

Using Virtual Meetings as a Research Context

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Associate Dean, WashU at Brookings
<http://apknight.org>



**WashU Olin
Business School**

11-16-20 | 9:00 AM | WORKPLACE EVOLUTION

More companies are hiring a ‘director of remote work’

As many embrace working from home, companies like Facebook are looking to hire a remote work leader.



[Photo: Unsplash]

≡ WIRED

BACKCHANNEL BUSINESS CULTURE GEAR IDEAS SCIENCE SECURITY

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ARIELLE PARDES

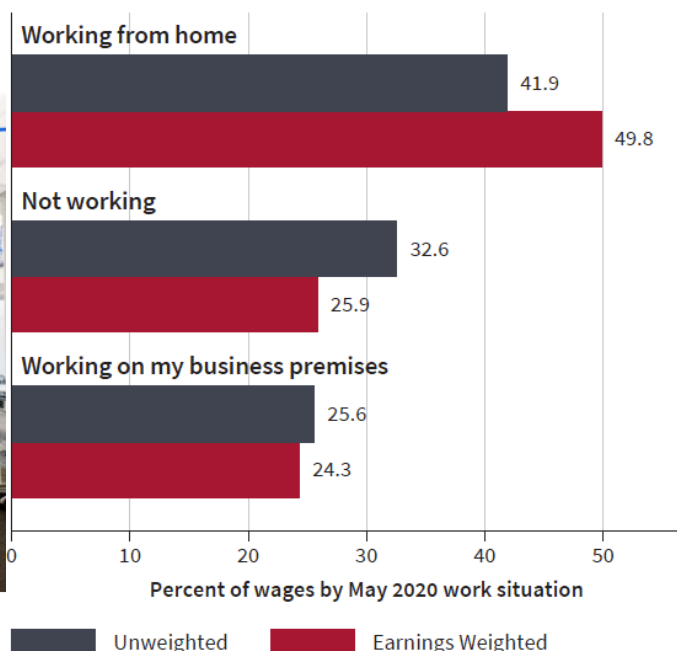
BUSINESS 10.30.2020 08:00 AM

WFH or Work at the Office—More Tech Employees Can Now Choose

The “hybrid workplace” is Silicon Valley’s latest buzzword, as tech companies start giving people more options for how and when and where they get stuff done.



PHOTOGRAPH: GABBY JONES/THE NEW YORK TIMES/REDUX



From Bloom (2020)

Heavy Reliance on Virtual Means of Collaboration Is Likely to Persist Beyond COVID-19

- REI abandoned its corporate HQ before ever using it; Dropbox said that it will become a “virtual first” company – a shift from pre-pandemic 3% employees working remote
- From a survey of 80 companies: 86% reported that people will work between 1 and 4 days at home going forward
- From a KPMG survey: 69% of CEOs are planning to downsize office space
- Bloom: “**Working from home is here to stay**”

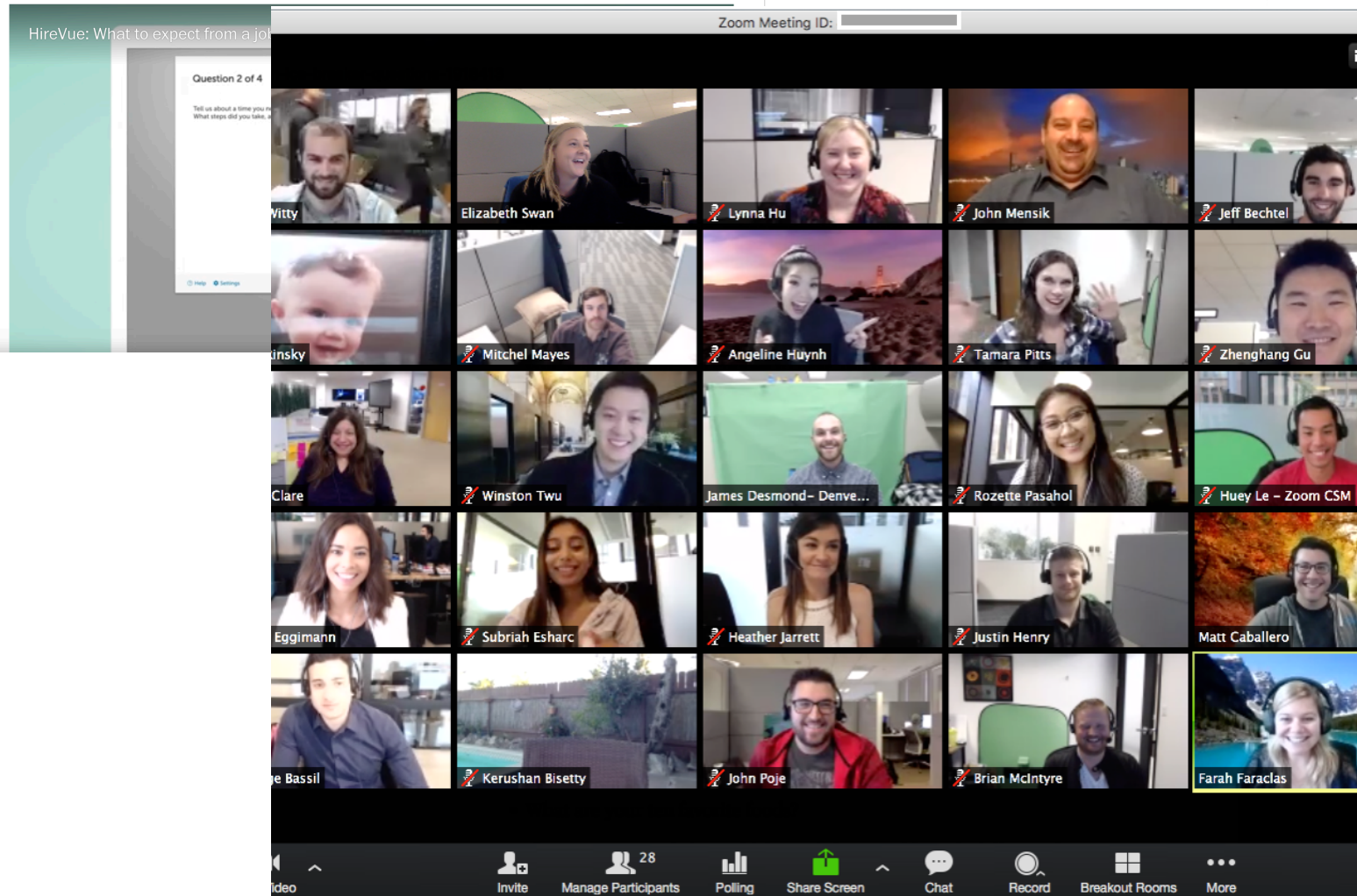


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Technology

A face-scanning algorithm increasingly decides whether you deserve the job

HireVue claims it uses artificial intelligence to decide who's best for a job. Outside experts call it 'profoundly disturbing.'



