



COMS 647:

Communication Technology

Agenda

- Publishing Internship
- Research Projects
- Review
- Presentation
- Preview

Review



Varieties and Types



Terminology

Collage

Sample

Bootleg

Mashup

Remix

Zeitgeist of the turn of the Century

zeit·geist

/ˈtsiːtˌɡɪst, ˈziː-/

noun

the defining spirit or mood of a particular period of history as shown by the ideas and beliefs of the time.

"the story captured the zeitgeist of the late 1960s"

The remix is the very nature of the digital...The recombinant (the bootleg, the remix, the mash-up) has become the characteristic pivot at the turn of our two centuries (William Gibson, 2005)

Critical Issues

1) For the Record:

The Original Metaphysics of Recording

2) Mashup & Remix:

The Art of Recombinant Rock and Roll

3) Conclusions:

Responses to Remix



Victor

Victor Records or on the grand-opera stage can you hear the wonderfully sweet and powerful voices of Caruso, Melba, Sembrich, Eames, Scotti, Schumann-Heink, and other world's famous operatic stars.

But not even at the opera can you hear in one evening such a celebrated group of artists as you can hear on the Victor anywhere at any time.

Any Victor dealer will gladly play grand-opera or any other Victor Records for you. Call and ask to hear them.

Victor Talking Machine Co., Camden, N. J., U. S. A.

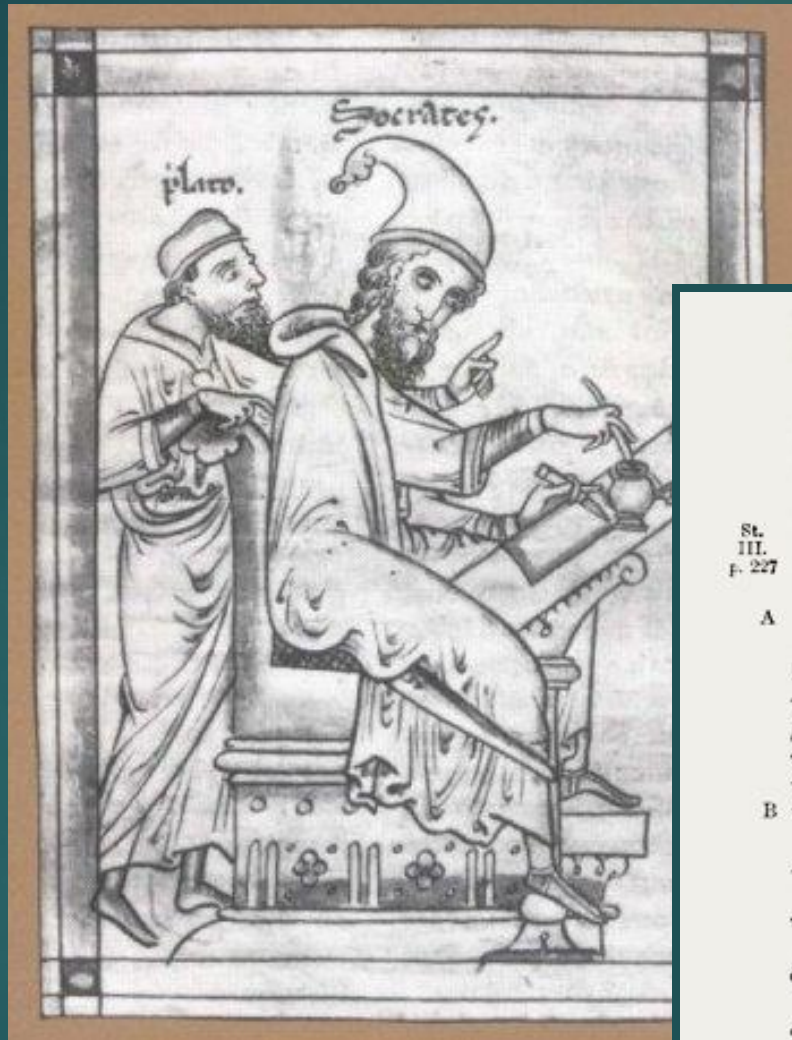
Patented Gramophone Co., Montreal, Canada Distributors.



1) For the Record: The Original Metaphysics of Recording

Plato's *Phaedrus*

First recorded account of recording technology



St.
III.
F. 227

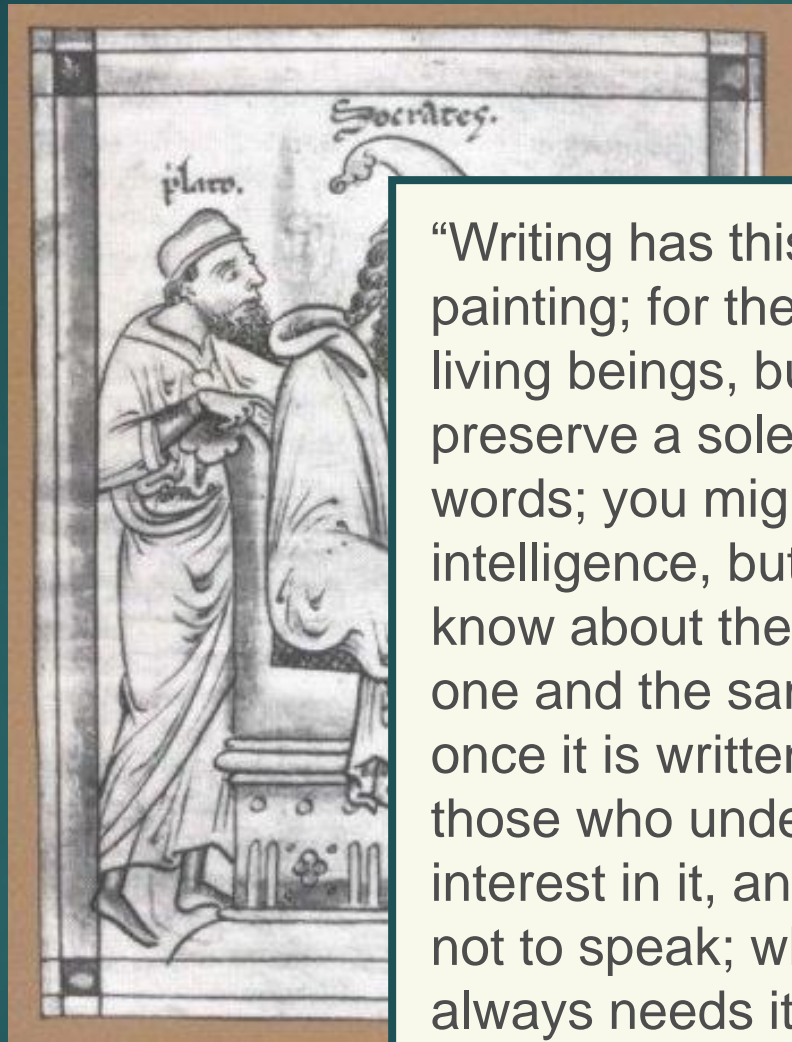
ΦΑΙΔΡΟΣ

[ἢ ΠΕΡΙ ΚΑΛΟΥ ἨΘΙΚΟΣ]

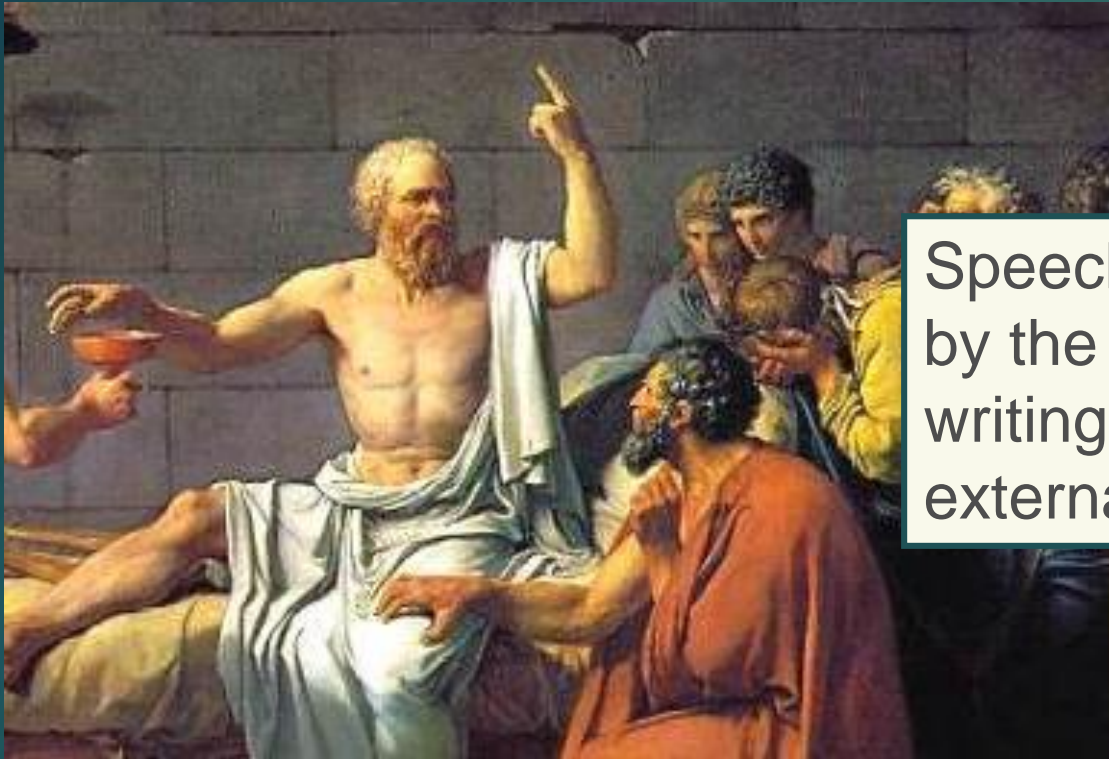
ΤΑ ΤΟΥ ΔΙΑΛΟΓΟΥ ΠΡΟΣΩΠΑ

ΣΩΚΡΑΤΗΣ ΚΑΙ ΦΑΙΔΡΟΣ

- A 1. ΣΩΚΡΑΤΗΣ. ὦ φίλε Φαίδρε, ποῖ δὴ καὶ πόθεν;
ΦΑΙΔΡΟΣ. Παρὰ Λυσίου, ὦ Σώκρατες, τοῦ
Κεφάλου· πορεύομαι δὲ πρὸς περίπατον ἔξω
τείχους. συχνὸν γὰρ ἐκεῖ διέτριψα χρόνον καθή-
μενος ἐξ ἰωθινοῦ· τῷ δὲ σὺ καὶ ἐμῷ ἐταίρῳ
πειθόμενος ἄκουμένῳ κατὰ τὰς ὁδοὺς ποιῶμαι
τούς περιπάτους· φησὶ γὰρ ἀκοπωτέρους εἶναι
B τῶν ἐν τοῖς δρόμοις.
ΣΩΚΡΑΤΗΣ. Καλῶς γάρ, ὦ ἐταῖρε, λέγει. ἀτὰρ
Λυσίας ἦν, ὡς ἴσκειν, ἐν ἄστει.
ΦΑΙΔΡΟΣ. Naί, παρ' Ἐπικράτει, ἐν τῇδε τῇ
πλησίον τοῦ Ὀλυμπίου οἰκίᾳ τῇ Μορυχίᾳ.
ΣΩΚΡΑΤΗΣ. Τίς οὖν δὴ ἦν ἡ διατριβή; ἢ δῆλον
ὅτι τῶν λόγων ὑμᾶς Λυσίας εἰστία;
ΦΑΙΔΡΟΣ. Πεύσει, εἰ σοι σχολὴ προΐοντι
ἀκούειν.
ΣΩΚΡΑΤΗΣ. Τί δέ; οὐκ ἂν οἶε με κατὰ Πίν-
412



“Writing has this strange quality, and is very like painting; for the creatures of painting stand like living beings, but if one asks them a question, they preserve a solemn silence. And so it is with written words; you might think they spoke as if they had intelligence, but if you question them, wishing to know about their sayings, they always say only one and the same thing. And every word, when once it is written, is bandied about alike among those who understand and those who have no interest in it, and it knows not to whom to speak or not to speak; when ill-treated or unjustly reviled it always needs its father to help it; for it has no power to protect itself” (*Phaedrus* 275d-e).



Speech is alive because it is animated by the breath of a living speaker; while writing, which utilizes artificial and external apparatus, is dead and lifeless.

