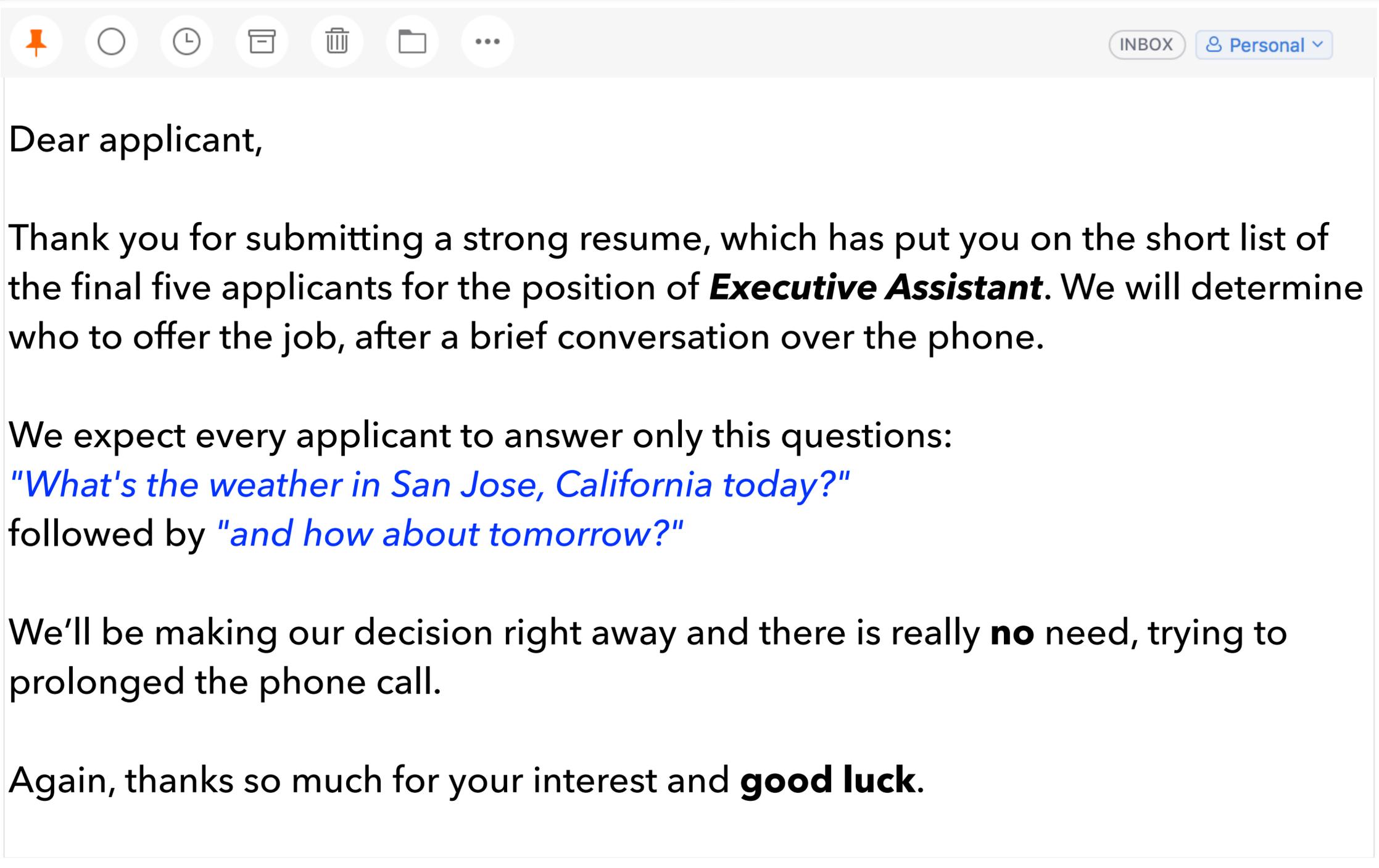
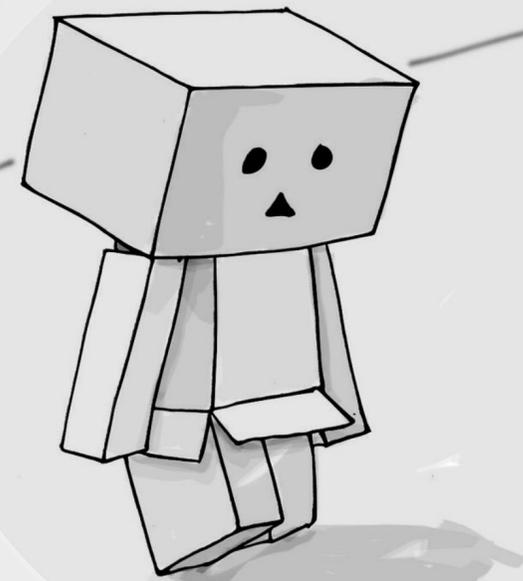