Purpose & Need

Even before COVID-19, knowledge work has been gradually shifting to virtual modalities

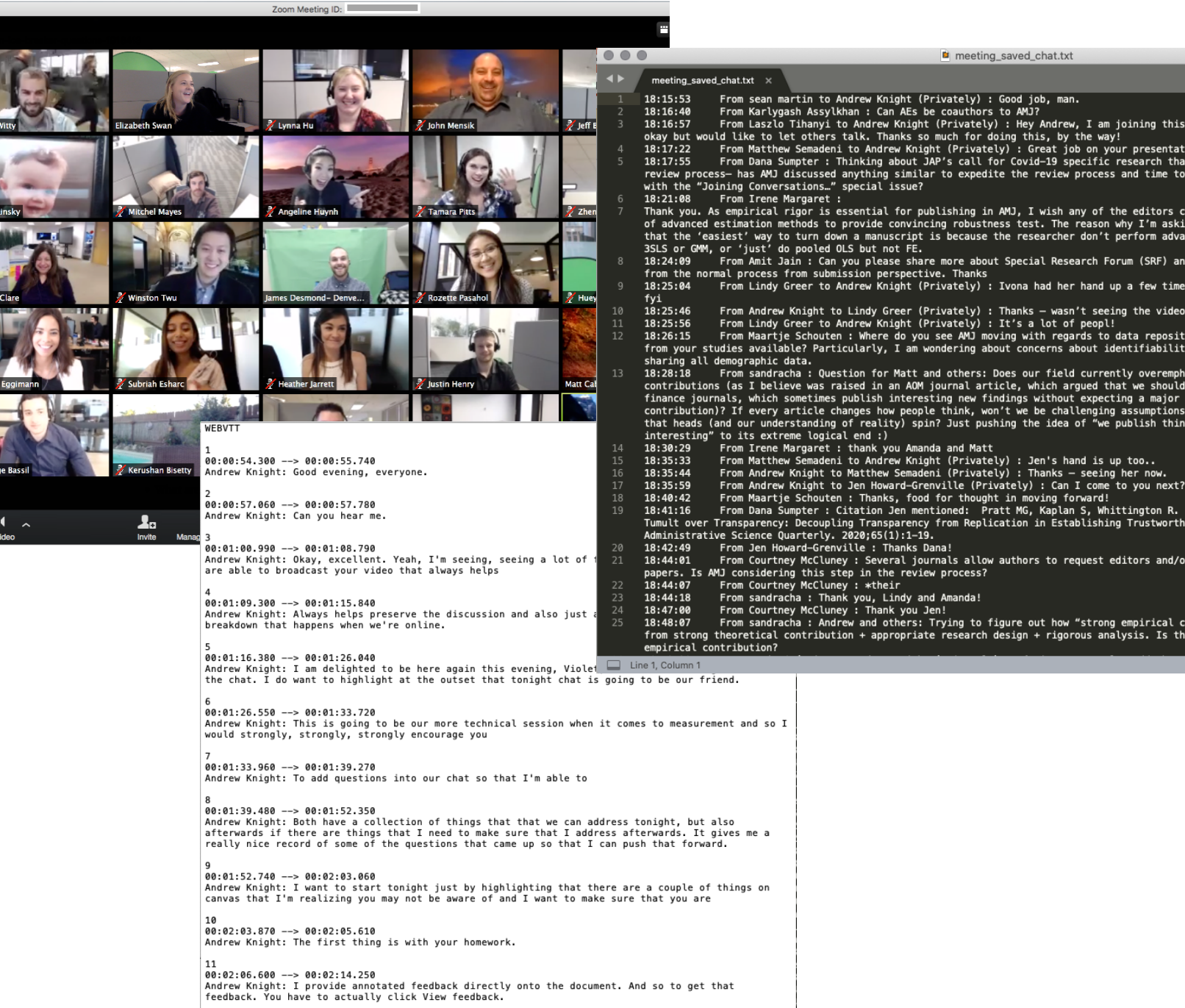
With COVID-19 accelerating this shift, there is an urgent need for tools to help...

- ...researchers understand virtual interactions
- ...students develop virtual collaboration skills



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Zoom Meeting ID: [redacted]



The image shows a Zoom meeting interface. On the left is a grid of participants. On the right is a chat window titled 'meeting_saved_chat.txt' showing a transcript of the meeting. Below the chat window is a transcript of the meeting audio.

Chat Window: meeting_saved_chat.txt

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Positive Externalities

Virtual meetings can also be a useful context for studying long-standing research questions

- Group dynamics and interpersonal relations
- Negotiation & conflict management
- Leadership

Virtual interactions are a rich source of high-resolution data on interpersonal interactions

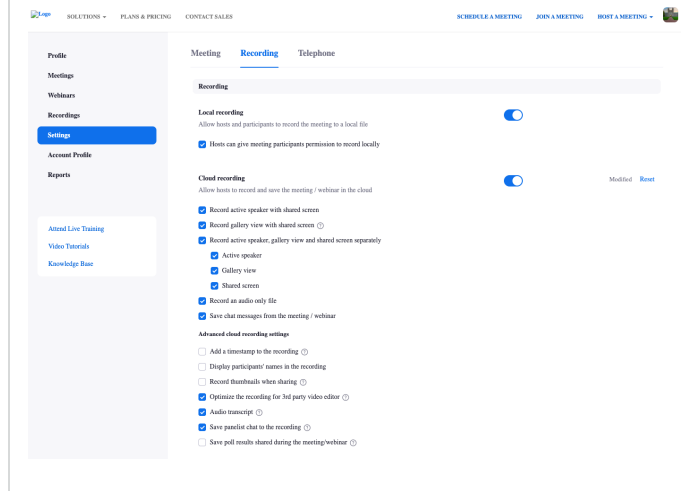


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Overview & Focal Topics for Today