1. Recordings are secondary and derivative



1. Recordings are secondary and derivative

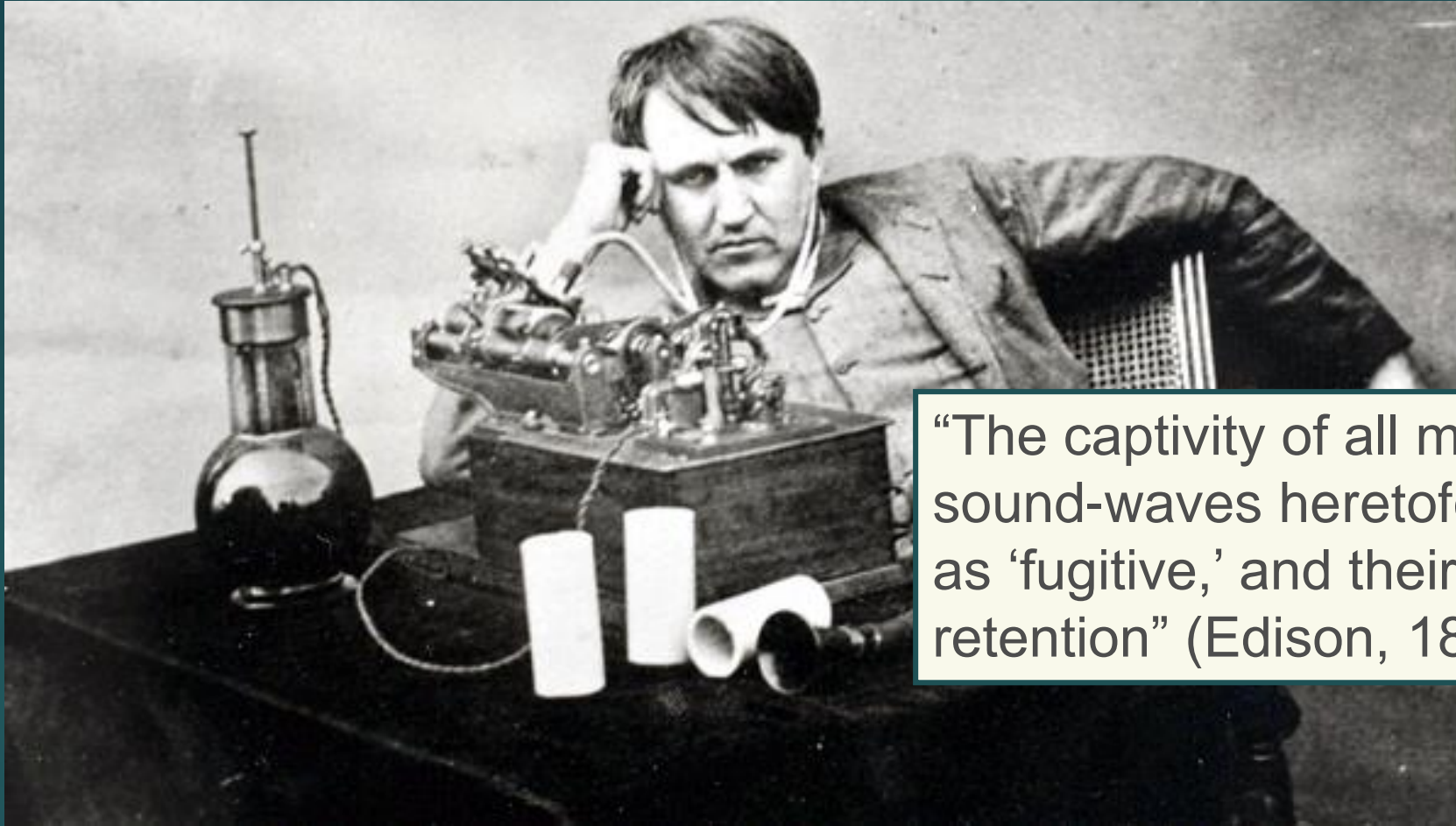
HiFi
& MUSIC REVIEW March

TOSCANINI
Viewed in New Perspective

16 RPM RECORDS
Hour of Music per Side

SPEAKER Baffles
The Why and How

Anyone can listen to music, but to listen to sound, now that takes some doing. For Hi-Fi nuts, sound was the appeal. And not just any sound. Record companies were fiercely competitive when it came to boasting about their latest technological breakthroughs. Album jackets devoted more space to the recording technology than to who was making the music—SurroundSound, 360° Sound, Full Spectrum Pan Orthophonic Sound, Stereophonic Curtain of Sound, and the oxymoronic but tantalizingly provocative Visual Sound! There was sound that did everything except wash

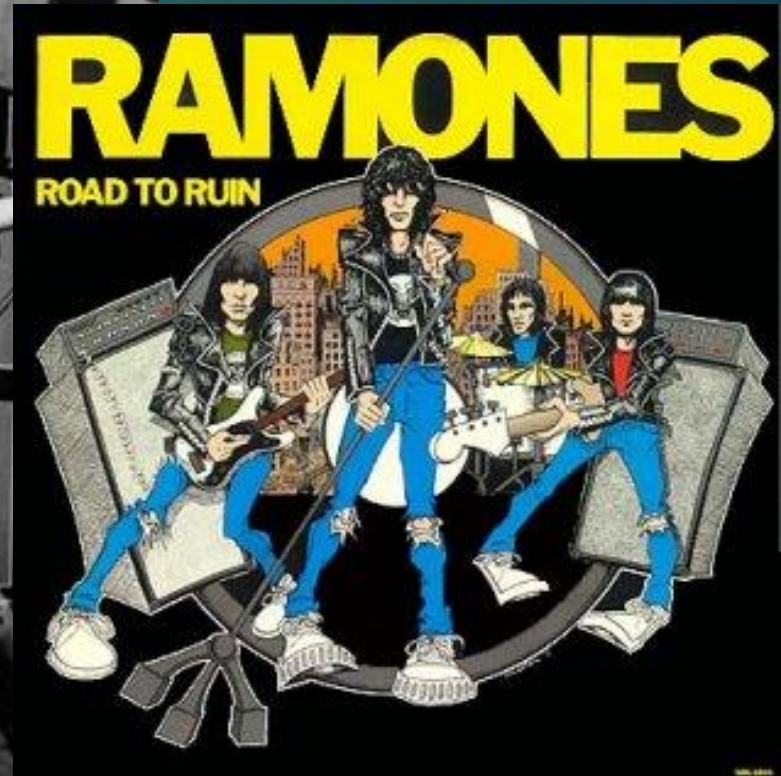
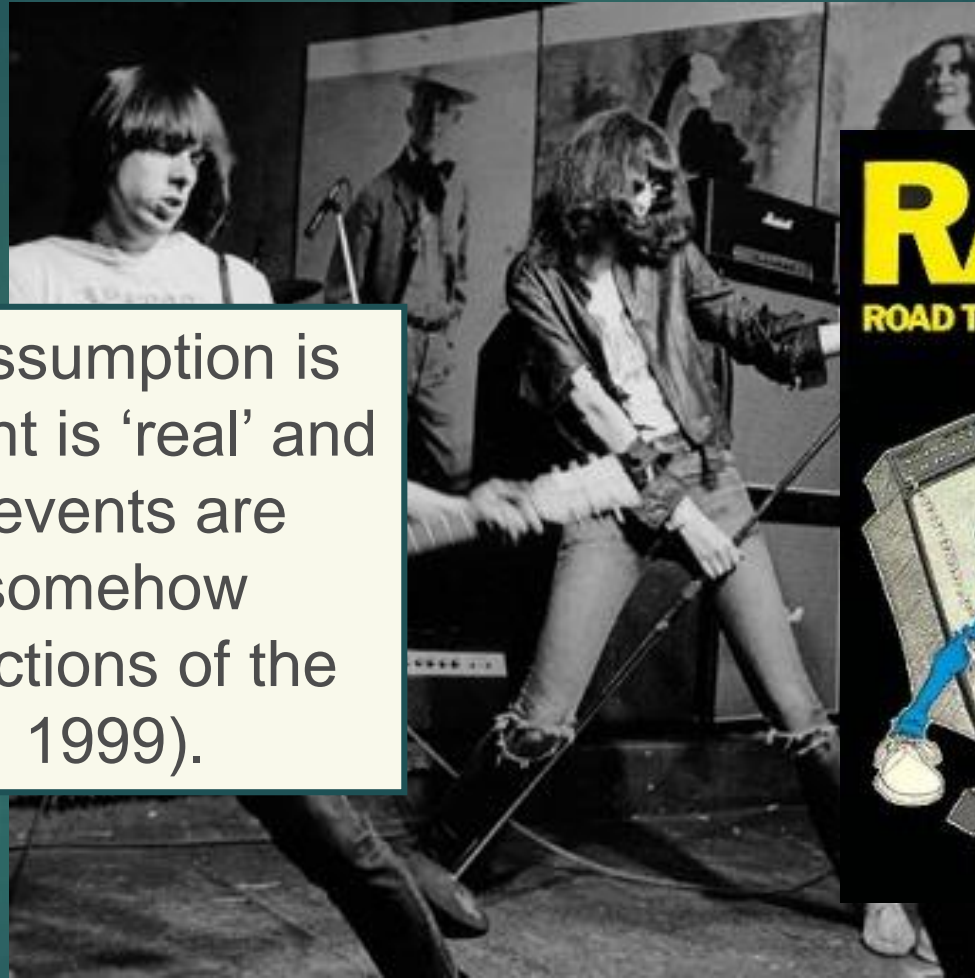


“The captivity of all manner of sound-waves heretofore designated as ‘fugitive,’ and their permanent retention” (Edison, 1878).

1. Recordings are secondary and derivative

LIVE!

“The common assumption is that the live event is ‘real’ and that mediatized events are secondary and somehow artificial reproductions of the real” (Auslander, 1999).



1. Recordings are secondary and derivative



**Is it live or
is it Memorex?
Who knows?**

The advertisement features a woman in a yellow and white outfit holding a microphone, with a large, cracked glass goblet in the foreground. A small inset photo shows a man's face. At the bottom right is a box of Memorex 60 MRX Oxide cassette tape. The text below the headline reads: "In our most recent test, we asked Ella Fitzgerald's old friend and longtime jazz arranger, Nelson Riddle, if he was listening to Ella live, or Ella as recorded on a Memorex cassette. He couldn't tell. We believe that's a strong endorsement of our exclusive MRX Oxide formulation. In fact, since we introduced MRX Oxide, a lot of other ferric tapes have been scrambling to find something to beat it. Nobody has." At the bottom, it says "MEMOREX Recording Tapes" and "It's live, or it's Memorex!"

MEMOREX 60
MRX OXIDE
Memorex's best cassette for use on all equipment
MEMOREX Recording Tapes
It's live, or it's Memorex!

2. Recordings preserve live performances

Victor Talking Machine Company



“His Master’s Voice”

2. Recordings preserve
live performances

LE PORTATIF
GRAMOPHONE
LE MEILLEUR ET LE MOINS CHER



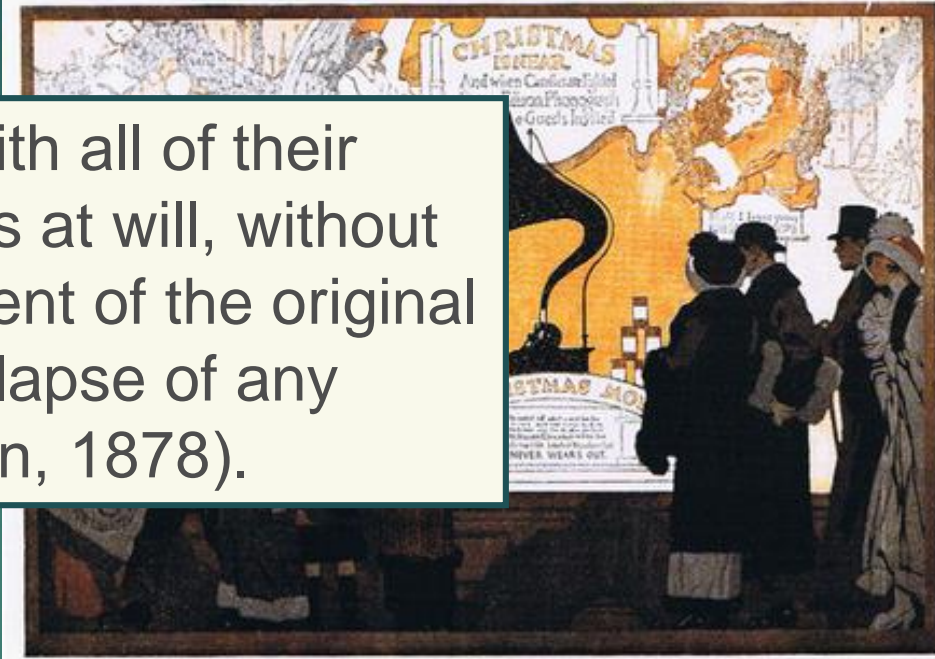
N°97
**NOUVEAU
MODÈLE. 395^{frs}**
MODÈLE DE LUXE (102): 800^{f.} et 875^{f.}

UNION FRANÇAISE DES DISQUES

“Music ceases to have interest for us...the instant we become aware of the fact of literal repetition, of mechanical reproduction, when we know and can anticipate exactly how a given phrase is going to be modeled, exactly how long a given fermata is to be held, exactly what quality of accent or articulation, of acceleration, or retard, will occur at a given moment” (Sessions, 1950).

2. Recordings preserve live performances

“Their reproduction with all of their original characteristics at will, without the presence or consent of the original source, and after the lapse of any period of time” (Edison, 1878).



I am your Christmas wish, the realization of your Christmas desire. I am the voice of Slezak, the soul of Sylva, the dramatic art of Sarah Bernhardt—I am the laugh of Lauder, the coon shouts of Stella Mayhew—I am Sousa and his entire band, Herbert and his orchestra—I am the

EDISON PHONOGRAPH

I hold, on a little sapphire button, scarcely bigger than the point of a pin, the ability to produce exactly the kind of music you and each member of your family like best. No one in your family is too young, none will ever be too old to enjoy my presence. I am supreme as an entertainer—the greatest kind of Christmas gift—a gift for all the family.

And I am the greatest Christmas gift of *the kind*. For I have four great advantages: Exactly the right volume of sound for your home; the sapphire reproducing point that never wears out—no needles to be changed after each record; Amberol

(four-and-one-half minute) Records rendering every composition *completely*, without cutting or hurrying; and home recording. This is a great feature: Talk to me, sing to me! I answer you back in your own words, in your own voice. I, the Edison Phonograph, am *you yourself!*

Go to an Edison dealer and hear and see me—be sure to have me in your home on Christmas Day.

There is an Edison Phonograph at a price to suit everybody's means, from \$15.00 to \$200.00, sold at the same price every where in the United States. Edison Standard Records, 51¢; Edison Amberol Records (two twice as long), 51¢; Edison Grand Opera Records, 75¢ to \$2.50.



3. Recordings are promiscuous bastards



The unauthorized reproduction or distribution of this copyrighted work is illegal. Criminal copyright infringement, including infringement without monetary gain, is investigated by the FBI and is punishable by up to 5 years in federal prison and a fine of \$250,000.

HOME TAPING IS KILLING MUSIC



3. Recordings are promiscuous bastards



3. Recordings are promiscuous bastards



Summary




1) Recordings are secondary and derivative

2) Recordings copy and preserve live performance

3) Recordings are promiscuous bastards

2) Mashup & Remix:

The Art of Recombinant Rock and Roll



MASHED
MALCOLM MCLAREN vs FRANZ FERDINAND/BLONDIE vs THE DOORS
PEGGY LEE vs IGGY POP/DURAN DURAN vs KELIS
MOUSSE T vs THE DANDY WARHOLS AND MANY MORE...

**MASHED THE ULTIMATE
BOOTLEG COLLECTION
OUT 12.02.07**

WWW.GOHOMEPRODUCTIONS.CO.UK/MASHED.HTML

MASH UP Your Boots

www.mashupyourbootz.com

Mash-Ups
Bootlegs
Bastard Pop
Remixes

U5-Club

Frankfurter Tor 9 (U5, M10)
U-Bhf Frankfurter Tor

PARTYDATES

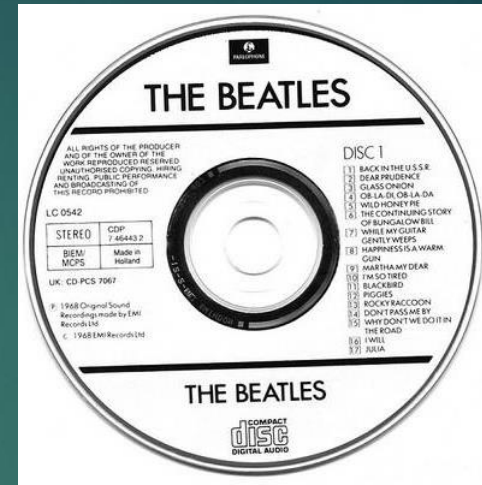
January
February
March
April
May

1) Mash-ups complicate and suspend common assumptions about origin and originality.