# Affect in Bot Conversations

Wolf Paulus

<http://wolfpaulus.com>



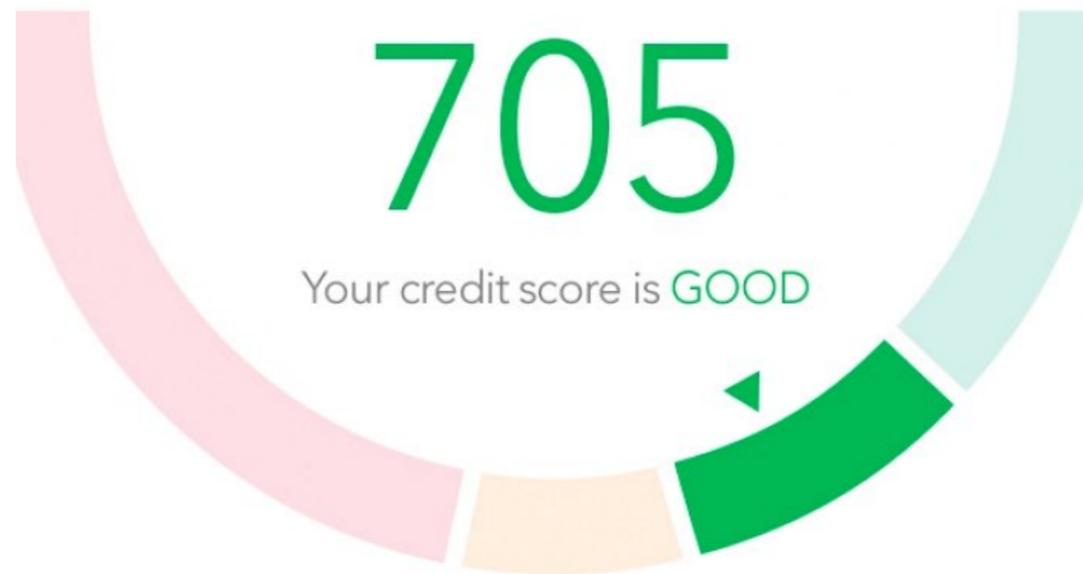


True at least, for the next couple of days..

1. Conversations with bots have limited or no GUI.
2. "*Ambient Computing*" makes device appearance / form factor almost irrelevant.
3. Most / many conversations with bots (voice or text) are rather short.
4. In short conversations, limited information is exchanged. I.e., opportunities for data-driven differentiation remain limited.
5. Information provided to a user, may come from the same source, e.g. weather, stock-market, financial accounts, etc.



What's my credit score?



What's my balance?

mintbills

BILLS MONEY CREDIT CARDS WAYS TO SAVE

Thursday, January 21st

Type here to search for any biller

TOTAL MONEY

\$6,718.01

CASH ACCOUNTS

Chase

Checking (...)

\$4,672.63

INVESTMENTS

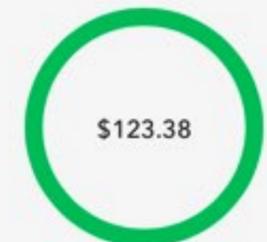
TIAA-CREF Financial Services

SEARCH INSTITUTE SEARCH INSTITUTE 403(B) TDA PLAN(X8442)

\$1,484.26

MONTHLY BILL TRENDS

January 2016



Credit Card \$123.38

# Prologue

An introductory section of a literary or musical work.

# Prelude

An introductory piece of music, poem, or other literary work.

Hey, what's up ?



"Got my MBA"

"Wow, can you believe it?  
I got my MBA."



*Talk to Siri, like talking to a friend*



# Can likability be a differentiator ?



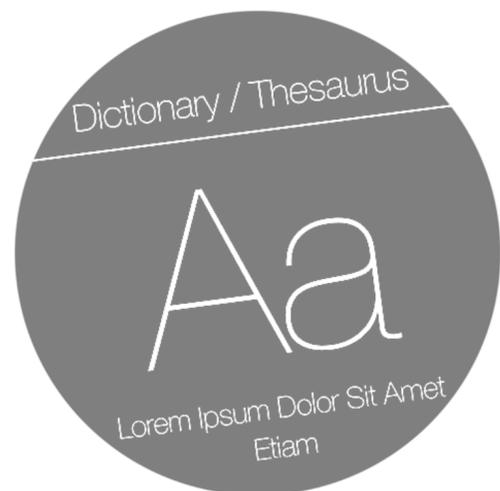
*A practical approach  
for creating an emotional response*

# Lexical database for English

**WordNet**<sup>®</sup> is a large lexical database of English.

Nouns, verbs, adjectives and adverbs are grouped into sets of cognitive synonyms (so called ***synsets***), each expressing a distinct concept.

