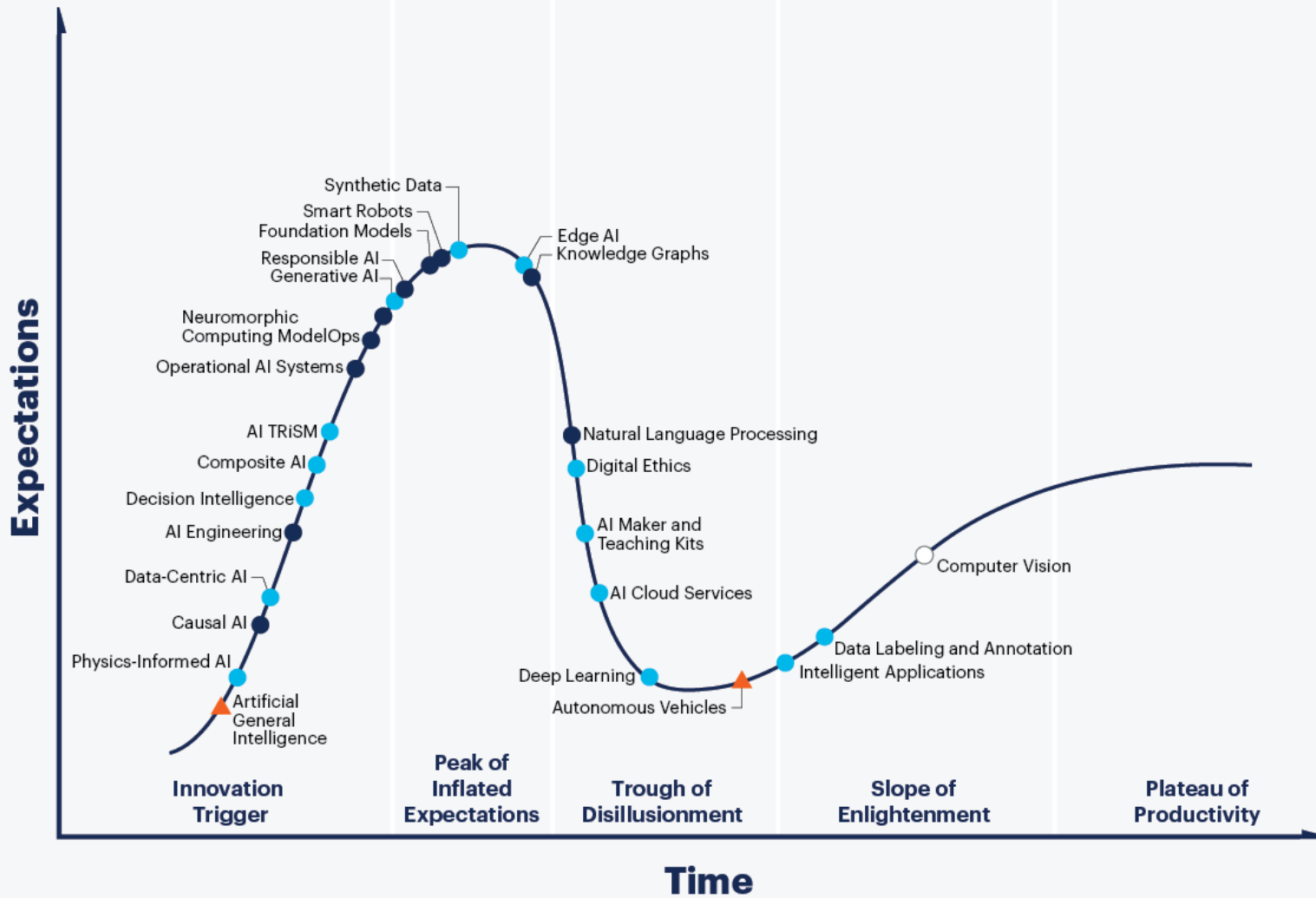




Jean-Louis Giavitto

IA & Musique
entre autotélisme et créativité computationnelle : dépasser l'imitation

Hype Cycle for Artificial Intelligence, 2022



Plateau will be reached:

○ less than 2 years

● 2 to 5 years

● 5 to 10 years

▲ more than 10 years

⊗ obsolete before plateau

As of July 2022

[gartner.com](https://www.gartner.com)

Source: Gartner
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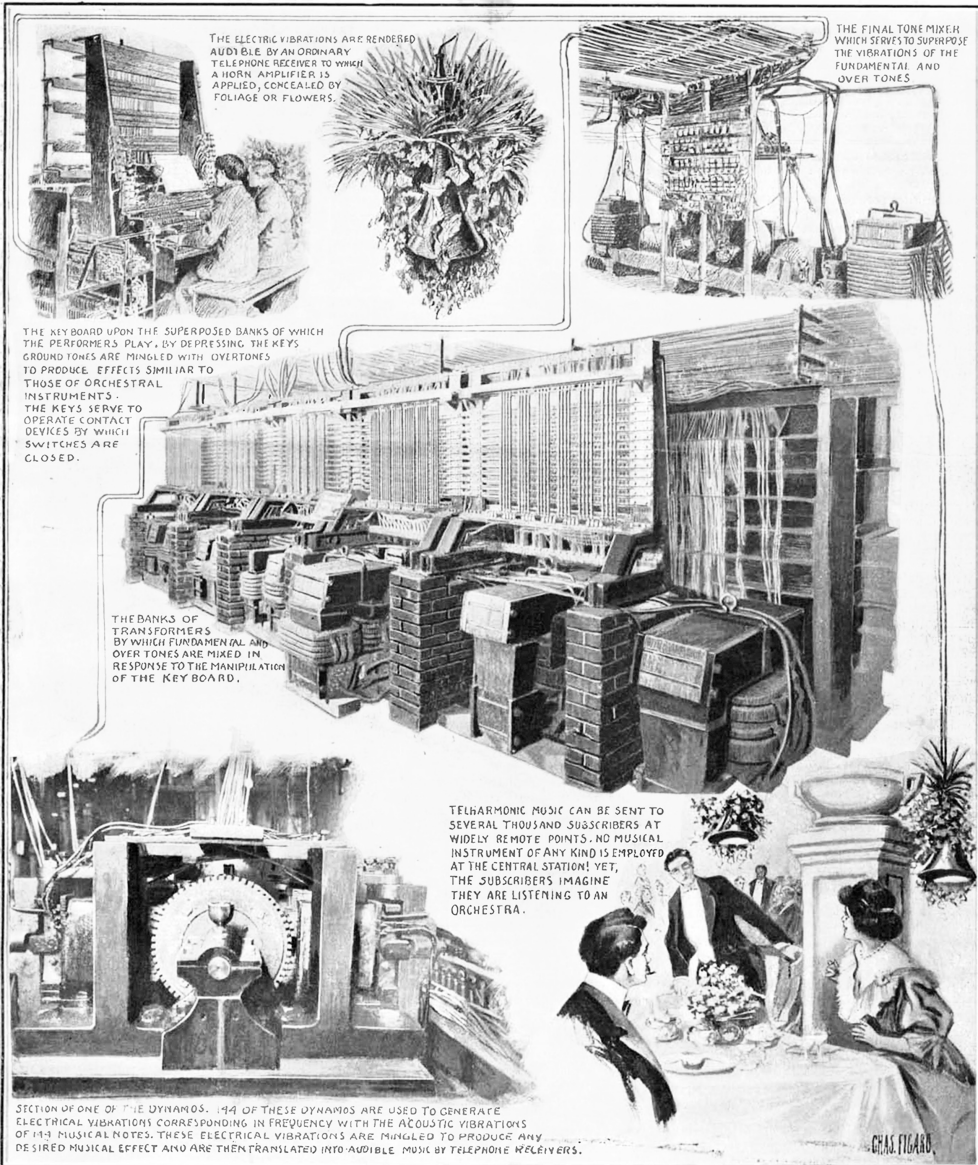
Gartner

Déroulé

- Musique et calcul
une brève histoire de la composition algorithmique
- Au-delà de la composition
- La chambre chinoise artistique
- La course à l'échalotte : IA et émotions
- Vivre ensemble

<https://polr.ircam.fr/wa6ur>

MUSIQUE ET CALCUL



THE TELHARMONIUM—AN APPARATUS FOR THE ELECTRICAL GENERATION AND TRANSMISSION OF MUSIC.—[See page 210.]

La musique électronique

<https://www.brainvoyagermusic.com/history-of-electronic-music>



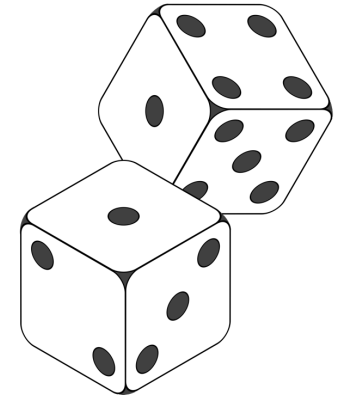
SWEETHEART SWEETHEART

YOU ARE MY LOVABLE ENCHANTMENT. MY BEAUTIFUL DEVOTION FONDLY
ADORES YOUR LUST. YOU ARE MY AVID HEART: MY WISTFUL LUST: MY CURIOUS
TENDERNESS.

YOURS PASSIONATELY

M. U. C.

1. "Vous êtes mon" AdjectifNom
2. "Mon" Adjectif (optionnel)NomAdverbe (optionnel)Verbe,
"Votre" Adjectif (optionnel)Nom
3. Générer "Votre" Adverbe, "M.U.C"



Musikalisches Würfelspiel

	m1	m2	m3	m4	m5	m6	m7	m8	m9	m10	m11	m12	m13	m14	m15	m16
roll 2	96	22	141	41	105	122	11	30	70	121	26	9	112	49	109	14
roll 3	32	6	128	63	146	46	134	81	117	39	126	56	174	18	116	83
roll 4	69	95	158	13	153	55	110	24	66	139	15	132	73	58	145	79
roll 5	40	17	113	85	161	2	159	100	90	176	7	34	67	160	52	170
roll 6	148	74	163	45	80	97	36	107	25	143	64	125	76	136	1	93
roll 7	104	157	27	167	154	68	118	91	138	71	150	29	101	162	23	151
roll 8	152	60	171	53	99	133	21	127	16	155	57	175	43	168	89	172
roll 9	119	84	114	50	140	86	169	94	120	88	48	166	51	115	72	111
roll 10	98	142	42	156	75	129	62	123	65	77	19	82	137	38	149	8
roll 11	3	87	165	61	135	47	147	33	102	4	31	164	144	59	173	78
roll 12	54	130	10	103	28	37	106	5	35	20	108	92	12	124	44	131

<https://dice.humdrum.org/>



Johann Philipp Kirnberger : *Der allezeit fertige Menuetten- und Polonaisencomponist (1757)*



Hiller & Isaacson

The Illiac Suite (1957)

4 mouvements pour quartet,
composés par un ordinateur,
chacun explorant une approche
algorithmique différente :

1. génération de cantus firmus
2. génération des segments à quatre voix par diverses règles
3. exploration dans les domaines du rythme, de la dynamique et des instructions de jeu
4. divers modèles et probabilités pour les grammaires génératives ou les chaînes de Markov

Experimental Music

COMPOSITION WITH
AN ELECTRONIC COMPUTER

Lejaren A. Hiller, Jr.