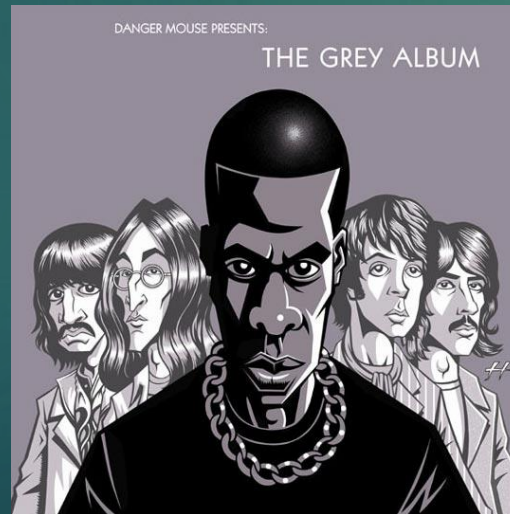
Conceptual Inversion



original



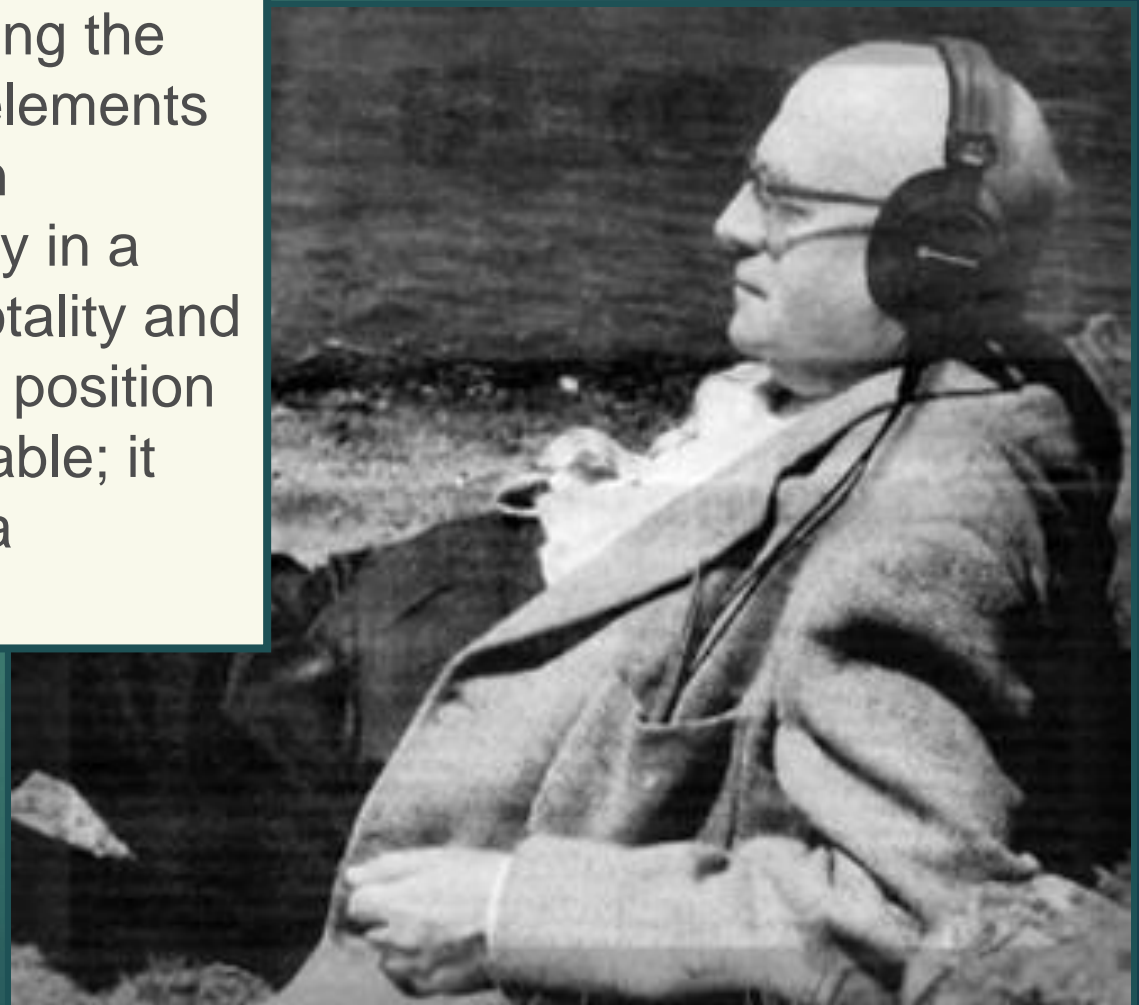
copies



2) Mash-ups are exceedingly and unapologetically redundant



“The beginning of the chorus is replaceable by the beginning of innumerable other choruses. The interrelationship among the elements or the relationship of the elements to the whole would be unaffected. In Beethoven, position is important only in a living relation between a concrete totality and its concrete parts. In popular music, position is absolute. Every detail is substitutable; it serves its function only as a cog in a machine” (Adorno, 1941).





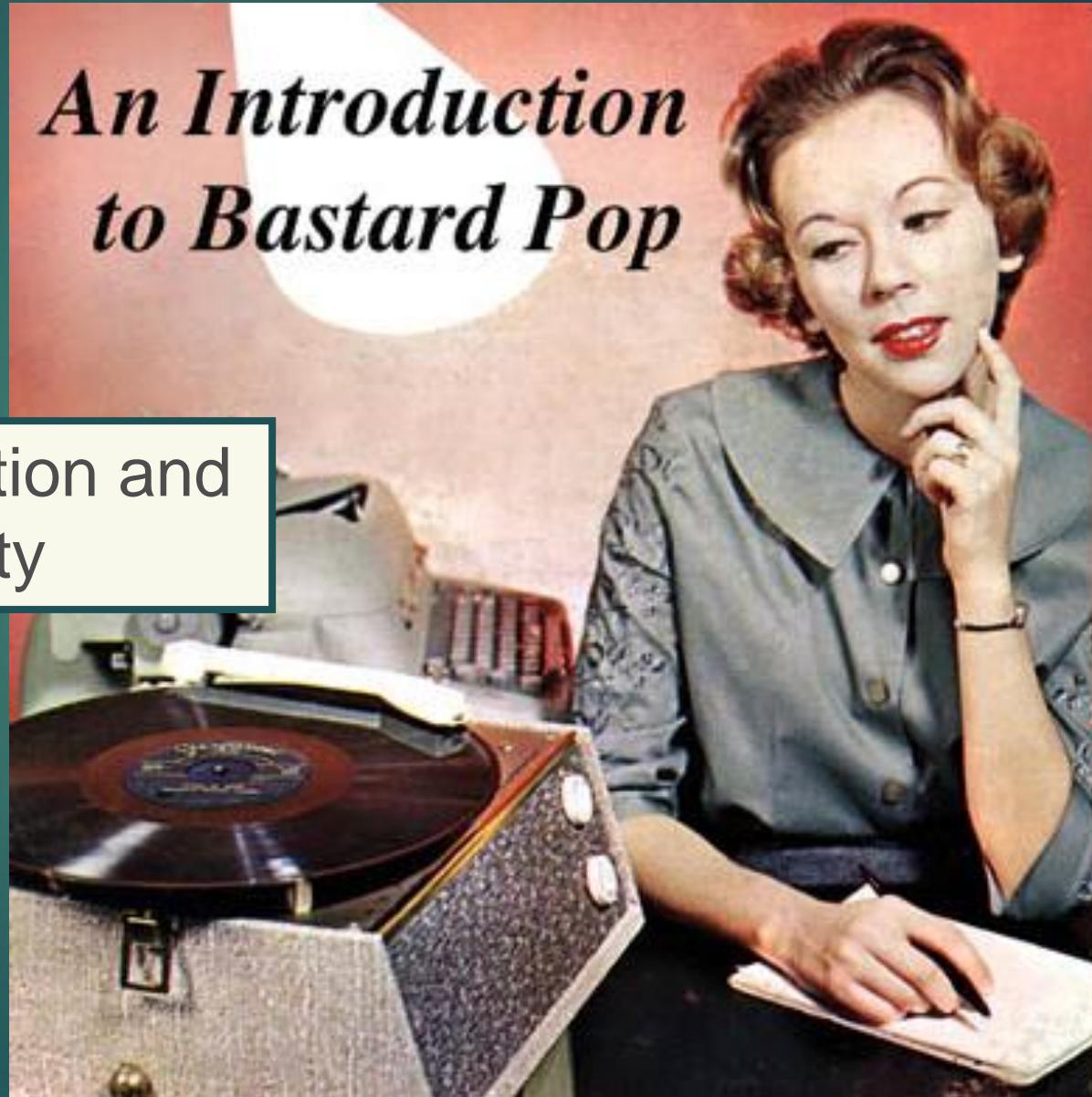
GOHOMEPRODUCTIONS

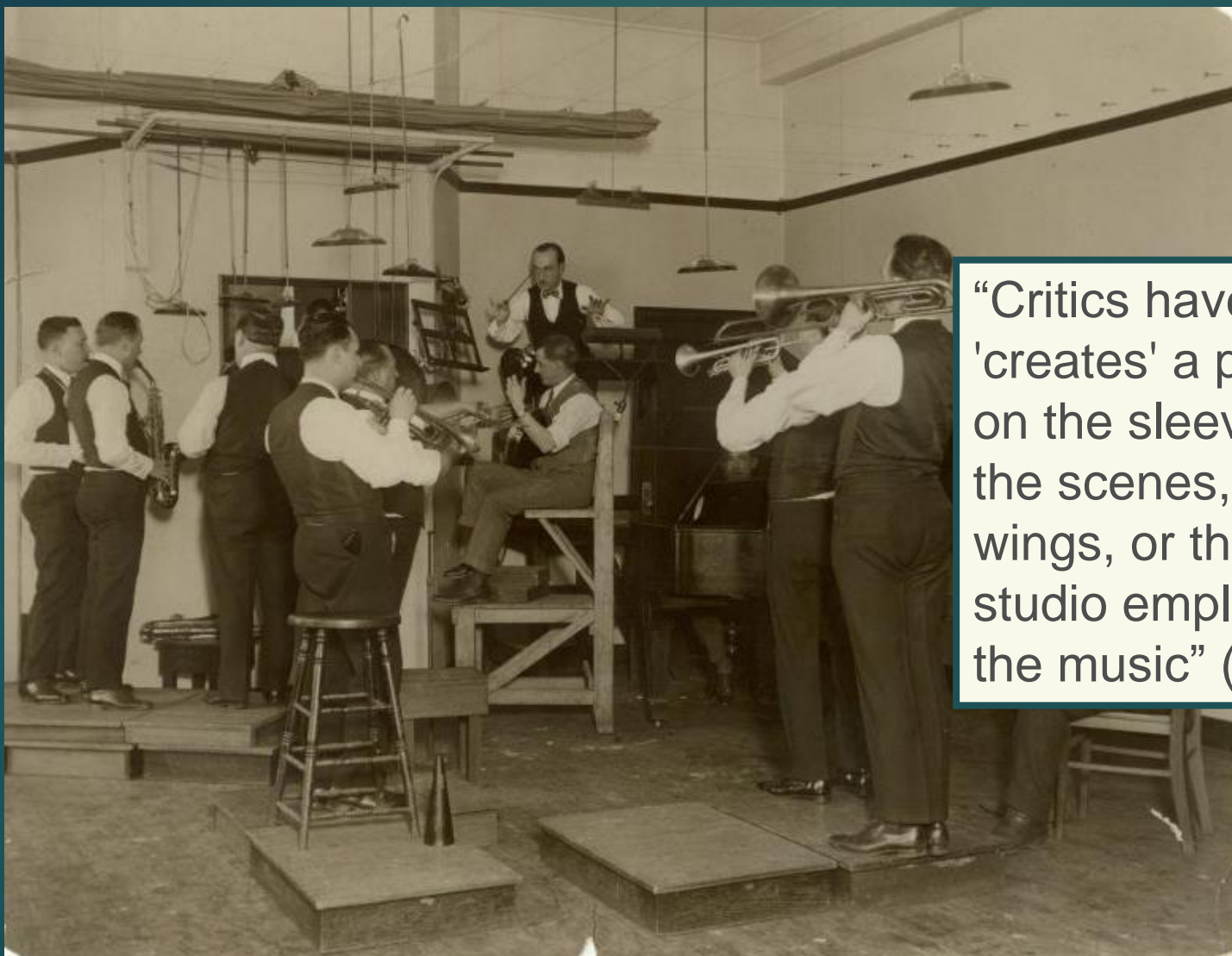


this was pop
2002-2007

An Introduction to Bastard Pop

3) Mash-ups question and
undermine authority





“Critics have long debated who 'creates' a pop record: the artist listed on the sleeve, the producer behind the scenes, the composer in the wings, or the sometimes anonymous studio employees who actually play the music” (Walker, 2003).

You Don't Need a Sword
to be a Pirate.

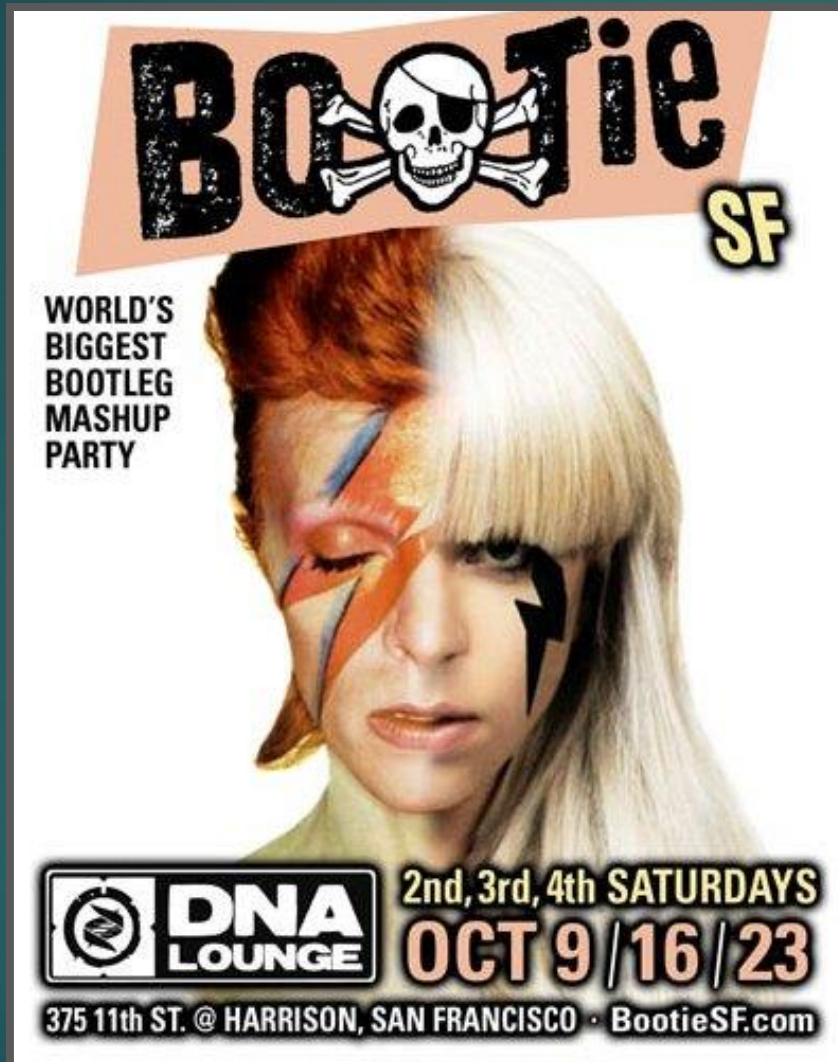


Muzik-Knightz.Co.Uk
The Anti-Piracy Division



Respect Copyright Laws.