Each of WordNet's 155,000 *synsets* is linked to other synsets by means of a small number of "conceptual relations." Its structure makes it a useful tool for ***computational linguistics*** and ***natural language processing***.

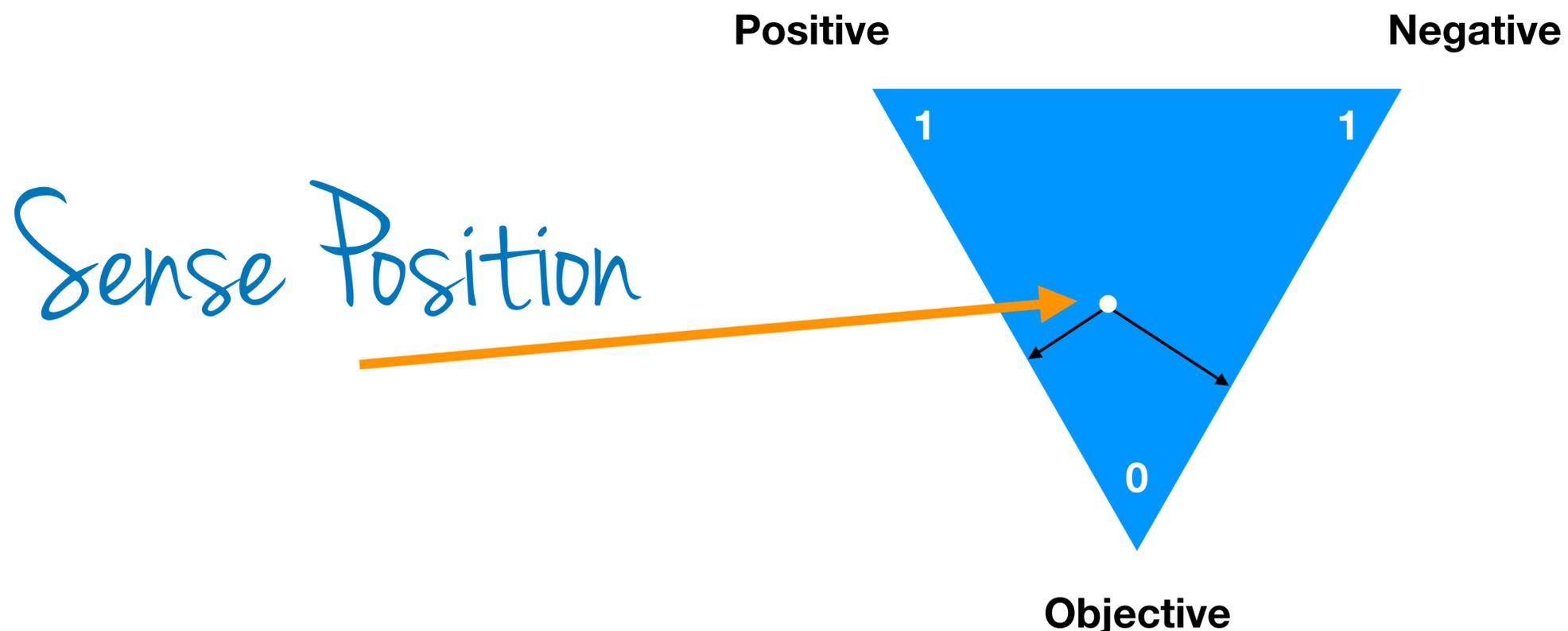


**WordNet** superficially resembles a thesaurus



# Sentiment classification

**SentiWordNet**, a lexical resource explicitly devised for supporting sentiment classification and opinion mining applications; annotating all WordNet *synsets* according to their degrees of **positivity**, **negativity**, and **neutrality**.





