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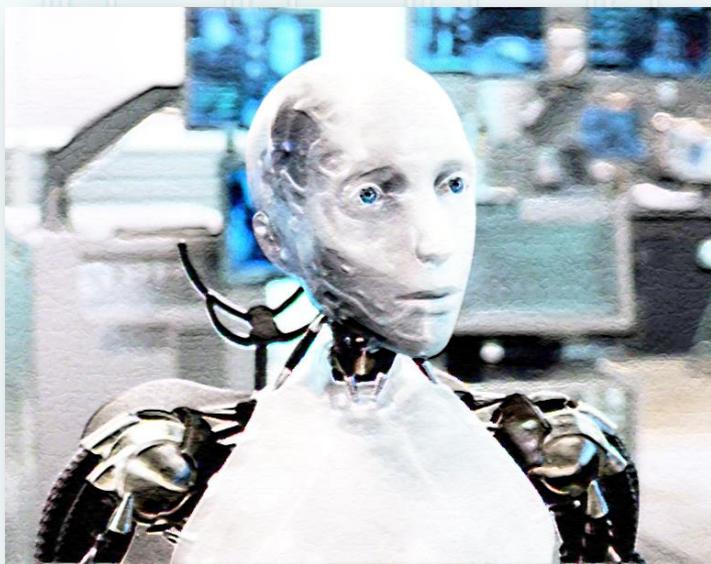
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What is Artificial Intelligence?

➤ As broadly defined in *Wikipedia*:

“Artificial Intelligence (AI) is technology and a branch of computer science that studies and develops intelligent machines and software. Major AI researchers and textbooks define the field as ‘the study and design of intelligent agents’, where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success.”



Artificial Intelligence in Music

Forms of AI

- Composing Music
- Playing Music
- Understanding Music

Alogrithms

- Encapsulate the 'rules' and limitations
- Incorporate some randomness
- Incorporate some probability

Vague Limitations and Few Rules

- 1) Random frequencies between 32-1046 Hz.
- 2) Random durations between 20-1000 ms.
- 3) Random timbre (128 possibilities).

Precise Limitations and Few Rules

- 1) Random choices from musical notes (C, D, E, F, G, A, B).
- 2) Random durations from a few proportionally related values (250ms, 500ms, 750ms, 1000ms).
- 3) One single timbre.

Precise Limitations and Better Rules

- 1) Random choices from musical notes (C, D, E, F, G, A, B).
- 2) Random durations from a few proportionally related values (250ms, 500ms, 750ms, 1000ms).
- 3) One single timbre.

If C:

- 60% of the time choose from (E, G)
- 35% of the time choose from (D, F, A)
- 5% of the time choose from (C, B)

If D:

- 60% of the time choose from (E, F, A)
- 35% of the time choose from (C, G)
- 5% of the time choose from (D, B)

If E:

- 60% of the time choose from (C, G)
- 35% of the time choose from (D, F, A)
- 5% of the time choose from (E, B)

If F:

- 60% of the time choose from (E, G, A)
- 35% of the time choose from (D, C)
- 5% of the time choose from (F, B)

If G:

- 60% of the time choose from (E, C, F)
- 35% of the time choose from (D, D, A)
- 5% of the time choose from (G, B)

If A:

- 60% of the time choose from (D, F, G, B)
- 35% of the time choose from (E, C)
- 5% of the time choose from (A)

If B:

- 60% of the time choose from (C)
- 35% of the time choose from (D)
- 5% of the time choose from (G, D)

David Cope



Created a program called

Created a program called
EMI which analyzes
music and then creates a
sophisticated composition
algorithm.

which analyzes
music and then creates an
algorithm.

Frederic Chopin



Frederic Chopin – Polish-born
composer principally for piano
(February 22, 1810 – October 17,
1849)

Sandeep Bhagwati



exploring the potentials of
Is exploring the potentials
of the computer as a real-
time 'partner' in musical
improvisation. as a real-time
partner in improvisation

Eduardo Miranda



Brazilian composer uses 'machine learning' based on 'artificial life' models.