Visit ww2.umflint.edu/piracy to learn how you can ensure that you're on the right side of the law.



BOOTIE **SF**

WORLD'S
BIGGEST
BOOTLEG
MASHUP
PARTY

DNA LOUNGE 2nd, 3rd, 4th SATURDAYS
OCT 9 / 16 / 23
375 11th ST. @ HARRISON, SAN FRANCISCO · BootieSF.com

3) Conclusions

Responses to Remix

Two Possible Responses

- Ptolemization
- Copernican Revolution

6.1 Responding to Remix

Responses to these challenges typically take one of two forms, which Žižek, in something of a remix of Thomas Kuhn, calls “Ptolemization” and “Copernican Revolution.” “When a discipline is in crisis,” Žižek (2008a, vii) explains, “attempts are made to change or supplement its theses *within* the terms of its basic framework—a procedure one might call ‘Ptolemization’ (since when data poured in which clashed with Ptolemy’s earth-centered astronomy, his partisans introduced additional complications to account for the anomalies). But the true ‘Copernican’ revolution takes place when, instead of just adding complications and changing minor premises, the basic framework itself undergoes a transformation.” Ptolemization indicates efforts to revise an existing paradigm by introducing modifications and complications, like the epicycles that were added to the Ptolemaic model to account for seemingly aberrant observational data, in order to ensure the continued functioning and success of the prevailing “normal science.” Copernican revolution, on the contrary, designates not minor adjustments or revisions in the prevailing system of knowledge but a complete reconfiguration or transformation of its basic framework. The name, of course, comes from Nicolaus Copernicus, whose heliocentric model of the solar system provides, for Kuhn and others, the prototype of scientific revolution, insofar as it not only introduced a new framework or model of astronomy but literally inverted or overturned the Ptolemaic system by moving the sun, which had been located on the periphery, to the center of the system.

Since remix constitutes something of a crisis in the normal science of recording, it has typically been explained and evaluated in terms of the two modes of response described by Žižek’s remix of Kuhn. “Does configurable music,” as Sinnreich (2010, 193) asks at the end of his analysis, “presage a discursive break in our understanding of what music is and how it operates, and therefore portend a breakdown in the existing social order? Or is the rise of the DJ simply one more development in an ongoing dialectic between cultural regulation and resistance, as easily contained within the strong yet flexible boundaries of the modern framework as atonality, the birth of sound recording, and the electrification of blues and rock music?” Without identifying this source material directly, Sinnreich ends his analysis of the “configurable culture” of remix with a set of questions

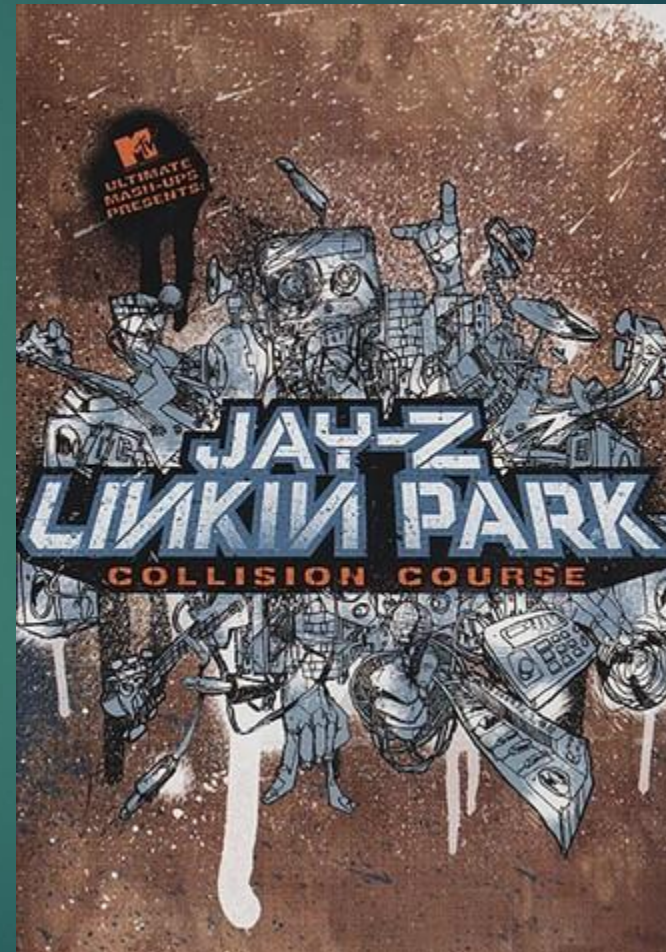
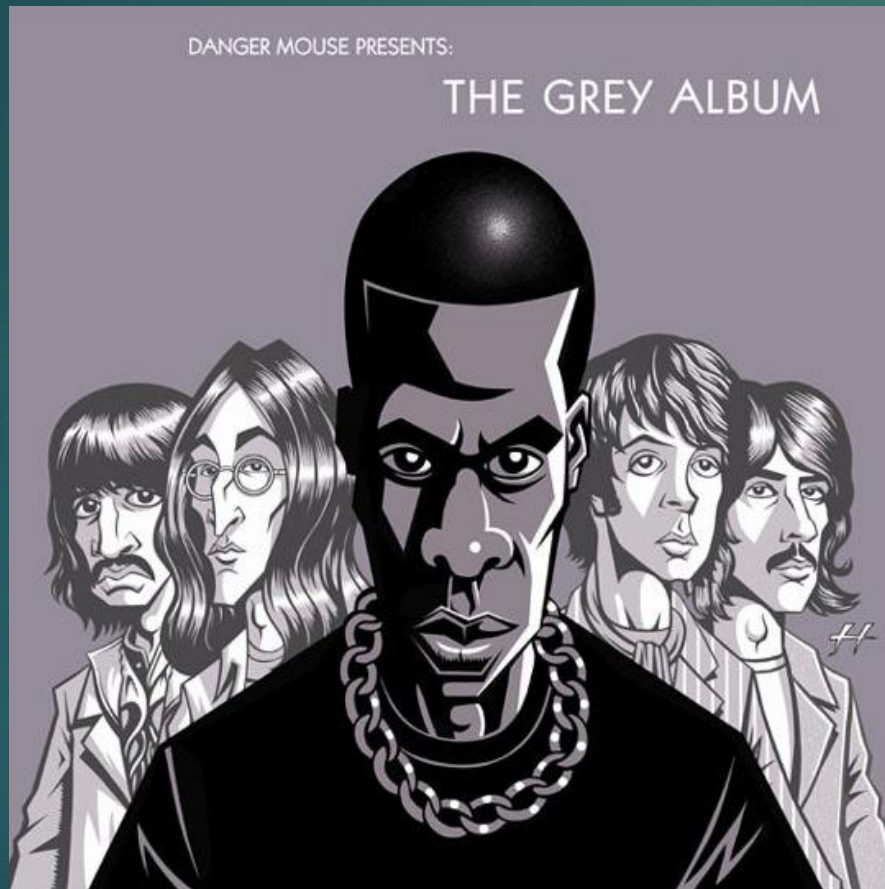


Ptolemization vs. Copernican Revolution

“When a discipline is in crisis attempts are made to change or supplement its theses within the terms of its basic framework—a procedure one might call ‘Ptolemization’ (since when data poured in which clashed with Ptolemy’s earth-centered astronomy, his partisans introduced additional complications to account for the anomalies). But the true ‘Copernican’ revolution takes place when, instead of just adding complications and changing minor premises, the basic framework itself undergoes a transformation.” (Žižek 2008, vii)

Ptolemization

DJ Danger Mouse, *The Grey Album*, 2004



Ptolemization



Alexander Rodchenko, *Books*, 1924
"Photomontage"



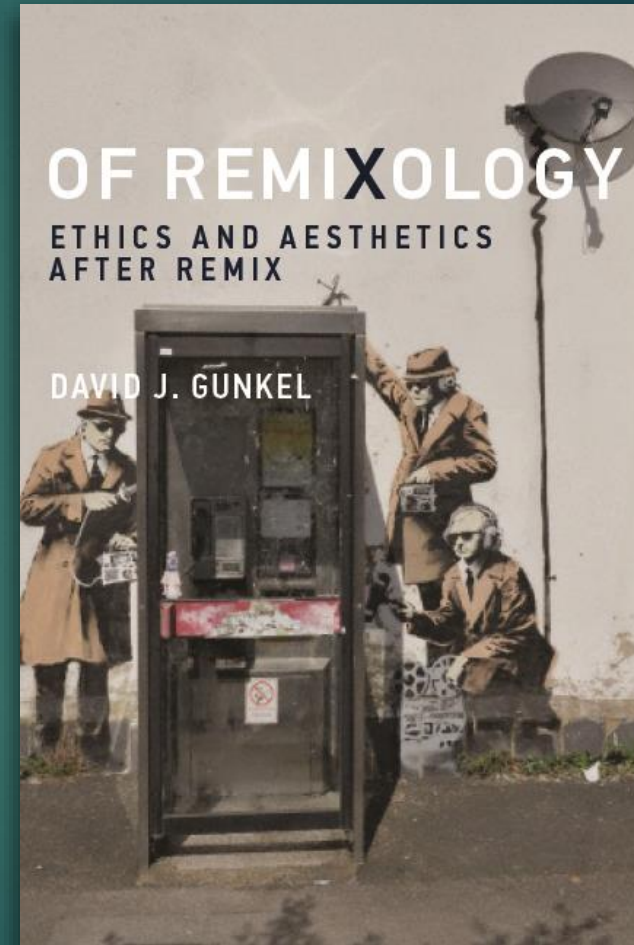
Copernican Revolution



Copernican Revolution

7.2.1 Competition

The claim of originality, which has been and continues to be a pivotal concept in many aspects of culture (e.g., art, science, commerce), is not itself original. It is always, and from the very beginning, contested and contestable. This contestation, for example, can be seen in the attempt to figure out and decide who created the first mashup. These debates, however, have been inconclusive, and the more we investigate the matter, the more uncertain things seem to become, leaving us not with a single innovator or authoritative voice but with a network of different actors all legitimately claiming some hold on the title of "origination." The trick in this circumstance is not to play according to the rules of the standard Platonic game, which involves trying to distinguish the true claimant—the one true original—from the false pretenders (Deleuze 1990, 254). What is important is not the resolution of the debate but the debate itself. What is valuable and what should be protected, therefore, are not pristine originals but the seemingly unresolvable circulation of things that make dispute over origination possible in the first place.



Copernican Revolution

7.2.1 Competition

The claim of originality, which has been and continues to be a pivotal concept in many aspects of culture (e.g., art, science, music), is never truly original. It is always, and from the very beginning, contestable. This contestation, for example, can be seen in the case of mashups: we can argue out and decide who created the first mashup. These arguments have been inconclusive, and the more we investigate, the more uncertain things seem to become, leaving us not with a clear or authoritative voice but with a network of different voices. Some claiming some hold on the title of "origination." The question of origination is not to play according to the rules of the game, but to play which involves trying to distinguish the true claimant from the false pretenders (Deleuze 1990, 254). What is important is not the resolution of the debate but the debate itself. What is valuable and what should be protected, therefore, are not pristine originals but the seemingly unresolvable circulation of things that make dispute over origination possible in the first place.

7.2.2 Decision

These competing claims can only be settled—even now at a time when one might believe that things operate otherwise—by an arbitrary and even random selection, or as Deleuze (1994, 62–63) characterizes it, by way of a grounding that is ungrounded. The question concerning origination, therefore, is resolved on the basis of a socially constructed decision, quite literally a cut made in the maelstrom of the eternal recurrence, that arbitrarily (although not without reason, argumentation, and supporting evidence) extracts and promotes one claimant as the originator. "Originality,"

Copernican Revolution

7.2.1 Competition

The claim of originality, which has been and continues to be a pivotal concept in many aspects of culture (e.g., art, science, music), is not always original. It is always, and from the very beginning, contestable. This contestation, for example, can be seen in the case of mashups. One might argue that one can go out and decide who created the first mashup. However, such decisions have been inconclusive, and the more we investigate, the more uncertain things seem to be. There is no or authoritative voice but claiming some hold on the matter. The stance is not to play according to the rules which involves trying to establish a precedent—rather than from the false pretense of originality—not the resolution of the matter but what should be protected. This is an inherently unresolvable circularity that is possible in the first place.

7.2.2 Decision

These competing claims can only be settled—even now at a time when one might believe that things operate otherwise—by an arbitrary and even random selection, or as Deleuze (1994, 62–63) characterizes it, by way of a grounding that is ungrounded. The question concerning origination, the contested decision, quite often results in an arbitrary occurrence, that arbitrary and supporting evidence is the arbitrator. “Originality,”

7.2.3 Finitude

Because a decision concerning the assignment of origination is contingent and socially constructed, it should have a predetermined shelf life or expiration date. The “original,” or better, the contingent decision settling a claim to originality, should be temporary and finite. Following (but also reconfiguring) the precedent of US patent law in pharmaceutical development (and by using an analogy to drugs, we come full circle to the pharmacology originally deployed in Plato's *Phaedrus*), the claim to originality should be granted for only a limited and rather short period of time (three to five years, for example), after which the claim expires, the protections accorded the so-called original no longer hold, and the “innovation” becomes part of the general fabric of culture—in the parlance of US copyright law, “public domain”—and therefore available for further sampling, remixing, and mashing up. This restricted period of time would allow successful claimants to capitalize on the efforts and investments they made in the process of developing an “innovation” while simultaneously recognizing that any “innovation” in any field of endeavor is derived from the work of others and must therefore give back in kind, becoming source material for future efforts.