POS	ID	PosScore	NegScore	SynsetTerms	Gloss
A	1459422	0.625	0	loveable#1 lovable#1	having characteristics that attract love or affection; "a mischievous but lovable child"
A	1459949	0.625	0	sweet#2 seraphic#2 cherubic#1 angelical#2 angelic#3	having a sweet nature befitting an angel or cherub; "an angelic smile"; "a cherubic face"; "looking so seraphic when he slept"; "a sweet disposition"
A	1460266	0.375	0	cuddly#1 cuddlesome#1	inviting cuddling or hugging; "a cuddlesome baby"; "a cuddly teddybear"
A	1460421	0.333	0.667	hateful#1	evoking or deserving hatred; "no vice is universally as hateful as ingratitude"- Joseph Priestly

# WordNet Domains

# WordNet-Affect Lexicon

**Word Net Domains:** <http://wndomains.fbk.eu>

**WordNet-Affect Lexicon:** [http://corpustext.com/reference/affect\\_wordnet.html](http://corpustext.com/reference/affect_wordnet.html)

The WordNet-Affect Lexicon is a **hand-curate** collection of almost 1,903 emotion-related words (nouns, verbs, adjectives, and adverbs), classified as "*Positive*", "*Negative*", "*Neutral*", or "*Ambiguous*" and categorized into 28 subcategories ("*Joy*", "*Love*", "*Fear*", etc.).

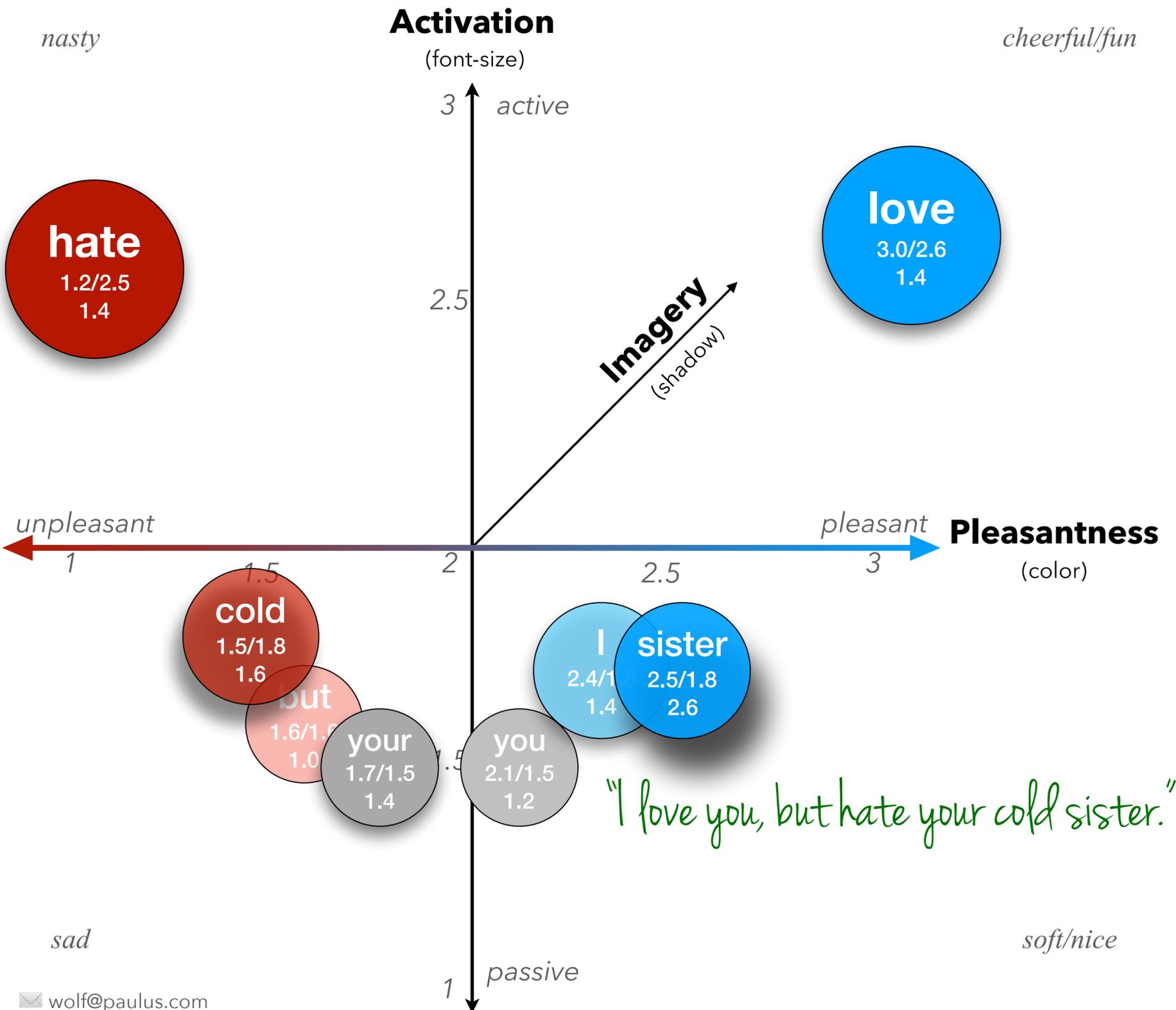
Category	Example Term
emotion	anger
cognitive state	doubt
trait	competitive
behaviour	cry
attitude	skepticism
feeling	pleasure