Setting Up Zoom & Extracting Output Files

- Recommendations for how to best configure Zoom
- Suggestions for what files to use for further analysis



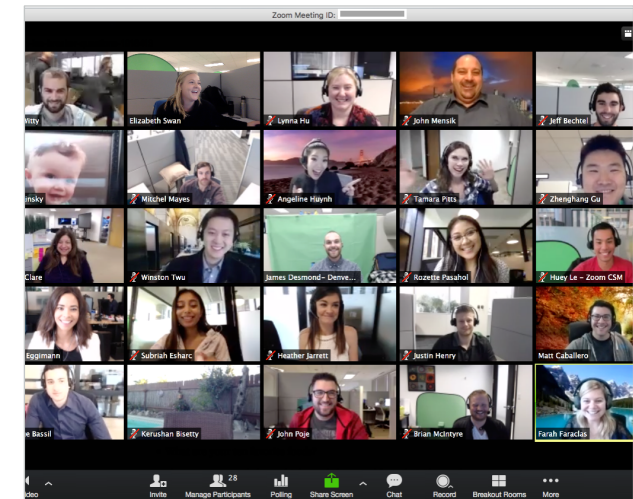
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- Using R to parse text-based output from Zoom
- Analyzing conversation dynamics and sentiment

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Analyzing Visuals

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A Few Ground Rules for our Session

- Play an active role in the workshop—ask questions and offer your ideas and insights
- Highlight “use cases” that help to bring to life how you would apply something to your research





Making the Most out of the Session

- Follow along with the code and examples that I am sharing
- Download your own files from your Zoom account and try to run your own files alongside me

[Link to Tutorial Guide](#)

[Link to the Tutorial Code](#)

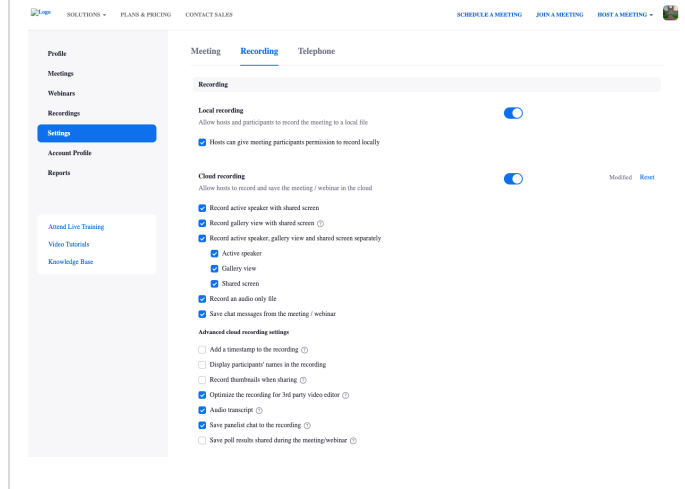


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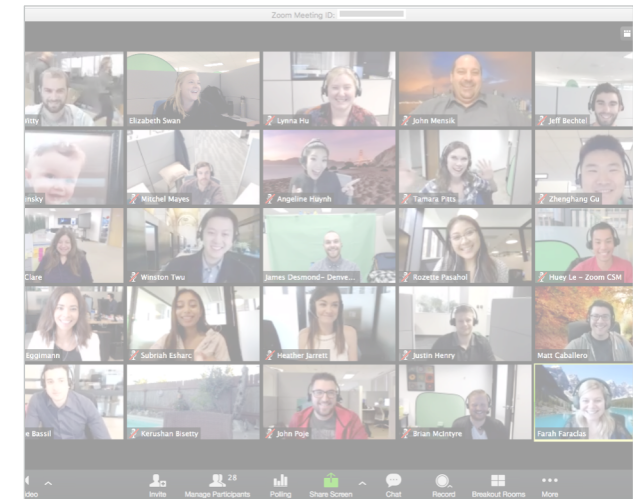
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Meeting**Recording****Telephone****Security**

Schedule Meeting

In Meeting (Basic)

In Meeting (Advanced)

Email Notification

Other

Security**Require that all meetings are secured with one security option**

Require that all meetings are secured with one of the following security options: a passcode, Waiting Room, or "Only authenticated users can join meetings". If no security option is enabled, Zoom will secure all meetings with Waiting Room. [Learn more](#)

Waiting Room

When participants join a meeting, place them in a waiting room and require the host to admit them individually. Enabling the waiting room automatically disables the setting for allowing participants to join before host.

Waiting Room Options

The options you select here apply to meetings hosted by users who turned 'Waiting Room' on

✓ Everyone will go in the waiting room

[Edit Options](#) [Customize Waiting Room](#)

The Usability of Zoom for Research Can Be Enhanced by Tweaking Settings

- Available options depend on the attributes of your Zoom subscription
- For research projects where you are asking others to record, you should develop a standardized protocol

Illustration



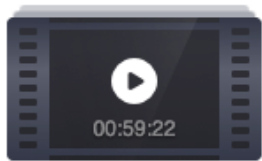
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[My Recordings](#) > Olin Lifelong Learning Presents: Prof. Liberty Vittert

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Sep 24, 2020 11:35 AM Central Time (US and Canada) ID: 948 6820 5123

6 total views • 3 total downloads [Recording Analytics](#)



Recording 1

8 files 1.17 GB



Download (8 files)



Copy shareable link



 Shared screen with speaker view

 Shared screen with gallery view

 Speaker view

 Gallery view

 Shared screen

 Audio only

 Audio transcript

 Chat file

By Tweaking Settings, You Have Several Files Available for Download after the Meeting

- Audio, Video, and Text records of what occurred during the meeting
- Some limited meta data about the meeting

