# Tools to Improve Interruption Management

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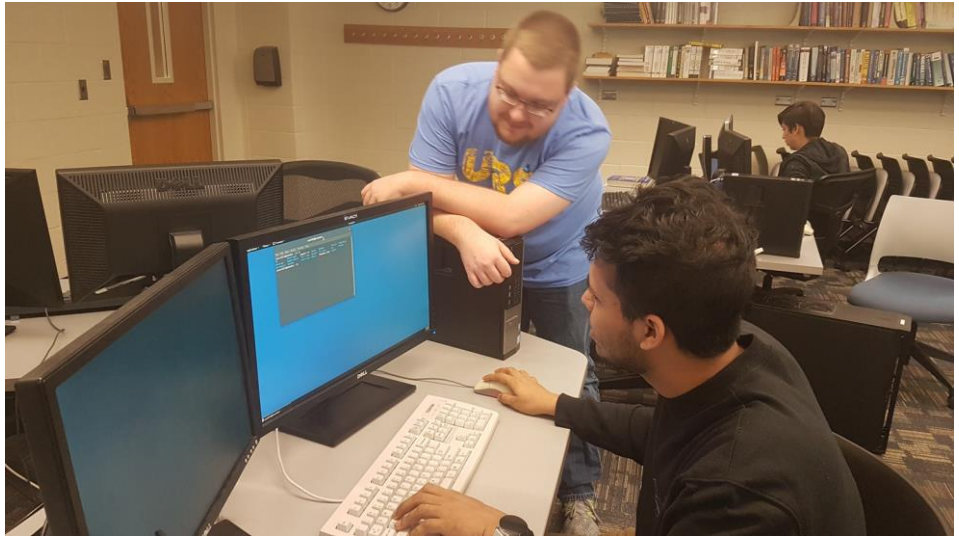

# Outline

1. Introduction
2. Background
3. Measuring Interruptibility
4. Preventing Interruptions
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# Introduction

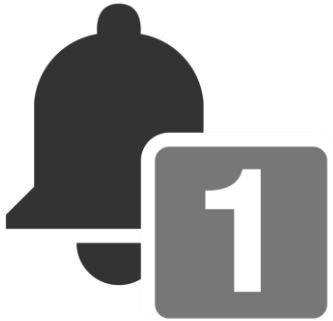
Why do interruptions matter?

- Interruptions cause lost productivity due to resumption lag (about 23 minutes each time)
- Can create negative emotions in the workplace
- People are not very good at guessing when to interrupt
- By measuring how interruptible someone is, we can prevent problematic interruptions

# Introduction

Different kinds of interruptions

- In-person interruptions
- Notifications
- Self-Interruptions




# Introduction

## Measuring Interruption

- Humans are bad at guessing how interruptible a co-worker is
- Using technology can allow us to better manage interruptions

# Background

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Biometric sensors

- Electroencephalogram (EEG)
- Heart Rate, Interbeat Interval, Blood Volume Pulse
- Electrodermal Activity (EDA)

# Background

Machine Learning Algorithm

- A type of artificial intelligence that can learn over time
- Doesn’t “learn” like humans do, can only be made to do a specific task well
- Uses training data to  calibrate the algorithm

# Background

Machine Learning Example - Identifying apples with a Naive Bayes classifier

- Looks at each feature of the fruit independently to determine the probability it's an apple
  - Uses the training data to generate this probability
- Multiply the probabilities together, and compare it to the probability it is not an apple




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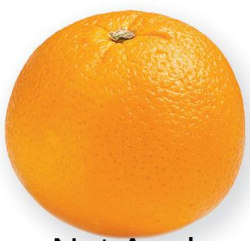
Training Data



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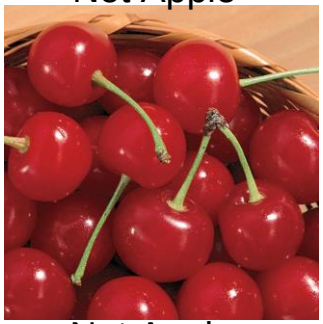

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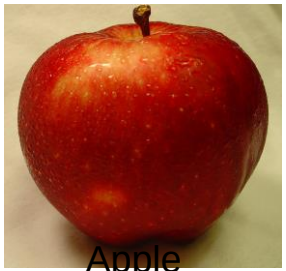

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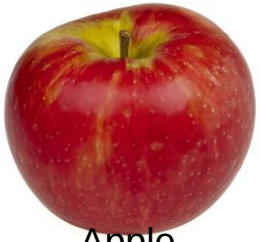

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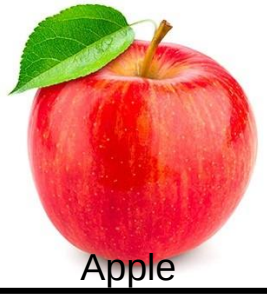

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# Measuring Interruptibility

# Measuring Interruptibility

Bio-metric measurement of interruptibility

- Headband to measure brain activity and eye blinks
- Wristband to measure electrodermal activity
- Chest strap to measure heartbeat and interbeat interval
- Data is recorded from subjects and used as training data in a machine learning algorithm

# Measuring Interruptibility

Bio-metric measurement of interruptibility

- Lab test and field test to gather data
- Participants worked on programming tasks while being interrupted
- Participants rated how interruptible they were, which labeled the training data
- Algorithm was successful 91.5% of the time in a lab test

# Measuring Interruptibility

FlowTracker algorithm

- Records clicks, key presses, and login state
- When activity reaches a peak, the user is classified as busy
- Smoothing algorithm is also applied so that the user's state doesn't switch too frequently

# Preventing Interruptions

# Preventing In-Person Interruptions

- FlowLight
  - Light displays interruptibility based on computer usage
  - Synced with Skype availability status
  - Tested on 449 employees of an international company
  - Month long study

# Preventing In-Person Interruptions

How does measuring interruptibility impact the workplace?

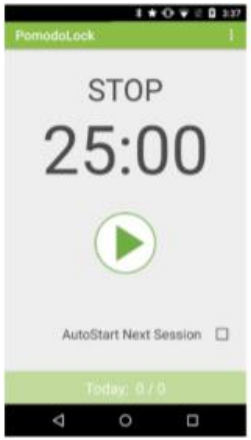
- The majority of workers said they were more productive and that the number of interruptions decreased
- Over 80% of participants continued using the FlowLight after the study
- Potential to be improved with biometric information

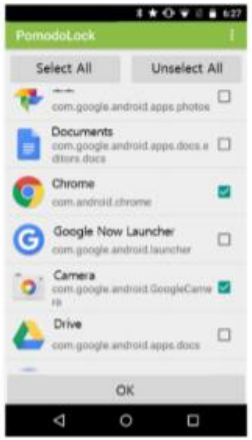
# Preventing Email Interruptions

- Uses computer interaction data, tries to determine breakpoints between tasks
- Displays emails when you are at a breakpoint
- Improves levels of stress and feelings of hindrance
- Can be improved by incorporating priority of the message

# Preventing Self Interruptions

- PomodoLock - A phone/PC app developed based off of the Pomodoro Technique
  - 25 minutes of work, 5 minute break
  - During work time, you are blocked from distracting apps and sites





# Conclusions

- Interruptions are costly to software developers
- Current technology allows us to prevent and manage the timing of interruptions
- Use of these technologies leads to increased productivity and other positive effects

# Acknowledgements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# Questions?

# References


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