**WordNet-Affect** is an extension of WordNet Domains, including a subset of *synsets*, suitable to represent affective concepts correlated with affective words.

# Revised Dictionary of Affect in Language

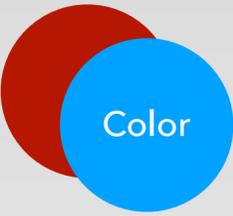
<https://www.god-helmet.com/wp/whissel-dictionary-of-affect>

DAL



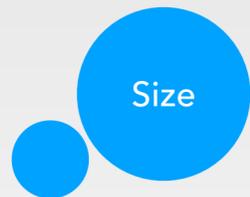
**Pleasantness** [unpleasant - pleasant]

How pleasant is a word?



**Activation** [passive - active]

How aroused or active is a word?

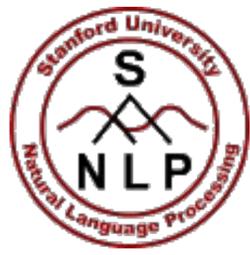


**Imagery** [poorly imaged - Highly imaged]

How easy is it to form a mental picture of a word?



8,742



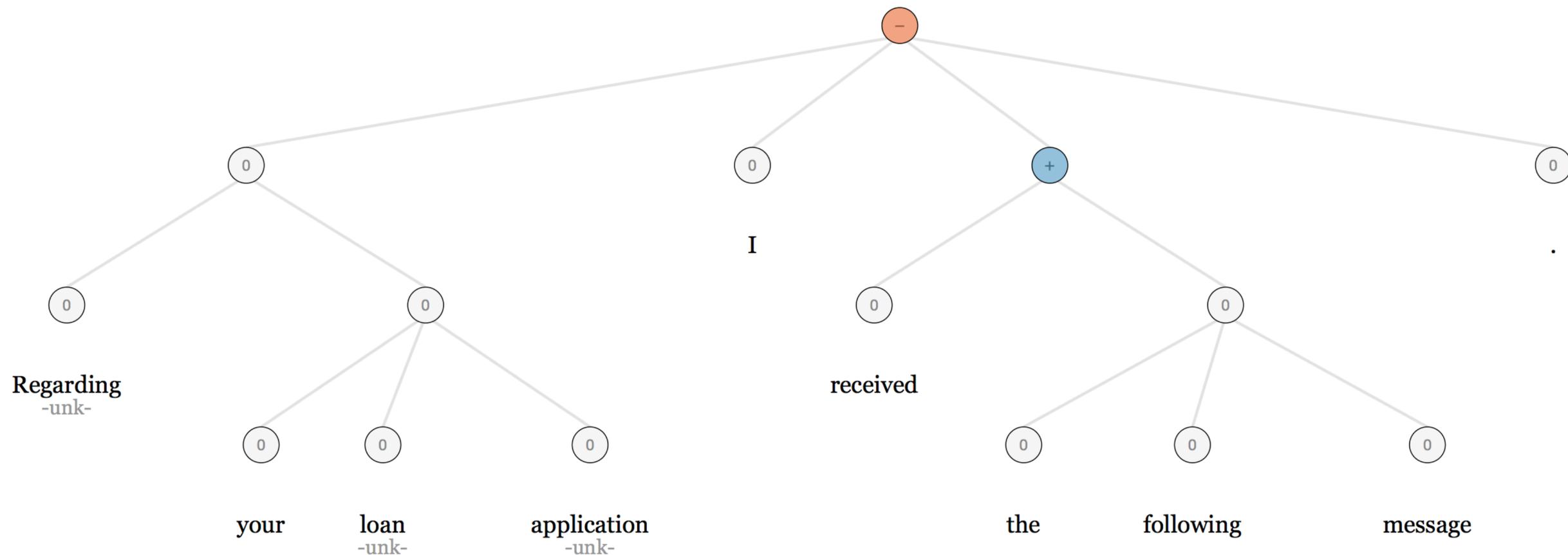
# Sentiment Analysis

<https://nlp.stanford.edu/sentiment>

## Sentiment of a Sentence

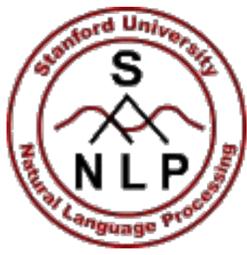
Recursive Neural Network built on top of grammatical structures.