Remix Spectrum

Copernican Revolution



Ptolemization



Today

- ▶ Artificial Intelligence
 - ▶ Intro to Communication & AI - ch.1-3
 - ▶ PBS - The Chinese Room (video)
 - ▶ Steiner - Algorithms Are Taking Over (video)

David J. Gunkel

An Introduction to **Communication and Artificial Intelligence**

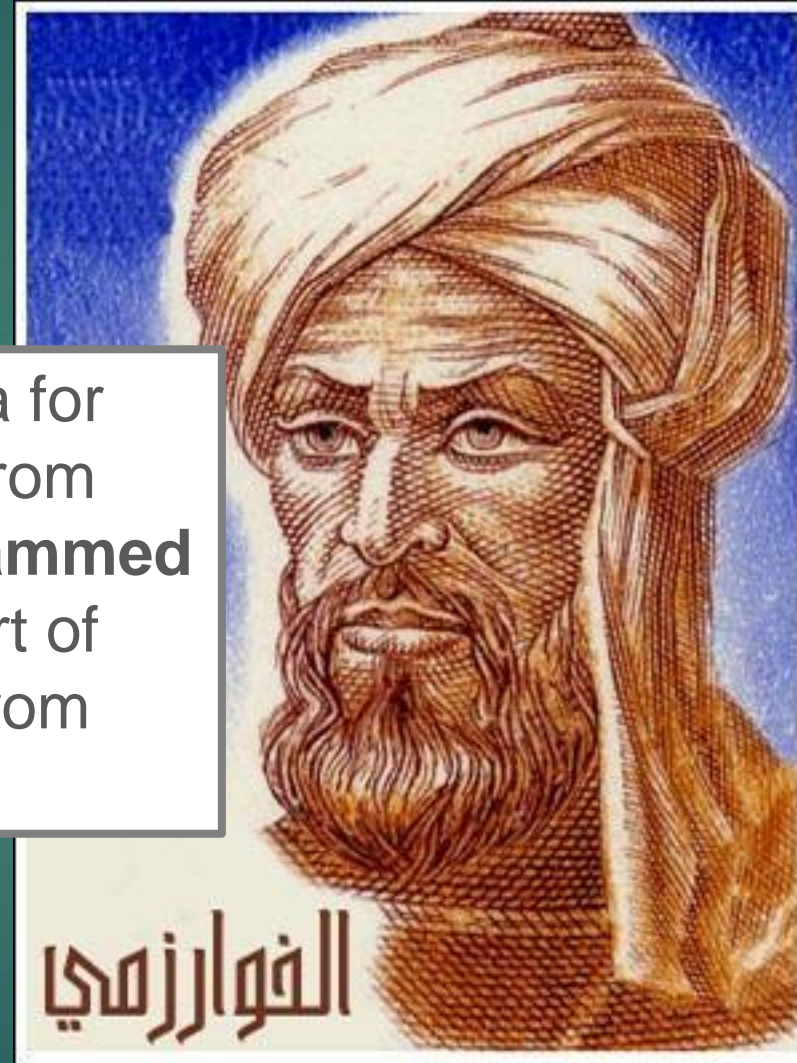


Algorithm Exercise

- ▶ Introduction
- ▶ Maker Exercise – Temperature Converter
 - ▶ GOFAI Algorithm
 - ▶ Machine Learning Algorithm

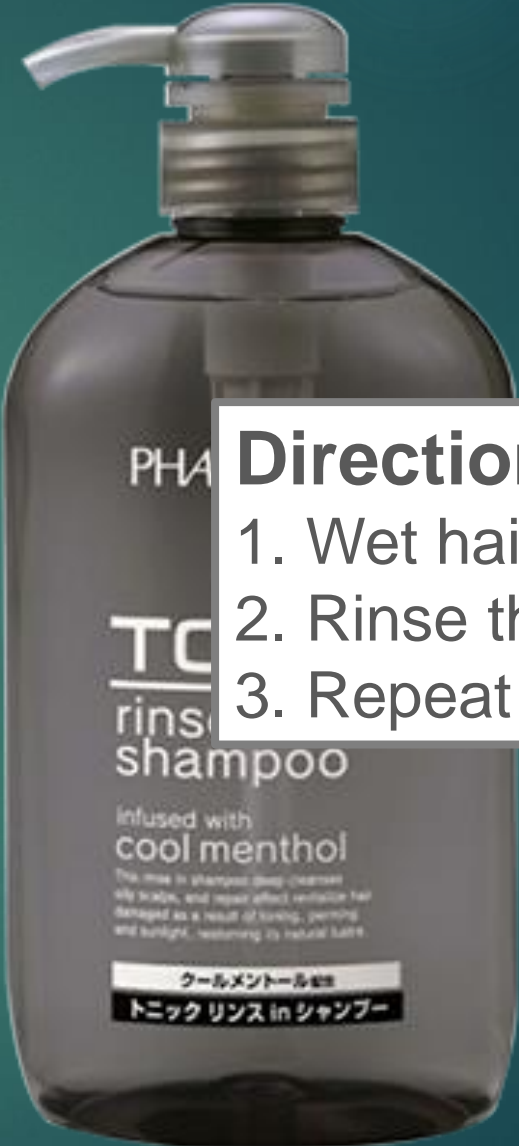
Algorithm Exercise

An algorithm is a procedure or formula for solving a problem. The word derives from the name of the mathematician, **Mohammed ibn-Musa al-Khwarizmi**, who was part of the royal court in Baghdad and lived from about 780 to 850.



Algorithm Exercise

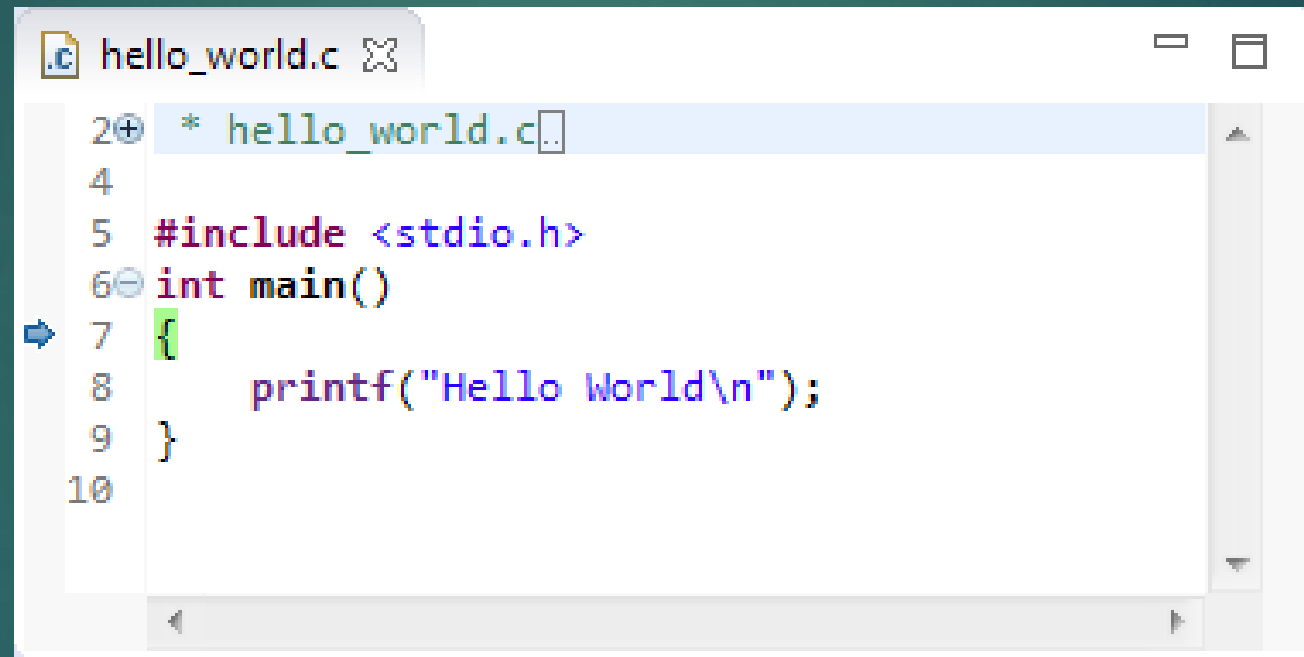
من جانبين عشرة عشرة والواحدة التي
 دللنا في جوفها الرض مربعة كم كل جانب من جوانب المربعة قياس
 ذلك ان تعرف عمود المثلثه وهو ان تعرب نصف القاعدة وهو ستة
 في مثلها تكون ستة والذلي فانقصها من احد الجانبين الاخرين مفرقا
 في مثلها وهو ما ينسب الى جهة وتكون الحزب حذبه هاتان ايه وهو العمود
 وكسري هاتان ايه وان جوف ذرعا وهو ضرب العمود في نصف القاعدة
 وهو ستة فحسبنا احد جوانب المربعة شيئا فخر بناه في مثلها فصار ما لا
 يحفظه لانهم علمت انه بقى لنا مثلثان عن جنبتي المربعة ومثلثه فوقها
 فامت اللتان عن جنبتي المربعة فصبا امتتا مبيات وعموديهما واحدا على
 زاوية قائمة فتكسري هاتان فخر شيئا في ستة الا نصف شي فكون ستة
 اشيا الا نصف ما اذ هو كثير المثلثين جميعا بقية اللذين عن جنبتي المربع
 واما العليا فتكسري هاتان فخر ثمانية عن شي وهو العمود في نصف شي فذالك جعلنا
 الاضلاع الخمسة تكسري المربعة ما اذ وتكسري اللات المثلثات عشرة اشيا الامان
 فحسبناه بما المربعة فصار عشرة اشيا امانا وهو بعد ثمانية والرعي بالذلي المثلثه
 العظمى فالشي الواحد من ذلكا بعد اذ ربع واربعه اجزاء بلرعه وهو كل جانب المربعة زهاء



Directions

1. Wet hair and lather.
2. Rinse thoroughly.
3. Repeat if necessary.

Algorithm Exercise



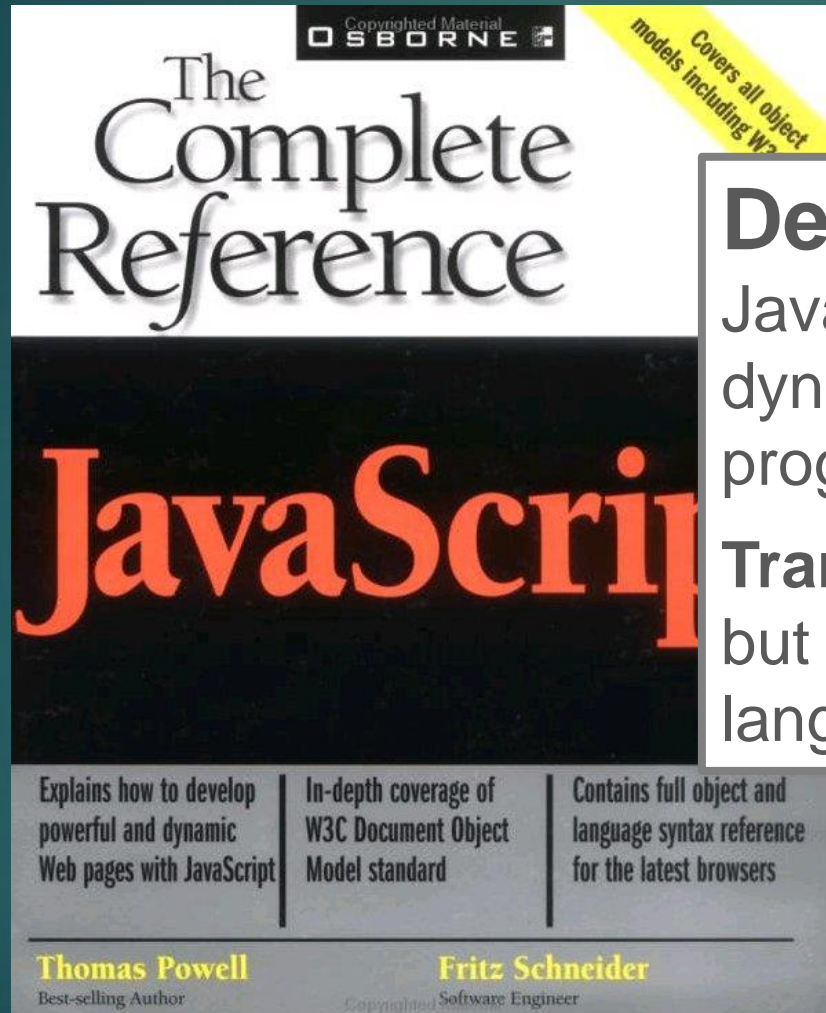
```
.c hello_world.c [X]
2⊕ * hello_world.c [..]
4
5 #include <stdio.h>
6⊖ int main()
7 {
8     printf("Hello World\n");
9 }
10
```

The image shows a code editor window titled 'hello_world.c'. The code is as follows:

```
2⊕ * hello_world.c [..]
4
5 #include <stdio.h>
6⊖ int main()
7 {
8     printf("Hello World\n");
9 }
10
```

The code is a simple C program that prints "Hello World" to the console. The first line is a comment. The second line is a blank line. The third line includes the standard input/output library. The fourth line is the main function signature. The fifth line is the opening curly brace of the main function. The sixth line is the printf statement. The seventh line is the closing curly brace of the main function. The eighth line is a blank line.