ASSISTANT PROFESSOR OF MUSIC
SCHOOL OF MUSIC, UNIVERSITY OF ILLINOIS

Leonard M. Isaacson

MATHEMATICIAN
STANDARD OIL COMPANY OF CALIFORNIA
FORMERLY RESEARCH ASSOCIATE
UNIVERSITY OF ILLINOIS

McGRAW-HILL BOOK COMPANY, INC.

1959 NEW YORK TORONTO LONDON

Lejaren Hiller - *Illiac Suite for String Quartet* (1956)

First experiment: presto, andante, allegro

Lejaren Hiller - *Illiac Suite for String Quartet* (1956)

Second experiment: adagio, ma non troppo lento

1957

Lejaren Hiller - *Illiac Suite for String Quartet* (1956)

Fourth experiment: tanto presto che possibile

Dada engine

<https://github.com/orenmazor/Dada-Engine>

<http://dev.null.org/dadaengine/>

https://www.huffingtonpost.co.uk/justin-cash/computer-arts_b_3083055.html

-> <https://www.elsewhere.org/pomo/>

-> <http://runme.org/feature/read/+postmodgen/+57/>

THE CONTEMPORARY CLASSICAL COMPOSER'S BULLSHIT GENERATOR

I coined the term 'transcription-narrative-music' to describe my most radical approaches to musical composition. I was first introduced to the concept of 'discontinuously-neo-Romantic fanfare-materials' last year, and it has allowed me a greater depth of tone-rows, especially whilst morphing the ultimate movement. This composition challenges all sorts of polychords, before modulating somewhat actively, and finishing with an extremely 20th-century series of 'idiom-timbres' (as I like to call them). My work is, in short, a re-imagining of the 'chromatic-ensembles' school of contemporary 'modulation-phenomenon' composition. For performers, I find that a slightly 21st-century approach can often help to incorporate postmodern gestures - or in some cases, even dictate the tension in question. My work aims to sense complexly-stylistic materials with abstractly-Romantic perceptions whilst repeating certain performers or intra-structured expressions.

<http://www.dominicirving.com/cccbgsg/>

Libertarianism in the works of Cage

Stephen Hubbard *Department of Sociolinguistics, University of Western Topeka*

Catherine E. la Tournier *Department of Deconstruction, Harvard University*

1. Stone and capitalist socialism

If one examines postcultural patriarchalist theory, one is faced with a choice: either accept capitalist socialism or conclude that culture is used to disempower the proletariat, but only if language is distinct from consciousness; if that is not the case, Debord's model of postcultural patriarchalist theory is one of "Foucaultist power relations", and hence intrinsically impossible. It could be said that the main theme of the works of Stone is a precultural whole. Pickett[1] holds that the works of Stone are not postmodern.

The primary theme of Hamburger's[2] essay on cultural theory is not, in fact, desemiocriticism, but postdesemiocriticism. Thus, if libertarianism holds, we have to choose between postcultural patriarchalist theory and precapitalist nihilism. Sontag suggests the use of libertarianism to attack hierarchy.

However, the masculine/feminine distinction depicted in Stone's *Natural Born Killers* emerges again in *Heaven and Earth*. An abundance of theories concerning a mythopoetical totality may be found.

But Brophy[3] states that we have to choose between postcultural patriarchalist theory and conceptual sublimation. Sartre promotes the use of capitalist socialism to read society.

However, if postcultural patriarchalist theory holds, we have to choose between Marxist class and postcultural depatriarchalism. Foucault uses the term 'postcultural patriarchalist theory' to denote the rubicon, and eventually the failure, of dialectic class.

Thus, Marx suggests the use of precultural narrative to deconstruct the status quo. In *Mason & Dixon*, Pynchon reiterates libertarianism; in *The Crying of Lot 49*, although, he deconstructs structural nationalism.

2. Consensuses of rubicon

"Language is part of the absurdity of consciousness," says Foucault. Therefore, la Tournier[4] holds that we have to choose between libertarianism and subcultural deconstructive theory. The subject is interpolated into a premodernist rationalism that includes reality as a whole.

Thus, the characteristic theme of the works of Gaiman is not theory per se, but neotheory. Postcultural patriarchalist theory implies that sexual identity has significance.

Therefore, the subject is contextualised into a deconstructive paradigm of discourse that includes narrativity as a totality. The primary theme of Porter's[5] model of postcultural patriarchalist theory is the difference between art and class.

3. Gaiman and libertarianism

"Culture is unattainable," says Sontag; however, according to Humphrey[6], it is not so much culture that is unattainable, but rather the meaninglessness, and therefore the absurdity, of culture.

Iannis Xenakis

- Musiques formelles (1963)
- théorie probabiliste (*Pithoprakta* et *Achorripsis*, 1956-1957),
- théorie des ensembles (*Herma*, 1960-1961)
- théorie des jeux (*Duel*, 1959 et *Stratégie*, 1962).

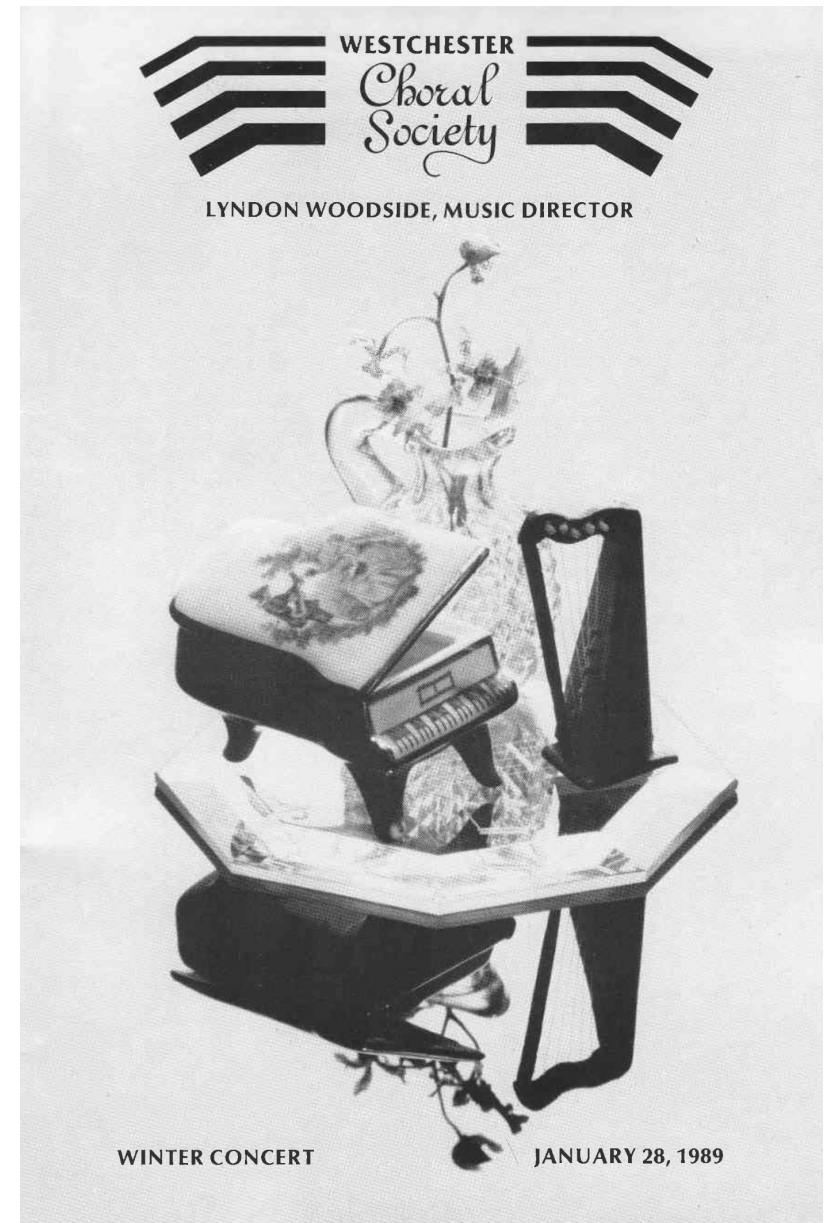


	MTPZ							
↓	A	B	C	D	E	F	G	H
	$(f_0g_0d_0)$	$(f_0g_0d_1)$	$(f_0g_1d_0)$	$(f_0g_1d_1)$	$(f_1g_0d_0)$	$(f_1g_0d_1)$	$(f_1g_1d_0)$	$(f_1g_1d_1)$
$A(f_0g_0d_0)$	0.021	0.357	0.084	0.189	0.165	0.204	0.408	0.096
$B(f_0g_0d_1)$	0.084	0.089	0.076	0.126	0.150	0.136	0.072	0.144
$C(f_0g_1d_0)$	0.084	0.323	0.021	0.126	0.150	0.036	0.272	0.144
$D(f_0g_1d_1)$	0.336	0.081	0.019	0.084	0.135	0.024	0.048	0.216
$E(f_1g_0d_0)$	0.019	0.063	0.336	0.171	0.110	0.306	0.102	0.064
$F(f_1g_0d_1)$	0.076	0.016	0.304	0.114	0.100	0.204	0.018	0.096
$G(f_1g_1d_0)$	0.076	0.057	0.084	0.114	0.100	0.054	0.068	0.096
$H(f_1g_1d_1)$	0.304	0.014	0.076	0.076	0.090	0.036	0.012	0.144

"Analogique A (1958) for 9 strings was dedicated to Fred Goldbeck. It is a practical application of Stochastic Music. The Sounds are chosen statistically in arbitrary ranges of frequency, intensity, and density. These ranges change in accordance with the transitional probabilities which follow a series of consequential events (the Markov series). The probabilities make up linked matrices in which the balanced entities are adjacent. They are linked at their limits. The result is a series of 8 linked 'sound states' which derive their order from a similar but more general Markovian series which is biased towards stability. This series is however subjected to the influence of certain random variations. By virtue of its construction the sound mechanism reverts from these to its balanced state.

Systèmes experts et représentation symbolique des connaissances

- dans les années 80 on passe de l'exploration d'une combinatoire à une approche logique de la représentation et de l'inférence des connaissances : les systèmes experts. La musique devient déductive.
- Kemal Ebcioglu (fin 80): CHORAL
 - l'encodage d'une grande quantité de connaissances sur le style musical considéré
 - l'utilisation de contraintes, à la fois pour générer automatiquement des solutions (avec algorithmes de retour-arrière) et pour éliminer celles qui seraient inacceptables (ce qui suppose l'instauration de règles pour évaluer la qualité du résultat)
 - l'utilisation d'heuristiques spécifiques au style considéré, afin de hiérarchiser les choix de l'algorithme dans le cas de l'extension d'une composition partiellement existante.



