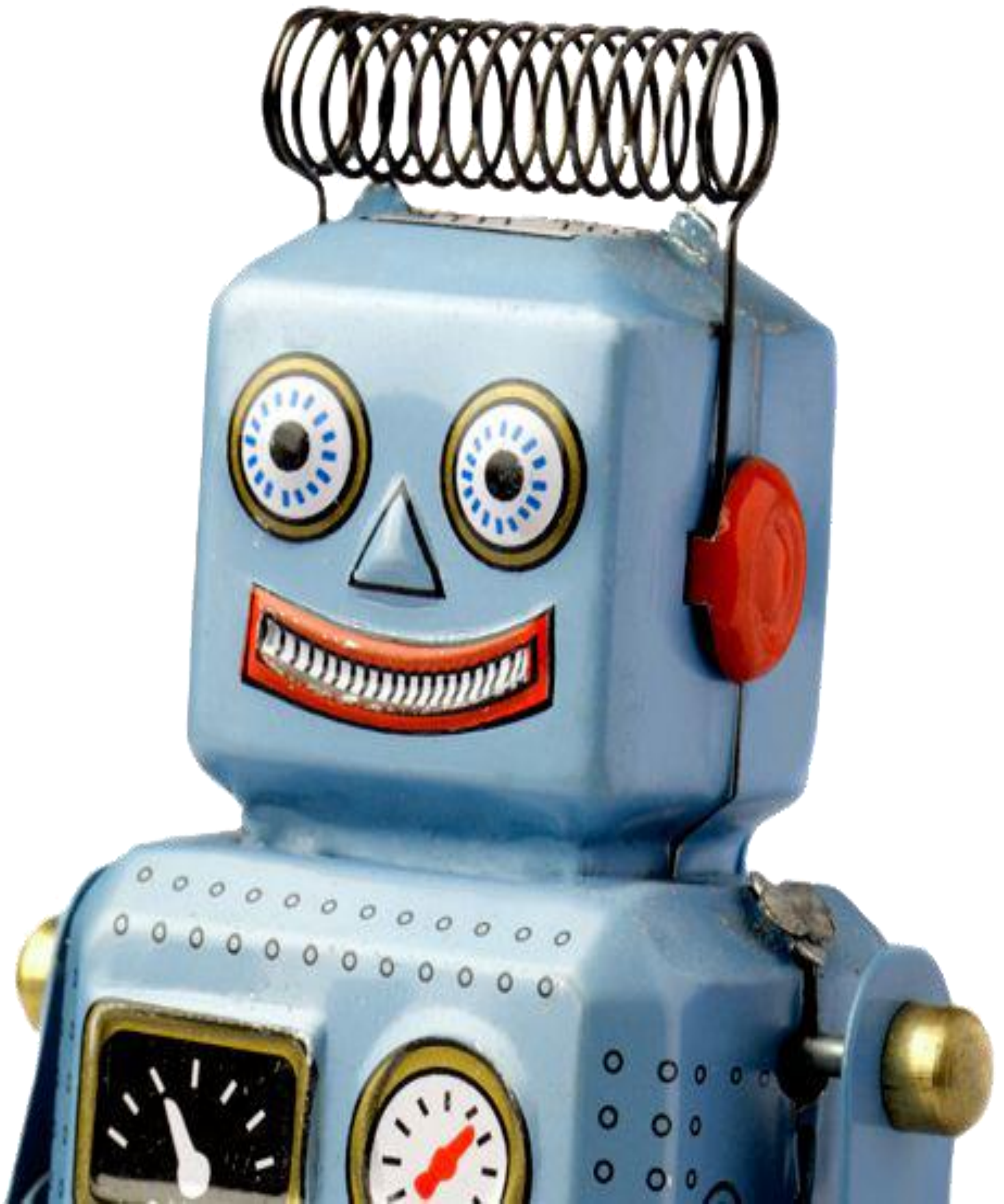
COMS 647

COMMUNICATION TECHNOLOGY

Agenda

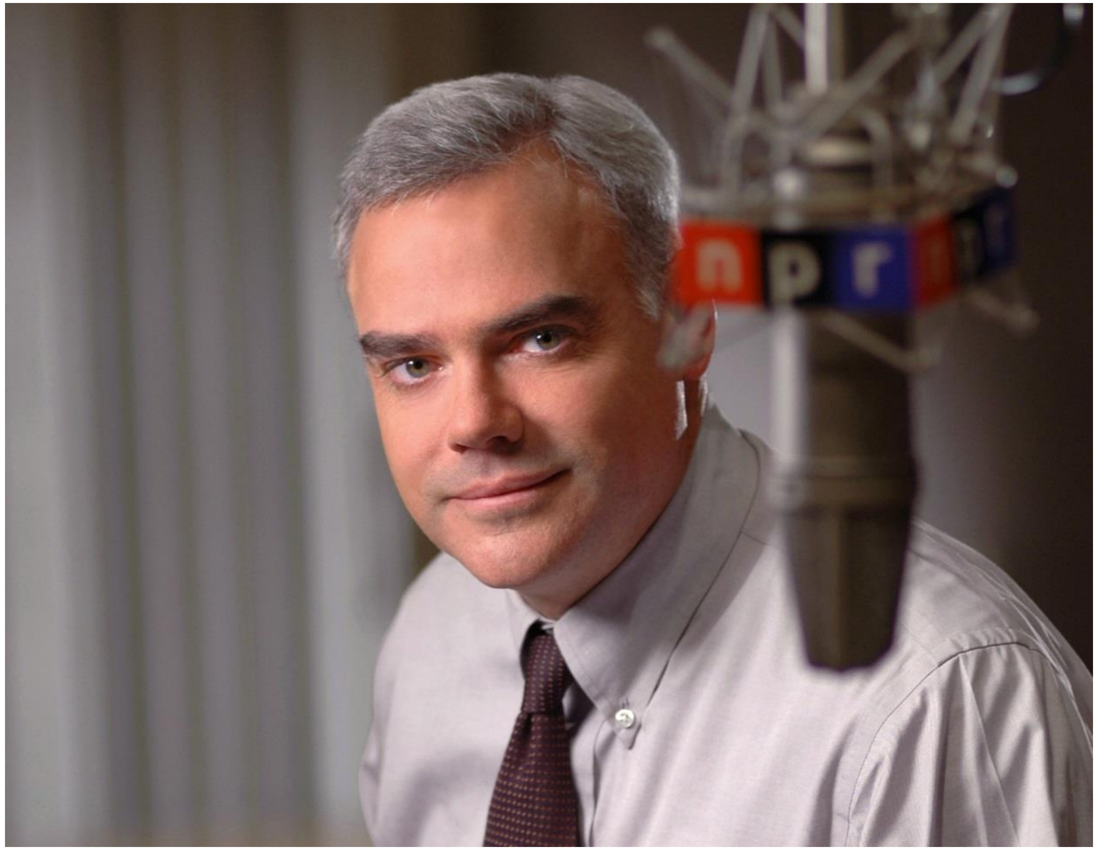
- Review
- Social Robots
- Preview



Review

Computational Creativity

VS



Automated Insights - Wordsmith

Scott Horsley - NPR Reporter

Story #1

▶ Denny's Corporation on Monday reported first-quarter profit of 8.5 million dollars. The Spartanburg, South Carolina-based company said it had profit of 10 cents per share. The results beat Wall Street expectations. The average estimate of four analysts surveyed by Zacks Investment Research was for earnings of 9 cents per share. The restaurant operator posted revenue of $120.2 million in the period, also beating Street forecasts. Three analysts surveyed by Zacks expected $117.1 million. Denny's shares have risen nearly 6 percent since the beginning of the year. In the final minutes of trading on Monday, shares hit $10.90, a climb of 61 percent in the last 12 months.

2 minutes

Story #2

▶ Denny's Corporation notched a grand slam of its own in the first quarter, earning a better-than-expected ten cents a share, as restaurant sales jumped by more than 7-percent. Operating revenues topped $120 million. Adjusted net income jumped 36 percent to $8.7 million. Denny's is one of the nation's largest full-service restaurant chains. The growth in sales suggests consumers are opening their pocketbooks for pancakes, eggs, and hash browns. Earnings were also helped by lower costs for raw materials. Denny's results were also helped by the re-opening of the high-volume location inside the Las Vegas Casino Royale restaurant. After sales grew faster than expected in the first three months of the year, managers raised their sales forecast for the remainder of 2015.

7 minutes

90% of news stories will be written algorithmically within the next decade

- Kris Hammond

NarrativeScience

Tell the Stories Hidden in Your Data™

Introduction

Author

Story #2

▶ Denny's Corporation notched a grand slam of its own in the first quarter, earning a better-than-expected ten cents a share, as restaurant sales jumped by more than 7-percent. Operating revenues topped $120 million. Adjusted net income jumped 36 percent to $8.7 million. Denny's is one of the nation's largest full-service restaurant chains. The growth in sales suggests consumers are opening their pocketbooks for pancakes, eggs, and hash browns. Earnings were also helped by lower costs for raw materials. Denny's results were also helped by the re-opening of the high-volume location inside the Las Vegas Casino Royale restaurant. After sales grew faster than expected in the first three months of the year, managers raised their sales forecast for the remainder of 2015.

Text

Story #1

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Text

?