Algorithm Exercise

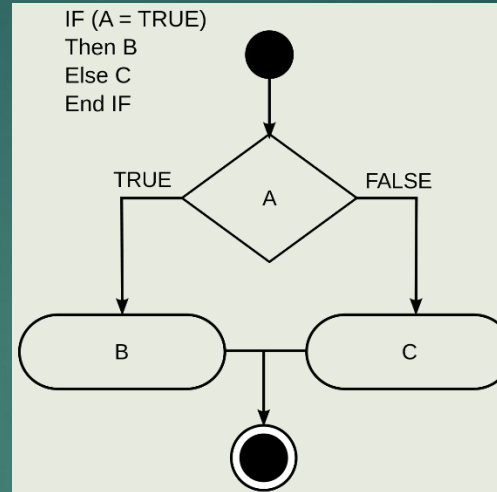
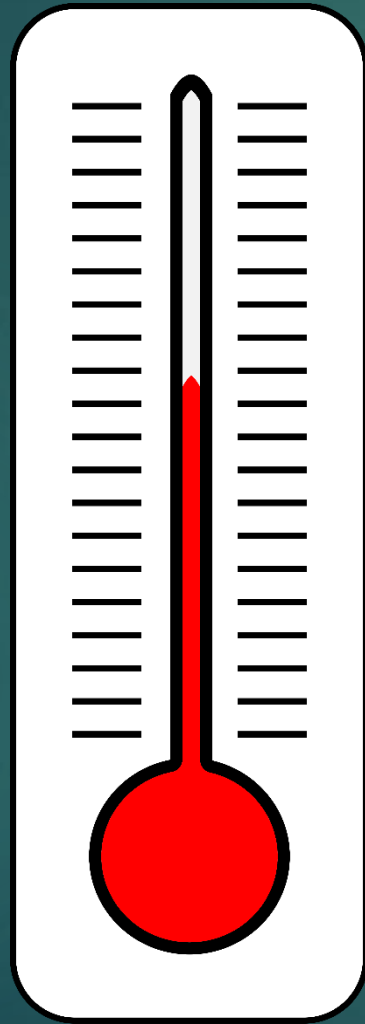


Definition

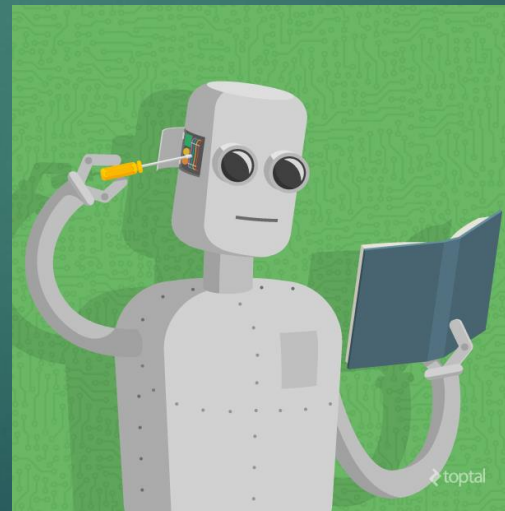
Javascript is a light-weight, high-level, dynamic, untyped, and interpreted programming language.

Translation: Javascript is a powerful but easy to use and learn programming language for writing web applications.

Algorithm Exercise

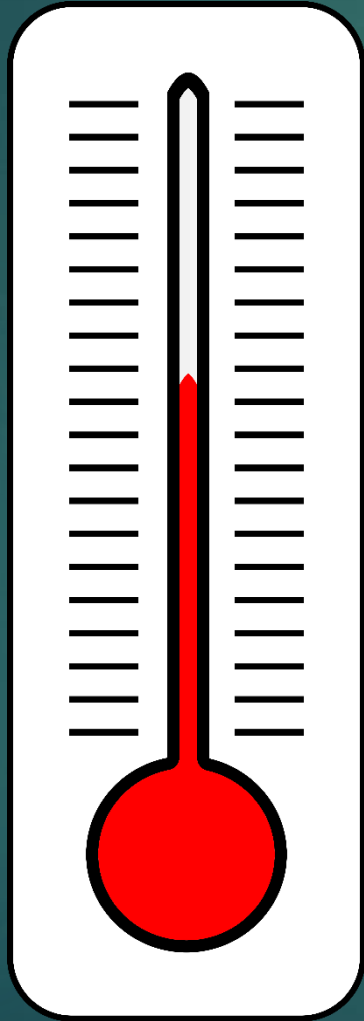


Temp Conversion – v1
Symbolic Reasoning
GOFAI approach



Temp Conversion – v2
Machine Learning
Neural Network

v1 – GOFAI



Overview

- Demonstrate rule-based, symbolic reasoning approach or GOFAI
- Use coded instructions to tell the computer step-by-step what to do in order to make the temperature conversion
- Three versions – Start small and then add incrementally to the code to make the temperature converter more accurate and robust

temp-version1.html

```
1
2 <script>
3
4     var TempF = prompt("Enter degrees Fahrenheit");
5     var TempC;
6
7     if(TempF == 32) TempC = 0;
8     else TempC = "UNDEFINED";
9
10    document.write("<h1>" + TempF + " converts to " + TempC + "</h1>");
11
12 </script>
13
```

temp-version1.html



Enter degrees Fahrenheit

OK Cancel

32 converts to 0

50 converts to UNDEFINED

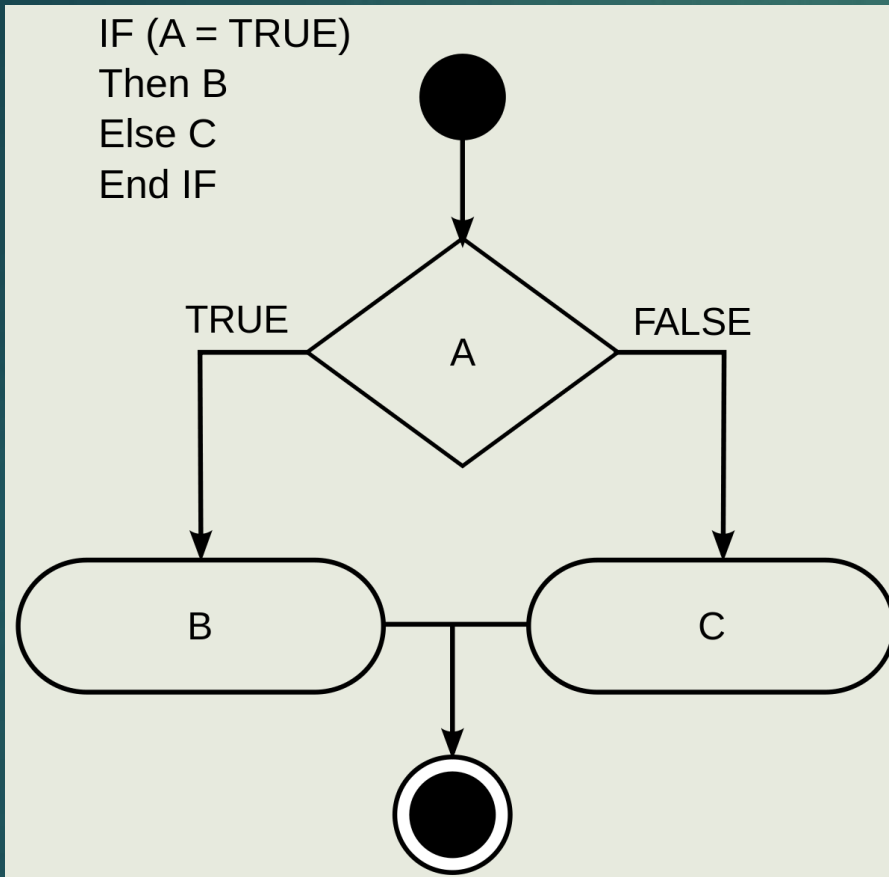
Modification #1

```
1
2 <script>
3
4   var TempF = prompt("Enter degrees Fahrenheit");
5   var TempC;
6
7   if(TempF == 32) TempC = 0;
8
9   else if(TempF == 50) TempC = 10;
10
11  else if(TempF ==99) TempC = 37.2;
12
13  else TempC = "UNDEFINED";
14
15  document.write("<h1>" + TempF + " converts to " + TempC + "</h1>");
16
17 </script>
18
```

Modification #2

```
1
2 <script>
3
4   var TempF = prompt("Enter degrees Fahrenheit");
5   var TempC;
6
7   if(TempF == 32) TempC = 0;
8
9   else if(TempF > 32 && TempF < 49) TempC = 4;
10
11  else if(TempF == 50) TempC = 10;
12
13  else if(TempF > 50 && TempF < 98) TempC = 21;
14
15  else if(TempF ==99) TempC = 37.2;
16
17  else TempC = "UNDEFINED";
18
19  document.write("<h1>" + TempF + " converts to " + TempC + "</h1>");
20
21 </script>
22
```

v1 – GOFAI



Summary

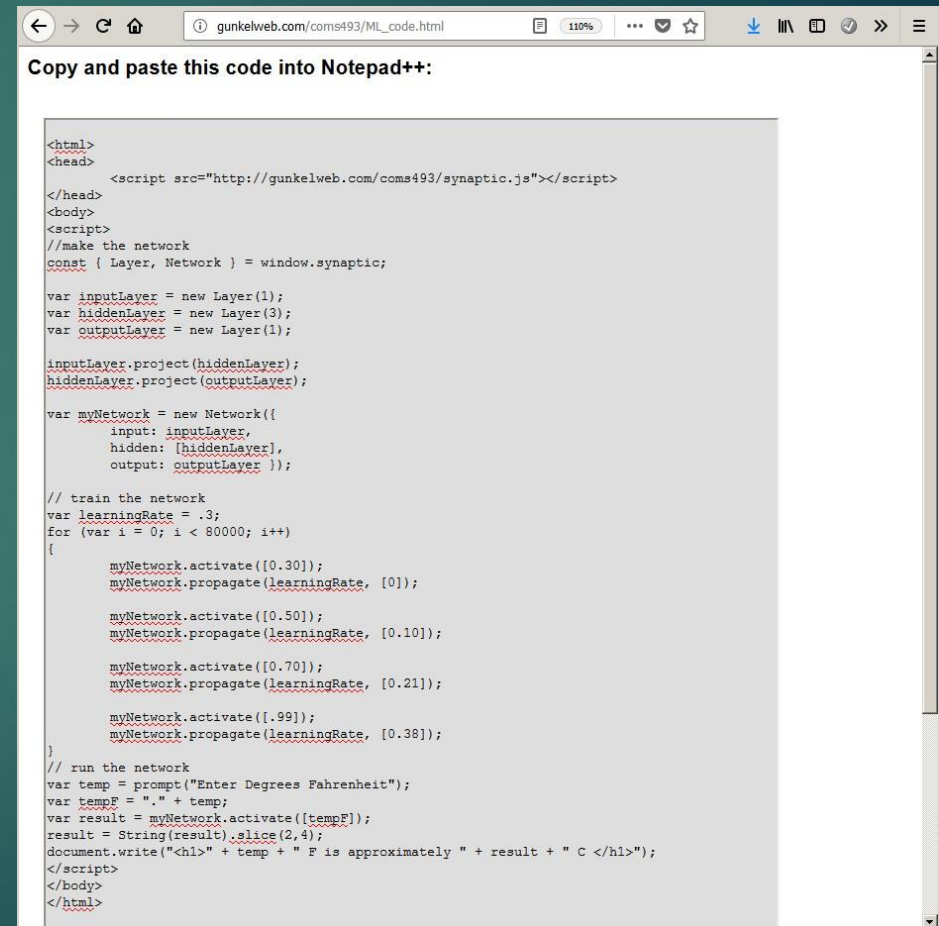
- Step-by-Step instructions
- Programmer must know the temperature conversions (i.e. 32 F = 0 C)
- Encode the conversion steps in Javascript
- More accurate converter = More lines of coded instructions

v2 – Machine Learning

http://gunkelweb.com/coms493/ML_code.html

Directions

1. Go to website
2. Copy the text in the grey box
3. Paste this copied text into Notepad++
4. Save as `temp_version2.html`
5. Open the file in the browser and try it



The screenshot shows a web browser window with the address bar displaying `gunkelweb.com/coms493/ML_code.html`. The page content includes a heading "Copy and paste this code into Notepad++:" followed by a grey box containing the following JavaScript code:

```
<html>
<head>
</head>
<body>
<script>
//make the network
const { Layer, Network } = window.synaptic;

var inputLayer = new Layer(1);
var hiddenLayer = new Layer(3);
var outputLayer = new Layer(1);

inputLayer.project(hiddenLayer);
hiddenLayer.project(outputLayer);

var myNetwork = new Network({
  input: inputLayer,
  hidden: [hiddenLayer],
  output: outputLayer });

// train the network
var learningRate = .3;
for (var i = 0; i < 80000; i++)
{
  myNetwork.activate([0.30]);
  myNetwork.propagate(learningRate, [0]);

  myNetwork.activate([0.50]);
  myNetwork.propagate(learningRate, [0.10]);

  myNetwork.activate([0.70]);
  myNetwork.propagate(learningRate, [0.21]);

  myNetwork.activate([.99]);
  myNetwork.propagate(learningRate, [0.38]);
}

// run the network
var temp = prompt("Enter Degrees Fahrenheit");
var tempF = "." + temp;
var result = myNetwork.activate([tempF]);
result = String(result).slice(2,4);
document.write("<h1>" + temp + " F is approximately " + result + " C </h1>");
</script>
</body>
</html>
```

```
temp_machine_learning.html x
1 <html>
2 <head>
3   <script src="http://gunkelweb.com/coms493/synaptic.js"></script>
4 </head>
5 <body>
6 <script>
7 //make the network
8 const { Layer, Network } = window.synaptic;
9
10 var inputLayer = new Layer(1);
11 var hiddenLayer = new Layer(3);
12 var outputLayer = new Layer(1);
13
14 inputLayer.project(hiddenLayer);
15 hiddenLayer.project(outputLayer);
16
17 var myNetwork = new Network({
18   input: inputLayer,
19   hidden: [hiddenLayer],
20   output: outputLayer });
21
22 // train the network
23 var learningRate = .3;
24 for (var i = 0; i < 80000; i++)
25 {
26   myNetwork.activate([0.30]);
27   myNetwork.propagate(learningRate, [0]);
28
29   myNetwork.activate([0.50]);
30   myNetwork.propagate(learningRate, [0.10]);
31
32   myNetwork.activate([0.70]);
33   myNetwork.propagate(learningRate, [0.21]);
34
35   myNetwork.activate([.99]);
36   myNetwork.propagate(learningRate, [0.38]);
37 }
38 // run the network
39 var temp = prompt("Enter Degrees Fahrenheit");
40 var tempF = "." + temp;
41 var result = myNetwork.activate([tempF]);
42 result = String(result).slice(2,4);
43 document.write("<h1>" + temp + " F is approximately " + result + " C </h1>");
44 </script>
45 </body>
46 </html>
```

1. Load the Synaptic Library

“Synaptic is a javascript neural network library. Its generalized algorithm is architecture-free, so you can build and train basically any type of first order or even second order neural network architectures.”


```

1 <html>
2 <head>
3   <script src="http://gunkelweb.com/coms493/s
4 </head>
5 <body>
6 <script>
7 //make the network
8 const { Layer, Network } = window.synaptic;
9
10 var inputLayer = new Layer(1);
11 var hiddenLayer = new Layer(3);
12 var outputLayer = new Layer(1);
13
14 inputLayer.project(hiddenLayer);
15 hiddenLayer.project(outputLayer);
16
17 var myNetwork = new Network({
18   input: inputLayer,
19   hidden: [hiddenLayer],
20   output: outputLayer });
21
22 // train the network
23 var learningRate = .3;
24 for (var i = 0; i < 80000; i++)
25 {
26   myNetwork.activate([0.30]);
27   myNetwork.propagate(learningRate, [0]);
28
29   myNetwork.activate([0.50]);
30   myNetwork.propagate(learningRate, [0.10]);
31
32   myNetwork.activate([0.70]);
33   myNetwork.propagate(learningRate, [0.21]);
34
35   myNetwork.activate([.99]);
36   myNetwork.propagate(learningRate, [0.38]);
37 }
38 // run the network
39 var temp = prompt("Enter Degrees Fahrenheit");
40 var tempF = "." + temp;
41 var result = myNetwork.activate([tempF]);
42 result = String(result).slice(2,4);
43 document.write("<h1>" + temp + " F is approxima
44 </script>
45 </body>
46 </html>

