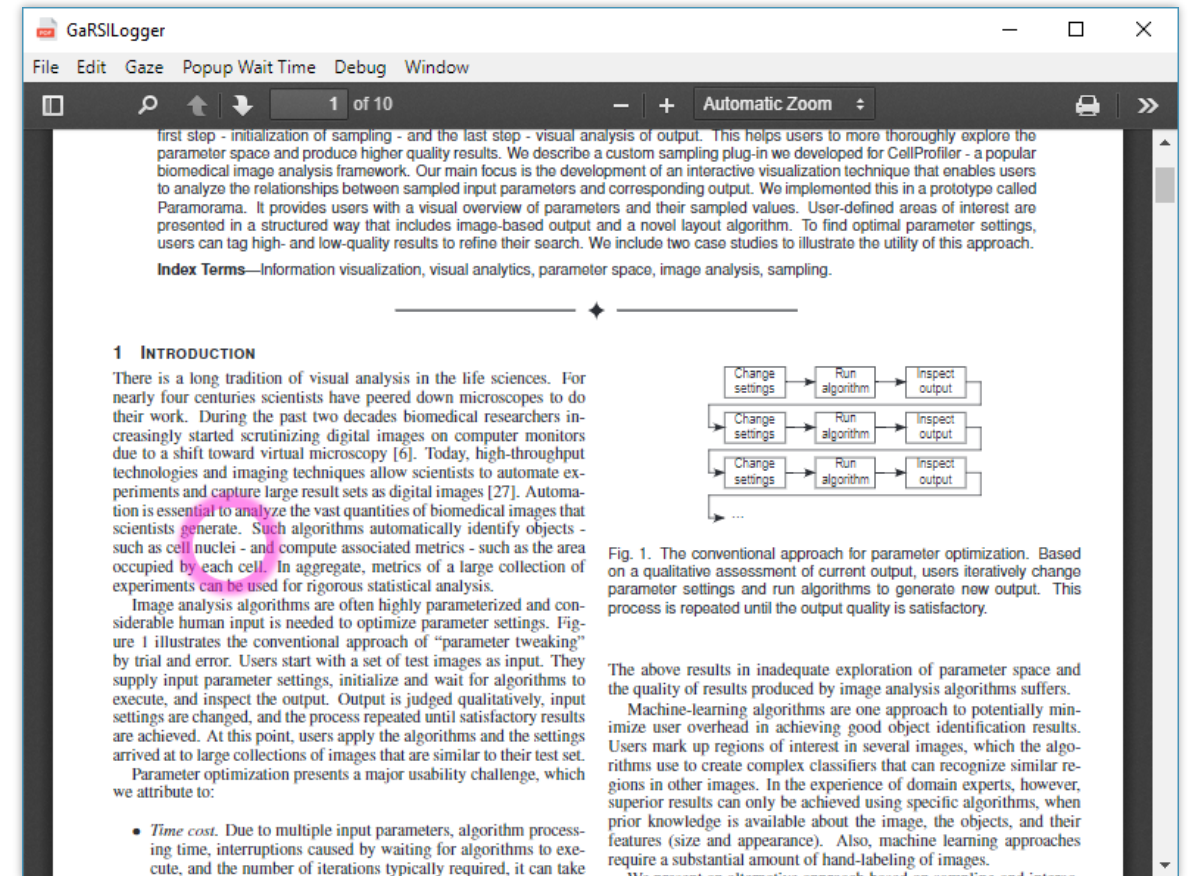
# Contributions

- **GaRSILogger: Gaze Reading Self-Interruption Logger**
  - A reading application connected to an eye tracker
  - Logs gaze data and self-interruptions
  
- **GaRSIVis: Gaze Reading Self-Interruption Visualizer**
  - A visualization front-end for gaze data cleansing
  - A prediction back-end to run as data improves
  - Relies on data collected by GaRSILogger



# GaRSILogger

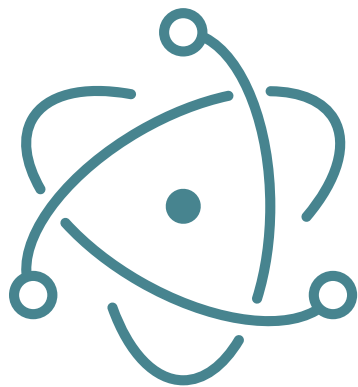
- A PDF viewer application
- Logging gaze data
  - Fixations
  - Raw Gaze
  - Head Position
- Tagging self-interruptions
  1. Application switches
  2. Absence of Gaze



# GaRSILogger: Implementation



- Eye tracking using a Tobii Eye Tracker 4C (\$150)
- GaRSILogger is implemented as an Electron application rendering PDFs using PDF.js