All previously mentioned systems work on words in isolation, (summing up points for positive words and negative words.) Stanford's system analysis whole sentences.



"Regarding your loan application I received the following message."



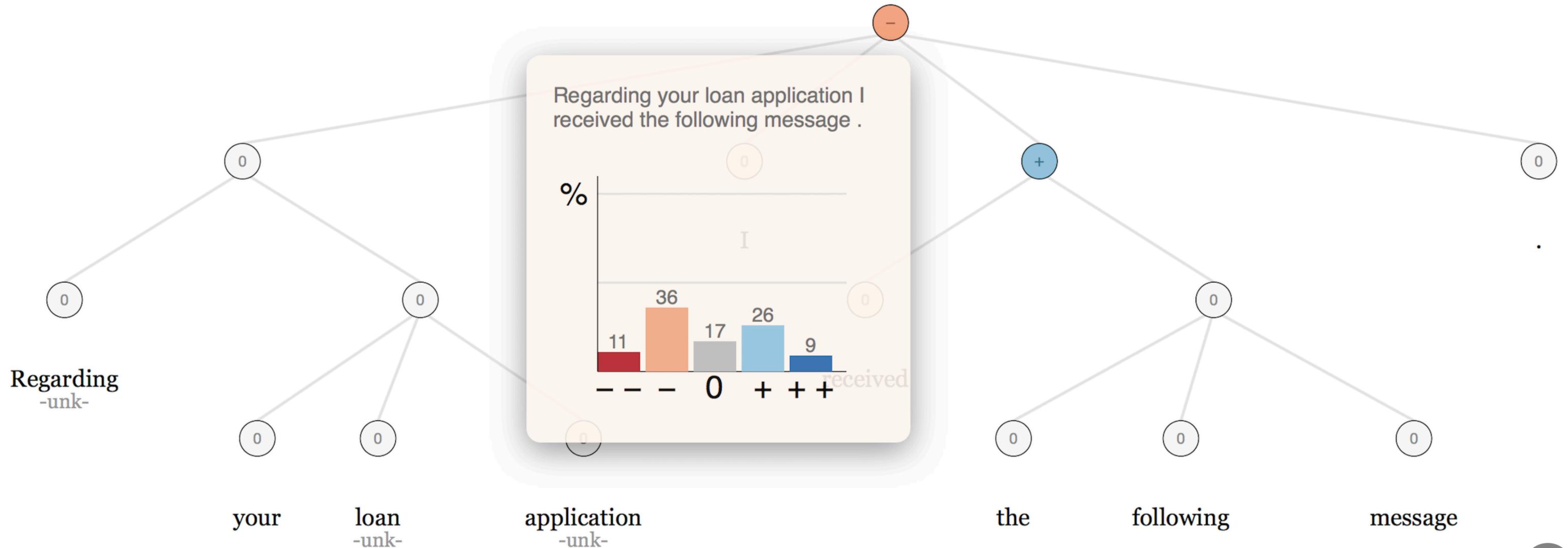


# Sentiment Analysis

<https://nlp.stanford.edu/sentiment>

## Sentiment of a Sentence

"Regarding your loan application I received the following message."





# IBM Cloud

## Text to Speech

<ssml/>

Convert written text into natural-sounding audio in a variety of languages and voices.



## Amazon Polly

<ssml/>

Turn text into lifelike speech using deep learning



## Bing Speech API

<ssml/>

Convert audio to text, understand intent, and convert text back to speech for natural responsiveness



<ssml/>

"Synthesizes written text into spoken speech with the most realistic voices on the market."



<ssml/>

"Realistic synthetic voices that say anything, anywhere, with personality and style."



"Voices not only sound real, they have character, making them suitable for any application that requires speech output."



"Our in-house speech technologies and solutions are designed to provide a smart and pleasant spoken audio result."