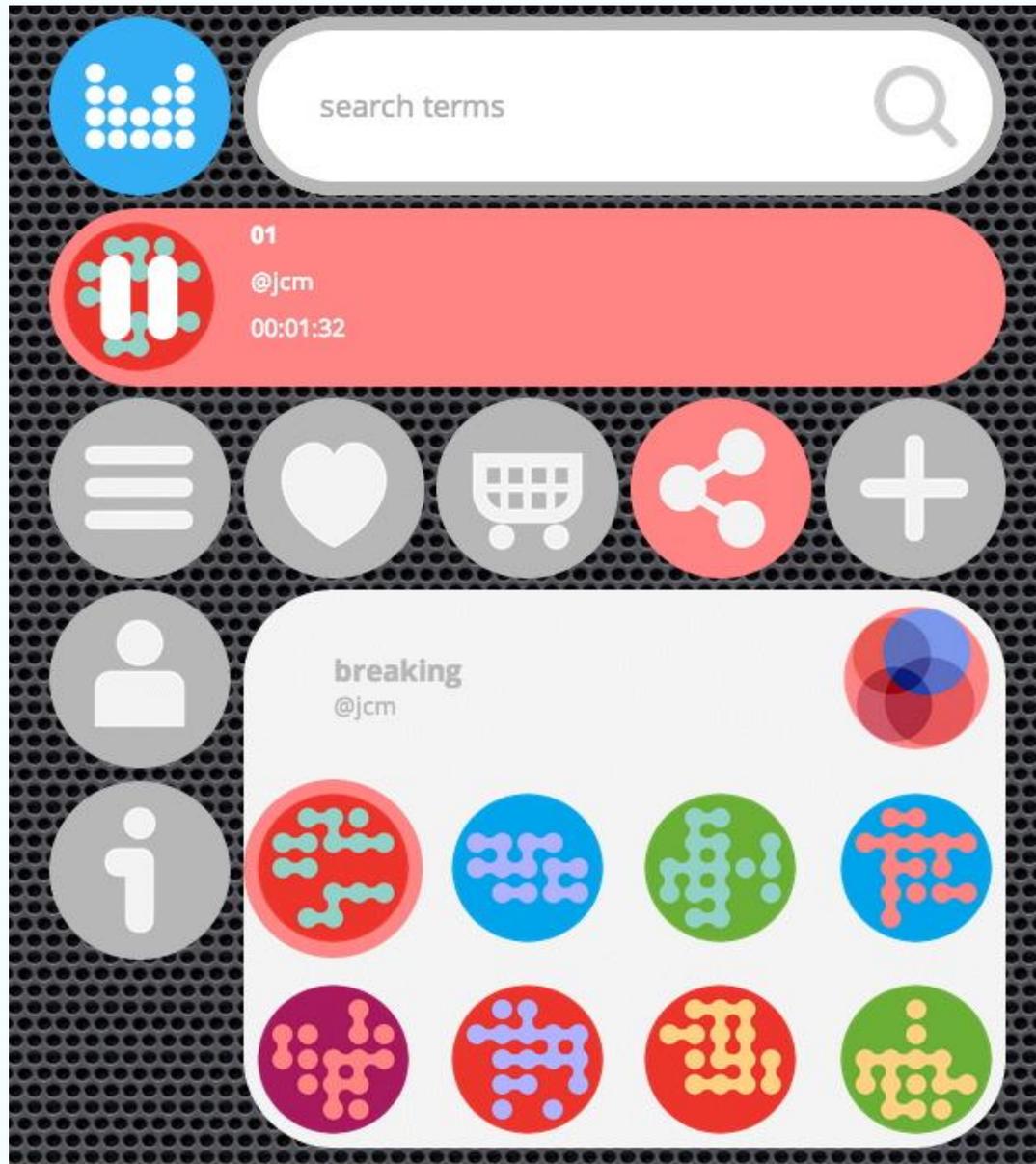
This is something beyond algorithmic composition.

Essentially the computer uses a kind of evolutionary process to refine its own experiments to create deep level "rules" that are not necessarily based on 'human' rules and tendencies.

What is out there?