# GaRSILogger: Data Collection

- Data collection of “natural reading”
- 24 reading sessions across 8 people
- PDF of readers’ choice
- Reading sessions split into segments of three types
  - Normal reading
  - Before a self-interruption
  - Invalid (for our analysis)

```
2017-11-12T01:06:21.913Z|FIXATIONDATA|369.73,715.79;17.47%,8.83%;<TEXT_LINE>
2017-11-12T01:06:21.915Z|FIXATIONEND|332.62,721.53;11.03%,35.74%;<TEXT_LINE>
2017-11-12T01:06:21.915Z|HEAD|6.08,107.60,702.73;-0.27,0.19,-0.07
2017-11-12T01:06:21.918Z|GAZE|357.64,718.33;15.37%,20.74%;<TEXT_LINE>
2017-11-12T01:06:21.933Z|GAZE|326.13,723.11;9.91%,43.14%;<TEXT_LINE>
2017-11-12T01:06:21.938Z|HEAD|6.08,107.60,702.73;-0.27,0.19,-0.07
2017-11-12T01:06:21.986Z|HEAD|6.08,107.60,702.73;-0.27,0.19,-0.07
2017-11-12T01:06:32.174Z|BLUR|
2017-11-12T01:06:32.175Z|ACTIVE|GazeReader.exe;Dialog
2017-11-12T01:37:11.421Z|REASON|distraction
2017-11-12T01:37:11.440Z|FOCUS|
2017-11-12T01:37:11.449Z|GAZE|872.82,534.01;4.50%,7.96%;<TEXT_LINE>
```

You didn't look at the screen for a while.

Please tell us what you were doing by selecting the option that comes closest.



**Reading related**

I had to make a note, look up a term, or translate a word.



**Interruption**

I was interrupted by a notification, a call, or another person.



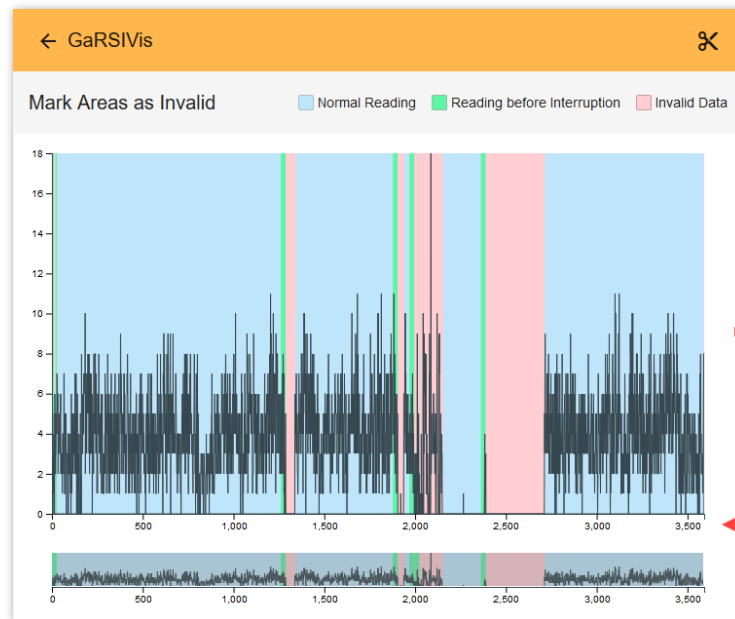
**Distraction**

I distracted myself by checking social networks, reading articles, or my phone.

# GaRSIVis

- A visualization front-end for gaze data cleansing
- A prediction back-end to run as data improves