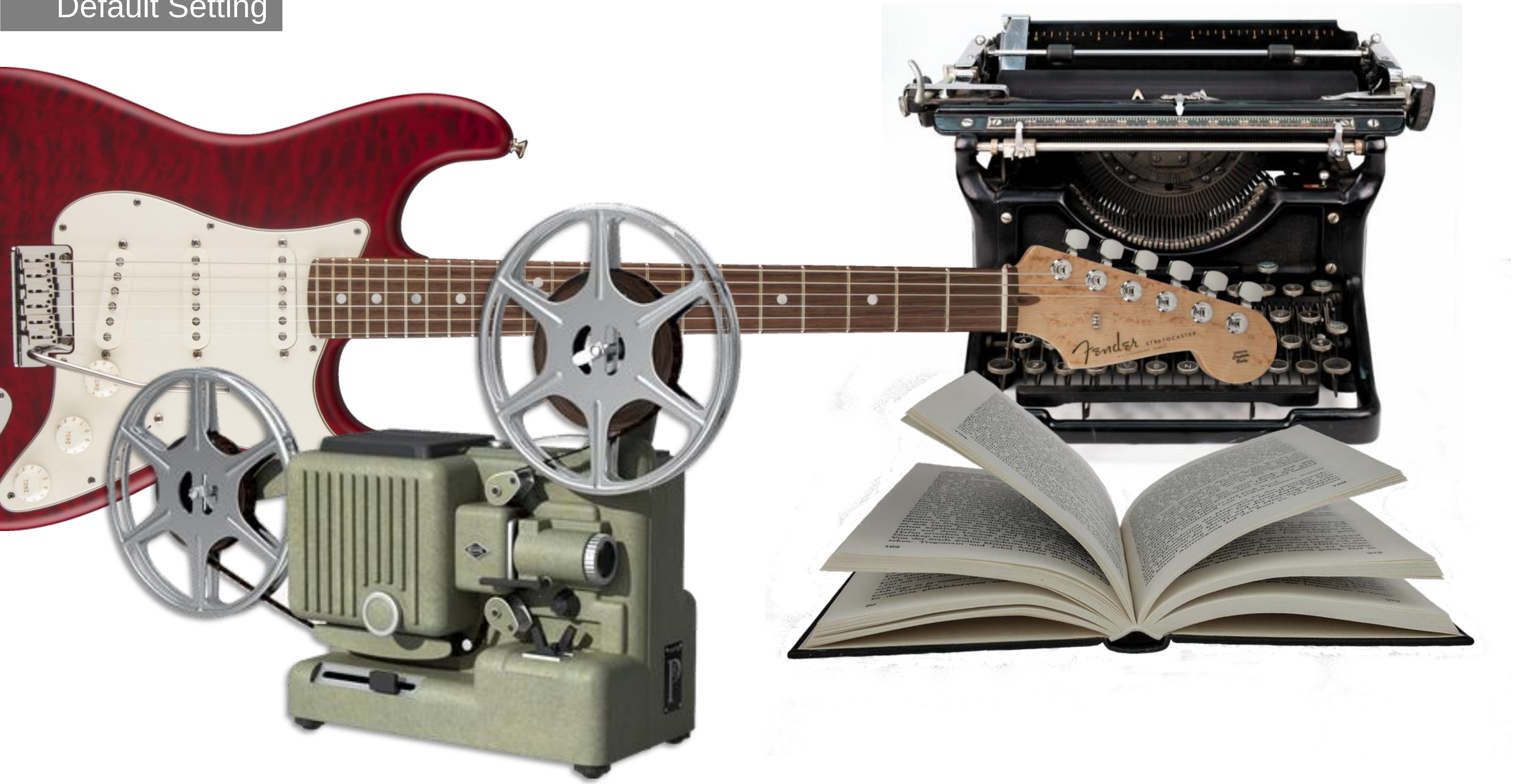
Author

“Responsibility Gap”

1. **Default Setting** – the way we usually make sense of responsibility when it involves technology
2. **New Normal** – how recent technological innovations are changing the rules of the game
3. **Opportunities/Challenges** – how we can respond to this situation

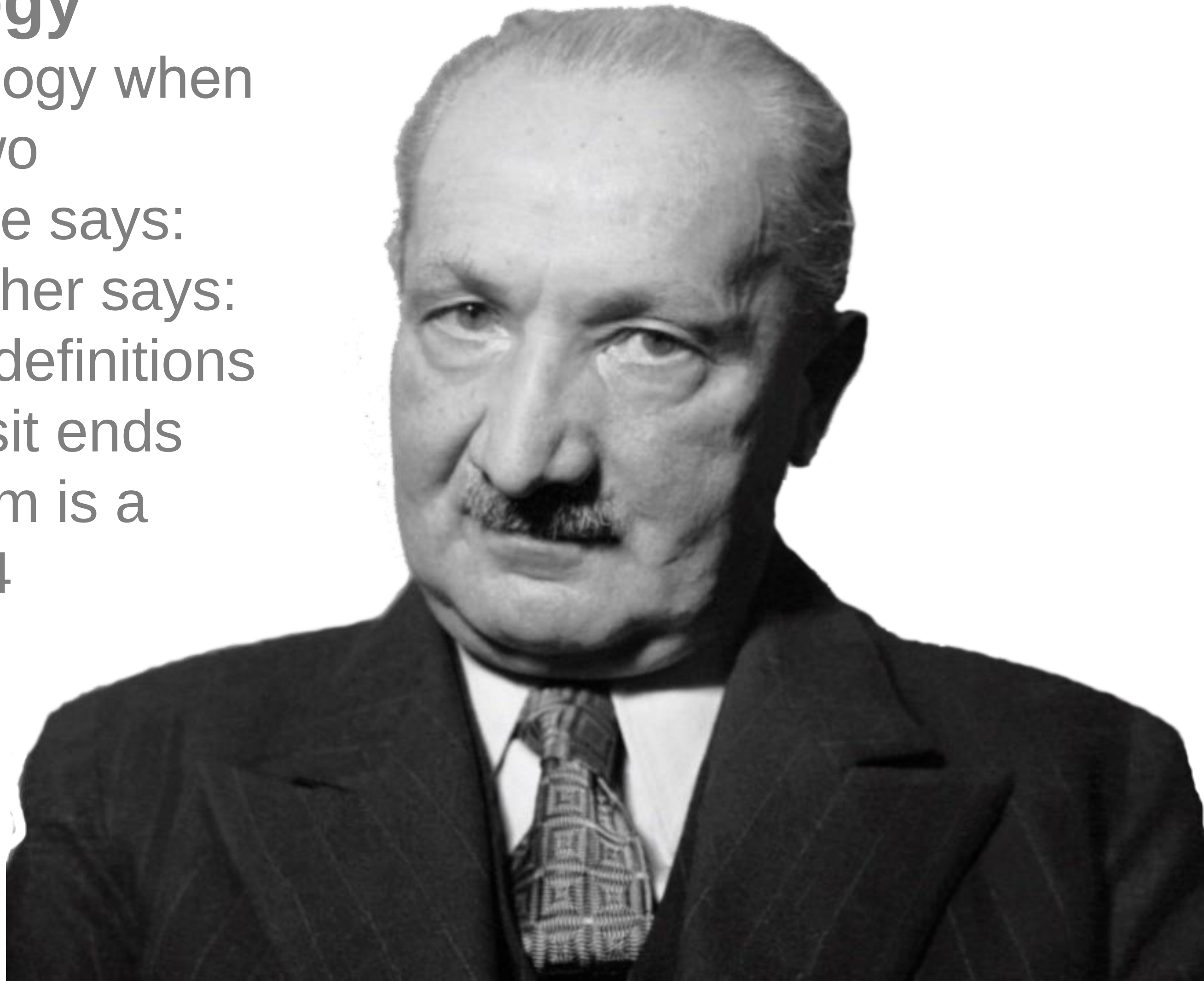
Default Setting

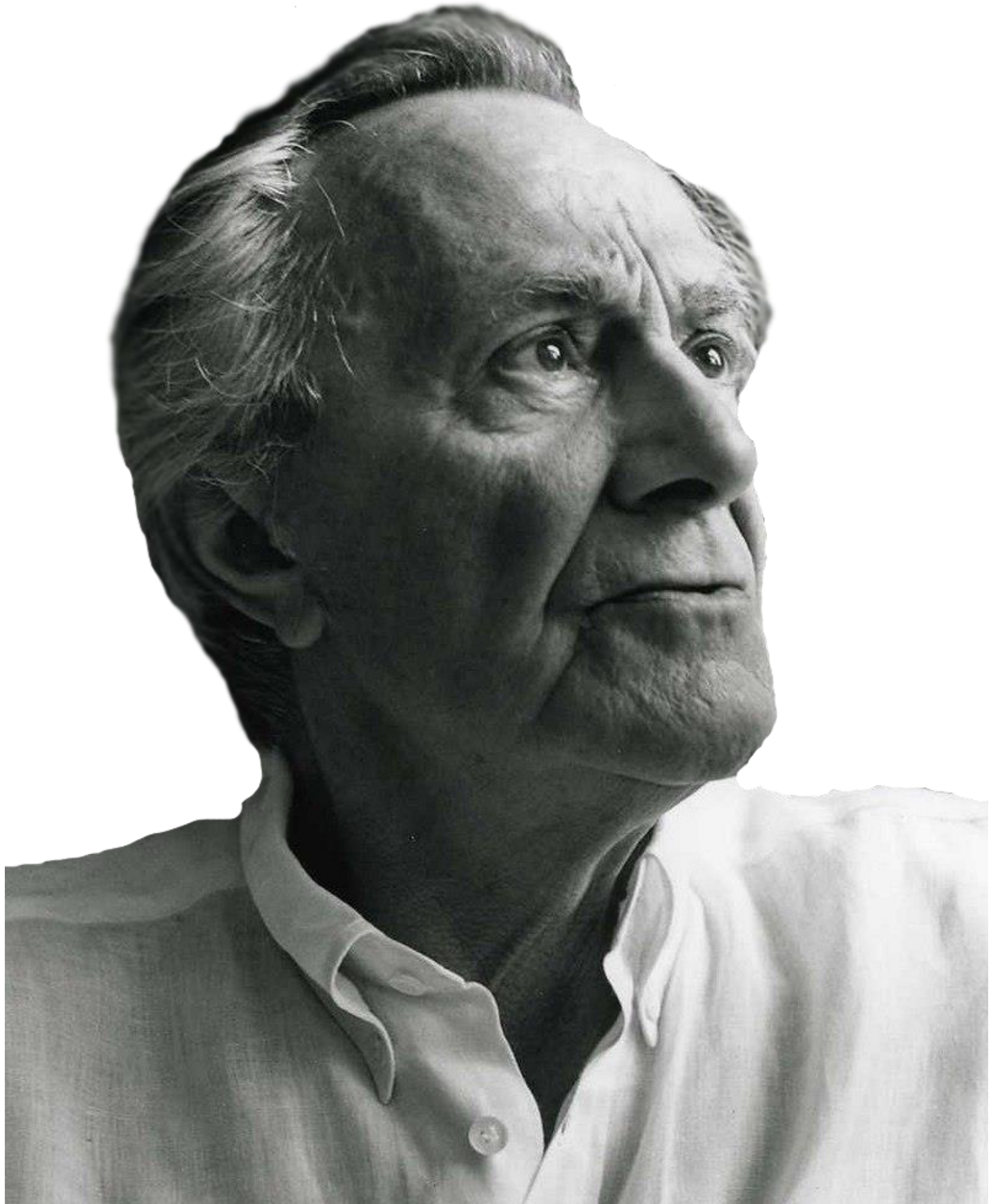
Default Setting



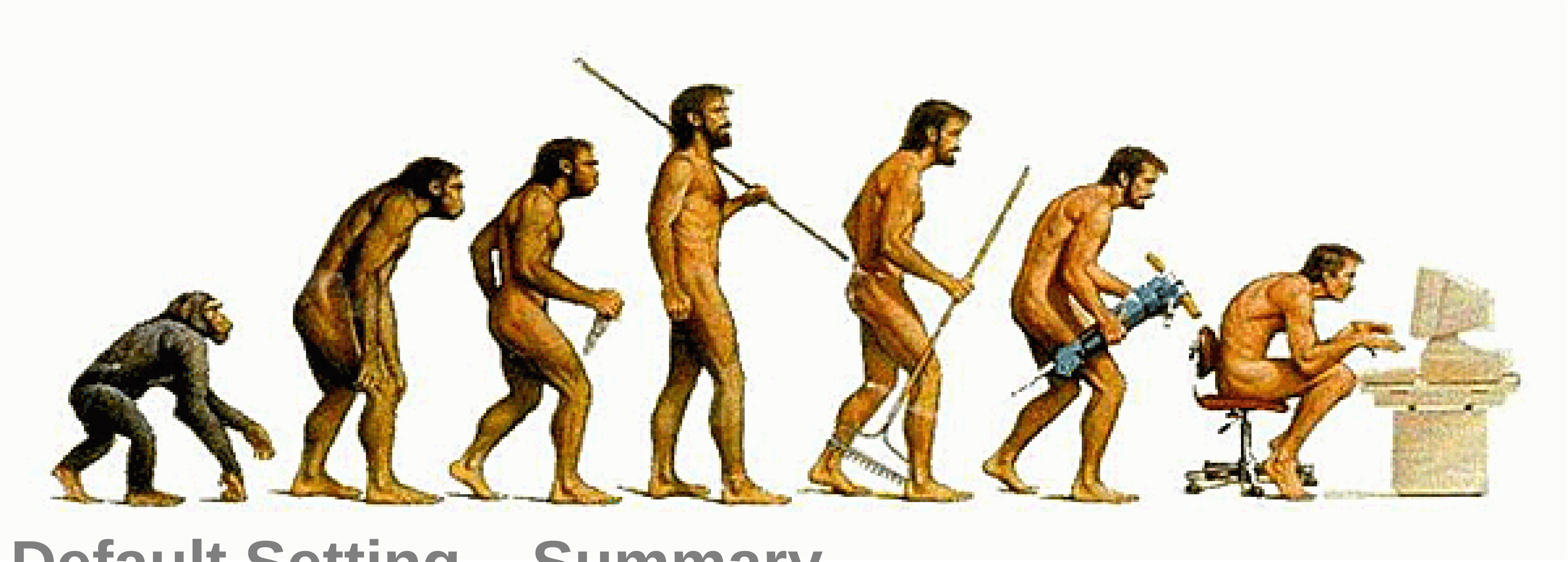
Instrumental Theory of Technology

"We ask the question concerning technology when we ask what it is. Everyone knows the two statements that answer our question. One says: Technology is a means to an end. The other says: Technology is a human activity. The two definitions of technology belong together. For to posit ends and procure and utilize the means to them is a human activity." – Martin Heidegger 1954