4'42

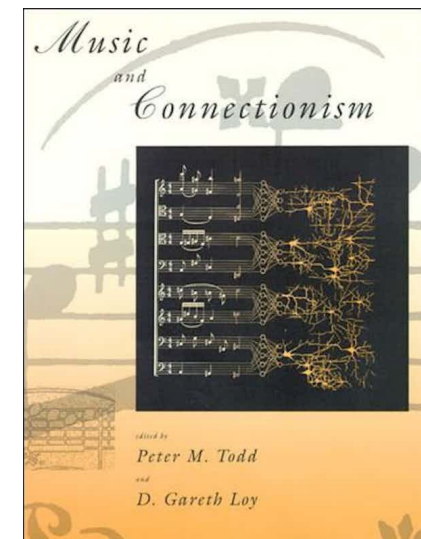
David Cope : Experiment in Musical Intelligence (EMI)

- *"J'ai décidé de passer le pas et de travailler avec une forme d'intelligence artificielle que je connaissais pour programmer quelque chose qui produirait de la musique dans mon propre style. L'idée était que je me ferais la remarque "Ah, je n'écrirais jamais un truc pareil !" et que je me sentirais alors obligé d'abandonner l'ordinateur pour aller écrire ce que j'aurais écrit à la place. C'était donc un peu pour me provoquer, quelque chose qui me donnerait l'impulsion d'aller composer."*
- combinaison les chaînes de Markov et d'autres techniques (grammaires musicales et combinatoire) dans un système semi-automatique
- EMMY, Alena, Emily Howel
- **Mazurka (After Chopin) by David Cope (1994?)**



Deep-learning vs. GOFAI « Good Old Fashioned Artificial intelligence »

- Une chaine de Markov ne produit que des sous-séquences qui existent dans le corpus d'apprentissage
- Les RNN (recurent neural network) peuvent extrapoler
 - 1994 : Todd, Mozer ... en midi
 - pb. de cohérence à court-terme
 - 2002 : Doug Eck LTMS
“long short term memory”

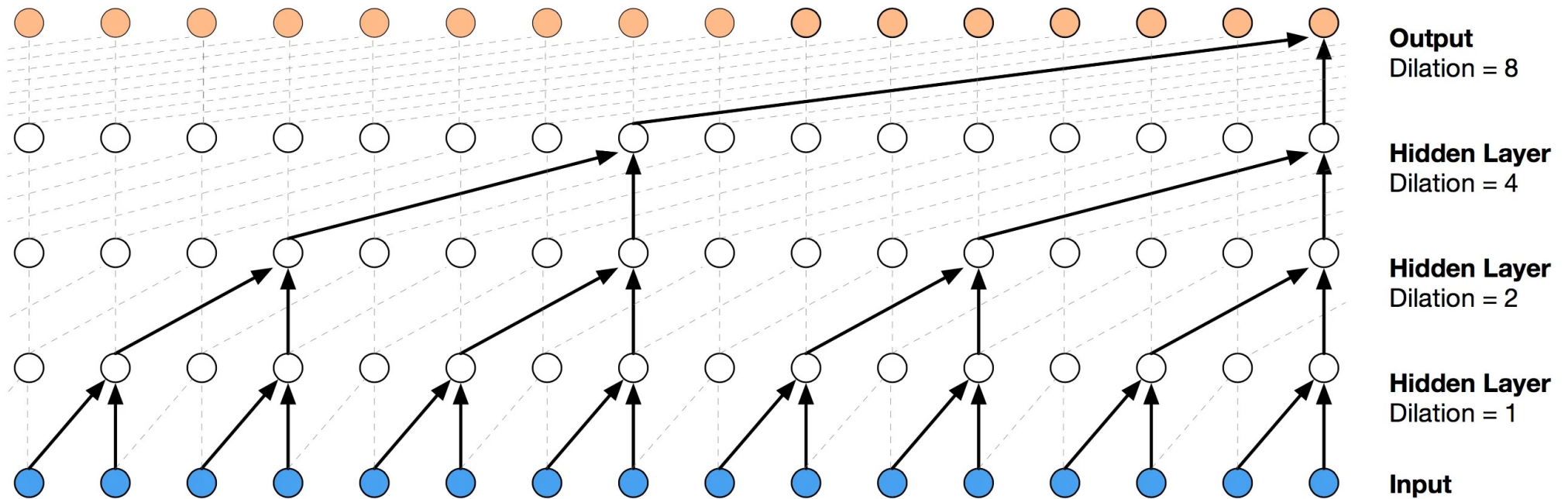


Deep-learning vs. GOFAI « Good Old Fashioned Artificial intelligence »

- La synthèse des sons
- WaveNet 2016 (Text2Speech)
 - dilated causal convolutional layers
 - apprentissage plus facile que RNN

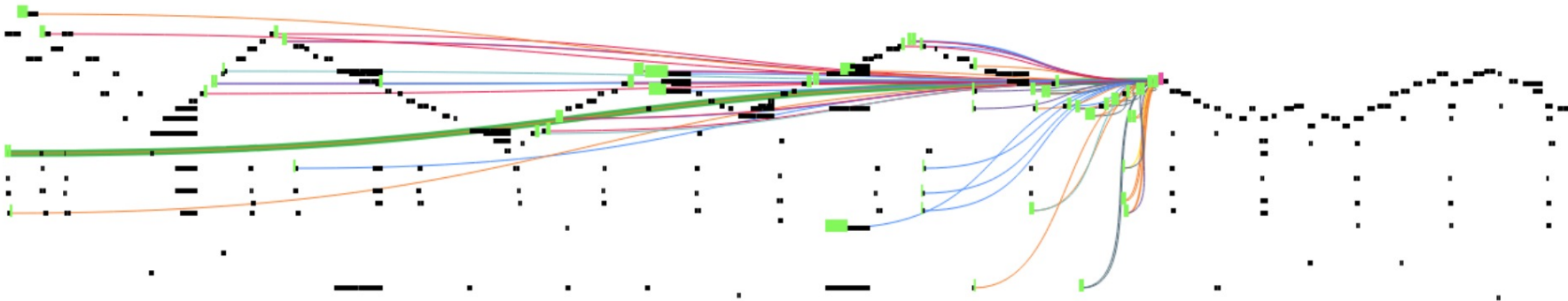
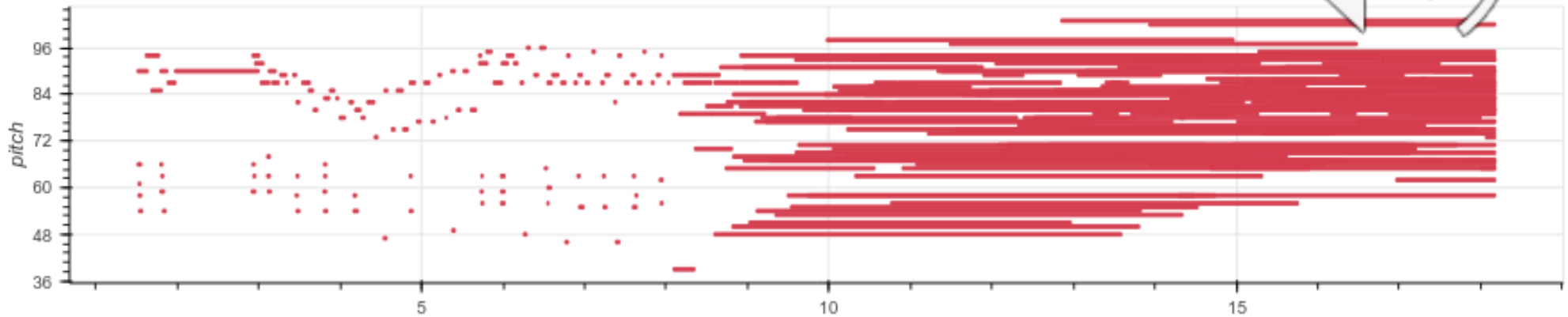


1 Second



Music Transformer (2018)

a sequence model based on self-attention



LES APPLICATIONS SONT LÀ

De la recherche en laboratoire à un marché économique

- AIVA Artificial Intelligence Virtual Artist (<https://www.aiva.ai/>)



La musique fonctionnelle (<http://www.ampermusic.com>)

shutterstock IMAGES VIDEOS MUSIQUE MODÈLES ÉDITORIAL MODÈLES 3D Tarifs Connexion **Essai gratuit**

Musique Rechercher de la musique Recherche par contenu audio

Amper-music musique de stock

107 190 pistes musicales libres de droits

Genres Ambiances Durée BPM Instruments Artistes Plus

PremiumBeat Trier par
Afficher PremiumBeat Populaire

Artiste : Amper Music [Tout effacer](#)

Titre	Extraits	Boucles	Fichiers Stem	Durée	BPM			
Lowly Trouble Proposée par Amper Music	15 30 60	1 2 3 ...	1 2 3 ...	2:16	101			Ajouter au panier
Documentary Gloomy Vitrilic Piano Proposée par Amper Music	15 30 60	1 2 3 ...	1 2 3 ...	2:26	96			Ajouter au panier
Motivational Pep Ambient Proposée par Amper Music	15 30 60	1 2 3 ...	1 2 3 ...	2:17	120			Ajouter au panier
Inspiring His Constitute Wonderful Proposée par Amper Music	15 30 60	1 2 3 ...	1 2 3 ...	2:19	129			Ajouter au panier
Compelling Conclusion Again Proposée par Amper Music	15 30 60	1 2 3 ...	1 2 3 ...	2:56	111			Ajouter au panier
Feisty Relax Clean Facetious Proposée par Amper Music	15 30 60	1 2 3 ...	1 2 3 ...	1:59	145			Ajouter au panier
This Off Weepy Proposée par Amper Music	15 30 60	1 2 3 ...	1 2 3 ...	2:12	87			Ajouter au panier
Abstract Misfire Heart Proposée par Amper Music	15 30 60	1 2 3 ...	1 2 3 ...	2:27	53			Ajouter au panier
I Look Good Business Proposée par Amper Music	15 30 60	1 2 3 ...	1 2 3 ...	2:41	104			Ajouter au panier

Miku Hatsune (初音ミク, *premier son du futur*)

- vocaloid idol
- Crypton Future Media (31 août 2007, Vocaloid 2)
- performances en 3D projetées sur scène
- tournées mondiales



♪ Music Like Magic! / OSTER project

MIKU EXPO
HATSUNE MIKU EXPO 2018 EUROPE

© Crypton Future Media, INC. www.piapro.net piapro / © SEGA
Graphics by SEGA / MARZA ANIMATION PLANET INC.
Production by Crypton Future Media, INC.

Flow Machines (F. Pachet, Sony CSL)

- learns music styles
- combinations of style transfer, optimization, and interaction techniques,
- interactive tool to suggest new melodic creative ideas
- "Daddy's Car" (2016) by Benoit Carré and François Pachet in the style of The Beatles

AU-DELÀ DE LA COMPOSITION

IA pour qui ?