- Commercial applications for accompanying
- Commercial applications for arranging
- Non-commercial algorithmic tools
- Commercial services

URL: melomics.com



melonomics services - @life



Android



Windows Phone



Chrome extension

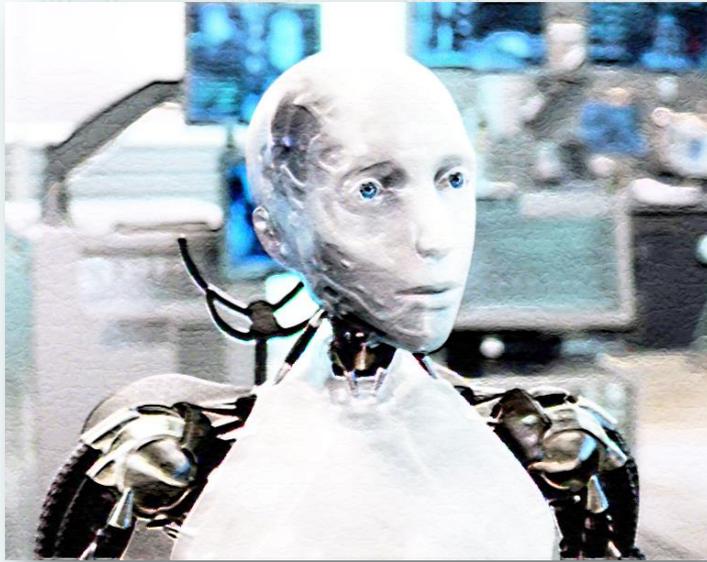
@life is a music streaming service that adapts the music to your activity and environment.

By selecting a scenario, you specify what situation you are in, and the smartphone will then monitor your activity and play the music accordingly:

Driving: according to the speed as estimated by GPS, relaxing music will play while immersed in dense traffic, changing to activating music when leaving the highway.

Sleep: placing the smartphone on the bed, music will get more and more relaxing, depending on the body movements, disappearing after falling asleep.

All in all, a playlist that adapts itself, where the next song depends just on what is going on in your surroundings.



Artificial Intelligence Examples

AI-Generated Fiction

❖ *A Romance Novel With Byte : Author Teams Ups With Computer to Write Book in Steamy Style of Jacqueline Susann*

Los Angeles Times

WOODSIDE – The steamy new novel is about “women . . . men . . . fame, fortune and tempation,” says the dust jacket. A cover picture features a couple, the man’s arm thrown around his partner.

There ends any resemblance to the partially clothed, big clinch school of cover art common to this genre of fiction. In this photograph, on the back cover of “Just This Once,” Scott French--scruffy, 40ish, wearing sunglasses, jeans and a T-shirt--cuddles a Macintosh 11Cx comptuer named Hal.

The hardcover potboiler, out this month from Carol Publishing Group’s Birch Lane Press , comes with a subtitle that explains: “A novel written by a computer programmed to think like the world’s best-selling author as told to Scott French.” . . .

It has been reported that the Susann estate threatened to sue but settled out of court for half of French’s profits and control over the publicity for the book.

AI-Generated Non-Fiction

The New York Times

He Wrote 200,000 Books (but Computers Did Some of the Work)



Philip Parker says he has computers do the substantial amount of repetitive work that is required in the writing of so many books.

It's not easy to write a book. First you have to pick a title. And then there is the table of contents. If you want the book to be categorized, either by a bookseller or a library, it has to be assigned a unique numerical code, like an ISBN, for International Standard Book Number. There have to be proper margins. Finally, there's the back cover.

Oh, and there is all that stuff in the middle, too. The writing.

Philip M. Parker seems to have licked that problem. Mr. Parker has generated more than 200,000 books, ... making him, in his own words, "the most published author in the history of the planet."

AI-Generated Non-Fiction



Most of Parker's automatically generated books target niche markets (the "long tail" concept). Examples include:

- Books series on medical subjects *The Official Patient's Sourcebook* series deals with classic diseases like spinal stenosis or autoimmune hepatitis. *The 3-in-1 Medical Reference* series deals with general medical topics like hemoglobin.
- A series on the future demand for certain products in certain regions in the world, largely consisting of tables and graphs, ... One book, *The 2009-2014 World Outlook for 60-milligram Containers of Fromage Frais*, won the 2008 Bookseller/Diagram Prize for Oddest Title of the Year.
- A series on cross-language crossword puzzle books, e.g. *Webster's English to Italian Crossword Puzzles: Level 1*, and thesauri, e.g. *Webster's Quechua – English Thesaurus Dictionary* Some of these titles raised concerns with linguists who claimed inaccuracies and ownership/citation rights in certain languages covered in these volumes. . . .
- A series of quotation collections subtitled *Webster's Quotations, Facts and Phrases*, each volume assembling quotations which feature a specific English word.. . . .