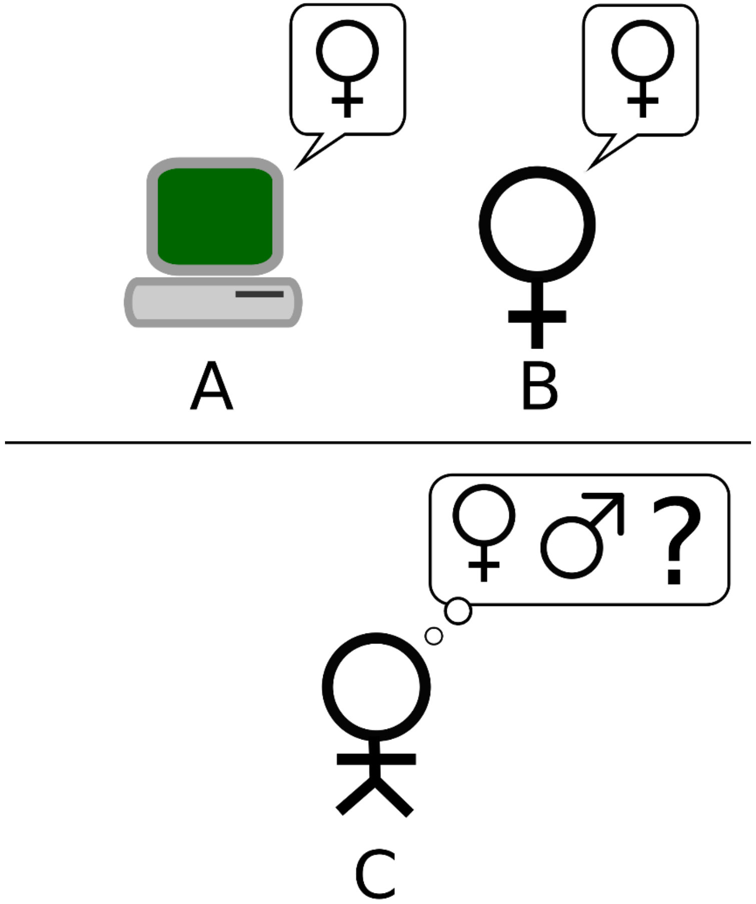
"Technical devices originated as prosthetic aids for the human organs or as physiological systems whose function it is to receive data or condition the context. They follow a principle, and it is the principle of optimal performance: maximizing output (the information or modification obtained) and minimizing input (the energy expended in the process). Technology is therefore a game pertaining not to the true, the just, or the beautiful, etc., but to efficiency: a technical 'move' is 'good' when it does better and/or expends less energy than another ." – Jean-François Lyotard 1979



Default Setting – Summary

The instrumental theory locates responsibility in human decision making and action, and it resists any and all efforts to defer to some inanimate object by crediting or blaming what are mere tools or instruments.

The New Normal



The Game of Imitation

- Alan Turing 1950

New Normal

Arthur Samuel
Checkers (1959)

IBM Deep Blue
Chess (1997)

IBM Watson
Jeopardy! (2011)

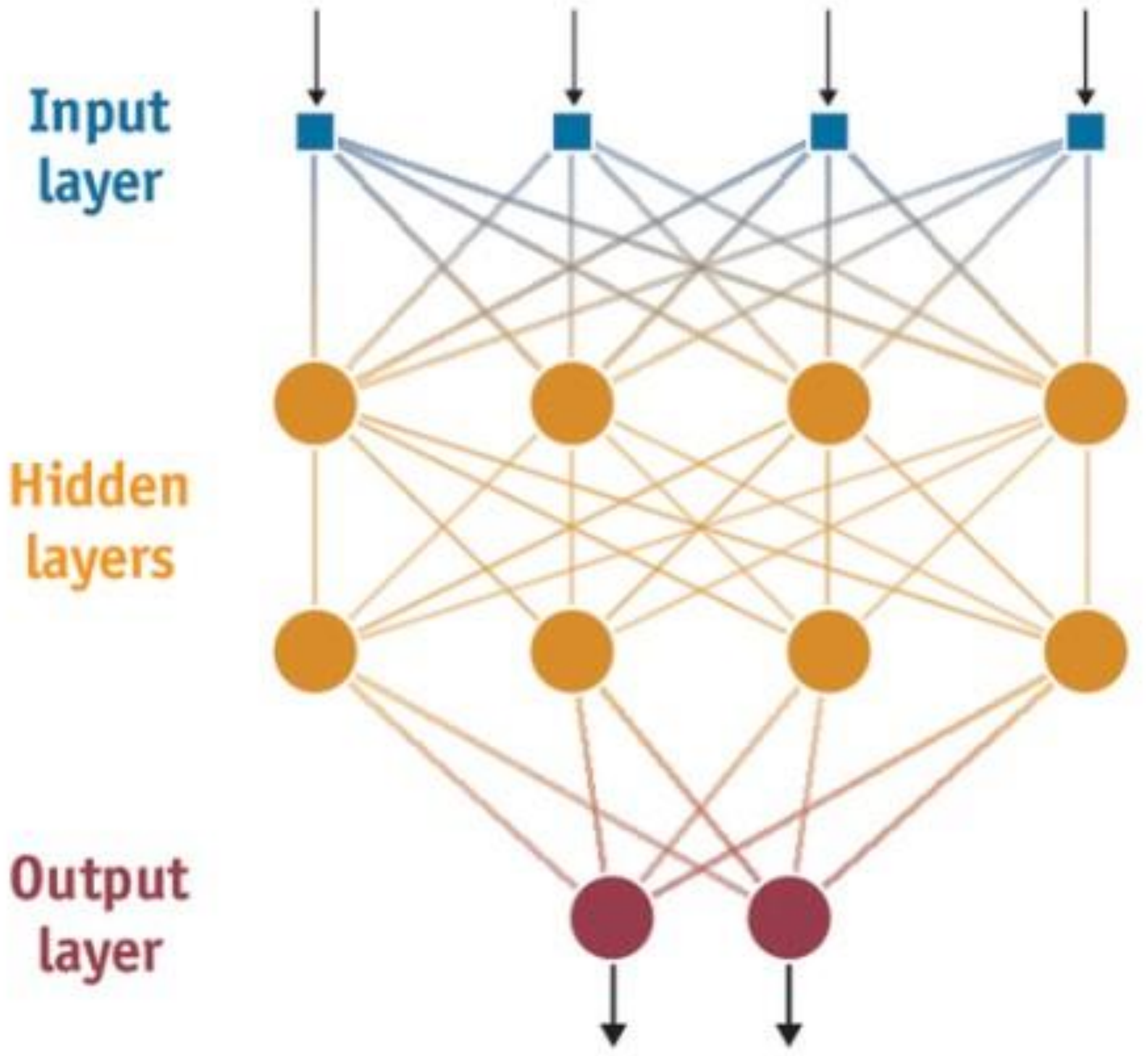
New Normal


Google DeepMind
AlphaGo
THE FIRST COMPUTER PROGRAM TO EVER BEAT A PROFESSIONAL PLAYER AT THE GAME OF GO.

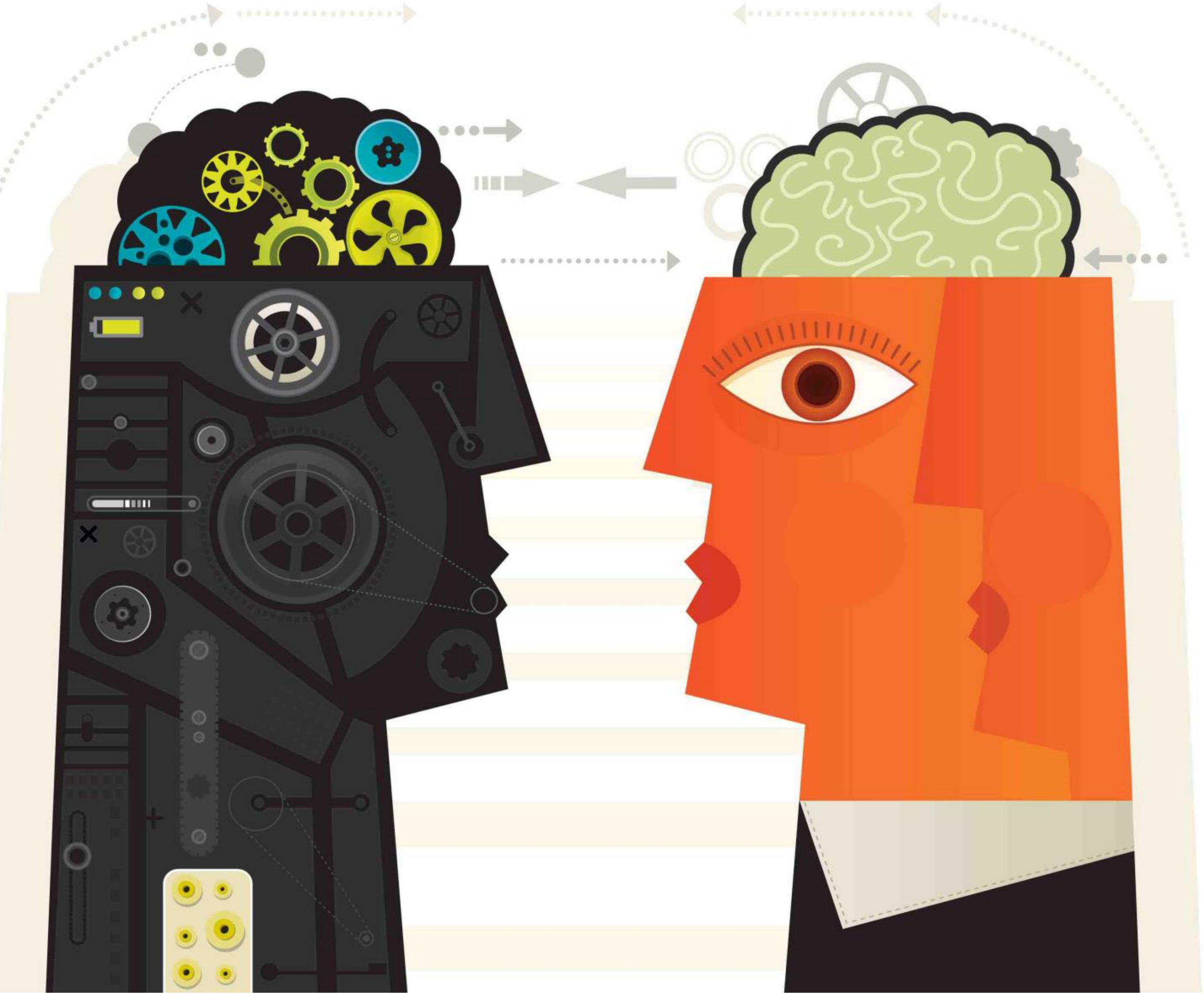
“Our Nature paper published on 28th January 2016, describes the technical details behind a new approach to computer Go that combines Monte-Carlo tree search with deep neural networks that have been trained by supervised learning, from human expert games, and by reinforcement learning from games of self-play.”