- IA pour le compositeur / l'instrumentiste / le chef d'orchestre / le prof de musique / l'élève / l'auditeur
- en quoi l'IA peut changer chaque étape du workflow musical :
production de matériaux, écoute, notation, orchestration, réalisation de l'électronique, interprétation, mixage, analyse
- quel impact de l'IA sur le dispositif du concert ? sur la « consommation » musicale (recommandation, auralisation)
- pour l'amateur (syst. [autotéliques](#)) ou le professionnel

Artisanat et industrie



Auctorialité

- En 2018, Christie's a vendu aux enchères pour la première fois une peinture créée avec des réseaux adversaires génératifs (GAN) pour 432 500 dollars
- Le mercredi 30 octobre 2019, le United States Patent and Trademark Office invitait le public à commenter treize questions concernant l'impact possible de l'intelligence artificielle sur la création de la propriété intellectuelle.
 - est-il légal de nourrir une IA avec des corpus issus d'auteurs humains ?
 - d'autres personnes que des personnes physiques peuvent-elle avoir droit à la protection du droit d'auteur ?
- Le style d'un auteur ne peut pas être réservé. Le droit d'auteur ne protège pas les idées mais les réalisations de forme.
- Pour l'instant, seul le travail d'un être humain peut faire l'objet d'un droit d'auteur

A Recent Entrance to Paradise



Steven Thaler and/or Creativity Machine

L'IA comme...

- **comme outil**

faire mieux ce qu'on faisait déjà par ailleurs
suivi de F0, synthèse vocale, hybridation, synthèse sonore, etc.

- **comme protagoniste**

la mise en scène de l'IA

- **comme compagnon**

- de nouvelles formes (par exemple des œuvres ouvertes qui s'adaptent à l'auditeur et aux lieux de présentation)
- de nouvelles interactions créatives
- éviter l'outil autonome, permettre le contrôle fin et expressif des capacités génératives de ces systèmes par les musiciens
- au-delà de la notion d'outil : adaptation à l'utilisateur, évolution avec leurs utilisations, brouillage des frontières entre les corps de métier (compositeur, RIM, performeur, ingénieur du son...) et les catégories classiques de l'auctorialité (auteurs, producteurs, receveurs).

Synthèse (par concaténation d'unités) de la voix parlée



Synthèse des enveloppes (génération des enveloppes spectrales, mais excitation originale)

Phrase : Boeu utile

Original

Resynthesisé



Synthèse du signal d'excitation (enveloppes spectrales originales, excitation synthétisée)

Phrase: καί τοίς κάμπουσι πρὸς σέ γόνυ

Original

Resynthesisé



excitation



Masque vocal

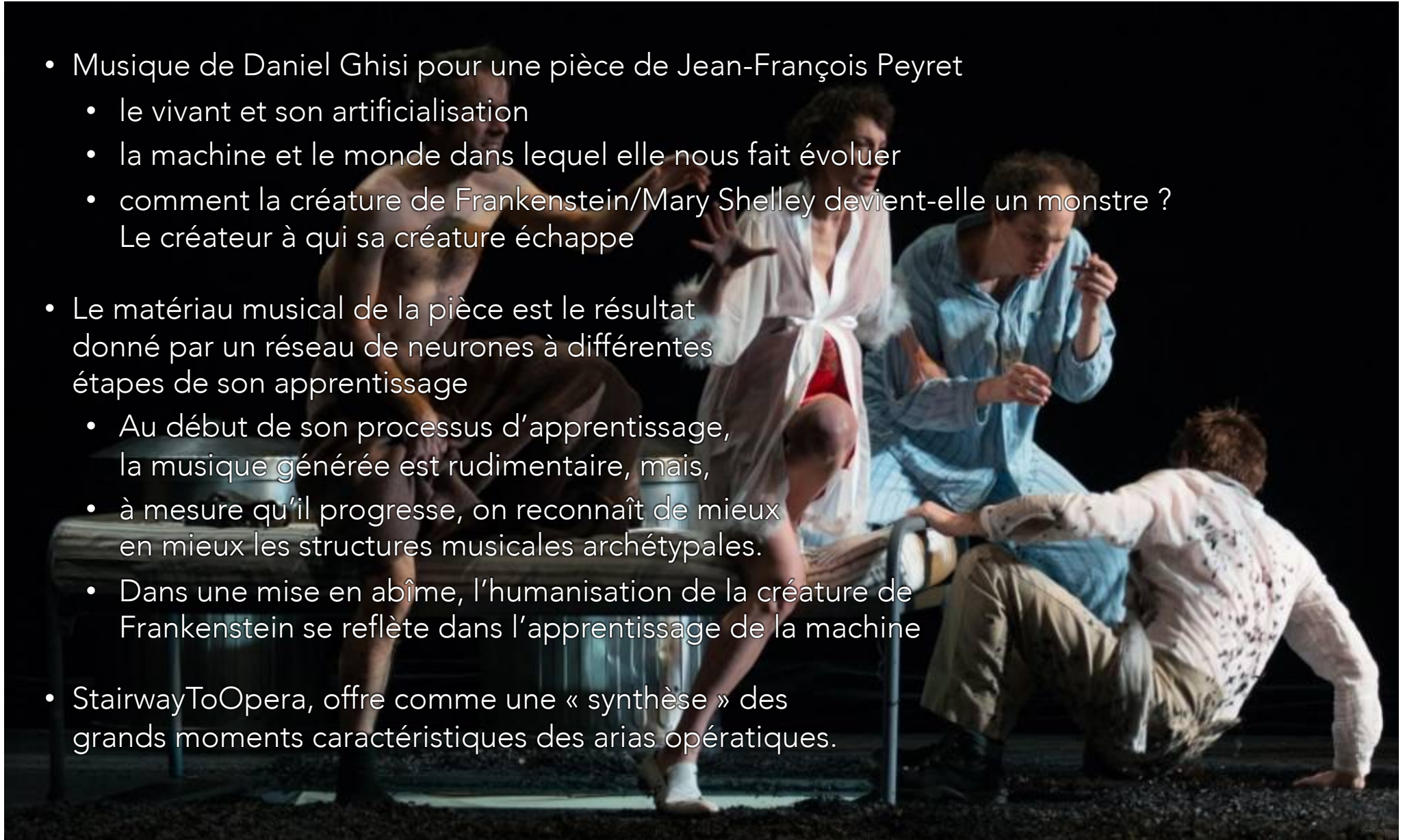


La fabrique des monstres ou mesure pour démesure

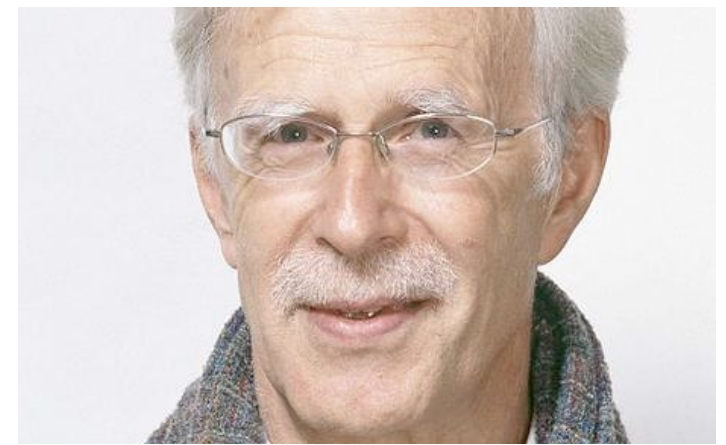
Daniel Ghisi



- Musique de Daniel Ghisi pour une pièce de Jean-François Peyret
 - le vivant et son artificialisation
 - la machine et le monde dans lequel elle nous fait évoluer
 - comment la créature de Frankenstein/Mary Shelley devient-elle un monstre ?
Le créateur à qui sa créature échappe
- Le matériau musical de la pièce est le résultat donné par un réseau de neurones à différentes étapes de son apprentissage
 - Au début de son processus d'apprentissage, la musique générée est rudimentaire, mais,
 - à mesure qu'il progresse, on reconnaît de mieux en mieux les structures musicales archétypales.
 - Dans une mise en abîme, l'humanisation de la créature de Frankenstein se reflète dans l'apprentissage de la machine
- StairwayToOpera, offre comme une « synthèse » des grands moments caractéristiques des arias opératiques.



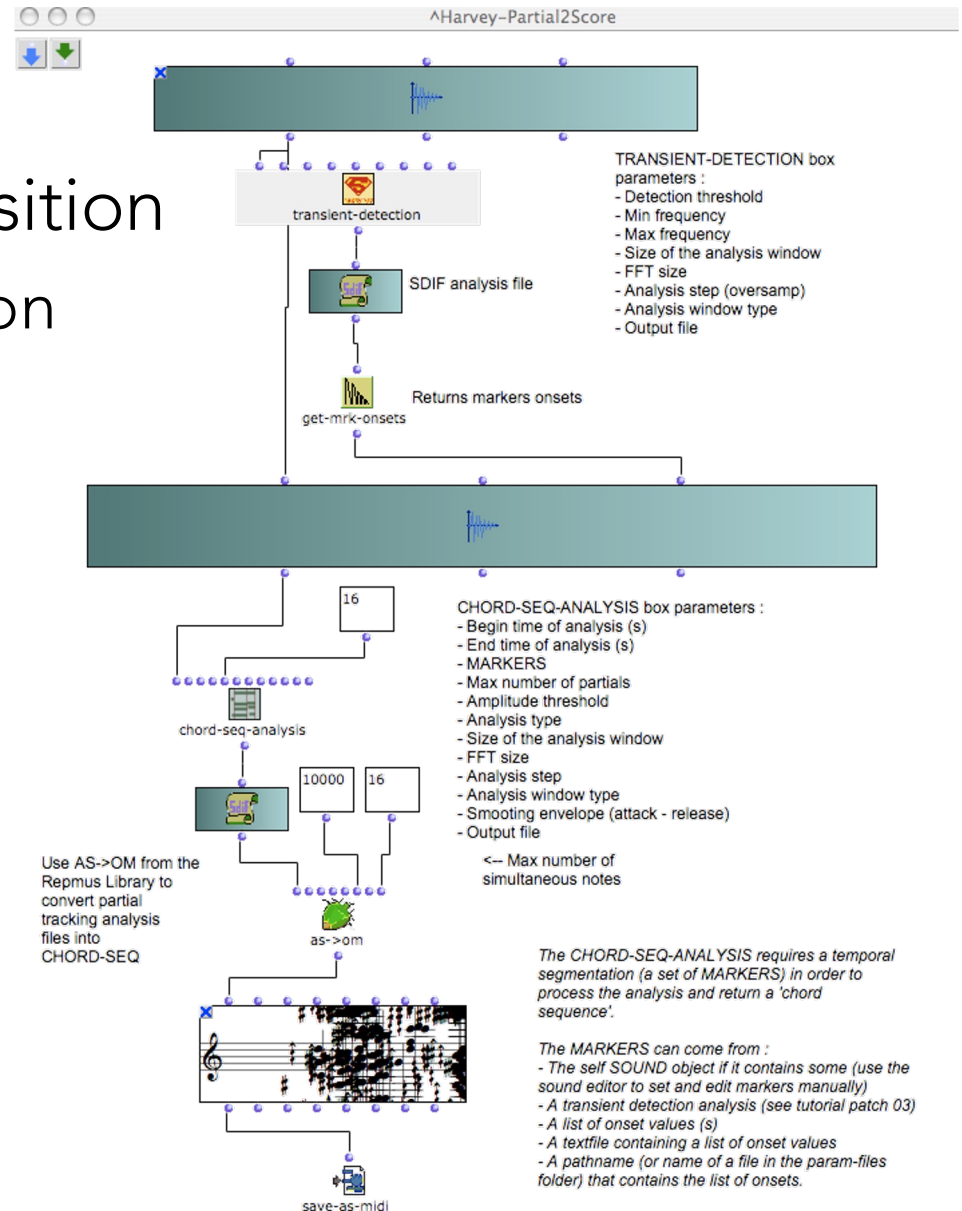
Harvey's « Speakings »