Using a collection of automation programs called "Eve," Parker has applied his techniques within his dictionary project to digital poetry; he reports posting over 1.3 million poems, aspiring to reach one poem for each of words found in the English language.

[FOOTNOTES OMITTED THROUGHOUT]

Robo-journalism

Could robots be the journalists of the future?

In this digital age, even journalism is being automated

theguardian



Once it was monkeys doing the typing, now it's robots. Photograph: Getty Images

Is robot journalism the future? It's not quite titanium machines in trenchcoats door-stepping celebrities or buzzing about in newsrooms, but media organisations are increasingly looking to developers to come up with smart ways to incorporate computer algorithms into the daily grind of the news industry . . .

Robo-journalism

Ken Schwencke, a journalist and programmer for the *Los Angeles Times*, was jolted awake at 6:25 a.m. on Monday by an earthquake. He rolled out of bed and went straight to his computer, where he found a brief story about the quake already written and waiting in the system. He glanced over the text and hit “publish.” And that’s how the *LAT* became the first media outlet to report on this morning’s temblor....

The First News Report on the L.A. Earthquake Was Written by a Robot



If that sounds faster than humanly possible, it probably is. While the post appeared under Schwencke’s byline, the real author was an algorithm called Quakebot that he developed a little over two years ago. Whenever an alert comes in from the U.S. Geological Survey about an earthquake above a certain size threshold, Quakebot is programmed to extract the relevant data from the USGS report and plug it into a pre-written template. The story goes into the *LAT*’s content management system, where it awaits review and publication by a human editor.

At the same time, Quakebot neatly illustrates the present limitations of automated journalism. It can’t assess the damage on the ground, can’t interview experts, and can’t discern the relative newsworthiness of various aspects of the story.... (Like many of its human counterparts, Quakebot doesn’t double-check its facts before publishing.)

Poetry

FROM "The Snow Man"
(Wallace Stevens)

One must have a mind of winter
To regard the frost and the boughs
Of the pine-trees crusted with snow;

And have been cold a long time
To behold the junipers shagged with ice,
The spruces rough in the distant glitter

Of the January sun; and not to think
Of any misery in the sound of the wind,
In the sound of a few leaves,

Which is the sound of the land
Full of the same wind
That is blowing in the same bare place

For the listener, who listens in the snow,
And, nothing himself, beholds
Nothing that is not there and the nothing that is.

TO "The Soap Mandible"
(OULIPO, by way of the N-7 rule)

One must have a miniature of wisdom
To regard the fruit and the boulders
Of the pinions crusted with soap;

And have been colic a long time
To behold the junkyards shagged with Idaho,
The spun-yarn rough in the distant gloom

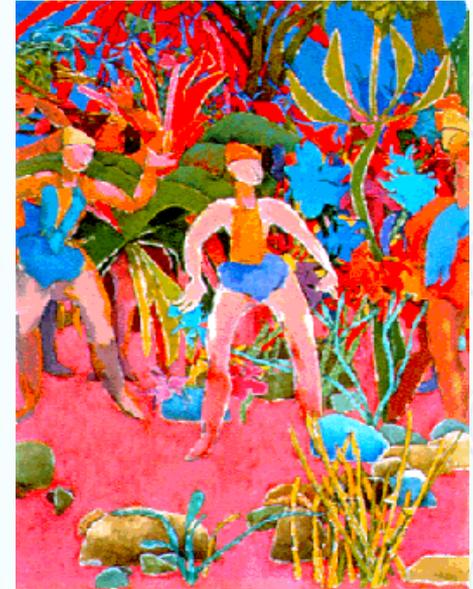
Of January surgery; and not to think
Of any mishap in the south of the winter,
In the south of a few lectures,

Which is the south of the language
Full of the same winter
That is blowing in the same bare plague

For the lithographer, who listens in the soap,
And, now himself, beholds
Now that is not thermal and the now that is.