- http://deepmind.com/alpha-go

"Although we have programmed this machine to play, we have no idea what moves it will come up with. Its moves are an emergent phenomenon from the training. We just create the data sets and the training algorithms. But the moves it then comes up with are out of our hands." - Thore Graepel 2016



New Normal

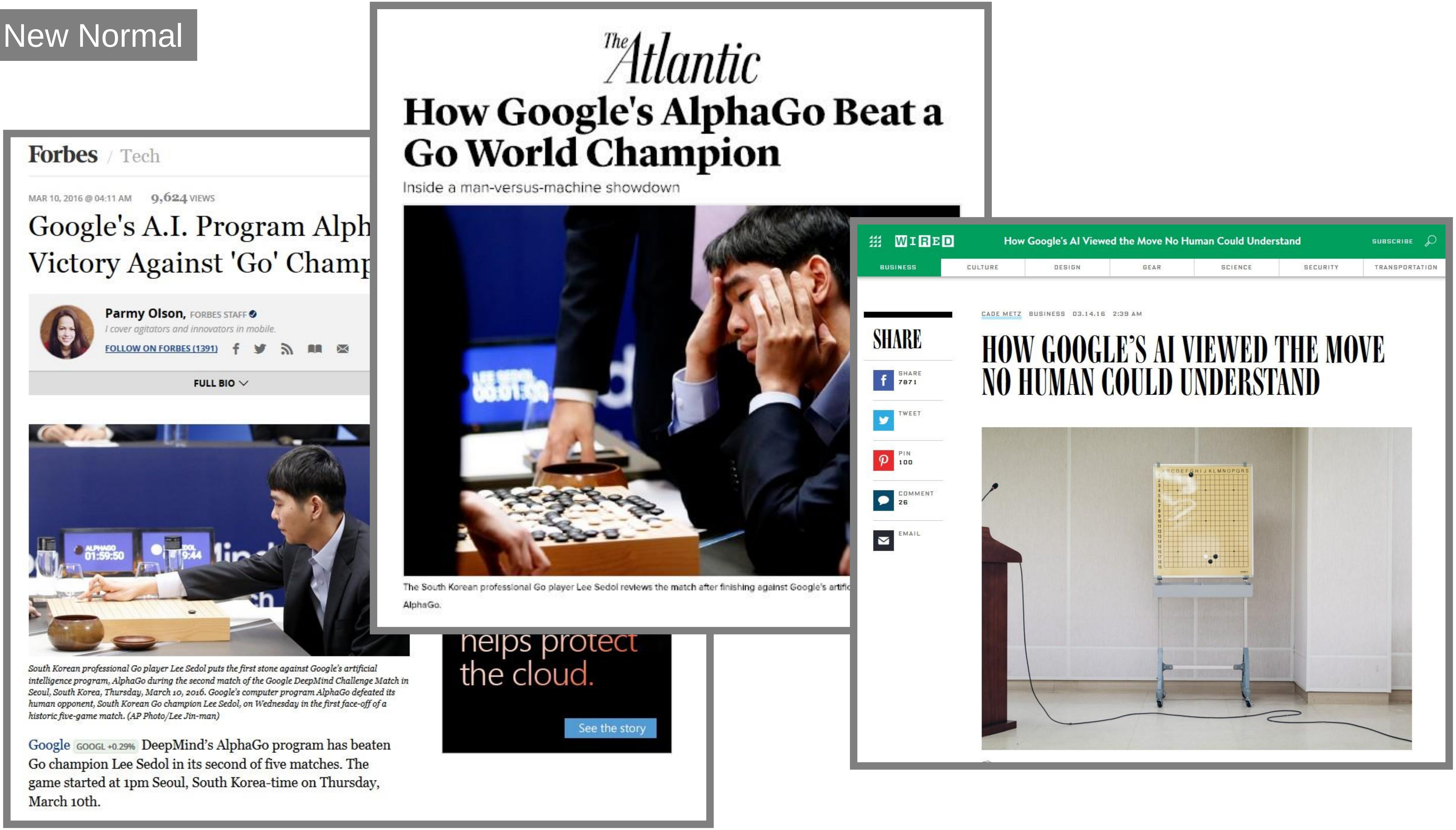


We now have autonomous computer systems that in one way or another have “a mind of their own.”

AlphaGo wins 4 of 5 games

- Who won?
- Who gets the accolade?
- Who beat Lee Sedol?

New Normal



Forbes / Tech

MAR 10, 2016 @ 04:11 AM 9,624 VIEWS

Google's A.I. Program Alph
Victory Against 'Go' Champ

Parmy Olson, FORBES STAFF
I cover agitators and innovators in mobile.
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FULL BIO

South Korean professional Go player Lee Sedol puts the first stone against Google's artificial intelligence program, AlphaGo during the second match of the Google DeepMind Challenge Match in Seoul, South Korea, Thursday, March 10, 2016. Google's computer program AlphaGo defeated its human opponent, South Korean Go champion Lee Sedol, on Wednesday in the first face-off of a historic five-game match. (AP Photo/Lee Jin-man)

Google GOOGL +0.29% DeepMind's AlphaGo program has beaten Go champion Lee Sedol in its second of five matches. The game started at 1pm Seoul, South Korea-time on Thursday, March 10th.

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The Atlantic

How Google's AlphaGo Beat a Go World Champion

Inside a man-versus-machine showdown

The South Korean professional Go player Lee Sedol reviews the match after finishing against Google's artific
AlphaGo.

WIRED How Google's AI Viewed the Move No Human Could Understand SUBSCRIBE

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HOW GOOGLE'S AI VIEWED THE MOVE NO HUMAN COULD UNDERSTAND

Shimon - Georgia Tech

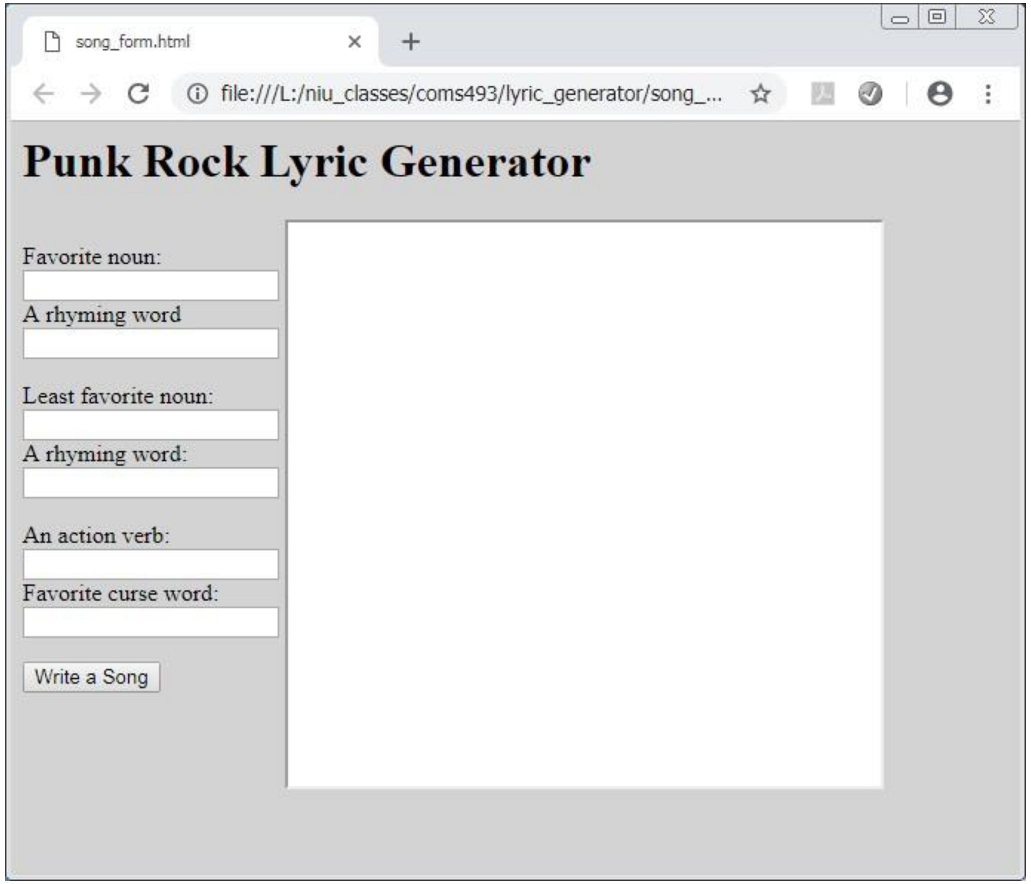
David Cope
- Experiments in Musical Intelligence
- Emily Howell (Algorithmic Composer)

New Normal

Taryn Southern & Amper – "Break Free"
I AM AI (2017)