- Jonathan Harvey
 - Idea: An orchestra that speaks
 - From speech to orchestra and vice versa
 - Enrich orchestral timbre using non-existing speech structures
 - Read:
 - G. Nouno, A. Cont, G. Carpentier, and J. Harvey
“Making an Orchestra Speak”, *Sound and Music Computing Conference, 2009*.
Best paper award.
 - Tribune article on Forumnet with Max and OpenMusic patches.
 - Precedence: Modest Mussorgsky, Clarence Barlow
 - Procedure:
 - Study existing artistic approaches (Modest Mussorgsky, Clarence Barlow, ...)
 - Musical research: Prototype ideas, artistic trial and error, choose pertinent approaches.
 - Development & Composition
 - Tests and performance considerations
 - Rehearsal and Concert (Royal Albert Hall, Proms Festival, BBC Orch. 2008)

Harvey's « Speakings »

- Computer Assisted Composition
- Speech to music transcription
- OpenMusic + SuperVP

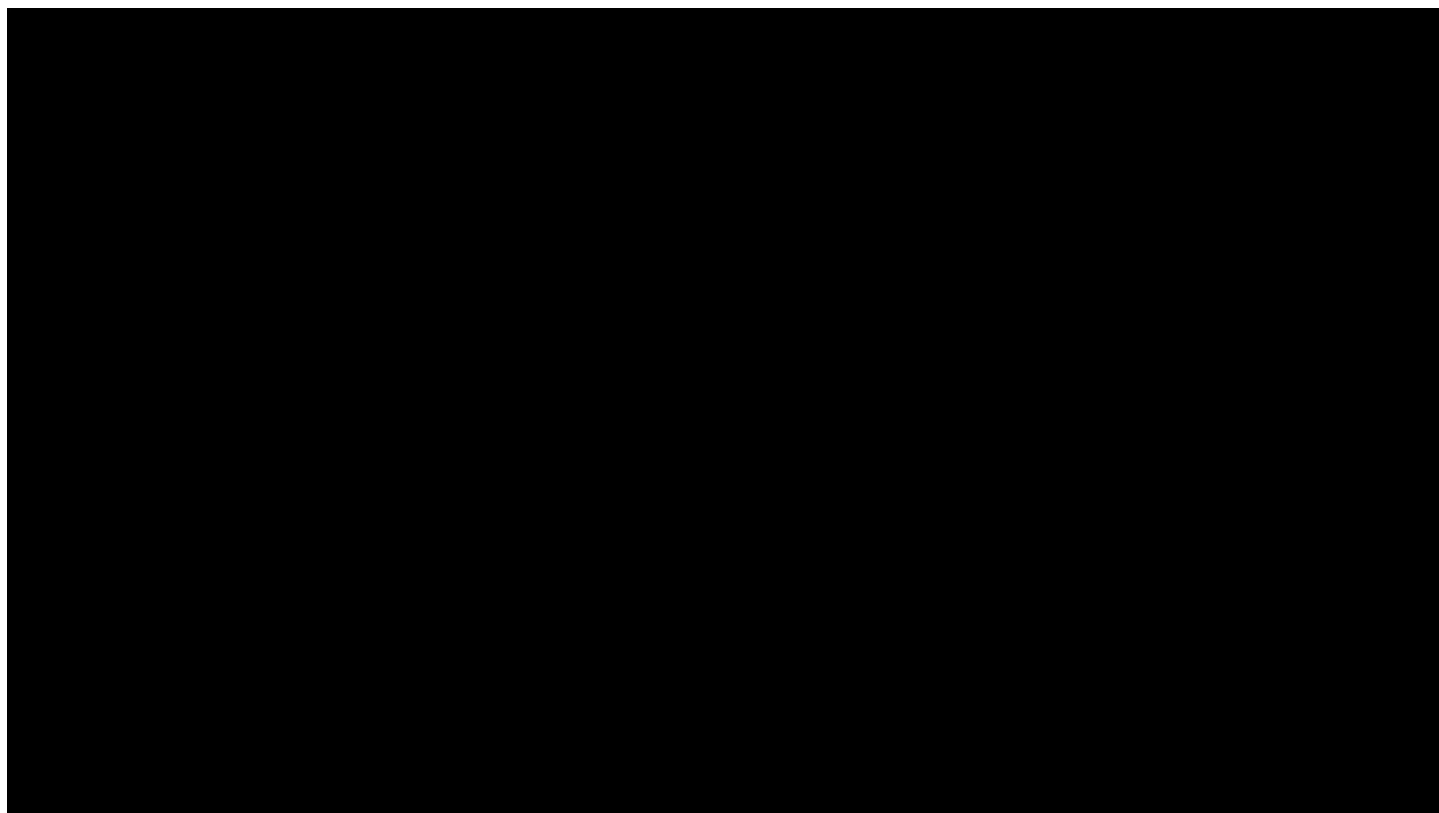


Phase I: CAC

- Automatic Orchestration
 - How to write speech structures for Orchestra?
 - The Orchidée project



Ten years after : Orchestration : « instrumentation by example »
(P. Esling ; C. Cella : Orchidea)



Ce sont les interactions qui sont créatives

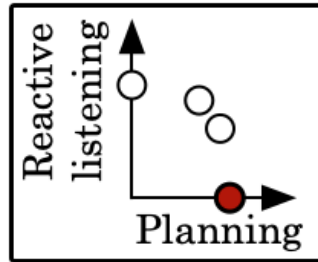
Gérard Assayag : famille OMax, projet REACH

Hervé Seling, Georges Bloch ; Jérôme Nika, Rémi Fox

IA et musique : les agents créatifs autonomes



Pascal Dusapin Lullaby experience



1) Accord cantus firmus



2) Chuchotement



3) Deux agents chaînés : harmonie et chœur, deux corpus



4) Deux agents chaînés :
rythme et chœur



5) 3 + passage de la structure d'une comptine à une autre



6) 5 +
« interpolation
d'une structure à
une autre

Pascal Dusapin : conception et création musicale

Claus Guth : mise en scène

Etienne Pluss : scénographie

Thierry Coduys : spatialisation et mixage

Jérôme Nika : dispositif électronique et informatique musicale,
RepMus et U. La Rochelle

Buzzing Light : développement de l'app. de collecte

Ensemble Modern commande

ENREGISTREMENTS COLLECTÉS



Transmodalité (vers le contrôle)