AI Generated Paintings

- The “Aaron” program evolved over 30 years to create “original” works of art, first as line drawings colored by a human hand, then as a robot that painted its own works, and then using large format printers to create finished works.
- “I don't tell it what to do. I tell it what it knows, and IT decides what to do.” – Martin Cohen
 - ❖ For example, it knows what an arm looks like and how it can attach to a torso and move, and it knows how to be a colorist and how to use space and composition.
- “I don't regard AARON as being creative; and I won't, until I see the program doing things it couldn't have done as a direct result of what I had put into it.”
 - ❖ Output still originates from the artistic decisions of the software programmer, but the ultimate goal is for the program to learn what makes a painting good or bad to create those it considers “good” and to learn on its own new things it can paint.
- Originality ≠ Creativity, but is originality is enough for authorship



Content Scraping & Aggregation

WHAT FACEBOOK WANTS WITH ARTIFICIAL INTELLIGENCE

POSTED BY GARY MARCUS



Earlier today, Facebook announced that one of the most prominent artificial-intelligence researchers in the world, Yann LeCun, will be joining the company to direct a massive new A.I. effort.... [T]he move ... points to a new layer in Facebook's ambitions, as well as a shift in the research and development of artificial intelligence. . . .

LeCun is not the only high-level computer scientist to join a Silicon Valley titan this year. In March, Google hired Geoff Hinton, the computer scientist most responsible for the development of "deep learning." Together, these moves reveal that artificial intelligence itself is commercially vital in a way that it never was before, and that research and development is shifting from the academy and toward corporate campuses. . . .

Precisely what LeCun will do at Facebook remains to be seen. . . . Facebook needs "to better understand its content, and to do it at the massive scale." . . . "the big challenge is how to build tunable systems that can draw inferences and do real reasoning."

Even before he approaches these larger challenges, LeCun can immediately get to work by mining Facebook's enormous library of user-submitted photographs. . . . I can ask Facebook to show me friends from college who are married and live in Boston, and it generates the data instantly, ... However, . . . it's not very good at extracting meaning from photos. I can't ask Facebook to show me pictures from my college friends in New York City that have babies and cats in them. LeCun's work could change that, making it possible, for example, to even ask Facebook "Which of my friends had babies recently?" and get a reasonable answer, complete with photos, even if the new parents had never explicitly said that a baby was born. (It can already figure out, with some reliability, who you're dating, and when you might break up, even if the relationship isn't listed on Facebook.) The advertising possibilities and privacy debates that will undoubtedly result from such a feature are less pleasant to contemplate

Scenario

- Input created by Author # 1
- Software created by Author # 2
- Selection, order and arrangement of input to software created by Author # 3
- Output generated by computer [Author 4?]

Overview of Legal Issues: Ownership

➤ Is the Output a “work of authorship”?

❖ 17 USC §102:

(a) Copyright protection subsists, in accordance with this title, in original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device....

➤ Is it sufficiently original to qualify for copyright protection?

➤ Who owns the copyright in the Output?

Overview of Legal Issues: Ownership

- Can the computer (Author #4) be the “author” under the Constitution?
 - ❖ Art. I, “The Congress Shall Have The Power ... §8 To Promote the Progress of Science and Useful Arts, By Securing For Limited Times To Authors and Inventors the Exclusive Right To Their respective Writings and Discoveries”
- See, generally:
 - ❖ *Stern Electronics v. Kaufman*, 699 F.2d 852 (2d Cir. 1982) (protectability)
 - ❖ *Williams Electronics v. Arctic Int’l., Inc.*, 685 F.2d 870 (3d Cir. 1982) (fixation)
 - ❖ *Urantic Foundation v. Maahera*, 114 F.3d 995 (9th Cir. 1997) (copyrightability)

Overview of Legal Issues: Ownership

- Is the Output a derivative of the input (Author #1)?
- Is the Output a derivative of the software (Author #2)?
- Does Author #3 have copyright in compilation?
- Is the Output a Joint Work (Authors ##2 & 3)?

Overview of Legal Issues: Moral Rights

- Rights of Original Author (#1) or Software Author (#2)
 - ❖ Rights of Integrity and Attribution for Visual Works – VARA §106A
 - ❖ Impact on derivative work right §106(2)
- Rights of output author (#3 [Selector] or #4 [computer])
- Impact on concept of authorship generally

Overview of Legal Issues: Fair Use/Input

- Assume new work of appropriation art that remains substantially similar to original after AI application
- Is there a violation of reproduction right by intermediate copying?
- Is intermediate copy a fair use under § 107 based upon the reverse engineering cases?
 - ❖ *Sony v. Connectrix*, 203 F.3d 596 (9th Cir. 2000);
 - ❖ *Sega v. Accolade*, 977 F.2d 1510 (9th Cir. 1992)