# Speech Synthesis Markup Language SSML

<https://www.w3.org/TR/speech-synthesis11/>

```
1 <?xml version="1.0"?>
2 <speak xmlns="http://www.w3.org/2001/10/synthesis"
  · xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.0"
  · xsi:schemaLocation="http://www.w3.org/2001/10/synthesis
  · http://www.w3.org/TR/speech-synthesis/synthesis.xsd" xml:lang="en-US">
3   <p>
4     <s>This is the first sentence of the paragraph.</s>
5     <s>Here's another sentence.</s>
6   </p>
7   It's the<say-as interpret-as="ordinal">27</say-as> day of the month.
8   That is a <emphasis>big</emphasis> car!
9   That is a <emphasis level="strong">huge</emphasis> bank account!
10 </speak>
11 |
```

**SSML**, think of it as the HTML and CSS of Speech Synthesis



# Speech Synthesis Markup Language to impact affect

---

## SSML

<**emphasis** level=".."> enclosed text be spoken with **emphasis**

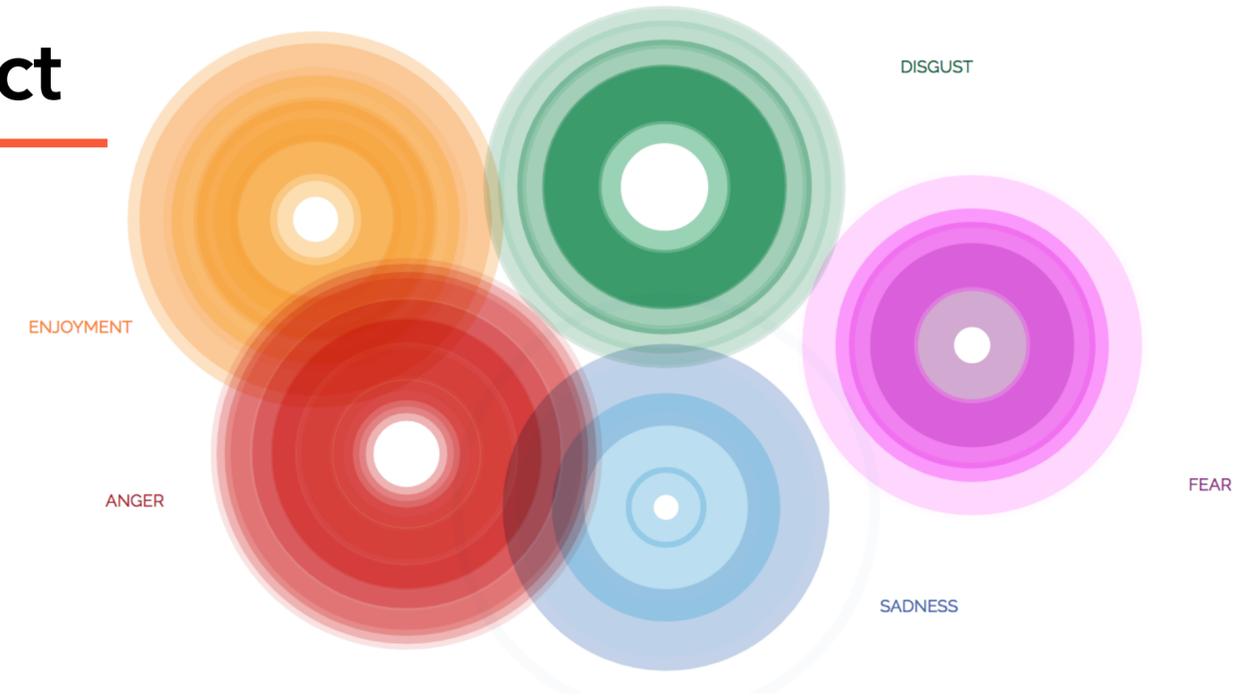
<prosody **pitch** = ".." > modifies the baseline pitch e.g., **low** / **high**

<prosody **rate** = ".." > change in the speaking rate, e.g., **slow** / **fast**

<prosody **volume** = ".." > modifies the volume, e.g., **soft** / **loud**

<prosody **range** = ".."> modifies pitch range (variability) e.g., **low** / **high**

<prosody **contour** = ".."> sets the actual pitch contour for the contained text. (time position, target)



## Voice transformation SSML - *none standard*

<**glottal\_tension** pitch = ".." > **tense** or **lax** speech quality e.g. low / high (low value is perceived as more breathy and generally more pleasant.)

<**breathiness** level=".."> perceived level of the aspiration (drawing breath) noise e.g., low / high

## Expressive SSML - *none standard*

<**express-as** type="GoodNews"> expresses a **positive, upbeat** message.

<**express-as** type="Apology"> expresses a message of **regret**.