- AudioLM

<https://google-research.github.io/seanet/audiolm/examples/>

- MusicLM

<https://google-research.github.io/seanet/musiclm/examples/>

- Music LDM

<https://musicldm.github.io/>

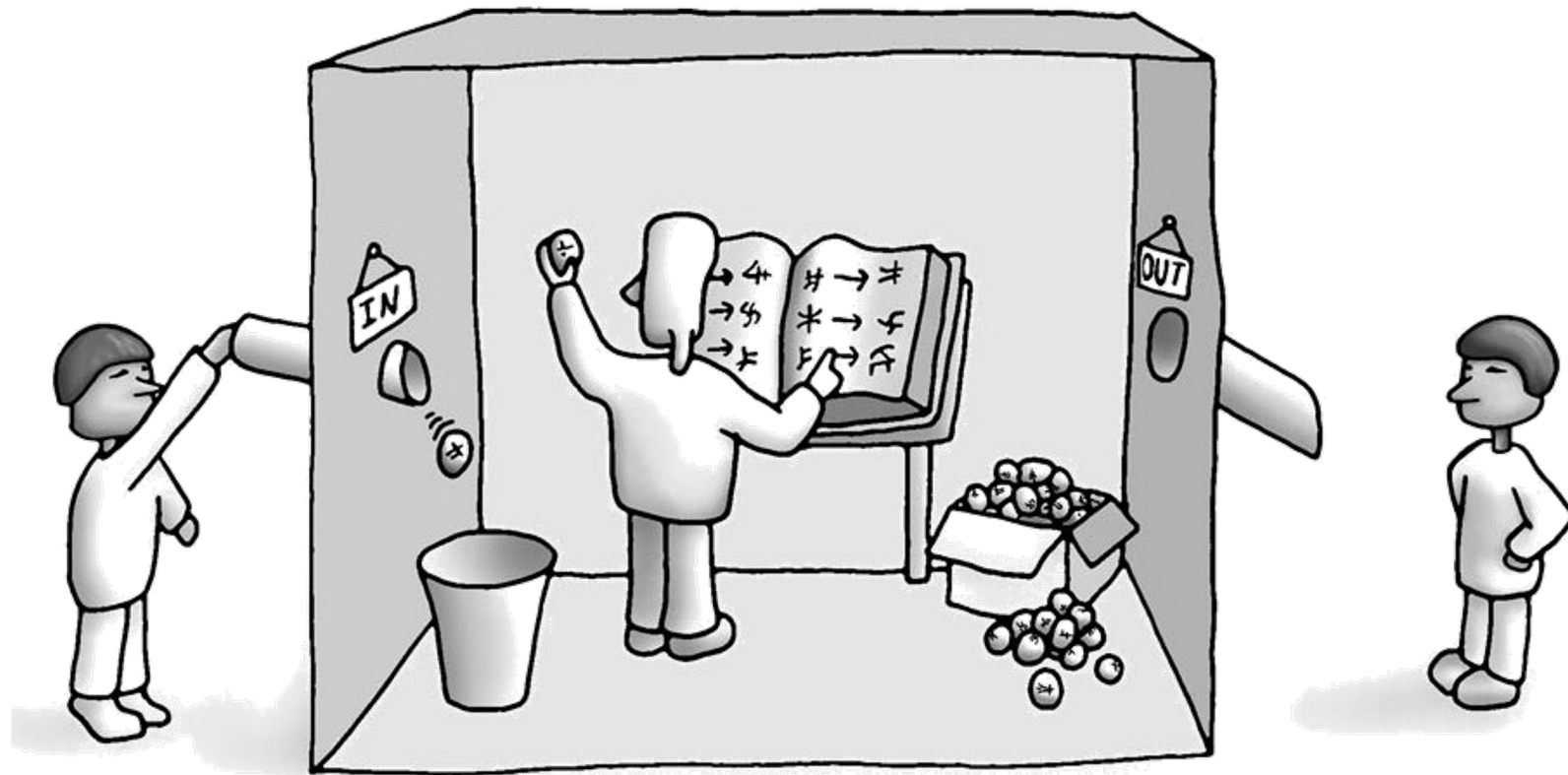
IA & Créativité

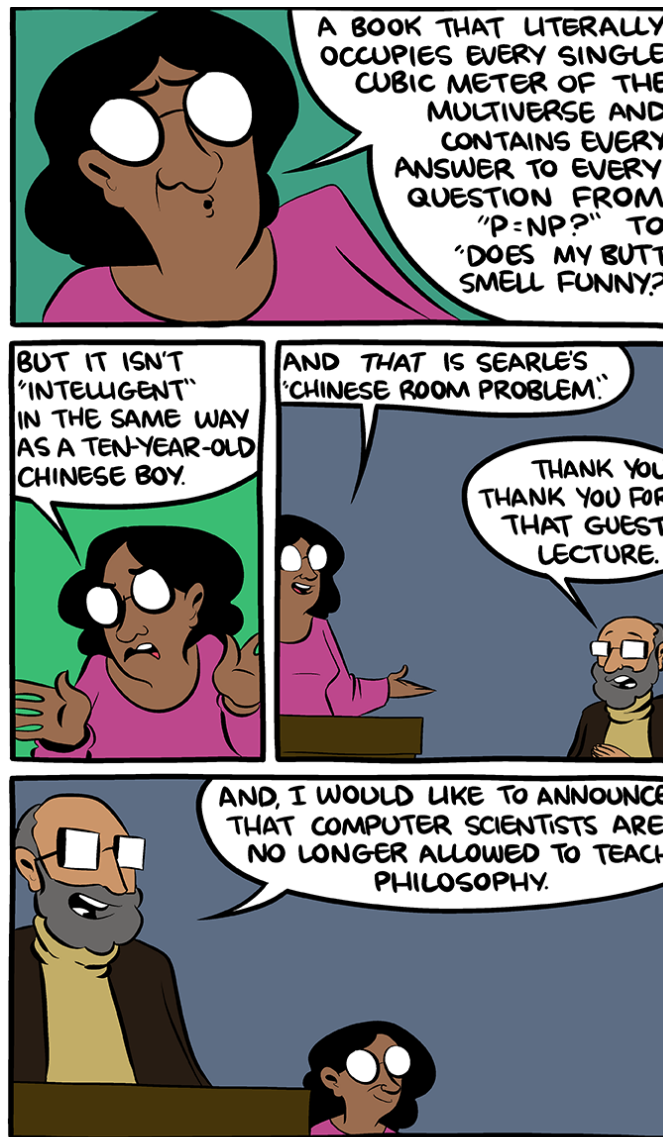
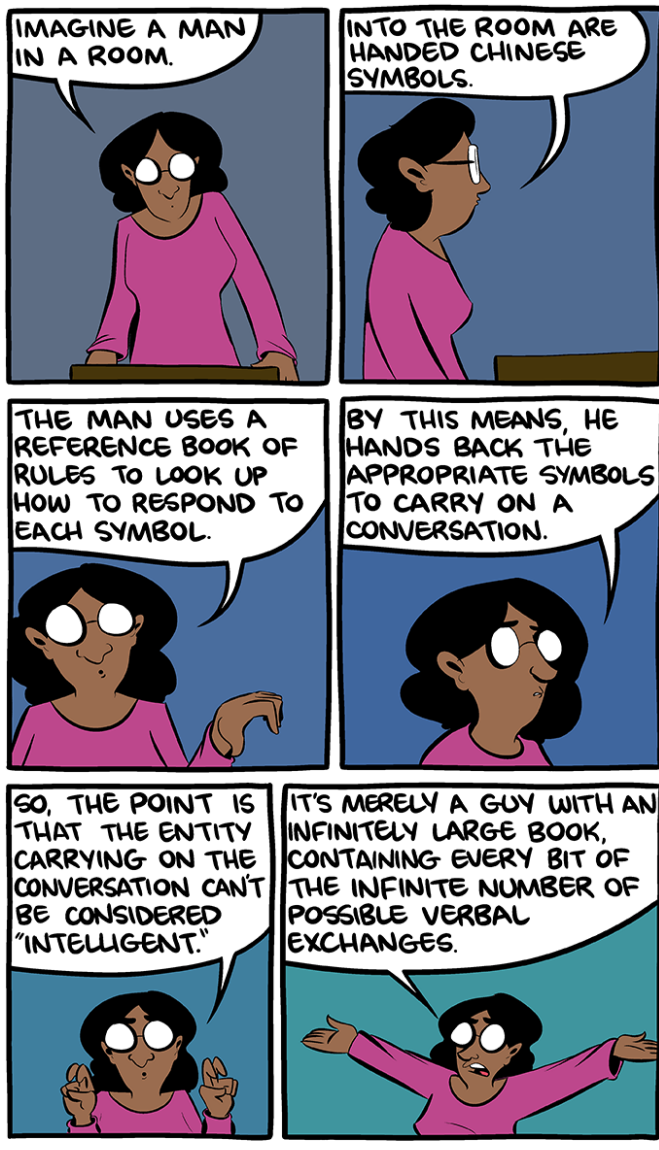
Le domaine musical comme sentinelle

De la naturalisation à l'artificialisation

LA CHAMBRE CHINOISE ARTISTIQUE

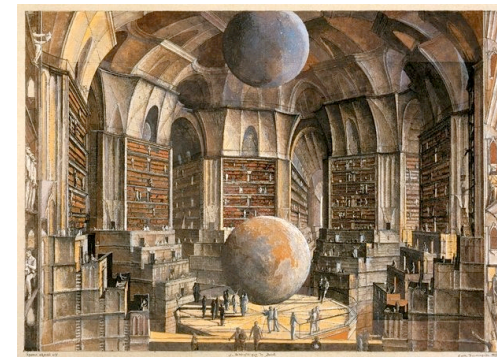
La chambre chinoise artistique





GPT-3

- un réseau avec 175 milliards de poids (= 175 Go en RAM)
- entraîné avec un corpus de 500 milliards de mots
- la bible hébraïque ~ 305.000 mots
→ GPT3 = 1.639.344 bibles
- romans de fiction ~ 80.000 mots
→ GPT3 = 6.250.000 romans
- En lisant un livre par jour, en 70 ans on peut lire 25.550 livres
→ GPT3 = 245 vies humaines



Can you compose a short tune (say four to eight bars) using ABC notation?

There are many possible ways to compose a short tune in abc notation, but here is one example:

```
X:1
T:Example Tune
M:4/4
L:1/8
K:C
|:G2AB c2BA | G2AB c2c2 | edcB c2BA | G4-G2z2 :|
|:c2de f2ed | c2de f2f2 | g2fe d2cB | c4-c2z2 :|
```

This tune has two four-bar phrases, each repeated once, forming an A part and a B part. The key is C major.

Can you describe the tune in musical terms?

Here is one possible description:

The tune starts with a rising arpeggio of the tonic chord (C major), followed by a descending scale that returns to the tonic. This pattern is repeated, but the second time the scale continues to the higher tonic note. The first phrase ends with a long tonic note.

The second phrase begins with a similar pattern, but using the subdominant chord (F major) instead of the tonic. The second time, the scale continues to the higher subdominant note. The phrase ends with a stepwise descent to the tonic, followed by a long tonic note.

The A part and the B part have a similar structure, but use different chords and ranges. The tune has a simple and catchy melody, with a clear sense of tonality and rhythm.

I like part A, but maybe part B is just a bit too similar to part A, making the song repetitive. How about beginning part B with a descending arpeggio instead of a rising one?

Sure, that would create some contrast and variation. Here is one possible way to do that:

```
X:1
T:Example Tune
M:4/4
L:1/8
K:C
|:G2AB c2BA | G2AB c2c2 | edcB c2BA | G4-G2z2 :|
|:f2ed c2BA | f2ed c2c2 | g2fe d2cB | c4-c2z2 :|
```

That's much better. Now how about making this into a duet, can you add a second staff for this with a bass accompanying the melody?

One possible way to write a second staff for this tune is to use root notes and fifths of the chords, as well as some passing notes, to create a simple accompaniment. Here is an example in abc notation, with the second hand bass on the lower staff:

```
X:1
T:Example Tune
M:4/4
L:1/8
K:C
V:1
|:G2AB c2BA | G2AB c2c2 | edcB c2BA | G4-G2z2 :|
|:f2ed c2BA | f2ed c2c2 | g2fe d2cB | c4-c2z2 :|
V:2 clef=bass
|:C,2C,2 G,2G,2 | C,2C,2 G,2G,2 | F,2F,2 E,2E,2 | C,4-C,2z2 :|
|:F,2F,2 C,2C,2 | F,2F,2 C,2C,2 | G,2G,2 F,2F,2 | E,2C,2 G,2C,2 :|
```

The sheet music of the final tune:

The sheet music consists of two systems. Each system has a treble clef staff (melody) and a bass clef staff (bass). The time signature is 4/4. The first system shows the first phrase (A part) and the second system shows the second phrase (B part). The melody line uses eighth notes and quarter notes, while the bass line uses quarter notes and half notes.