```

```

/*****
NEURON
*****/

function Neuron() {
  this.ID = Neuron.uid();
  this.label = null;
  this.connections = {
    inputs: {},
    projected: {},
    gated: {}
  };
  this.error = {
    responsibility: 0,
    projected: 0,
    gated: 0
  };
  this.trace = {
    eligibility: {},
    extended: {},
    influences: {}
  };
  this.state = 0;
  this.old = 0;
  this.activation = 0;
  this.selfconnection = new Neuron.connection(this, this, 0); // weight = 0 -> not connected
  this.squash = Neuron.squash.LOGISTIC;
  this.neighbors = {};
  this.bias = Math.random() * .2 - .1;
}

Neuron.prototype = {

  // activate the neuron
  activate: function(input) {
    // activation from environment (for input neurons)
    if (typeof input !== 'undefined') {
      this.activation = input;
      this.derivative = 0;
      this.bias = 0;
      return this.activation;
    }

    // old state
    this.old = this.state;

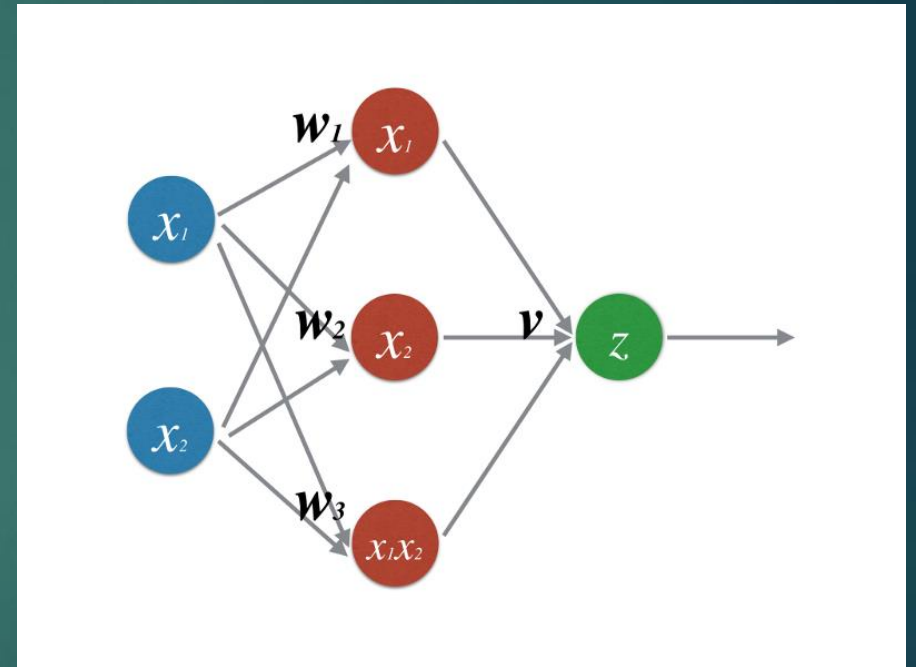
    // eq. 15
    this.state = this.selfconnection.gain * this.selfconnection.weight *
      this.state + this.bias;

    for (var i in this.connections.inputs) {
      var input = this.connections.inputs[i];
      this.state += input.from.activation * input.weight * input.gain;
    }
  }
}

```

```
temp_machine_learning.html x
1 <html>
2 <head>
3   <script src="http://gunkelweb.com/coms493/synaptic.js"></script>
4 </head>
5 <body>
6 <script>
7   //make the network
8   const { Layer, Network } = window.synaptic;
9
10  var inputLayer = new Layer(1);
11  var hiddenLayer = new Layer(3);
12  var outputLayer = new Layer(1);
13
14  inputLayer.project(hiddenLayer);
15  hiddenLayer.project(outputLayer);
16
17  var myNetwork = new Network({
18    input: inputLayer,
19    hidden: [hiddenLayer],
20    output: outputLayer });
21
22  // train the network
23  var learningRate = .3;
24  for (var i = 0; i < 80000; i++)
25  {
26    myNetwork.activate([0.30]);
27    myNetwork.propagate(learningRate, [0]);
28
29    myNetwork.activate([0.50]);
30    myNetwork.propagate(learningRate, [0.10]);
31
32    myNetwork.activate([0.70]);
33    myNetwork.propagate(learningRate, [0.21]);
34
35    myNetwork.activate([.99]);
36    myNetwork.propagate(learningRate, [0.38]);
37  }
38  // run the network
39  var temp = prompt("Enter Degrees Fahrenheit");
40  var tempF = "." + temp;
41  var result = myNetwork.activate([tempF]);
42  result = String(result).slice(2,4);
43  document.write("<h1>" + temp + " F is approximately " + result + " C </h1>");
44 </script>
45 </body>
46 </html>
```

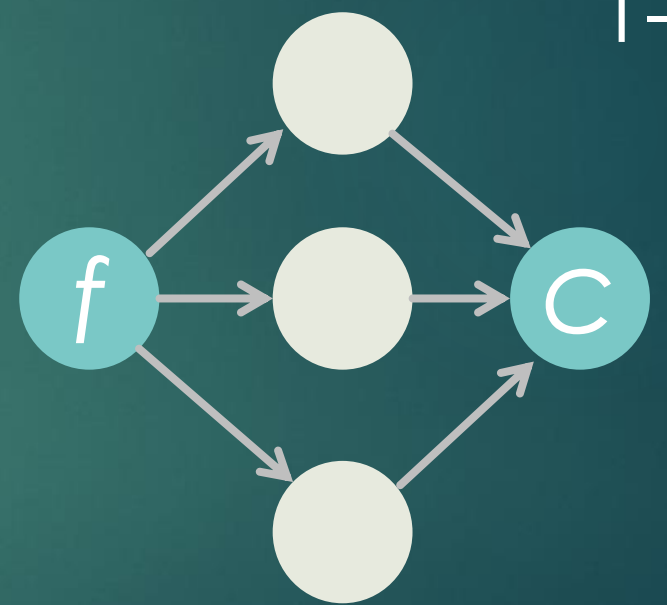
2. Construct the Neural Network



```
temp_machine_learning.html x
1 <html>
2 <head>
3   <script src="http://gunkelweb.com/coms493/synaptic.js"></script>
4 </head>
5 <body>
6 <script>
7   //make the network
8   const { Layer, Network } = window.synaptic;
9
10  var inputLayer = new Layer(1);
11  var hiddenLayer = new Layer(3);
12  var outputLayer = new Layer(1);
13
14  inputLayer.project(hiddenLayer);
15  hiddenLayer.project(outputLayer);
16
17  var myNetwork = new Network({
18    input: inputLayer,
19    hidden: [hiddenLayer],
20    output: outputLayer });
21
22  // train the network
23  var learningRate = .3;
24  for (var i = 0; i < 80000; i++)
25  {
26    myNetwork.activate([0.30]);
27    myNetwork.propagate(learningRate, [0]);
28
29    myNetwork.activate([0.50]);
30    myNetwork.propagate(learningRate, [0.10]);
31
32    myNetwork.activate([0.70]);
33    myNetwork.propagate(learningRate, [0.21]);
34
35    myNetwork.activate([.99]);
36    myNetwork.propagate(learningRate, [0.38]);
37  }
38  // run the network
39  var temp = prompt("Enter Degrees Fahrenheit");
40  var tempF = "." + temp;
41  var result = myNetwork.activate([tempF]);
42  result = String(result).slice(2,4);
43  document.write("<h1>" + temp + " F is approximately " + result + " C </h1>");
44 </script>
45 </body>
46 </html>
```

2. Construct the Neural Network

1-3-1



Input Layer

Hidden Layer

Output Layer

```
temp_machine_learning.html x
1 <html>
2 <head>
3   <script src="http://gunkelweb.com/coms493/synaptic.js"></script>
4 </head>
5 <body>
6 <script>
7 //make the network
8 const { Layer, Network } = window.synaptic;
9
10 var inputLayer = new Layer(1);
11 var hiddenLayer = new Layer(3);
12 var outputLayer = new Layer(1);
13
14 inputLayer.project(hiddenLayer);
15 hiddenLayer.project(outputLayer);
16
17 var myNetwork = new Network({
18   input: inputLayer,
19   hidden: [hiddenLayer],
20   output: outputLayer });
21
22 // train the network
23 var learningRate = .3;
24 for (var i = 0; i < 80000; i++)
25 {
26   myNetwork.activate([0.30]);
27   myNetwork.propagate(learningRate, [0]);
28
29   myNetwork.activate([0.50]);
30   myNetwork.propagate(learningRate, [0.10]);
31
32   myNetwork.activate([0.70]);
33   myNetwork.propagate(learningRate, [0.21]);
34
35   myNetwork.activate([.99]);
36   myNetwork.propagate(learningRate, [0.38]);
37 }
38 // run the network
39 var temp = prompt("Enter Degrees Fahrenheit");
40 var tempF = "." + temp;
41 var result = myNetwork.activate([tempF]);
42 result = String(result).slice(2,4);
43 document.write("<h1>" + temp + " F is approximately " + result + " C </h1>");
44 </script>
45 </body>
46 </html>
```

3. Train the Network on Data

Four pieces of data:

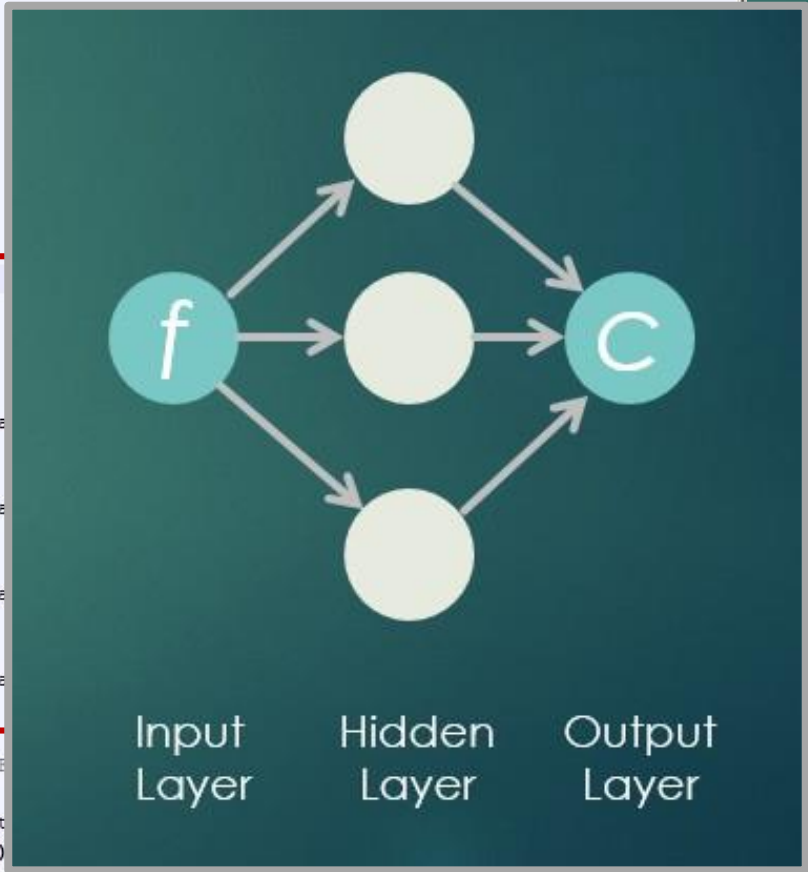
30 F / 0 C

50 F / 10 C

70 F / 21 C

99 F / 38 C

```
temp_machine_learning.html x
1 <html>
2 <head>
3   <script src="http://gunkelweb.com/coms493/synaptic.js"></script>
4 </head>
5 <body>
6 <script>
7 //make the network
8 const { Layer, Network } = window.synaptic;
9
10 var inputLayer = new Layer(1);
11 var hiddenLayer = new Layer(3);
12 var outputLayer = new Layer(1);
13
14 inputLayer.project(hiddenLayer);
15 hiddenLayer.project(outputLayer);
16
17 var myNetwork = new Network({
18   input: inputLayer,
19   hidden: [hiddenLayer],
20   output: outputLayer });
21
22 // train the network
23 var learningRate = .3;
24 for (var i = 0; i < 80000; i++)
25 {
26   myNetwork.activate([0.30]);
27   myNetwork.propagate(learningRate);
28
29   myNetwork.activate([0.50]);
30   myNetwork.propagate(learningRate);
31
32   myNetwork.activate([0.70]);
33   myNetwork.propagate(learningRate);
34
35   myNetwork.activate([.99]);
36   myNetwork.propagate(learningRate);
37 }
38 // run the network
39 var temp = prompt("Enter Degrees F");
40 var tempF = "." + temp;
41 var result = myNetwork.activate([tempF]);
42 result = String(result).slice(2,4);
43 document.write("<h1>" + temp + " F is approximately " + result + " C </h1>");
44 </script>
45 </body>
46 </html>
```



3. Train the Network on Data

- a) Forward Propagation – activate the network; send data into the network from the input layer
- b) Produce different outputs and compare the actual output to the intended output. The “weight” of the connections to the hidden layer influence the value of the output.
- c) Back Propagation – calculate the difference between actual and intended result. Use this figure to adjust the weights of the connections to the hidden layer.
- d) Do this **80,000** times! “Tune” the weights to produce better results.

```
temp_machine_learning.html x
1 <html>
2 <head>
3   <script src="http://gunkelweb.com/coms493/synaptic.js"></script>
4 </head>
5 <body>
6 <script>
7 //make the network
8 const { Layer, Network } = window.synaptic;
9
10 var inputLayer = new Layer(1);
11 var hiddenLayer = new Layer(3);
12 var outputLayer = new Layer(1);
13
14 inputLayer.project(hiddenLayer);
15 hiddenLayer.project(outputLayer);
16
17 var myNetwork = new Network({
18   input: inputLayer,
19   hidden: [hiddenLayer],
20   output: outputLayer });
21
22 // train the network
23 var learningRate = .3;
24 for (var i = 0; i < 80000; i++)
25 {
26   myNetwork.activate([0.30]);
27   myNetwork.propagate(learningRate, [0]);
28
29   myNetwork.activate([0.50]);
30   myNetwork.propagate(learningRate, [0.10]);
31
32   myNetwork.activate([0.70]);
33   myNetwork.propagate(learningRate, [0.21]);
34
35   myNetwork.activate([.99]);
36   myNetwork.propagate(learningRate, [0.38]);
37 }
38 // run the network
39 var temp = prompt("Enter Degrees Fahrenheit");
40 var tempF = "." + temp;
41 var result = myNetwork.activate([tempF]);
42 result = String(result).slice(2,4);
43 document.write("<h1>" + temp + " F is approximately " + result + " C </h1>");
44 </script>
45 </body>
46 </html>
```