Illustration



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```
zoomGroupStats.R UNREGISTERED
1 #####
2 # Author:      Andrew Knight (http://apknight.org)
3
4 # Last Update:  2020-04-14 13:00 US CDT
5 # Update Note:  Added the textConversationAnalysis function
6
7 # I created this as a way to help people do social science research through web-based
8 # meetings (i.e., Zoom).
9 # It's still a work in progress, but this is a start. If you would like to use it or help
10 # build it,
11 # please reach out!
12
13 #####
14 # OVERVIEW OF FUNCTIONS
15 #####
16 # This script contains functions to use for analyzing recorded Zoom sessions
17 # This is a work in progress and more are coming.
18
19 # processZoomChat      Parses the downloaded chat file from a recorded Zoom session
20 # processZoomTranscript Parses the downloaded transcript from a recorded Zoom session
21 # sentiOut             Conducts a sentiment analysis on either the Chat or Transcript
22 # videoFaceAnalysis    Analyzes the video from a Zoom session and outputs face/emotion
23 # measures
24 # textConversationAnalysis Analyzes either chat or transcript and outputs conversation
25 # metrics
26
27 # Note you will require the following packages to run these:
28 # reshape2
29 # stringr
30 # paws
31 # magick
32 # data.table
33
34 # You will also require an aws account with privileges for rekognition and comprehend to use
35 # the
36 # text analysis and video analysis. If you don't know how to do this, please:
37 # Search online for (a) setting up AWS account; (b) setting up paws. I found the following
38 # useful:
39 # https://github.com/paws-r/paws/blob/master/docs/credentials.md
40
41 # If, after you try you are still struggling, I can give guidance on this if useful—just
42 # contact me.
43
44 #####
45 # processZoomChat Function
46 #####
47
48 # Zoom Chat File Processing
49 # This function parses the data from the chatfile that is downloaded from the Zoom website.
50 # NOTE: This is the file that accompanies a recording. This is not the file
51 # that you download directly within the window. It is also not the one that is
52 # saved locally on your computer. This is the file that you can access after a session
```

zoomGroupStats

- An in-progress set of R functions for processing data from recorded Zoom meetings.
- Relies on open source software and AWS
- See <http://apknight.org>

Include in your R code:
`source("http://apknight.org/zoomGroupStats.R")`



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Utilities Currently in zoomGroupStats

“Helper” Functions

Processing Audio Files

- Transcribe audio
- Parse transcription

Parsing Text-Based Output

- Chat output
- Transcribed audio feed

Processing Video Files

- Sample still frames
- Recognize and label “known” participants

Temporal Windowing

- Create windows in text, audio, or video output

“Analysis” Functions

Conversation Analysis

- Text-based chat
- Transcribed audio

NLP-Based Sentiment Analysis

- Text-based chat
- Transcribed audio

Analysis of Detected Faces in Video File

- Attributes (e.g., glasses)
- Emotional expressions (e.g., smile, happy, sad)

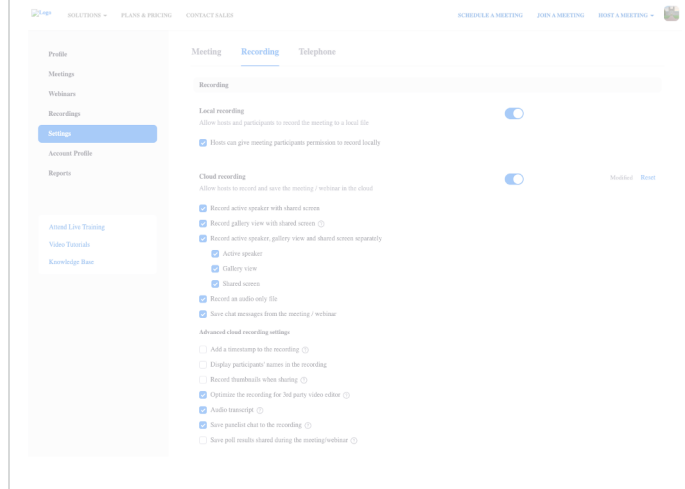
Windowed Analyses

- Produce metrics in specified temporal windows

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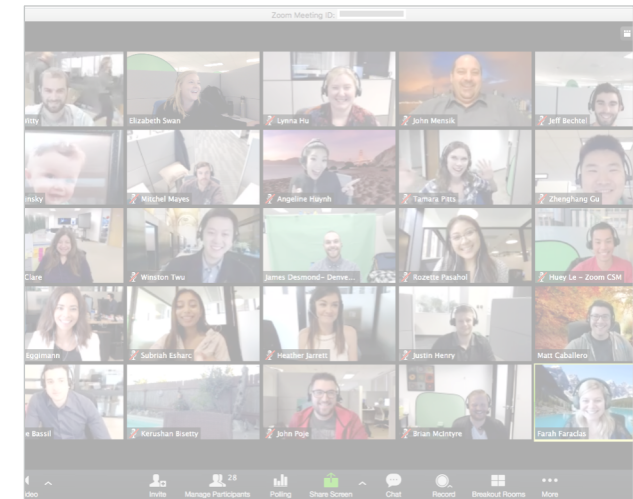
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Data Streams for Analyzing Language

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Auditory Feed through Microphones



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Illustrations

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Andrew Knight: Okay, excellent. Yeah, I'm seeing, seeing a lot of folks there. And again, if you are able to broadcast your video that always helps

4

00:01:09.300 --> 00:01:15.840

Andrew Knight: Always helps preserve the discussion and also just avoid some of the coordination breakdown that happens when we're online.

5

00:01:16.380 --> 00:01:26.040

Andrew Knight: I am delighted to be here again this evening, Violet, thanks for kicking it off with the chat. I do want to highlight at the outset that tonight chat is going to be our friend.

6

00:01:26.550 --> 00:01:33.720

Andrew Knight: This is going to be our more technical session when it comes to measurement and so I would strongly, strongly, strongly encourage you

Using Either Transcription or Chat

Parse the Zoom Output

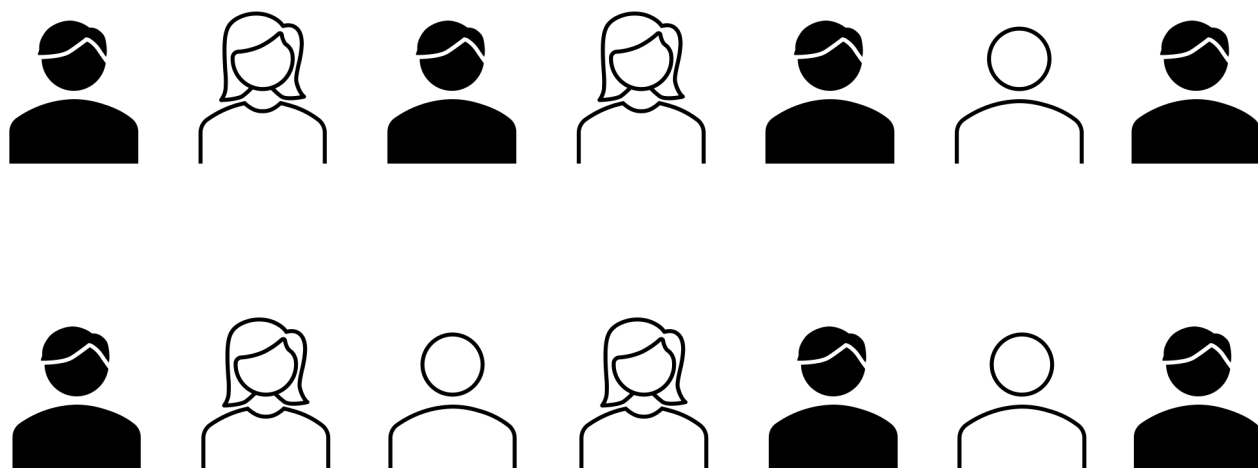
- Convert the text file into a usable dataset
- Fix identifier and timestamping issues

Analyze the conversation to derive metrics at the meeting, individual, and dyad levels

- Volume of linguistic contributions
- Gaps between contributors
- Flow of conversation from one person to the next

Illustration

A Little More Complex: Turntaking



Analysis of Turntaking in Transcript

Background

- The flow of a conversation is akin to a network of utterances
- Turntaking analysis considers who follows whom in the conversation
- Can measure leading and following

Derivative Metrics at the Speaker Level

- Percent of other speakers' utterances that follow a given speaker's utterances

Illustration

Sentiment of Language