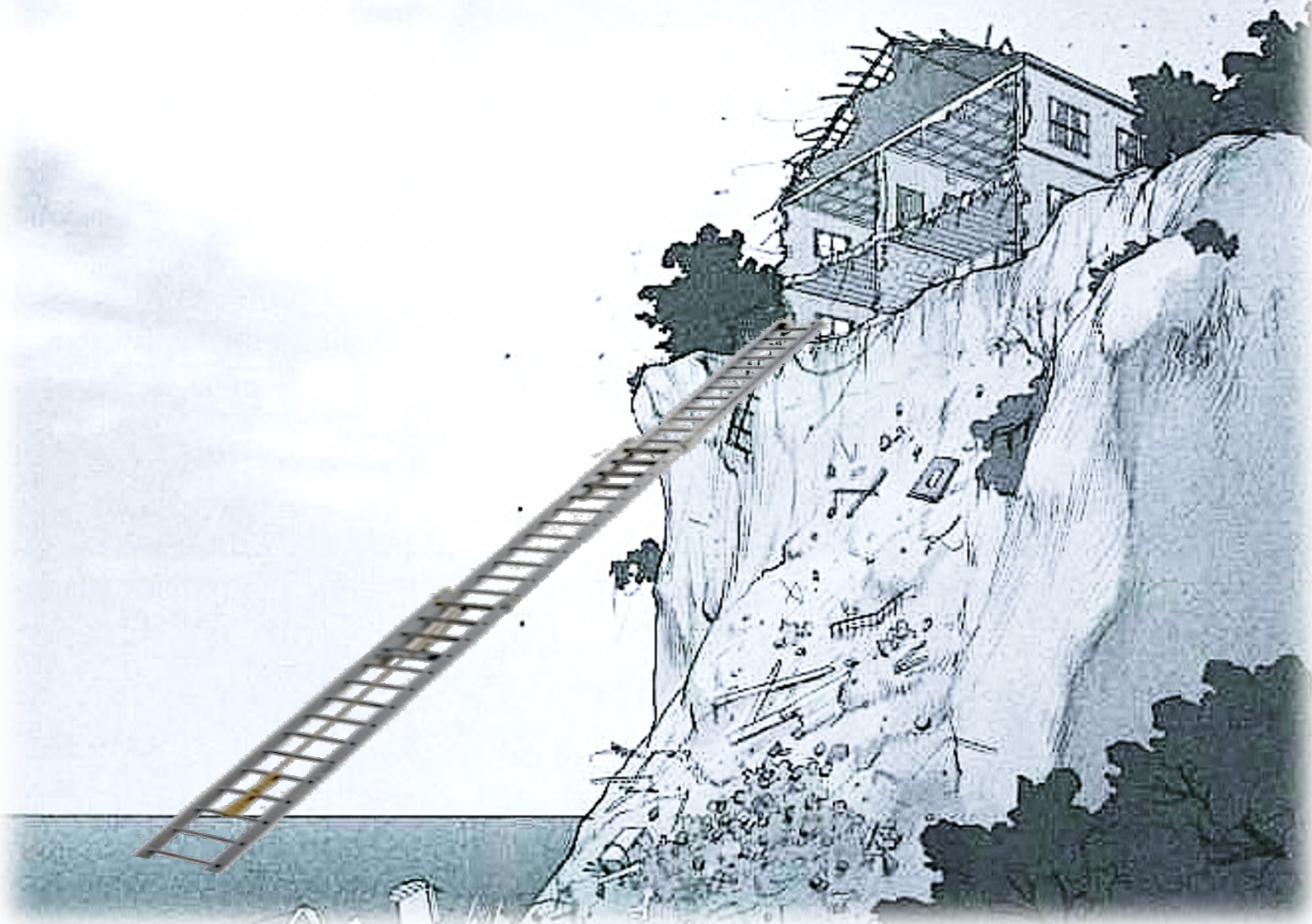
Abraham Moles, Art et ordinateur

- *Communication et langages.*
N° 7, 1970. pp. 24-33
« Une machine est parfaitement capable de sortir des séries de nombres ou de mots les uns au bout des autres, c'est-à-dire de se livrer aux barbouillages du chimpanzé peintre ou aux bafouillages du discours automatique, elle peut aussi reproduire indéfiniment les discours du perroquet. »
- « Les formes n'existent pas en elles-mêmes, elles sont seulement perçues : ce sont des produits du récepteur appliqués au message. »



Le fossé sémantique (the semantic gap)

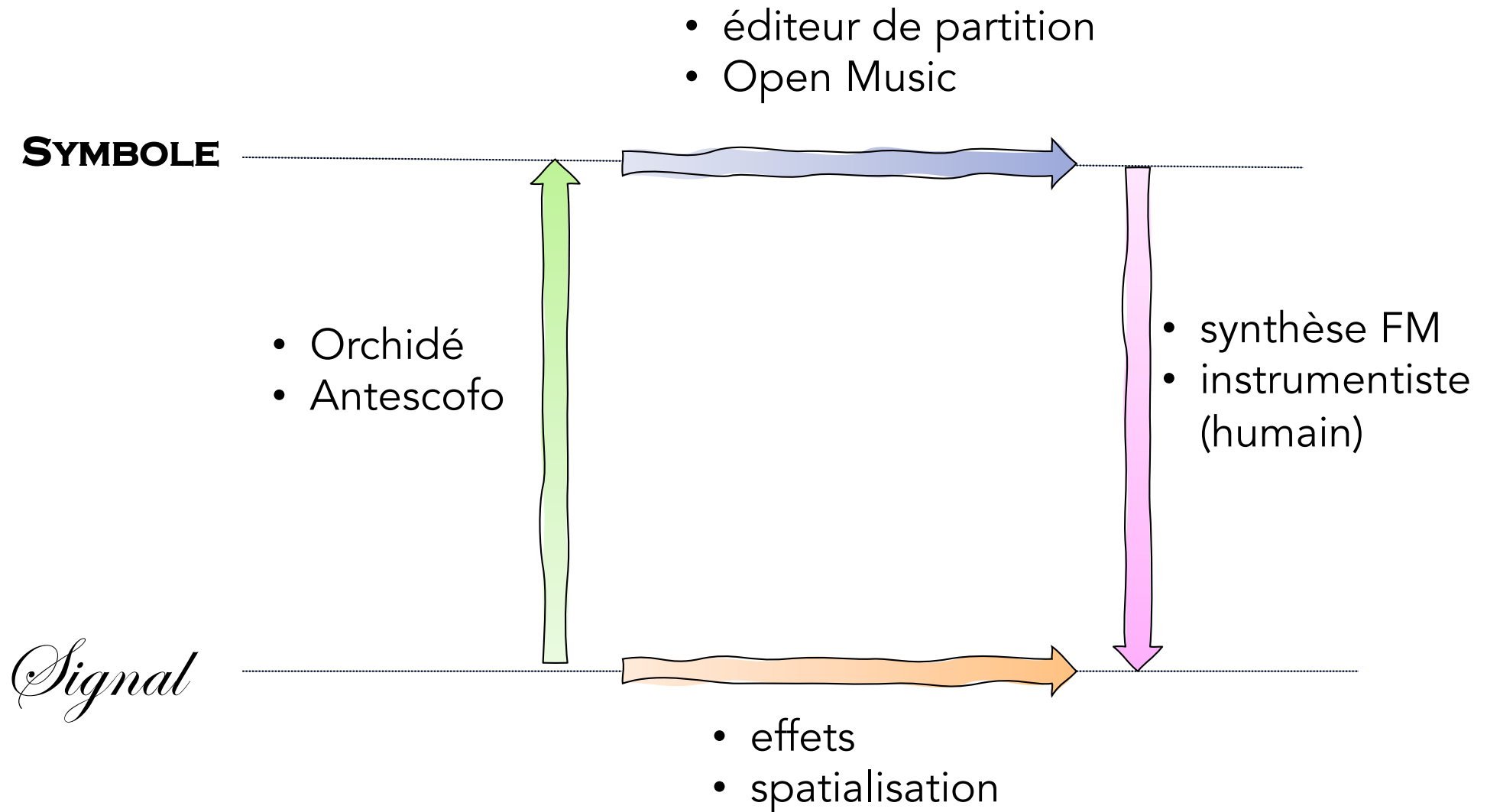
SYMBOL



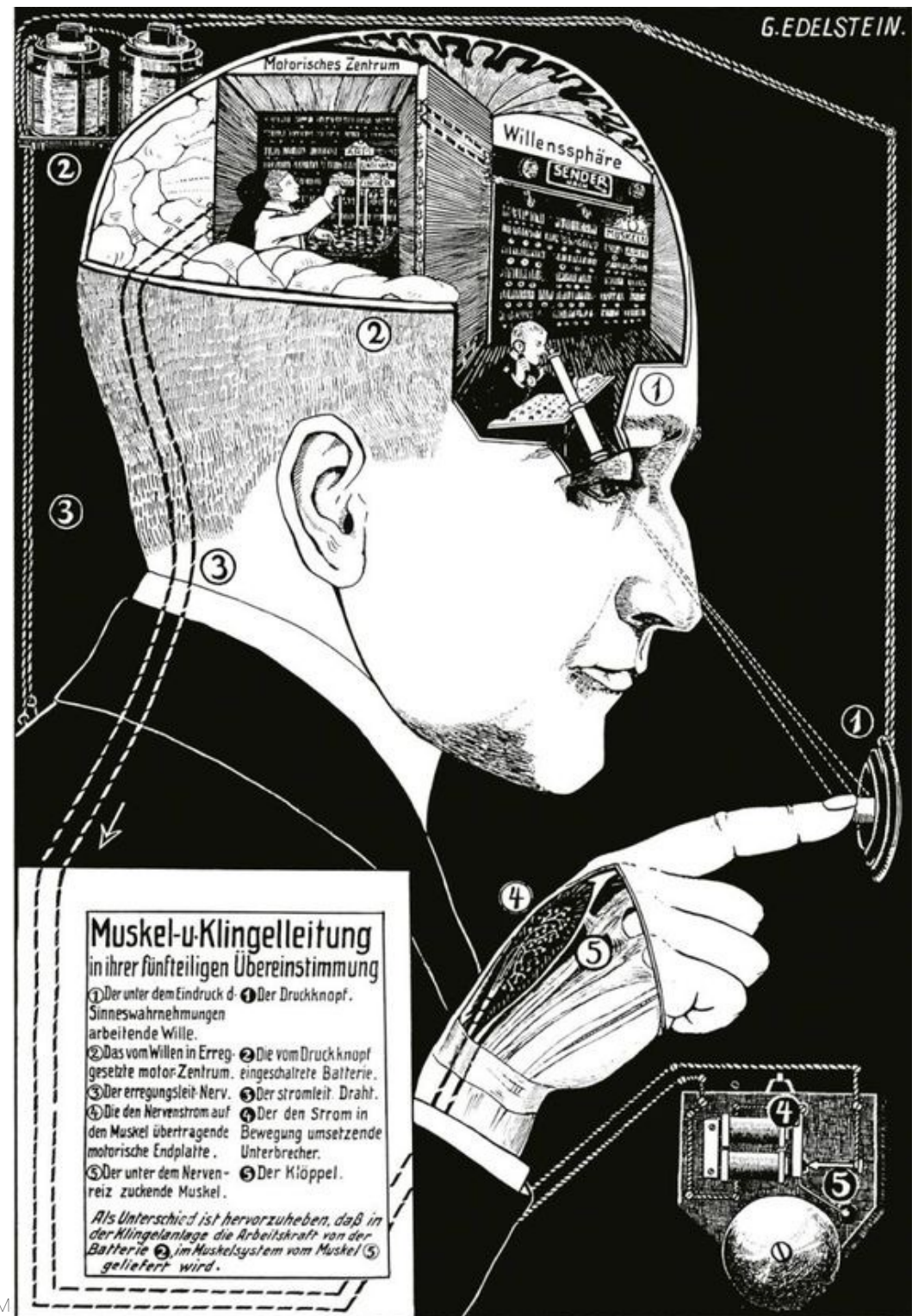
```
rUv"  
B60nI'  
BB$Bn'  
^i'ns!  
^d1-...  
^9as"1-  
^RU<.v<  
Z8av^<  
:$$Rs-  
i$HXFX'  
^RZruisIfr'  
I8RqaIZ^'c<  
^Ras;ruK<  
ucXXvBq^  
-HsuX^'HRv<  
^a'lic =H<  
^X;c< Z1  
^aaa. v1<  
^uzn' Xj<  
^uas'  
^ps^<  
^~^<
```

