Affect, the ultimate differentiator
The Engineering of Emotion

Wolf Paulus
Intuit Inc. Technology Futures
you are a bitch

That's not nice to say

Silence.

Sorry, my team will try to fix whatever went wrong 😞
immersive

3D Virtual Reality

2D WIMP (windows, icons, menus, pointer)

1D Texting / ChatBOT UI

0D Voice User Interface

frictionless
Voice first or voice only experiences don’t have a traditional (graphical) user interface.

In this new environment of ambient-computing, form factor or looks hardly matter. Not only what, but equally important how a virtual assistant says it, will determine success.

Likability becomes the ultimate differentiator in an otherwise un-differentiable experience.
Validate that a response carries the intended attitude.

Apply techniques and *off the shelf* tools, originally created to analyze user input, like customer feedback.
Alexa, ask Mint, can I go out for dinner tonight?

There are still $70 left in your restaurants budget, but you also significantly over spent in all other categories.
There are still $70 left in your restaurants budget, but you also significantly over spent in all other categories.

You still have $70 in your restaurants budget, but please understand, in all other categories you are in the red.
Stanford Sentiment Analysis

https://nlp.stanford.edu/sentiment

VADER Sentiment Analysis

**VADER** (Valence Aware Dictionary and sEntiment Reasoner) is a lexicon and rule-based sentiment analysis tool that is specifically attuned to sentiments expressed in social media, and works well on texts from other domains.
How does the interpretation of Sentiment Analyzers compare with what people perceive?

We ran several modern novels through both sentiment analyzer, which produced **5 sets, each containing at least 200 sentences** that the analyzers had tagged as:

- Very Positive
- Positive
- Neutral
- Negative
- Very Negative

We asked 156 people:

to read and determine the attitude expressed in those sentences: if it was **very positive, positive, neutral, negative, or very negative**

156 people tagged a total of 7470 sentences (on average a participant looked at about 50 sentences, containing sentences from each of the 5 sets)
93% of all responses exactly matched or were just one off the sentiment analysis

5 sets, each containing at least 200 sentences

Very Positive • Positive • Neutral • Negative • Very Negative
++ + 0 - -

156 people tagged a total of 7470 sentences
(each looked at about 50 sentences, containing sentences from each of the 5 sets)
"I love you, but hate your cold sister."
Please realize, overall you are in the red.
Quantified Synonyms

<table>
<thead>
<tr>
<th>Term</th>
<th>Positive</th>
<th>Objective</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>faithful</td>
<td>0.625</td>
<td>0.375</td>
<td>0</td>
</tr>
<tr>
<td>hateful</td>
<td>0.333</td>
<td>0</td>
<td>0.667</td>
</tr>
<tr>
<td>honorable</td>
<td>0.625</td>
<td>0.125</td>
<td>0.25</td>
</tr>
</tbody>
</table>
Speech Synthesis
Identifying emotion in a speaker's voice

Speech Synthesis

A COUSTICAL ANALYSIS

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral</td>
<td></td>
</tr>
<tr>
<td>Happiness</td>
<td>80</td>
</tr>
<tr>
<td>Sadness</td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td></td>
</tr>
<tr>
<td>Fear</td>
<td></td>
</tr>
</tbody>
</table>

ANALYSIS OVER TIME

- Neutral
- Happiness
- Sadness
- Anger
- Fear
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”**

- `<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 noise (drawing breath) e.g., low / high

**“Expressive SSML”**

- `<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.
Miserable is a very tough word, you should avoid. Unless you’re stuck, suffering in traffic.

SPEECH SYNTHESIS MARKUP LANGUAGE (SSML)

```xml
<?xml version="1.0" encoding="UTF-8"?>
<speak version="1.0" xml:lang="en-US">
  <p>
    <prosody volume="loud">Miserable</prosody> is a very tough word, you should avoid. <emphasis level="moderate">Unless</emphasis> you're stuck, <emphasis level="strong">suffering</emphasis> in traffic. <prosody pitch="low" rate="slow" volume="soft">in traffic.</prosody>
  </p>
</speak>
```
Summary

likable
capable
Summary & conclusion

• Tools & techniques mentioned were created to analyze customer feedback.
• We can still use them, to validate that a chatbot’s responses carries the intended attitude or sentiment.
• Smart-speakers may hear "Please" and "Thanks" less often than before, let’s make sure the skills or bots we are building responds kindly, considerately and empathically if warranted, and thereby deserve a user’s politeness.
• The number of “Thanks” a bot hears, may tell if you are on the right track.
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Thank You!