DIY Example

- Machine generated song lyrics
- Template NLG
- GOFAI Approach



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       word1b = document.forms[0].word1b.value;
       word2a = document.forms[0].word2a.value;
       word2b = document.forms[0].word2b.value;
       verb1 = document.forms[0].verb1.value;
       verb2 = document.forms[0].verb2.value;
       results = window.top.results.document;

       results.open();
       results.write("<blockquote><h1>I don't wanna</h1>" +
            "<br>I don't wanna " + word1a +
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  </script></head>
<body bgcolor="lightgrey">
<h1>Punk Rock Lyric Generator</h1>
  <form style="float:left">
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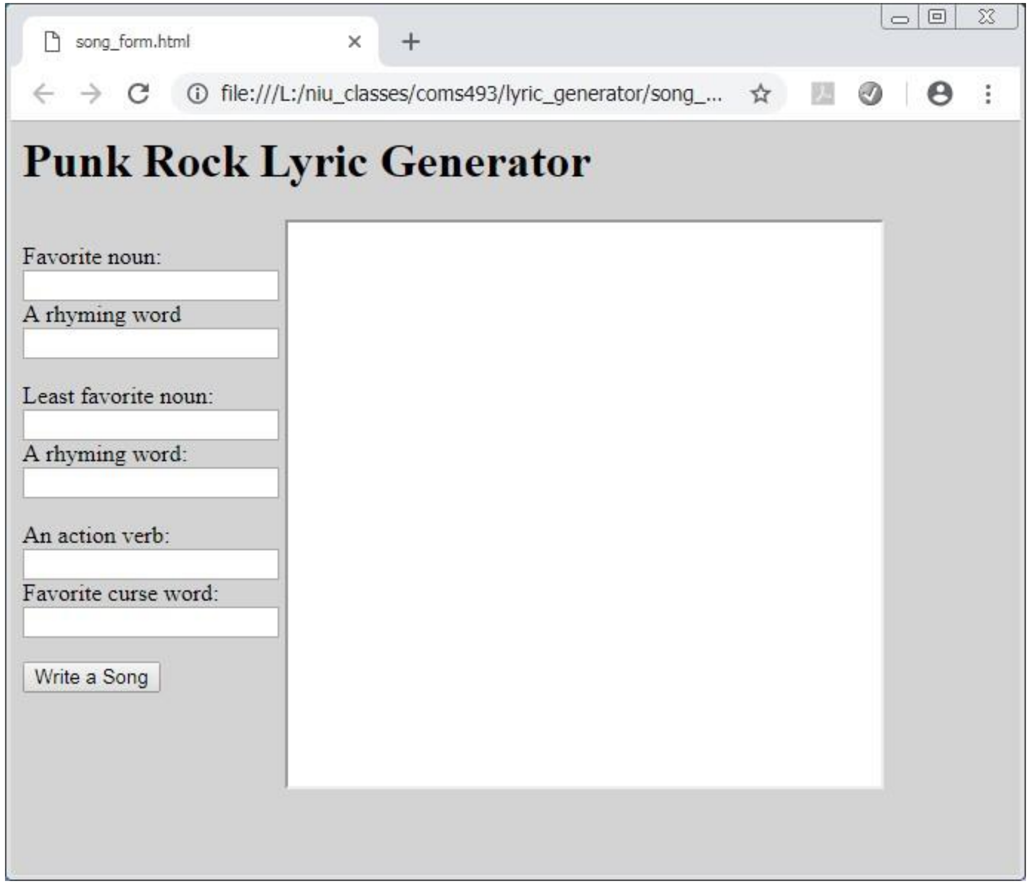

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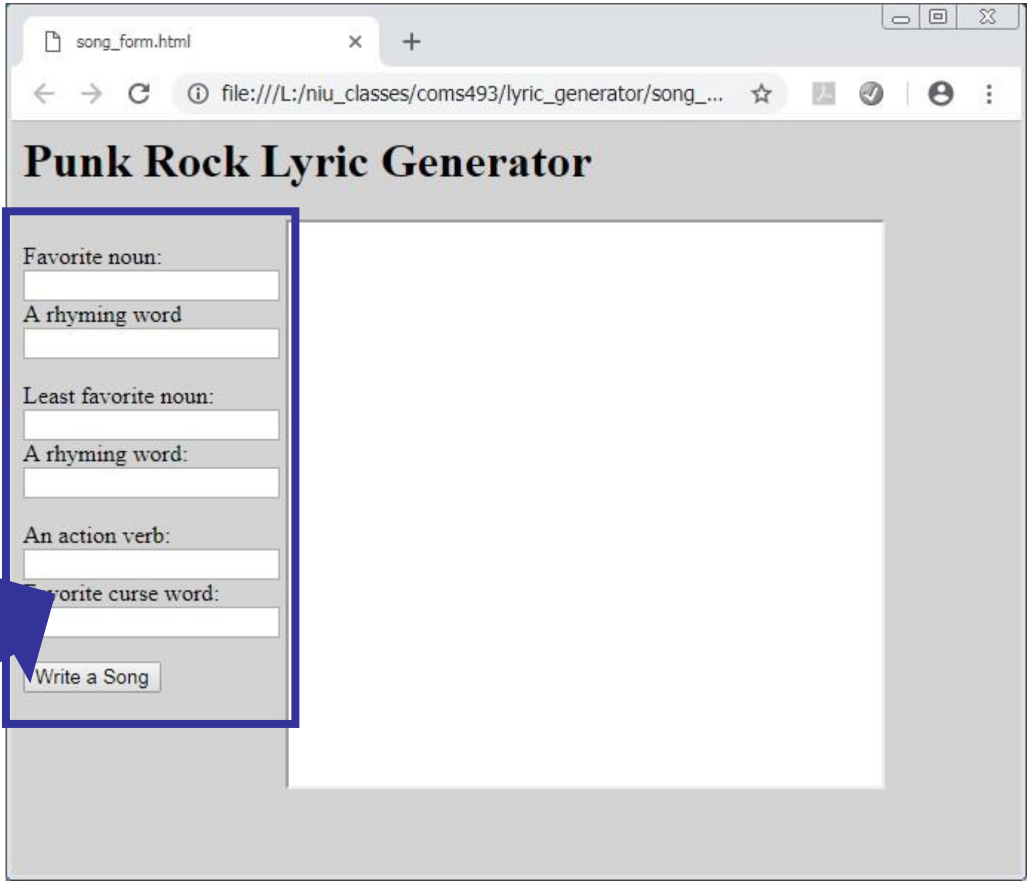

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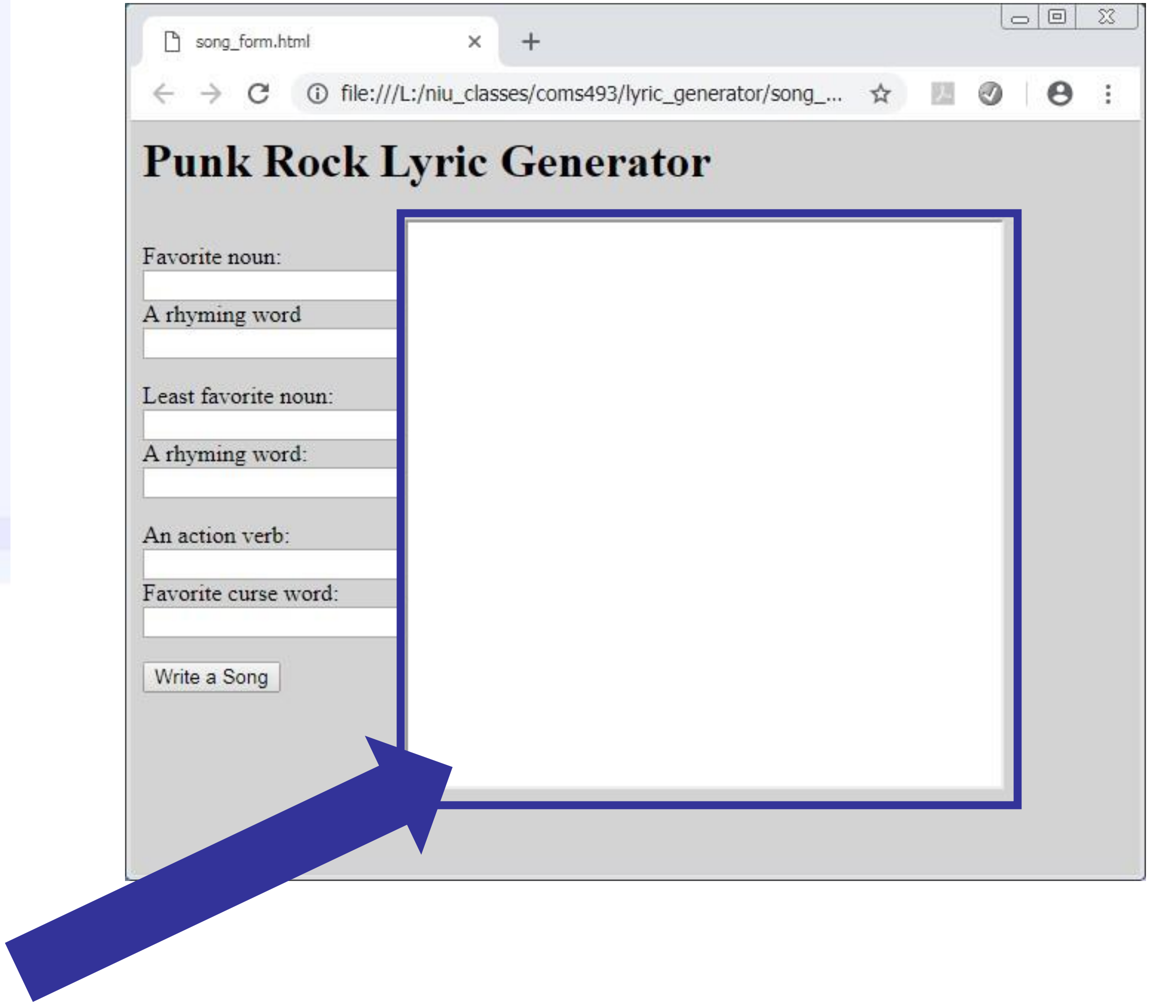

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Extract the data entered on the form

Assign this data to variables

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```

Assemble a song

Insert the values assigned to each one of the variables into prefabricated phrases