4. Run or Test the Network

- Use `prompt()` to create a dialogue box where you can enter degrees F
- Activate the network by sending this number into the network. Produce an output and format the number.
- Use `document.write()` to display the result (the output).

```
temp_machine_learning.html x
1 <html>
2 <head>
3   <script src="http://gunkelweb.com/coms493/synaptic.js"></script>
4 </head>
5 <body>
6 <script>
7 //make the network
8 const { Layer, Network } = window.synaptic;
9
10 var inputLayer = new Layer(1);
11 var hiddenLayer = new Layer(3);
12 var outputLayer = new Layer(1);
13
14 inputLayer.project(hiddenLayer);
15 hiddenLayer.project(outputLayer);
16
17 var myNetwork = new Network({
18   input: inputLayer,
19   hidden: [hiddenLayer],
20   output: outputLayer });
21
22 // train the network
23 var learningRate = .3;
24 for (var i = 0; i < 80000; i++)
25 {
26   myNetwork.activate([0.30]);
27   myNetwork.propagate(learningRate, [0]);
28
29   myNetwork.activate([0.50]);
30   myNetwork.propagate(learningRate, [0.10]);
31
32   myNetwork.activate([0.70]);
33   myNetwork.propagate(learningRate, [0.21]);
34
35   myNetwork.activate([.99]);
36   myNetwork.propagate(learningRate, [0.38]);
37 }
38 // run the network
39 var temp = prompt("Enter Degrees Fahrenheit");
40 var tempF = "." + temp;
41 var result = myNetwork.activate([tempF]);
42 result = String(result).slice(2,4);
43 document.write("<h1>" + temp + " F is approximately " + result + " C </h1>");
44 </script>
45 </body>
46 </html>
```



A number that was part of the training data



A number that was **NOT** part of the training data


```
temp_machine_learning.html x
1 <html>
2 <head>
3   <script src="http://gunkelweb.com/coms493/synaptic.js"></script>
4 </head>
5 <body>
6 <script>
7 //make the network
8 const { Layer, Network } = window.synaptic;
9
10 var inputLayer = new Layer(1);
11 var hiddenLayer = new Layer(3);
12 var outputLayer = new Layer(1);
13
14 inputLayer.project(hiddenLayer);
15 hiddenLayer.project(outputLayer);
16
17 var myNetwork = new Network({
18   input: inputLayer,
19   hidden: [hiddenLayer],
20   output: outputLayer });
21
22 // train the network
23 var learningRate = .3;
24 for (var i = 0; i < 80000; i++)
25 {
26   myNetwork.activate([0.30]);
27   myNetwork.propagate(learningRate, [0]);
28
29   myNetwork.activate([0.50]);
30   myNetwork.propagate(learningRate, [0.10]);
31
32   myNetwork.activate([0.70]);
33   myNetwork.propagate(learningRate, [0.21]);
34
35   myNetwork.activate([.99]);
36   myNetwork.propagate(learningRate, [0.38]);
37 }
38 // run the network
39 var temp = prompt("Enter Degrees Fahrenheit");
40 var tempF = "." + temp;
41 var result = myNetwork.activate([tempF]);
42 result = String(result).slice(2,4);
43 document.write("<h1>" + temp + " F is approximately " + result + " C </h1>");
44 </script>
45 </body>
46 </html>
```

Improvements/Mods

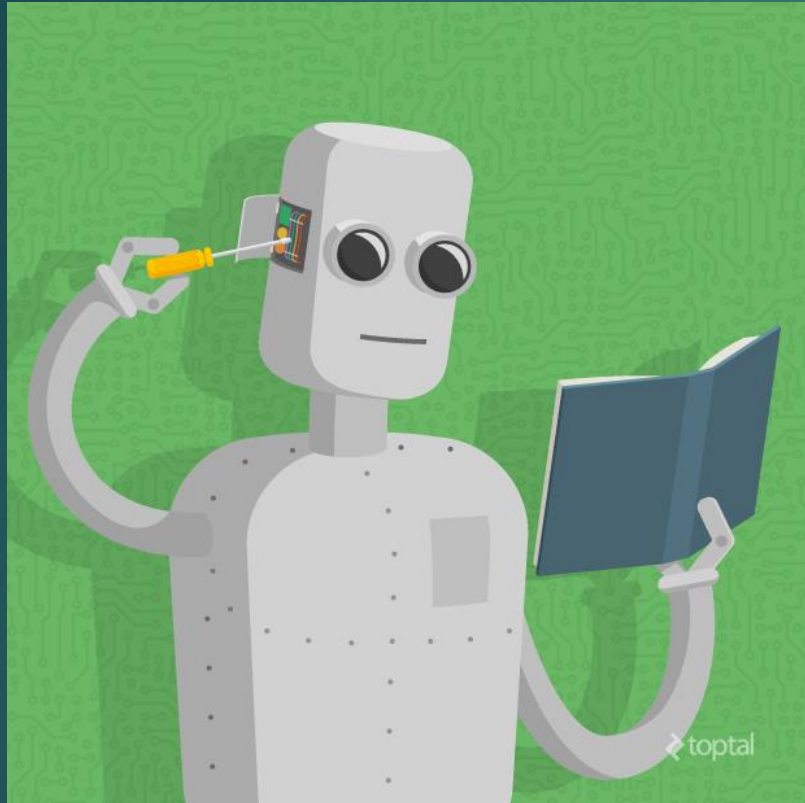
Increase the size of the data that is used for training

Adjust the number of times this data is feed through the network.

Adjust the way the network alters the weights; this is called the Learning Rate

Increase the size of the network. Add more neurons to the hidden layer or add more layers. When there are numerous hidden layers, this is called "deep learning."

v2 – Machine Learning



Summary

- Set-up a neural network (i.e. 1-3-1 network) and feed it some data
- Programmer does not know all the conversion data. The network “discovers” or “learns” conversion patterns from data.
- Variables effecting outcome: Quality and quantity of the data; number of layers in the network; learning rate (weight adjustment)

Summary



Algorithm

Input



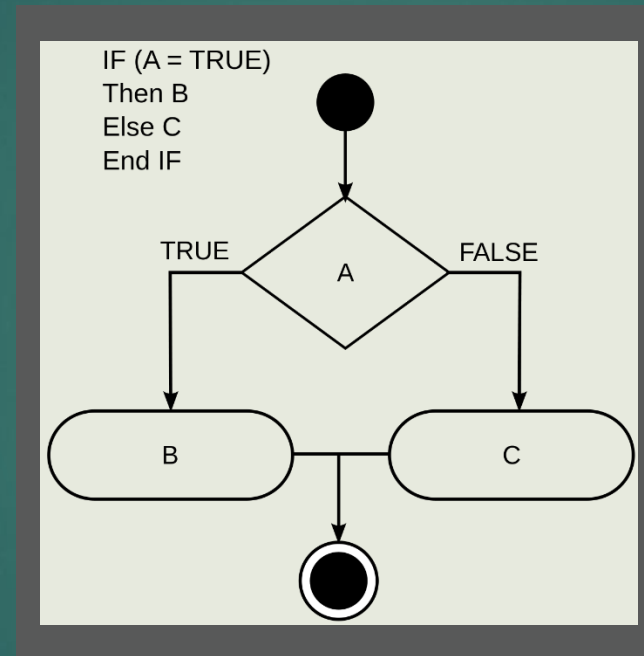
Output

*Magic
Fear*

Summary

GOF AI Algorithm

Input



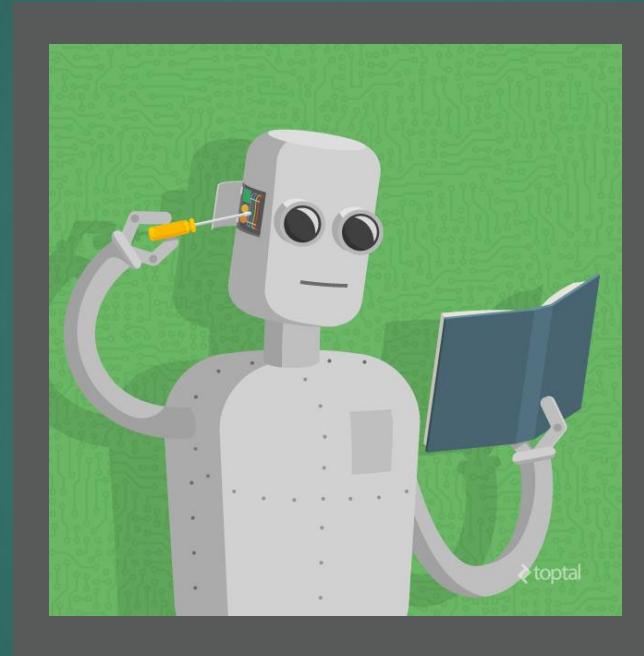
Output

- Explicit step-by-step instructions
- Programmer can locate problems in the code and make edits to affect the output
- Proprietary Algorithms vs. Open Access

Summary

ML Algorithm

Input

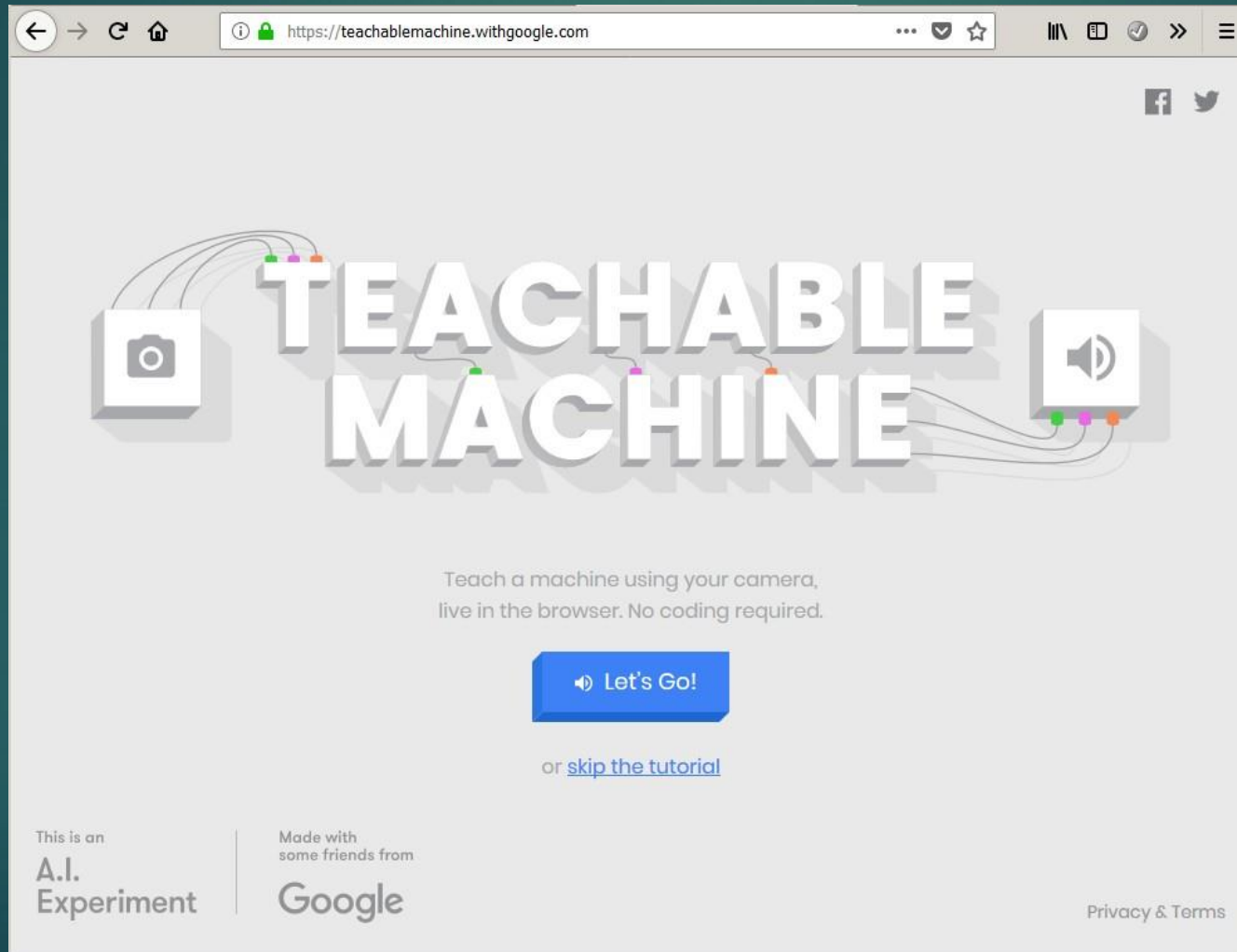


Output

- Algorithm discovers patterns in data
- Potential problems – Error or bias in the training data
- Cannot inspect code to find the source of the error
- Programmer does not know what the program will do until it does it.

Learning More

<https://teachablemachine.withgoogle.com/>



The screenshot shows a web browser window with the URL <https://teachablemachine.withgoogle.com/>. The page features a large, stylized title "TEACHABLE MACHINE" in white, 3D block letters. To the left of the title is a camera icon, and to the right is a speaker icon, both connected to the text by thin lines. Below the title, the text reads: "Teach a machine using your camera, live in the browser. No coding required." A prominent blue button with a white play icon and the text "Let's Go!" is centered below this text. Underneath the button, there is a link that says "or [skip the tutorial](#)". At the bottom left, it says "This is an A.I. Experiment". In the center, it says "Made with some friends from Google". At the bottom right, there is a link for "Privacy & Terms".

← → ↻ 🏠 <https://teachablemachine.withgoogle.com/> ⋮ 🛡️ ☆ 📄 📄 📄 📄 📄 📄

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TEACHABLE MACHINE

Teach a machine using your camera,
live in the browser. No coding required.

▶ Let's Go!

or [skip the tutorial](#)

This is an
A.I.
Experiment

Made with
some friends from
Google

[Privacy & Terms](#)

Preview

- ▶ NLP & Computational Creativity
 - ▶ Intro to Communication & AI - ch. 5-6
 - ▶ Amper & Taryn Southern (videos)
 - ▶ Sunspring (video)

David J. Gunkel

An Introduction to **Communication and Artificial Intelligence**