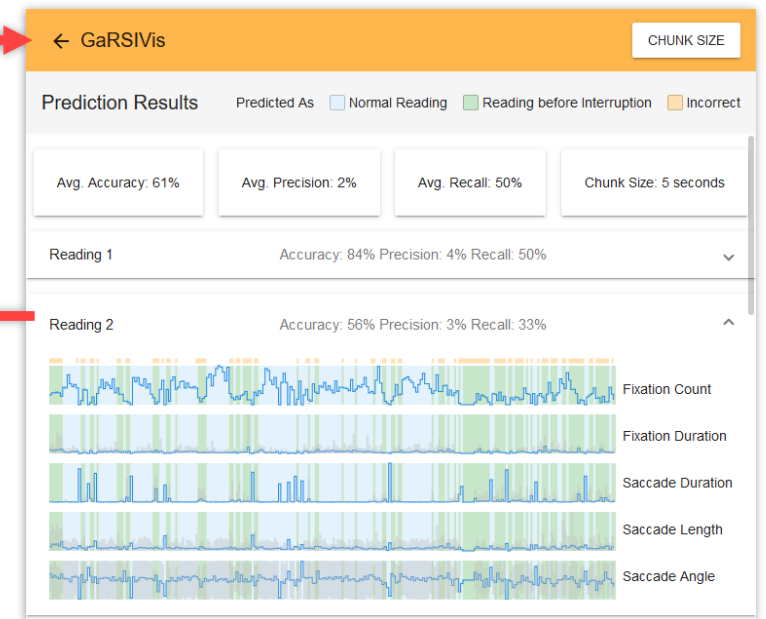
## Data Cleansing



## Overview



## Prediction Results



# GaRSIVis: Overview

- Sparklines showing fixation count per second
- Color to encode reading segments





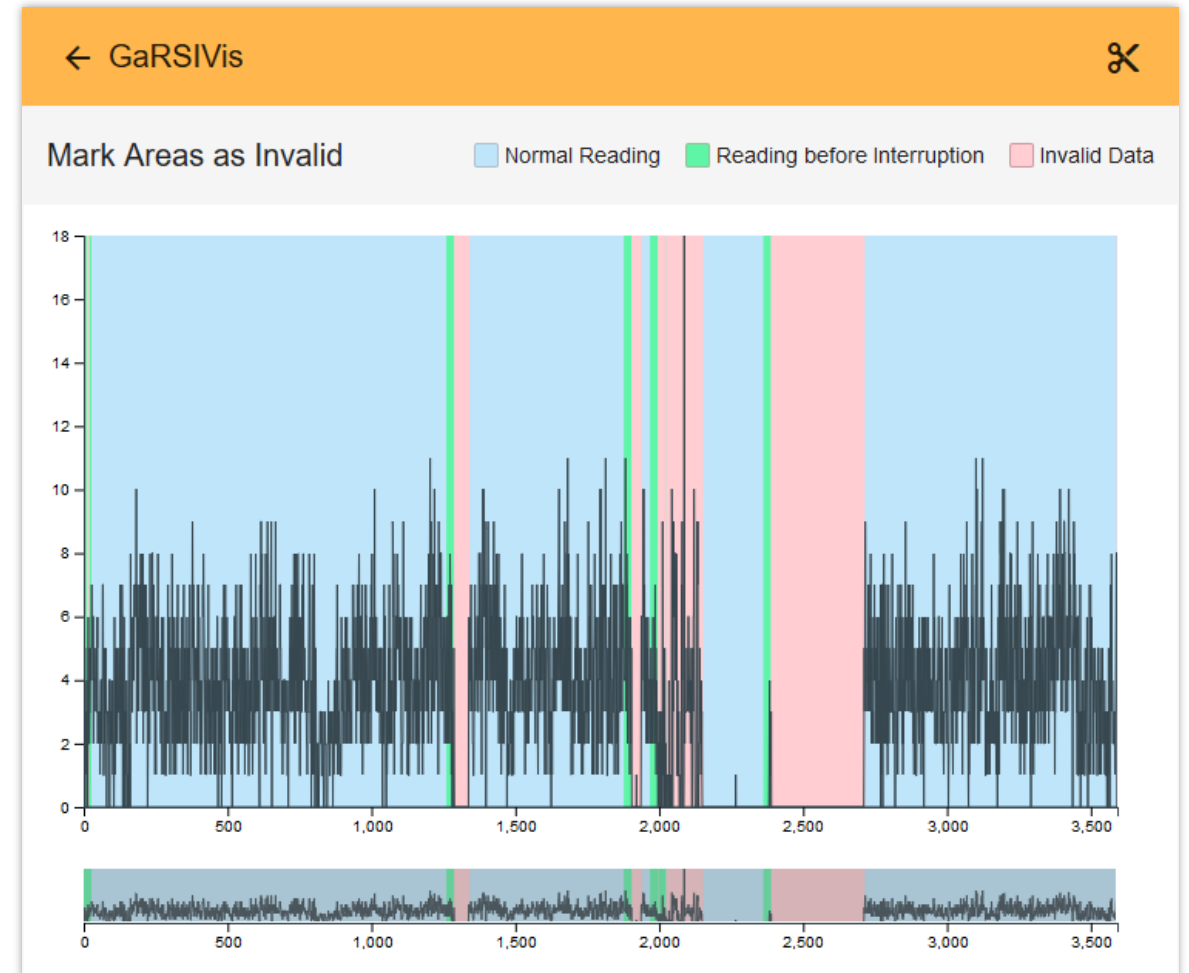
# GaRSIVis: Overview

- Sparklines showing fixation count per second
- Color to encode reading segments