Overview of Legal Issues: Fair Use/Output

- Nature and Purpose of Use
 - ❖ Transformative Use – Depends on level of interaction: is it using existing content to create a new “transformative” work, as that term is used in current case law?
- Nature of Copyright Work
- Amount and Substantiality of Taking
- Effect on potential market and/or value
 - ❖ Impact on derivative work right

Specific Applications

- Chopin – assume concerto ≠ PD
 - ❖ Who owns the copyright in the Output?
 - ❖ Is the Output a “work of authorship”?
 - ❖ Is the Output a derivative of the input?
 - ❖ Is the Output a derivative of the software?
 - ❖ Does the software user have copyright in compilation?
 - ❖ Is the Output a Joint Work of the creator and user of the software?
 - ❖ Is the Output a Fair Use?

Specific Applications

➤ Kip's work

- ❖ Who owns the copyright in the Output?
- ❖ Is the Output a “work of authorship”?
- ❖ Is the Output a derivative of the input?
- ❖ Is the Output a derivative of the software?
- ❖ Does the software user have copyright in compilation?
- ❖ Is the Output a Joint Work of the creator and user of the software?
- ❖ Is the Output a Fair Use?

Specific Applications

- Parker's non-fiction books
 - ❖ Who owns the copyright in the Output?
 - ❖ Is the Output a “work of authorship”?
 - ❖ Is the Output a derivative of the input?
 - ❖ Is the Output a derivative of the software?
 - ❖ Does the software user have copyright in compilation?
 - ❖ Is the Output a Joint Work of the creator and user of the software?
 - ❖ Is the Output a Fair Use?

Specific Applications

- Novel in style of Jacqueline Susann
 - ❖ Who owns the copyright in the Output?
 - ❖ Is the Output a “work of authorship”?
 - ❖ Is the Output a derivative of the input?
 - ❖ Is the Output a derivative of the software?
 - ❖ Does the software user have copyright in compilation?
 - ❖ Is the Output a Joint Work of the creator and user of the software?
 - ❖ Is the Output a Fair Use?

Specific Applications

➤ Poetry application

- ❖ Who owns the copyright in the Output?
- ❖ Is the Output a “work of authorship”?
- ❖ Is the Output a derivative of the input?
- ❖ Is the Output a derivative of the software?
- ❖ Does the software user have copyright in compilation?
- ❖ Is the Output a Joint Work of the creator and user of the software?
- ❖ Is the Output a Fair Use?

Specific Applications

➤ Aaron –

- ❖ Who owns the copyright in the Output?
- ❖ Is the Output a “work of authorship”?
- ❖ Is the Output a derivative of the input?
- ❖ Is the Output a derivative of the software?
- ❖ Does the software user have copyright in compilation?
- ❖ Is the Output a Joint Work of the creator and user of the software?
- ❖ Is the Output a Fair Use?

Specific Applications

➤ Appropriation Art

- ❖ Would cases reach same result if art mix had been product of AI?
- ❖ *Rogers v. Koons*, 960 F.2d 301 (2d Cir. 1992) (not fair use)



Art Rogers
Photograph:
Puppies
1980



Jeff Koons
Wood painted sculpture:
String of Puppies
1998

❖ *Blanch v. Koons*, 467 F.3d 244 (2d Cir. 2006) (fair use)



❖ *Cariou v. Prince*, 714 F.3d 694 (2d Cir. 2013), *rev'g and remanding* 784 F. Supp. 2d 337 (S.D.N.Y. 2011) (most images fair use)



Where Do We Go From Here?

- Are traditional notions of authorship outmoded?
 - ❖ *Nb.* In the UK, the author of a computer generated work is the “person by whom the arrangements necessary for the creation of the work are undertaken” Design and Patents Act 1988, §9(3) (cases define as creator of software)
- Does AI commoditize art?
- Are new kinds of author agreements desirable in this field?
- How to maximize benefits of AI but continue to protect rights of original author?



Where Do We Go From Here?



➤ How does art generated by AI align with constitutional objectives:

- ❖ Stimulating creativity
- ❖ Rewarding authorship
 - Machines don't need incentives to create, but machines rely on human input to program
- ❖ Building public weal



Striking the Proper Balance



Thank You