Write the results to the “results” window

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</body>
</html>
```
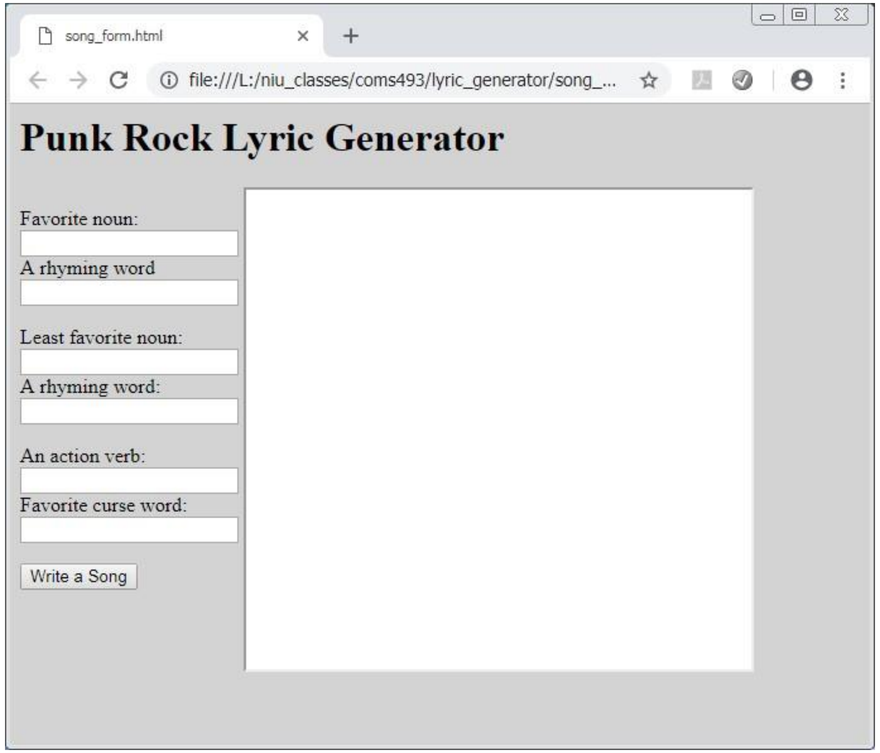
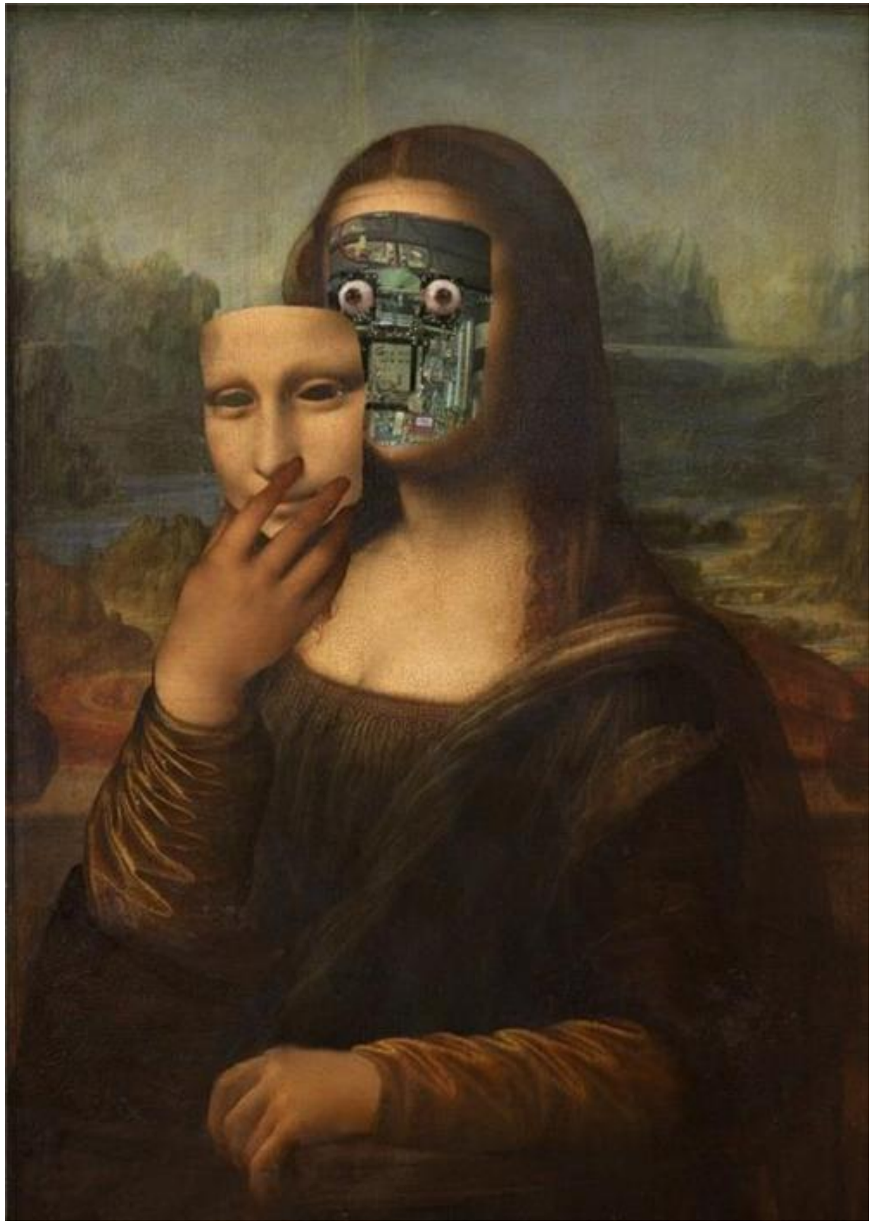

Try it out….

http://gunkelweb.com/coms647/song_form.html



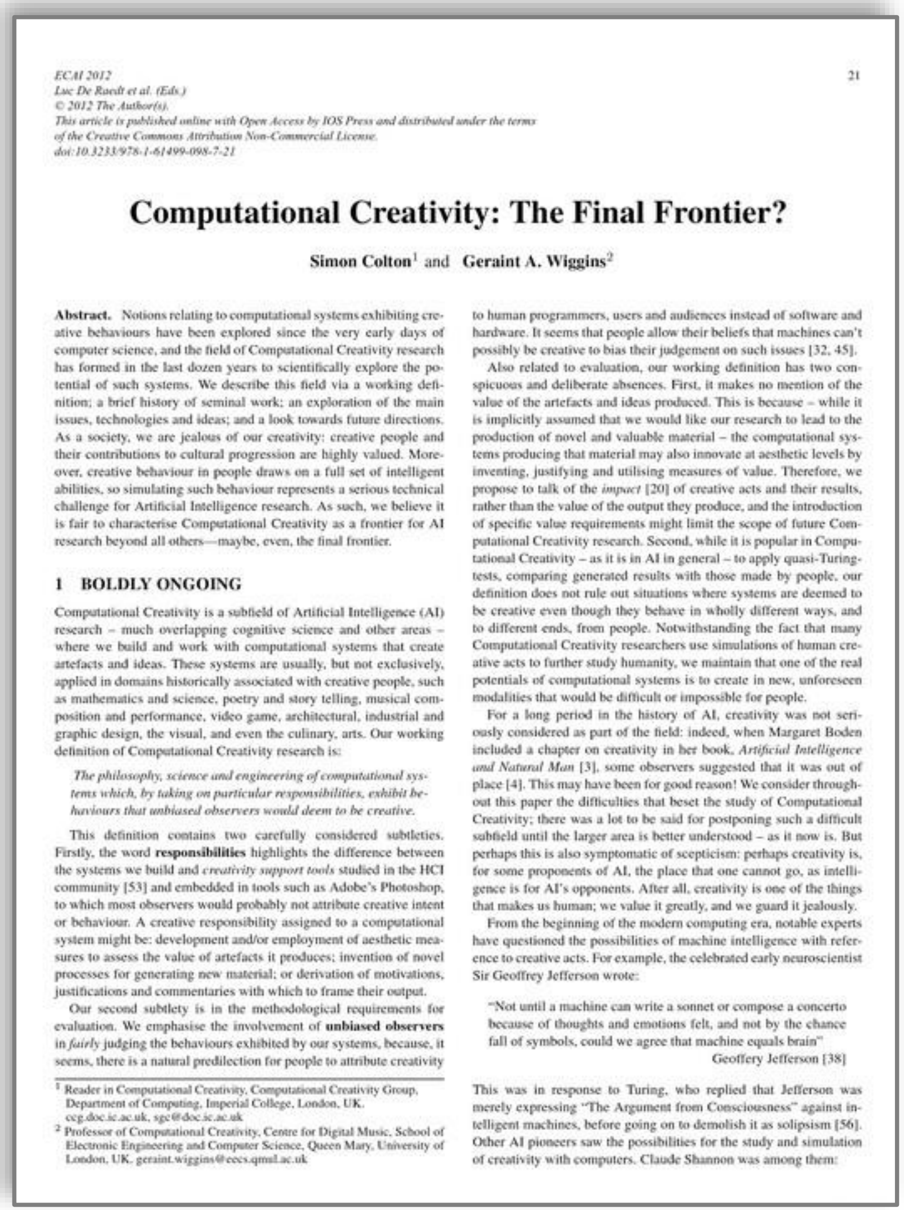


Responsibility Gap

Even if this is merely “imitation,” and not real creativity—whatever that might mean—these machine generated works compel us to reconsider how responsibility comes to be assigned and in the process challenges how we typically respond to the questions concerning responsibility and creativity.

Opportunities/Challenges

Opportunities/Challenges



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doi:10.3233/978-1-61499-098-7-21

Computational Creativity: The Final Frontier?

Simon Colton[1] and **Geraint A. Wiggins**[2]

Abstract. Notions relating to computational systems exhibiting creative behaviours have been explored since the very early days of computer science, and the field of Computational Creativity research has formed in the last dozen years to scientifically explore the potential of such systems. We describe this field via a working definition; a brief history of seminal work; an exploration of the main issues, technologies and ideas; and a look towards future directions. As a society, we are jealous of our creativity: creative people and their contributions to cultural progression are highly valued. Moreover, creative behaviour in people draws on a full set of intelligent abilities, so simulating such behaviour represents a serious technical challenge for Artificial Intelligence research. As such, we believe it is fair to characterise Computational Creativity as a frontier for AI research beyond all others—maybe, even, the final frontier.

1 BOLDLY ONGOING

Computational Creativity is a subfield of Artificial Intelligence (AI) research – much overlapping cognitive science and other areas – where we build and work with computational systems that create artefacts and ideas. These systems are usually, but not exclusively, applied in domains historically associated with creative people, such as mathematics and science, poetry and story telling, musical composition and performance, video game, architectural, industrial and graphic design, the visual, and even the culinary, arts. Our working definition of Computational Creativity research is:

> *The philosophy, science and engineering of computational systems which, by taking on particular responsibilities, exhibit behaviours that unbiased observers would deem to be creative.*

This definition contains two carefully considered subtleties. Firstly, the word **responsibilities** highlights the difference between the systems we build and *creativity support tools* studied in the HCI community [53] and embedded in tools such as Adobe's Photoshop, to which most observers would probably not attribute creative intent or behaviour. A creative responsibility assigned to a computational system might be: development and/or employment of aesthetic measures to assess the value of artefacts it produces; invention of novel processes for generating new material; or derivation of motivations, justifications and commentaries with which to frame their output.

Our second subtlety is in the methodological requirements for evaluation. We emphasise the involvement of **unbiased observers** in *fairly* judging the behaviours exhibited by our systems, because, it seems, there is a natural predilection for people to attribute creativity to human programmers, users and audiences instead of software and hardware. It seems that people allow their beliefs that machines can't possibly be creative to bias their judgement on such issues [32, 45].