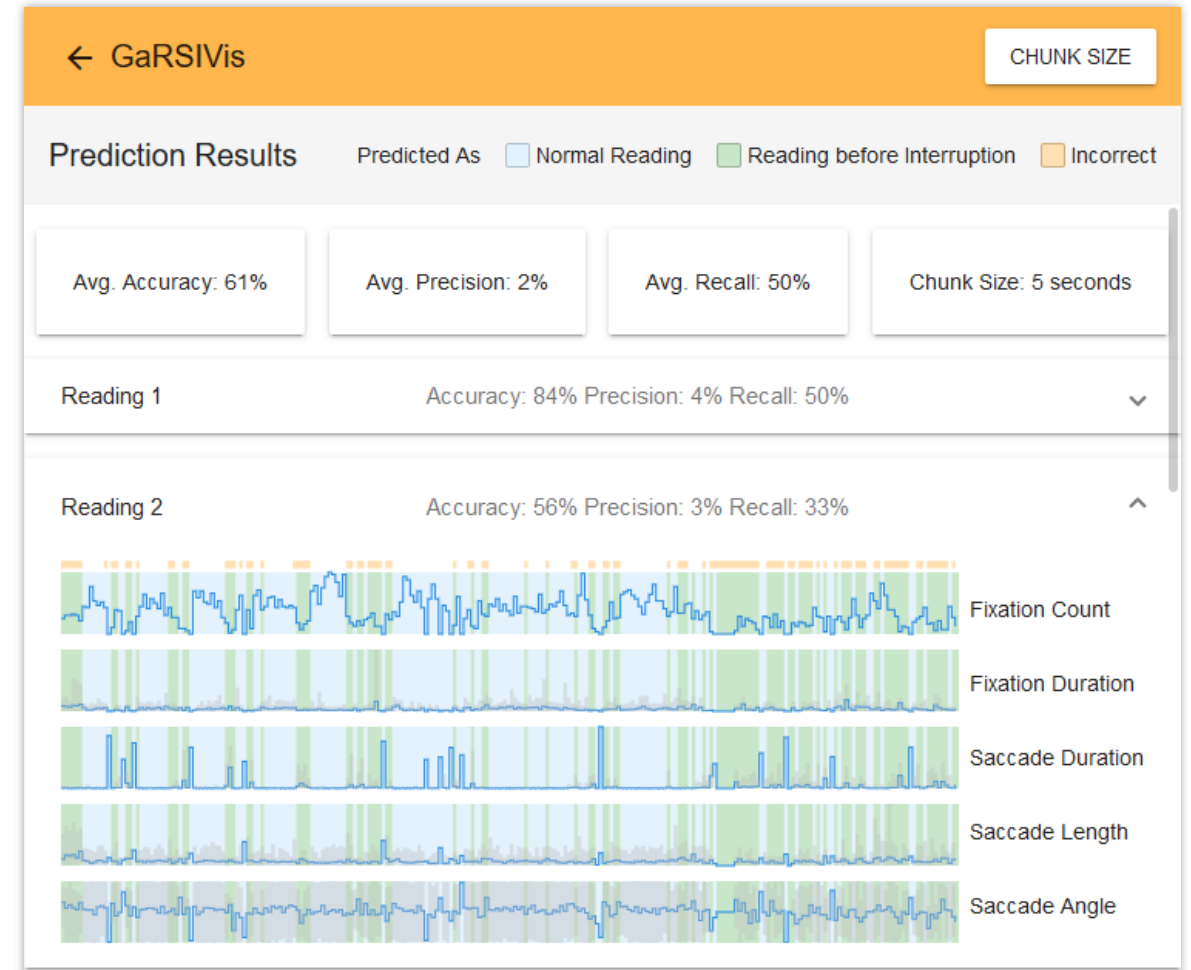
# GaRSIVis: Data Cleansing

- Navigate from the overview list of readings to analyze a single reading
- Brush and Zoom for detailed inspection and annotation
- Mark an area as invalid to exclude from further analysis



# GaRSIVis: Prediction Results

- Invalid segments of data removed
- Detailed analysis of prediction features
- Colors represent predicted label
- Misclassifications are tagged by small tick marks in gold



# GaRSIVis: Implementation

## Front-End

- Angular as base framework
- Angular Material for design and components
- D3.js rendering SVG for visualization



## Back-End

- Python WebSocket Server
- Prediction with scikit-learn
- Logistic Regression Classifier



[github.com/Hirse/GaRSIVis](https://github.com/Hirse/GaRSIVis)

# Implications

Preventing self-interruptions during reading before they occur.

Next steps:

- Assisted automatic data cleansing
- Comparison of classifiers
- Improved prediction model

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