```
WEBVTT

1
00:00:54.300 --> 00:00:55.740
Andrew Knight: Good evening, everyone.

2
00:00:57.060 --> 00:00:57.780
Andrew Knight: Can you hear me.

3
00:01:00.990 --> 00:01:08.790
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```

Using Either Transcription or Chat

Use natural language processing to assess the sentiment of each of a speaker's utterances

- Rely on AWS Comprehend

Aggregate individual linguistic contributions to the level of a given person or to the meeting as a whole:

- Percent classified as positive, negative, neutral, or mixed
- Mean of the probability value for each utterance in each category

Illustration

A brief peak into the black box of sentiment analysis using natural text data

Sentiment classification problem

x	y
The dessert is excellent.	★★★★☆
Service was quite slow.	★★☆☆☆
Good for a quick meal, but nothing special.	★★★☆☆
Completely lacking in good taste, good service, and good ambience.	★☆☆☆☆

10,000 → 100,000 words

Andrew Ng

Approach relies on a trained model. The text as a whole is considered as communicating a particular sentiment.

- First, a model is trained to classify a text as positive, negative, or neutral. Training set has quantitative sentiment markers already (e.g., open-ended comments at the end of a quantitative survey; Yelp reviews)
- Second, the model is applied to new text data that lacks quantitative sentiment markers and used to score the valence of comments

Illustration



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Illustration

Conducting a “Windowed” Analysis

Virtual meetings afford the ability to analyze the flow of constructs over time

- Cut a single meeting up into several windows (e.g., every 10 minutes; pre intervention / post intervention)
- Analyze the conversation within each of these windows

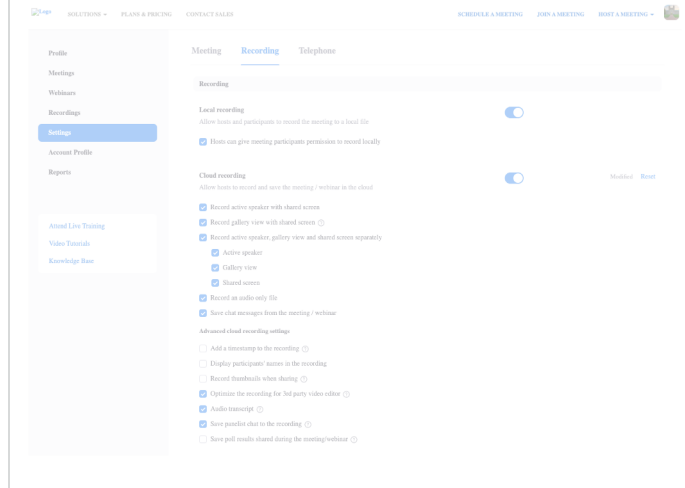


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Overview & Focal Topics for Today

Setting Up Zoom & Extracting Output Files

- Recommendations for how to best configure Zoom
- Suggestions for what files to use for further analysis