Also related to evaluation, our working definition has two conspicuous and deliberate absences. First, it makes no mention of the value of the artefacts and ideas produced. This is because – while it is implicitly assumed that we would like our research to lead to the production of novel and valuable material – the computational systems producing that material may also innovate at aesthetic levels by inventing, justifying and utilising measures of value. Therefore, we propose to talk of the *impact* [20] of creative acts and their results, rather than the value of the output they produce, and the introduction of specific value requirements might limit the scope of future Computational Creativity research. Second, while it is popular in Computational Creativity – as it is in AI in general – to apply quasi-Turing-tests, comparing generated results with those made by people, our definition does not rule out situations where systems are deemed to be creative even though they behave in wholly different ways, and to different ends, from people. Notwithstanding the fact that many Computational Creativity researchers use simulations of human creative acts to further study humanity, we maintain that one of the real potentials of computational systems is to create in new, unforeseen modalities that would be difficult or impossible for people.

For a long period in the history of AI, creativity was not seriously considered as part of the field: indeed, when Margaret Boden included a chapter on creativity in her book, *Artificial Intelligence and Natural Man* [3], some observers suggested that it was out of place [4]. This may have been for good reason! We consider throughout this paper the difficulties that beset the study of Computational Creativity; there was a lot to be said for postponing such a difficult subfield until the larger area is better understood – as it now is. But perhaps this is also symptomatic of scepticism: perhaps creativity is, for some proponents of AI, the place that one cannot go, as intelligence is for AI's opponents. After all, creativity is one of the things that makes us human; we value it greatly, and we guard it jealously.

From the beginning of the modern computing era, notable experts have questioned the possibilities of machine intelligence with reference to creative acts. For example, the celebrated early neuroscientist Sir Geoffrey Jefferson wrote:

> "Not until a machine can write a sonnet or compose a concerto because of thoughts and emotions felt, and not by the chance fall of symbols, could we agree that machine equals brain"
> Geoffery Jefferson [38]

This was in response to Turing, who replied that Jefferson was merely expressing "The Argument from Consciousness" against intelligent machines, before going on to demolish it as solipsism [56]. Other AI pioneers saw the possibilities for the study and simulation of creativity with computers. Claude Shannon was among them:

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"Perhaps creativity is, for some proponents of AI, the place that one cannot go, as intelligence is for AI's opponents. After all, creativity is one of the things that makes us human; we value it greatly, and we guard it jealously" – Colton and Wiggins 2012

The Question

How can or should we respond to the new opportunities and challenges of increasingly creative machines?

