The Singularity

A technically informed, but very speculative critique of recent statements of e.g. Elon Musk, Stephen Hawking and Bill Gates

Elon Musk Compares Building Artificial Intelligence To “Summoning The Demon”

Musk: I think we should be very careful about artificial intelligence. If I had to guess at what our biggest existential threat is, it’s probably that. So we need to be very careful with artificial intelligence.

I’m increasingly inclined to think that there should be some regulatory oversight, maybe at the national and international level, just to make sure that we don’t do something very foolish. With artificial intelligence we’re summoning the demon. You know those stories where there’s the guy with the pentagram, and the holy water, and he’s like — Yeah, he’s sure he can control the demon? Doesn’t work out.

MIT, October 2014 (from Techcrunch.com)
Elon Musk: a Machine Tasked with Getting Rid of Spam Could End Humanity

“I don’t think anyone realizes how quickly artificial intelligence is advancing. Particularly if [the machine is] involved in recursive self-improvement . . . and its utility function is something that’s detrimental to humanity, then it will have a very bad effect,” said Musk.

“If its [function] is just something like getting rid of e-mail spam and it determines the best way of getting rid of spam is getting rid of humans . . .” Musk trailed off, as the crowd laughed.

Vanity Fair New Establishment Summit October 2014

Stephen Hawking: AI could end human race

“The primitive forms of artificial intelligence we already have have proved very useful. But I fear the development of full artificial intelligence could spell the end of the human race. Once humans develop artificial intelligence, it would take off on its own, and re-design itself at an ever increasing rate. Humans, who are limited by slow biological evolution, couldn’t compete and would be superseded”

Stephen Hawking
Dec 2, 2014

Bill Gates
• “I am in the camp that is concerned about super intelligence. First the machines will do a lot of jobs for us and not be super intelligent. That should be positive if we manage it well. A few decades after that though the intelligence is strong enough to be a concern. I agree with Elon Musk and some others on this and don’t understand why some people are not concerned.”


Welcome to the Singularity ??

The Coming Technological Singularity: How to Survive in the Post-Human Era: Vernor Vinge 1993

• “Within 30 years, we will have the technological means to create superhuman intelligence. Shortly after, the human era will be ended.”
The Singularity – Origin of the phrase

"His conversations with friends on scientific subjects could last for hours. There never was a lack of subjects, even when one departed from mathematical topics.

... One conversation centered on the ever accelerating progress of technology and changes in the mode of human, life, which gives the appearance of approaching some essential singularity in the history of the race beyond which human affairs, as we know them, could not continue."

– John von Neumann 1903-1957, Stanislaw Ulam

Deep Neural Nets – Breakthrough in Speech Recognition Accuracy

<table>
<thead>
<tr>
<th>Method</th>
<th>PER (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender Confusion 10 k</td>
<td>20.1</td>
</tr>
<tr>
<td>Bayesian Triphone GMM</td>
<td>29.6</td>
</tr>
<tr>
<td>Hidden Trigraphs (Weiss/Sch)Model</td>
<td>24.9</td>
</tr>
<tr>
<td>Monophone CER (GMM)</td>
<td>25.4</td>
</tr>
<tr>
<td>Monophone CER (DNN)</td>
<td>22.4</td>
</tr>
<tr>
<td>Triphone GMM HMM with BHM</td>
<td>21.7</td>
</tr>
<tr>
<td>Monophone CER (BHM)</td>
<td>20.7</td>
</tr>
<tr>
<td>Computational CER</td>
<td>24.9</td>
</tr>
<tr>
<td>Computational CER + Relighting + Focusing</td>
<td>19.1</td>
</tr>
<tr>
<td>End-to-End CER (WT)</td>
<td>19.9</td>
</tr>
</tbody>
</table>

Word error rates “at human accuracy” 5.5%

Phone Error Rate
Training: 630 speakers x 10 sentences TIMIT

Unsupervised Learning With 1B Parameters

DATA: 10M youtube (unlabeled) frames of size 200x200.

Best HMM result

Best DNN result

IMAGENET v.2011 (16M images, 20K categories)

<table>
<thead>
<tr>
<th>METHOD</th>
<th>ACCURACY %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weston &amp; Bengio 2011</td>
<td>9.3</td>
</tr>
<tr>
<td>Linear Classifier on deep features</td>
<td>13.1</td>
</tr>
<tr>
<td>Deep Net (from random)</td>
<td>13.6</td>
</tr>
<tr>
<td>Deep Net (from unsup.)</td>
<td>15.8</td>
</tr>
</tbody>
</table>

Le et al. “Building high-level features using large-scale unsupervised learning” ICLR, 2012
MIT Spinoff Funded $143M to Create Sentient Computers

The End of Moore’s Law

Moore’s Law – the original graph...

Bye-bye Moore’s Law...


Intel’s former chief architect Bob Colwell, head of DARPA’s Microsystems Technology Office: “For planning horizons, I pick 2020 as the earliest date we could call [Moore’s law] dead. You could talk me into 2022, but whether it will come at 7 or 5nm, it’s a big deal.” – 2013
The brain has special-purpose hardware

The brain is complex in architecture.

"Real soon now"

"By 1991, the impressive list of goals penned in 1981 for Japan's Fifth Generation Project had not been met. Indeed, some of them, like "carry on a casual conversation" had not been met by 2010. As with other AI projects, expectations had run much higher than what was actually possible."

History of Artificial Intelligence, Wikipedia

Then why believe the Singularity is near?

"Most of us accept that our lives are limited... Not Ray Kurzweil. Kurzweil, 65, decided decades ago that mortality wasn't for him. He didn't have to die, and he wasn't going to, if he could help it. Fortunately, he believes he can help it — and he's been working feverishly at the task of staying alive ever since.

"How long do you think you will live?" I asked Kurzweil in a recent phone interview.

"I think I have a good chance — I would put it at 80 percent — of getting to the point where it becomes indefinite, because you'll be adding more time than is going by to your remaining life expectancy."

http://www.slate.com/articles/technology/future_tense/2013/11/ray_kurzweil_s_singularity_what_it_s_like_to_pursue_immortality.html