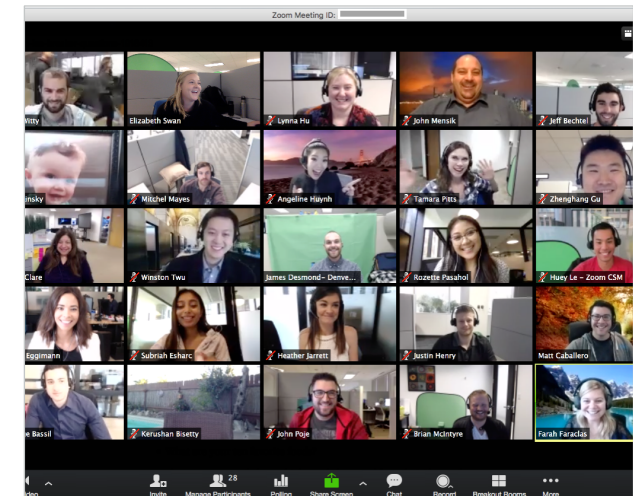
Analyzing Language

- Using R to parse text-based output from Zoom
- Analyzing conversation dynamics and sentiment

```
WEBVTT
1
00:00:54.300 --> 00:00:55.740
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00:01:26.550 --> 00:01:33.720
Andrew Knight: This is going to be our more technical session when it comes to measurement and so I would strongly, strongly, strongly encourage you
7
00:01:33.960 --> 00:01:39.270
Andrew Knight: To add questions into our chat so that I'm able to
8
00:01:39.400 --> 00:01:52.350
Andrew Knight: Both have a collection of things that that we can address tonight, but also afterwards if there are things that I need to make sure that I address afterwards. It gives me a really nice record of some of the questions that came up so that I can push that forward.
9
00:01:52.740 --> 00:02:03.860
Andrew Knight: I want to start tonight just by highlighting that there are a couple of things on canvas that I'm realizing you may not be aware of and I want to make sure that you are
10
00:02:03.870 --> 00:02:05.610
Andrew Knight: The first thing is with your homework.
11
00:02:06.600 --> 00:02:14.250
Andrew Knight: I provide annotated feedback directly onto the document. And so to get that feedback. You have to actually click View feedback.
```

Analyzing Visuals

- Using R to process video output from Zoom
- Analyzing facial attributes and expressions



Sentiment of Facial Expressions



Using the Gallery Style Video Feed

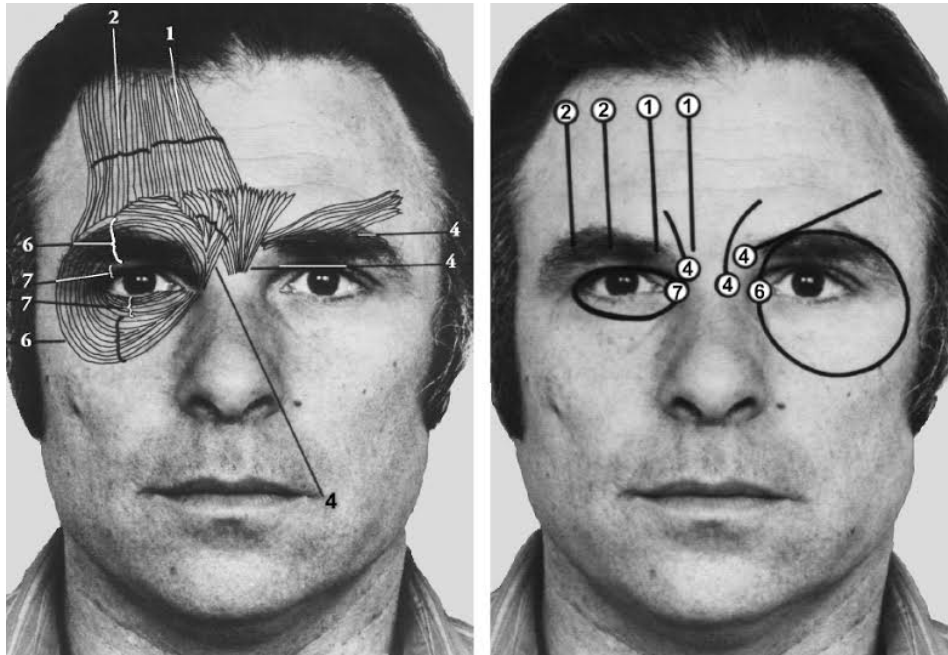
Use facial recognition and analysis software to detect people and assess their affective expressions

- Split feed into image frames
- Detect identity of people in each frame
- Analyze face
- Rely on AWS Rekognition

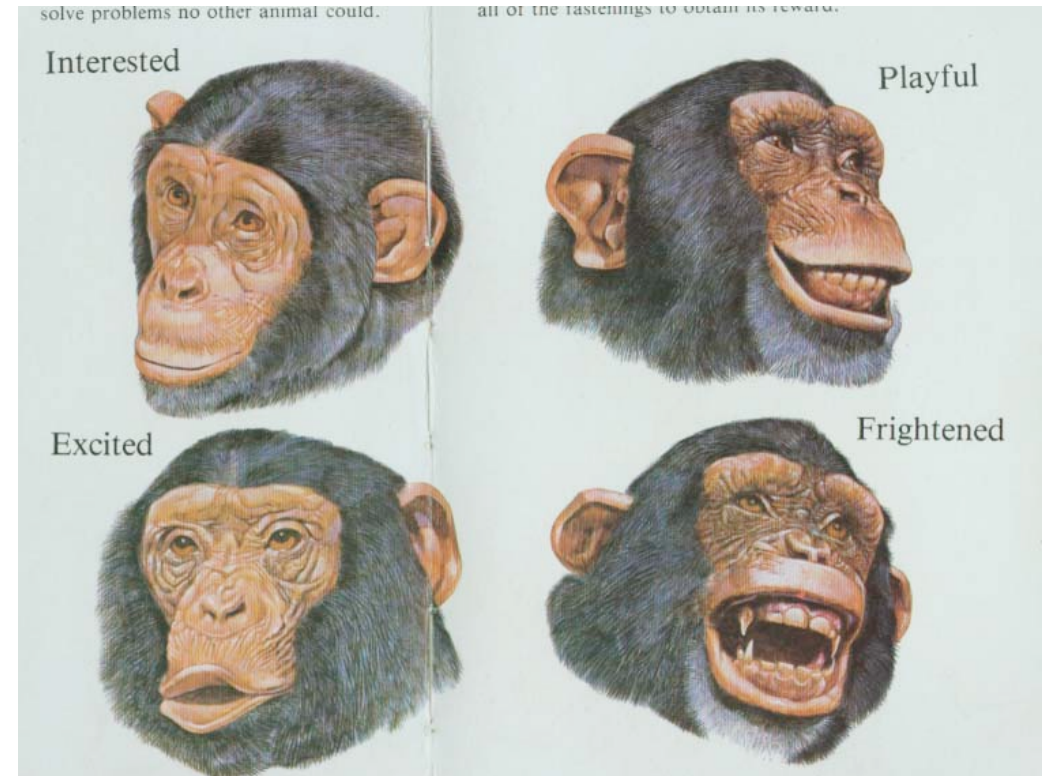
Aggregate the sentiment of the speaker's expressions across the duration of the meeting:

- Percent classified into discrete emotions (e.g., happy, angry)
- Mean of the probability value for each detection in each category

A brief peak into the black box of facial expression analysis



Illustration



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Big Picture Aims of this Project

1. Develop Methods to Collect Meeting-Based Metrics

- Freely available
- Accessible to researchers with varying skills
- Cross-platform (eventually)

2. Examine Validity of Meeting-Based Metrics

- Do the metrics perform as we would expect?
- Connections with other methods and constructs

3. Identify Drivers & Markers of Meeting Effectiveness

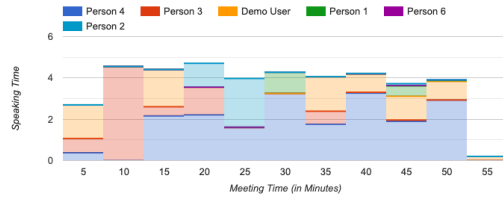
- Do effective meetings have an unobtrusively observable “signature”?
- What leader (and member) behaviors increase effectiveness?

4. Create a Feedback Mechanism for Participants

- Parsimonious & actionable
- Rapid-cycle
- Does feedback change behavior?

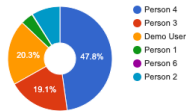
Pacing of Speaking over Time

Do you regularly make contributions throughout the discussion? The chart below shows how much you contributed during 5 minute windows throughout the duration of the meeting. Asking questions or making relevant comments regularly will help your teammates see you as interested, invested, and engaged in the conversation.



Proportion of Speaking Time

How much of the available speaking time during a meeting do you own? This graph shows how much you spoke during the meeting compared to others. In general, effective discussions are characterized by roughly balanced speaking time across members.



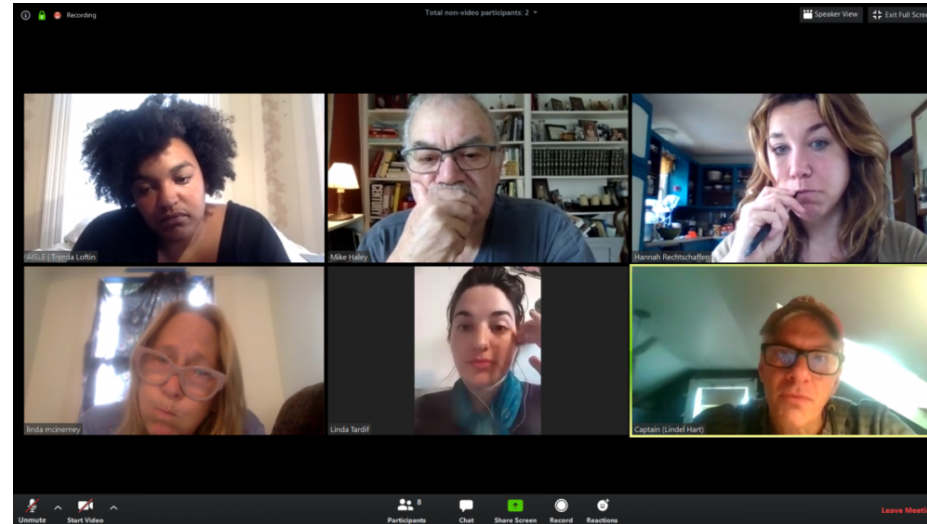
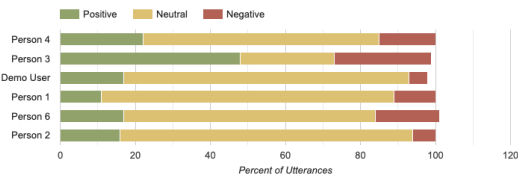
Average Utterance Length

When you speak, how long is your vocal contribution (i.e., an utterance), on average? This graph shows how your average utterance length compares to others in this meeting. In general, it aids group process if your contributions are concise and to the point. This ensures that everyone has a chance to share perspectives and ideas.



Sentiment of Language

How positive or negative is the emotional tone of your vocal contributions? The graph below depicts how much of your contributions are positive, negative, or neutral in their emotional tone. In general, you want your positive contributions to outweigh your negative contributions over the course of the conversation. Note that the total may not add up to 100% because some utterances may be classified as having mixed sentiment, which is not displayed.



```
zoomGroupStats.R
UNREGISTERED

1 #####
2 # Author: Andrew Knight (http://apknights.org)
3
4 # Last Update: 2020-04-14 13:00 US CDT
5 # Update Note: Added the textConversationAnalysis function
6
7 # I created this as a way to help people do social science research through web-based
8 # meetings (i.e., Zoom).
9 # It's still a work in progress, but this is a start. If you would like to use it or help
10 # build it,
11 # please reach out!
12
13 #####
14 # OVERVIEW OF FUNCTIONS
15 #####
16 # This script contains functions to use for analyzing recorded Zoom sessions
17 # This is a work in progress and more are coming.
18
19 # processZoomChat Parses the downloaded chat file from a recorded Zoom session
20 # processZoomTranscript Parses the downloaded transcript from a recorded Zoom session
21 # sentiment Conducts a sentiment analysis on either the Chat or Transcript
22 # videoFaceAnalysis Analyzes the video from a Zoom session and outputs face/emotion
23 # measures
24 # textConversationAnalysis Analyzes either chat or transcript and outputs conversation
25 # metrics
26
27 # Note you will require the following packages to run these:
28 # reshape2
29 # stringr
30 # paws
31 # magick
32 # data.table
33
34 # You will also require an aws account with privileges for rekognition and comprehend to use
35 # the
36 # text analysis and video analysis. If you don't know how to do this, please:
37 # Search online for (a) setting up AWS account; (b) setting up paws. I found the following
38 # useful:
39 # https://github.com/paws-r/paws/blob/master/docs/credentials.md
40
41 # If, after you try you are still struggling, I can give guidance on this if useful—just
42 # contact me.
43
44 #####
45 # processZoomChat Function
46 #####
47
48 # Zoom Chat File Processing
49 # This function parses the data from the chatfile that is downloaded from the Zoom website.
50 # NOTE: This is the file that accompanies a recording. This is not the file
51 # that you download directly within the window. It is also not the one that is
52 # saved locally on your computer. This is the file that you can access after a session
53
54 14 lines, 764 characters selected
Tab Size: 4
R
```