Instrumentalism 2.0

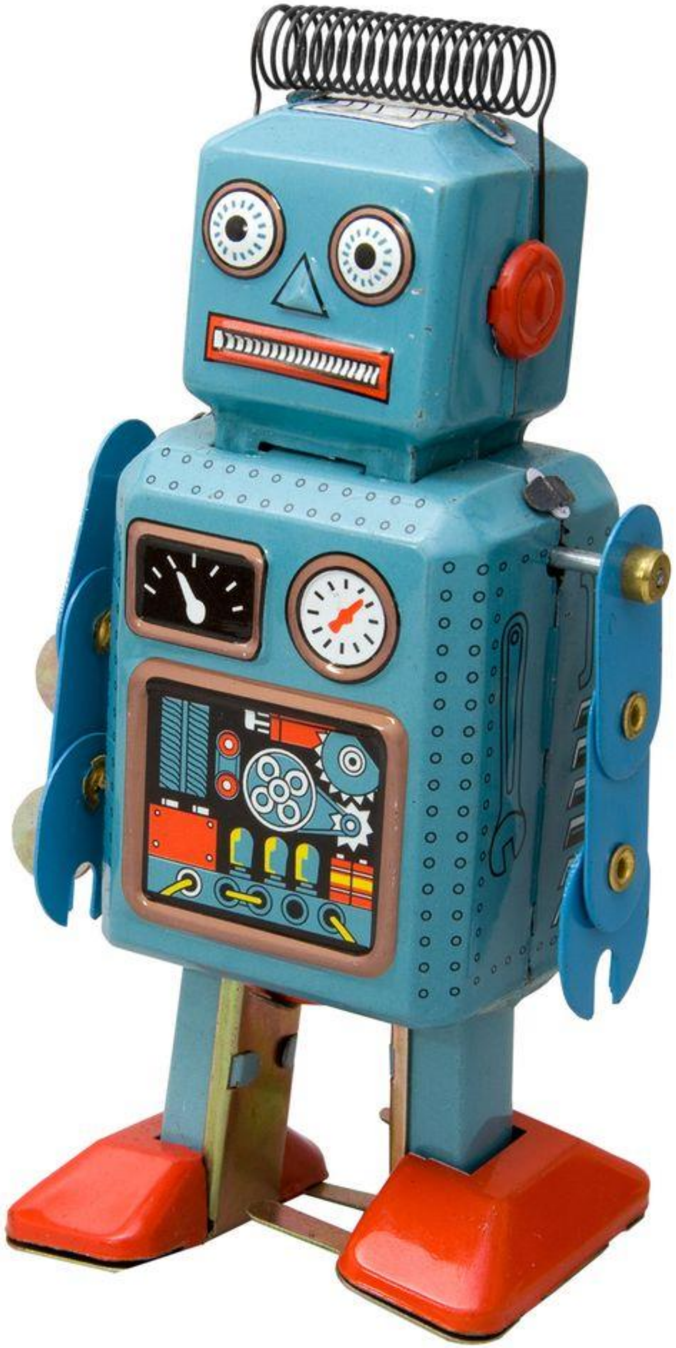
“Computer systems are produced, distributed, and used by people engaged in social practices and meaningful pursuits. This is as true of current computer systems as it will be of future computer systems. No matter how independently, automatic, and interactive computer systems of the future behave, they will be the products (direct or indirect) of human behavior, human social institutions, and human decision.” – Deborah Johnson 2006

Instrumentalism 2.0

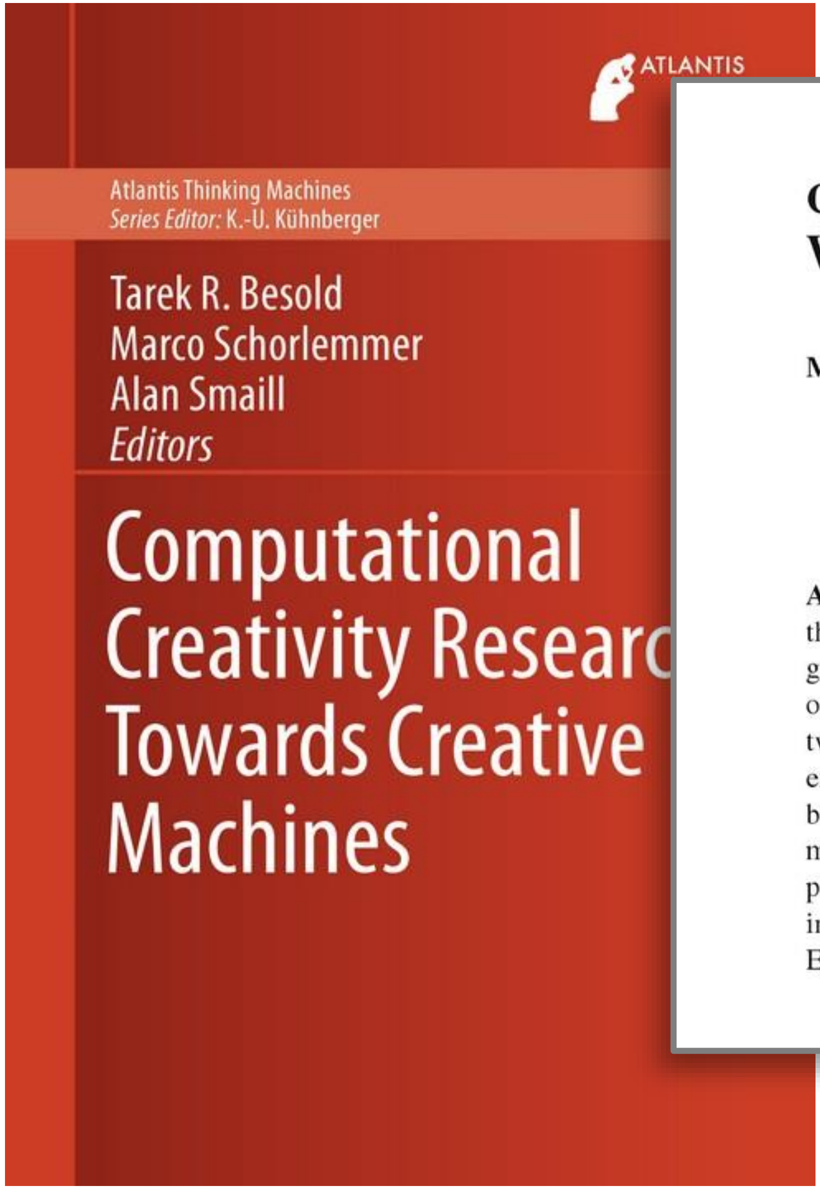
Understood in this way, computer systems no matter how automatic, independent, or seemingly autonomous they may become, are not and can never be autonomous, independent agents. They will, like all other technological artifacts, always and forever be instruments of human value, decision making, and action.

Opportunities/Challenges

The issue is not simply whether computers, learning algorithms, or other applications can or cannot be responsible for what they do or do not do; the issue also has to do with how we have determined, described, and defined responsibility in the first place.



Opportunities/Challenges



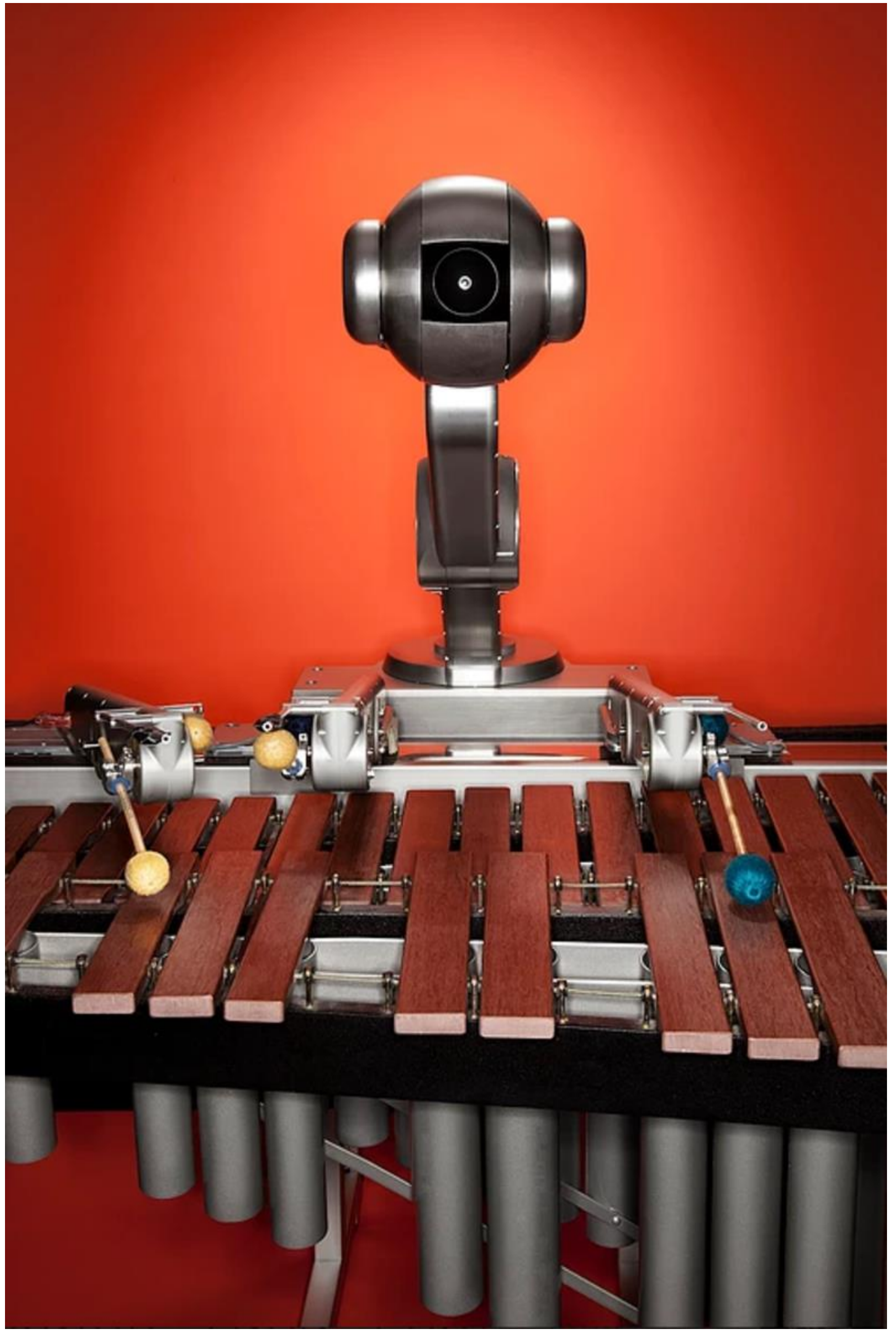
Chapter 2
Weak and Strong Computational Creativity

Mohammad Majid al-Rifaie and Mark Bishop

Abstract In the spirit of Searle's definition of weak and strong artificial intelligence, this paper presents a discussion on weak computational creativity in swarm intelligence systems. It addresses the concepts of *freedom* and *constraint* and their impact on the creativity of the underlying systems. An analogy is drawn on mapping these two 'prerequisites' of creativity onto the two well-known phases of exploration and exploitation in swarm intelligence algorithms, followed by the visualisation of the behaviour of the swarms whose performance are evaluated in the context of arguments presented. The paper also discusses that the strong computational creativity is presented in ways emphasising that genuine creativity implies 'genuine understanding' and other cognitive states, along with autonomy—asserting that without 'Strong Embodiment', computational systems are not genuinely autonomous.

Strong Computational Creativity

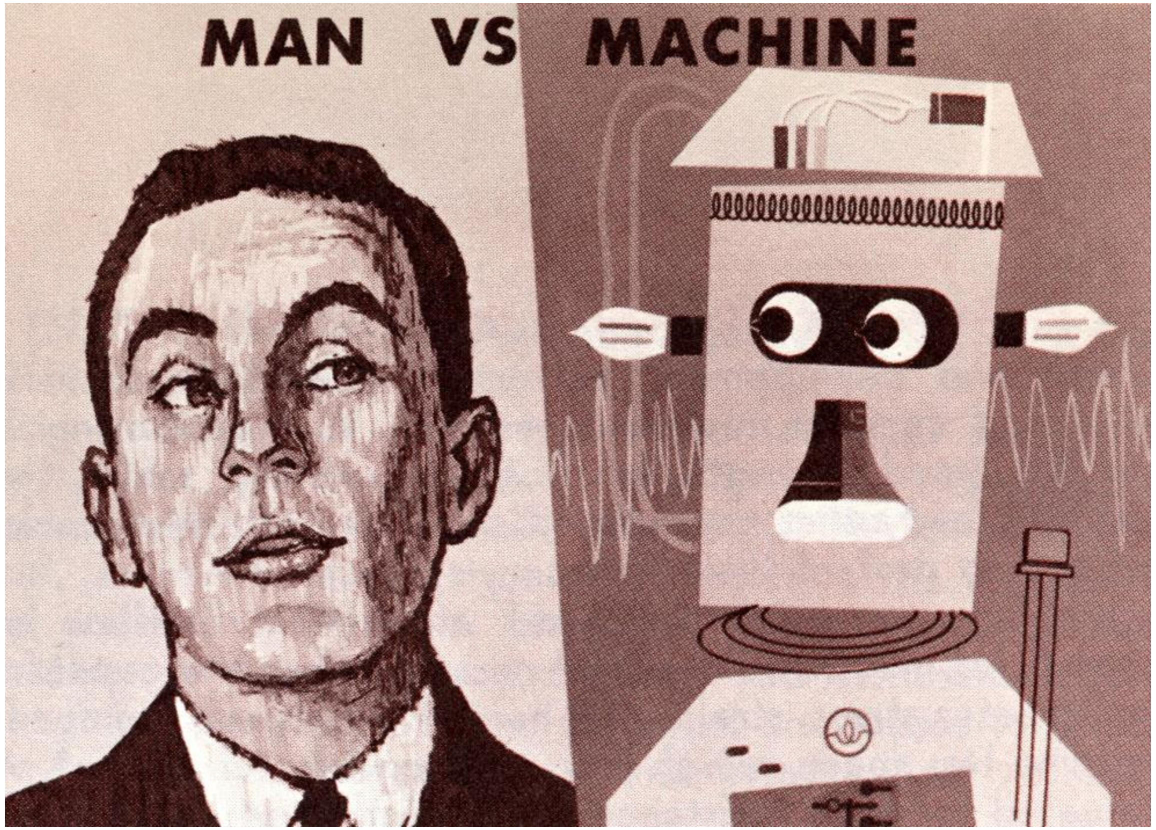
Design, build and demonstrate robots, algorithms, and applications that generate output that can be called creative.

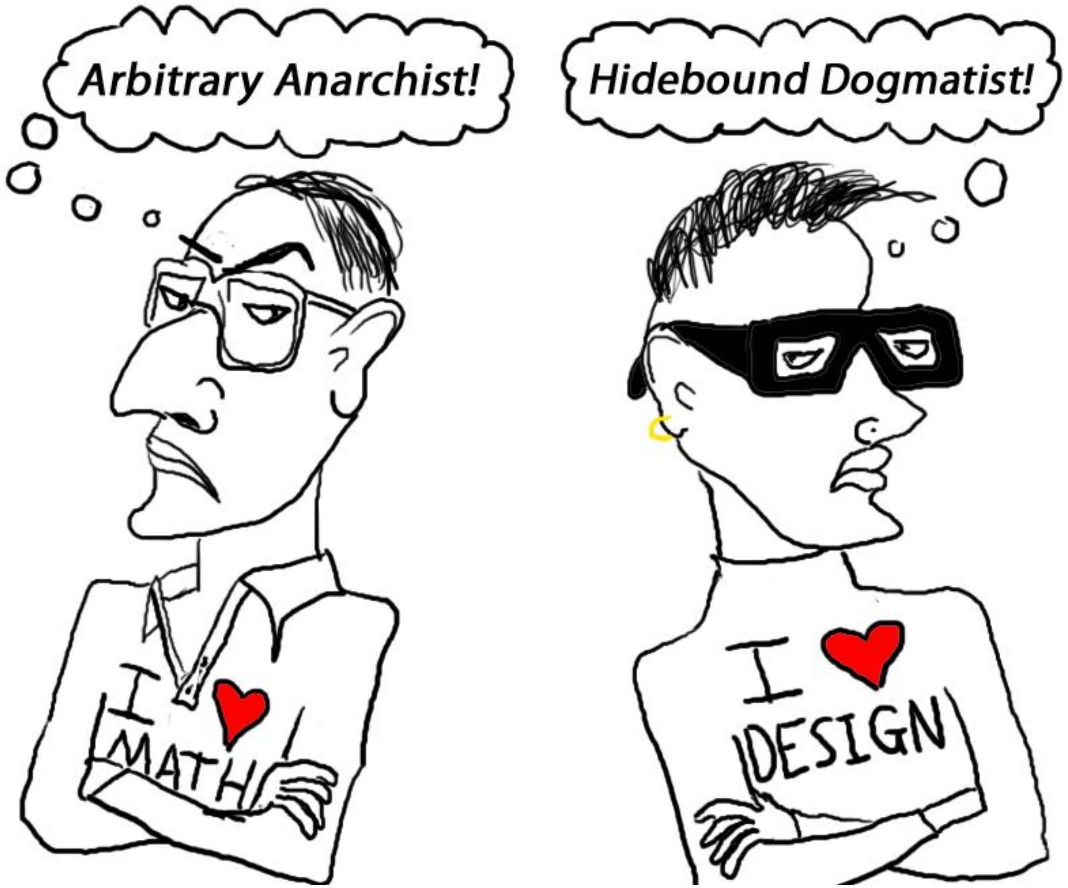


Weak Computational Creativity

Simulate, operationalize, and stress test various conceptualizations of artistic responsibility and expression, leading to critical and potentially insightful reevaluations of how we have characterized this concept in our own thinking.

Developing and experimenting with new machine capabilities does not necessarily take anything away from human beings and what makes them special. It offers new opportunities to be more precise and scientific about these distinguishing characteristics and their limits.



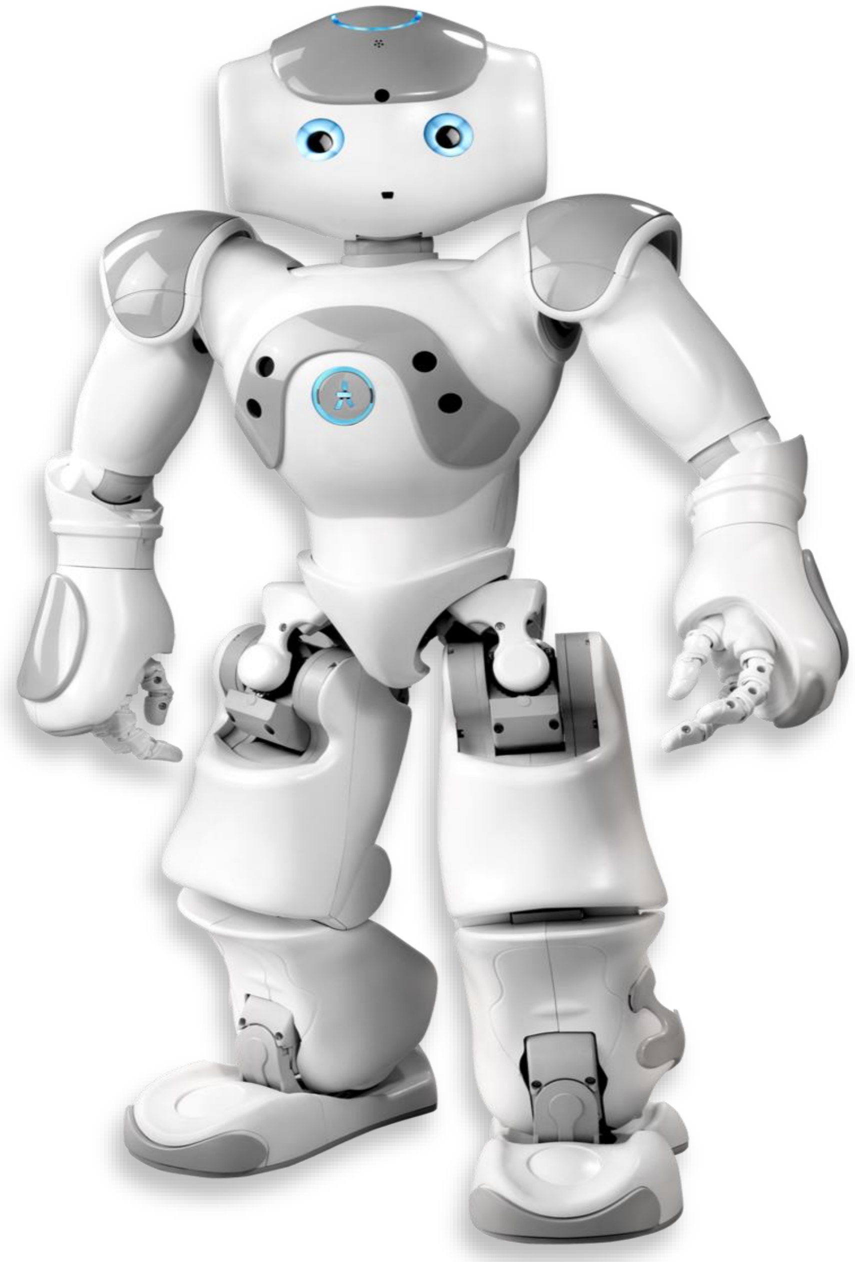


Because the challenge of computational creativity penetrates to the core of what we think makes us human, this effort will requires a response that draws on the full range and depth of human endeavor. This is the task for thinking in the 21st century.

TODAY

Social Robots

Ch. 7 - Social Robots
Jibo - Promotional Video
Breazeal - Personal Robots



PREVIEW

Final Class meeting

- Research Projects Due
- Research Project Presentations
- Course Evaluation
- Final Exam Preparation