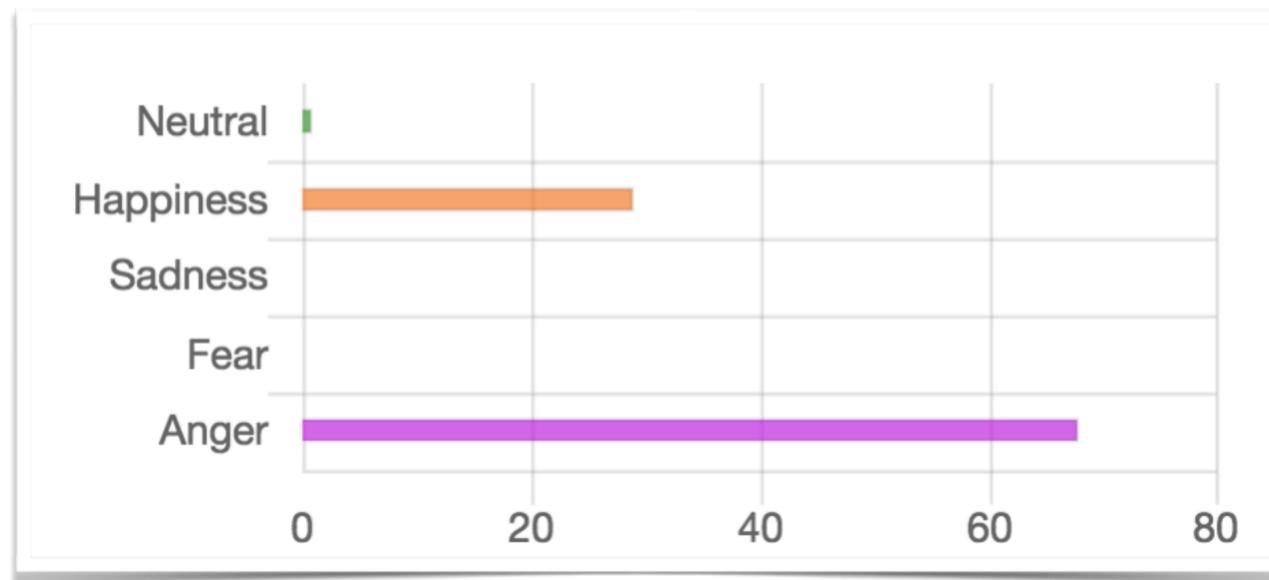
<**express-as** type="Uncertainty"> conveys an uncertain, **interrogative** message.

<https://vokaturi.com>

Based on algorithms by Paul Boersma, professor of Phonetic Sciences at the University of Amsterdam, who is the main author of the speech analysis software Praat,

Vokaturi measures directly from voice, whether the speaker is **happy**, **sad**, **afraid**, **angry**, or has a **neutral** state of mind.

## Acoustical Analysis



.. not intended,  
but can also analyze synthesized voices





# Everything But The Kitchen Sink Soup



IBM Cloud



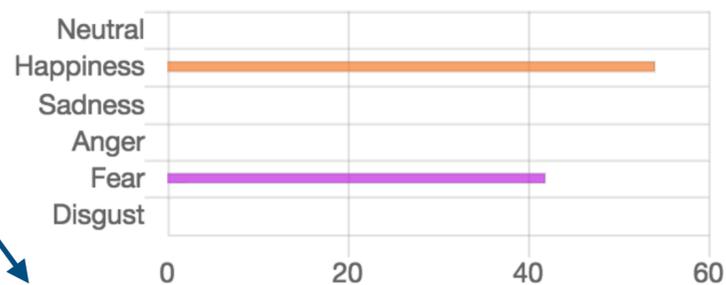
LumenVox  
Speech Understood

POWERED BY  
CEPSTRAL  
WE BUILD VOICES

<ssml/>

alpha:8080/webmumbler/

## Acoustical Analysis



0:04 / 0:04

Text:

Speech:

default emphasis

neutral express...

Regarding your loan application, I received the following message.

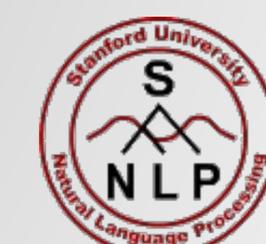
**consider**  
reckon  
**affect**  
**regard [+]**  
**view**  
**see**  
involve

## Dictionary of Affect in Language / Sentiment Analysis

Regarding your **loan application**, I **received** the **following message**. [negative]

## Speech Synthesis Markup Language (SSML)

```
<?xml version="1.0" encoding="UTF-8"?>
<ssml version="1.0" xml:lang="en-US">Regarding your loan application, I received the following message.</ssml>
```



Sentiment Analysis