On the Horizon (1)

Building Database of Meetings

- Compile validation data
- Expand the range of tasks and types of participants
- Identify drivers and markers of effectiveness

Examine Effects of Feedback

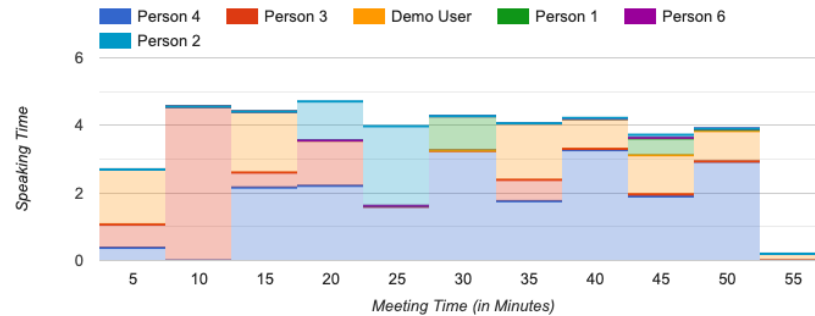
- Changes in speaking time
- Changes in sentiment



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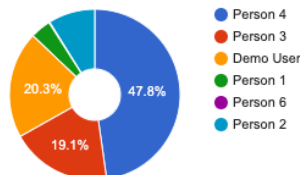
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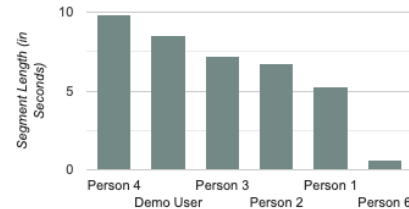
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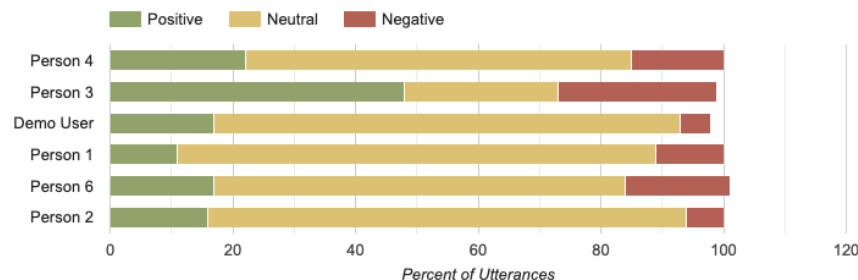
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Meeting Measures

<http://www.meetingmeasures.com>

Web-based feedback platform to provide rapid-cycle feedback on meeting dynamics and effectiveness

- Survey-based measures
- Zoom-based measures



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On the Horizon (2)

Technical Extensions

- Expand and refine conversation analysis (help!)
- Incorporate non-verbal auditory signals (e.g., Praat)
- Standardizing templates and building wrappers



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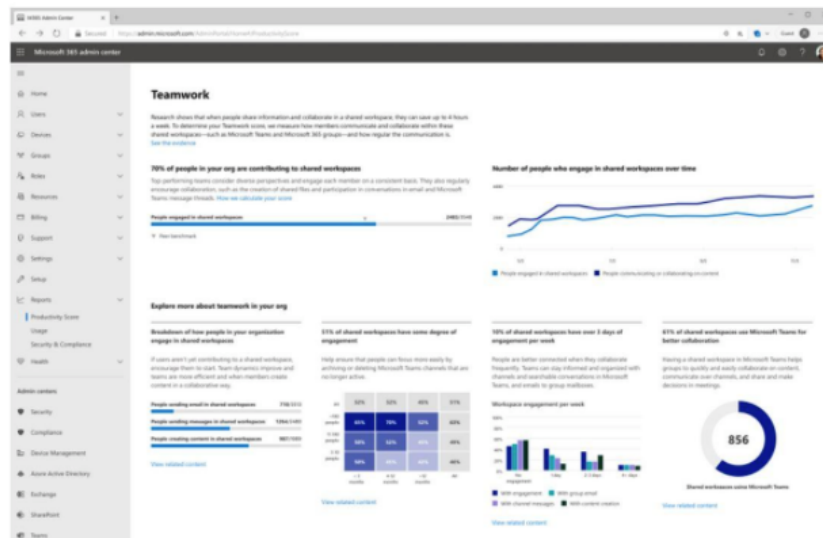
📄 MUST READ: [What is cyber insurance? Everything you need to know about what it covers and how it works](#)

Microsoft to make changes to Productivity Score after privacy complaints

After criticism from a known privacy advocate and others, Microsoft is tweaking how its Productivity Score tool for Microsoft 365 looks and operates.

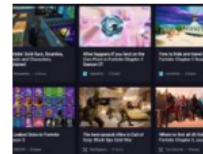


By [Mary Jo Foley](#) for [All About Microsoft](#) | December 1, 2020 -- 18:11 GMT (10:11 PST) | Topic: [Productivity](#)



Credit: Microsoft

MORE FROM MARY JO FOLEY



Microsoft
Microsoft buys
eSports platform
vendor Smash.gg



Collaboration
Microsoft is adding
more calling
features to Teams



Windows 10
Microsoft starts
testing Windows
Feature Experience
Pack updates with
Windows Insiders



Productivity
Microsoft starts
adding consumer
features to Teams
desktop and web
apps

Final Thought

Just like any new method of quantifying human behavior, validation and caution are necessary

- Cannot presume plug-and-play validity
- Must scrutinize data security & privacy practices
- How prepared are social science IRBs for this?



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If you have a project in mind that might fit
and are interested in collaborating,
please contact me:

knightap@wustl.edu



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