Signal

La dualité signal/symbole

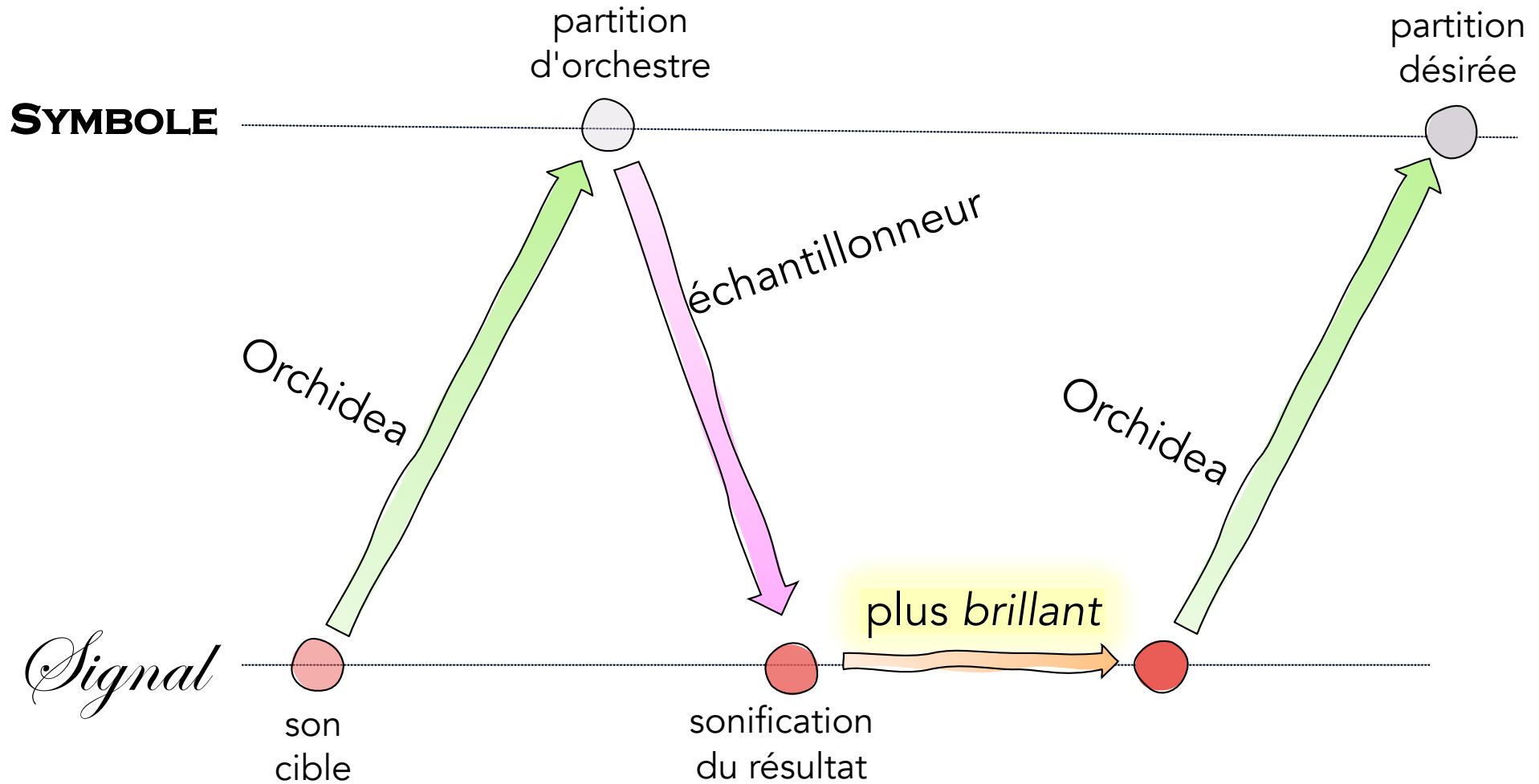


L'erreur de l'homuncule (the homunculus fallacy)



La dualité signal/symbole

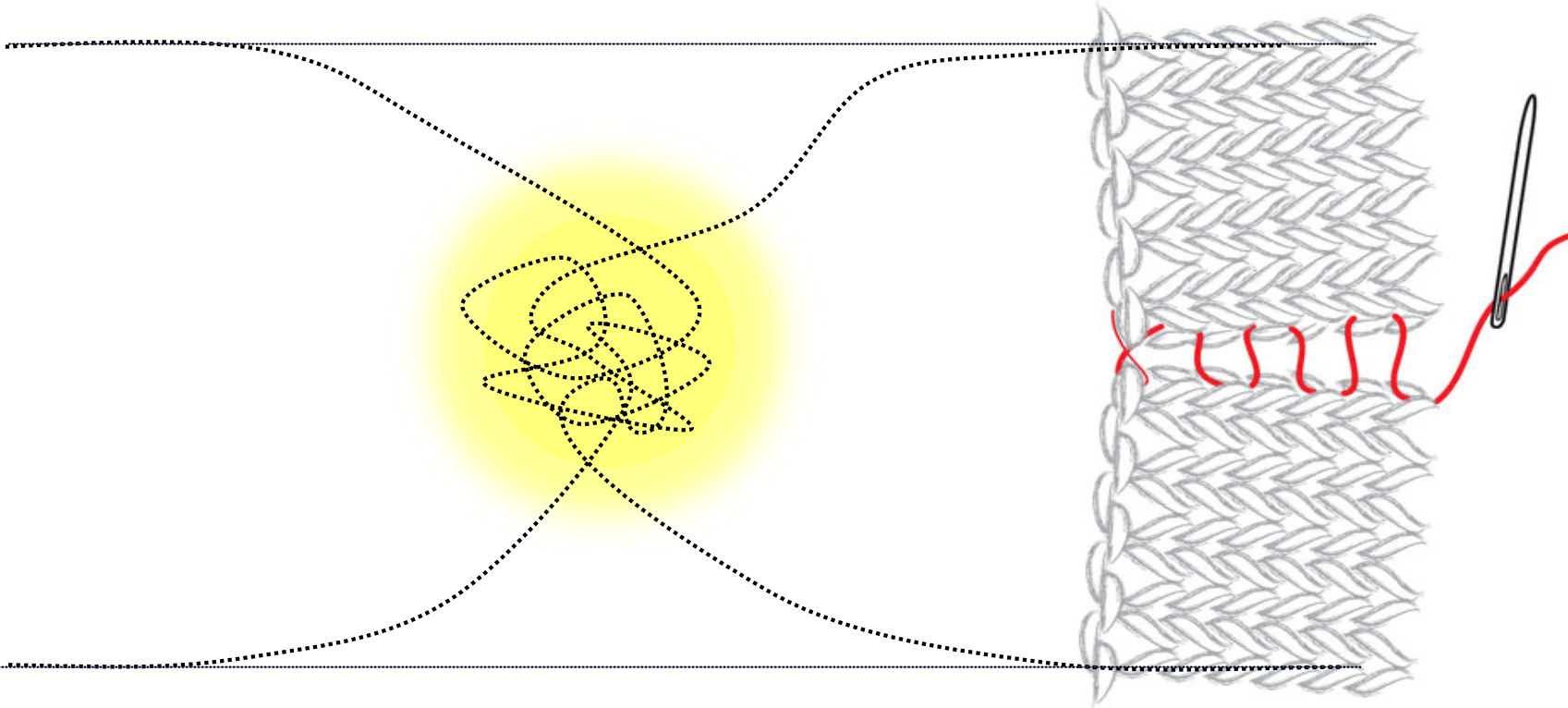
un exemple en **Orchidea** (Carmine Cella + Daniele Ghisi)



La dualité signal/symbole... à intriquer tricoter

SYMBOLE

Signal



IA ET ÉMOTION

IA et émotion

- Existe t'il une émotion artificielle ?
- Un jugement esthétique artificiel ?
- Est-ce que nos émotions sont « vraies » ? Est-ce qu'une machine peut aimer des fraises à la crème

ArtEmis: Affective Language for Visual Art

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[Paper]



[Videos]



[Dataset]



[Code]



[Supplemental
Material]

Abstract

We present a novel large-scale dataset and accompanying machine learning models aimed at providing a detailed understanding of the interplay between visual content, its **emotional effect**, and **explanations** for the latter in **language**. In contrast to most existing annotation datasets in computer vision, we focus on the affective experience triggered by visual artworks and ask the annotators to indicate the dominant emotion they feel for a given image and, crucially, to also provide a grounded verbal explanation for their emotion choice. As we demonstrate below, this leads to a rich set of signals for both the objective content and the affective impact of an image, creating associations with abstract concepts (e.g., “*freedom*” or “*love*”), or references that go beyond what is directly visible, including visual **similes** and **metaphors**, or **subjective references** to personal experiences. We focus on visual art (e.g., paintings, artistic photographs) as it is a prime example of imagery created to elicit emotional responses from its viewers. Our dataset, termed ArtEmis, contains **439K** emotion attributions and explanations from humans, on 81K artworks from WikiArt. Building on this data, we train and demonstrate a series of captioning systems capable of expressing and explaining emotions from visual stimuli. Remarkably, the captions produced by these systems often succeed in reflecting the semantic and abstract content of the image, going well beyond systems trained on existing datasets.

Qualitative Results



Awe

"The blue and white colors of this paintings make me feel like I am looking at a dream"



Amusement

"The man's outfit is funny and his expression too"



Contentment

"The woman's eyes are very expressive and she is dressed nicely"



Excitement

"The bright colors and the way the painting is painted makes it look like a party"



Disgust

"The red paint looks like blood and the colors are ugly"



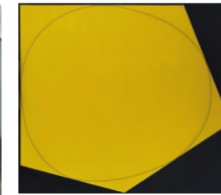
Fear

"It looks like an animal is laying dead on the ground"



Sadness

"The woman looks like she is sad and lonely"



Something Else

"The painting is very simple and does not make me feel anything"

Examples of neural speaker productions on *unseen* artworks. The produced explanations reflect a variety of dominant emotional-responses (shown above each utterance in bold font). The top row shows examples where the deduced grounding emotion is positive; the bottom row shows three examples where the grounding emotion is negative and an example from the something-else category. Remarkably, the neural speaker produces pragmatic explanations that include **visual analogies**: *looks like blood, a dead animal*, and **nuanced** explanations of affect: *sad and lonely, expressive eyes*.



Contentment:

"The woman looks like she is having a good time"



Contentment:

"The purple flowers remind me of my grandmother's house"



Contentment:

"The man looks like he is content with himself"



Contentment:

"The woman's pale skin contrasts well the background"

Sadness:

"The man in the middle looks like he is in pain"

Something Else:

"I am not sure what this is supposed to be"

Awe:

"The man looks like he is very important"

Awe:

"The woman's hair is intricately detailed"

Au-delà de la capacité/compétence

- **Intelligence incarnée**
 - perceptions
 - émotions
- **Intelligence située**
 - dans un contexte social
 - culturel
 - géographique
 - historique
- **Intelligence sociale**
 - collaborative
 - dans l'interaction
- **Intentionnalité**

Turing : Aimer les fraises à la crème

COMPUTING MACHINERY AND INTELLIGENCE

A. Turing, *Mind*, vol. 59, n° 236, p. 433–460

- 6. *Contrary Views on the Main Question.*

- ...

- (5) *Arguments from Various Disabilities.*

These arguments take the form, "I grant you that you can make machines do all the things you have mentioned but you will never be able to make one to do X". (...) I offer a selection: (...) enjoy strawberries and cream

- ...

The inability to enjoy strawberries and cream may have struck the reader as frivolous. Possibly a machine might be made to enjoy this delicious dish, but any attempt to make one do so would be idiotic. What is important about this disability is that it contributes to some of the other disabilities, e.g. to the difficulty of the same kind of friendliness occurring between man and machine as between white man and white man, or between black man and black man.

VIVRE ENSEMBLE

ALL WATCHED OVER BY MACHINES OF LOVING GRACE

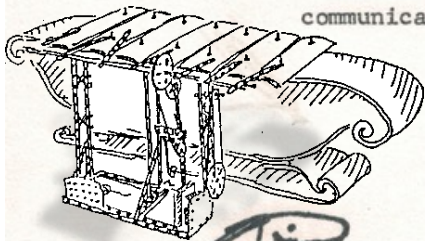
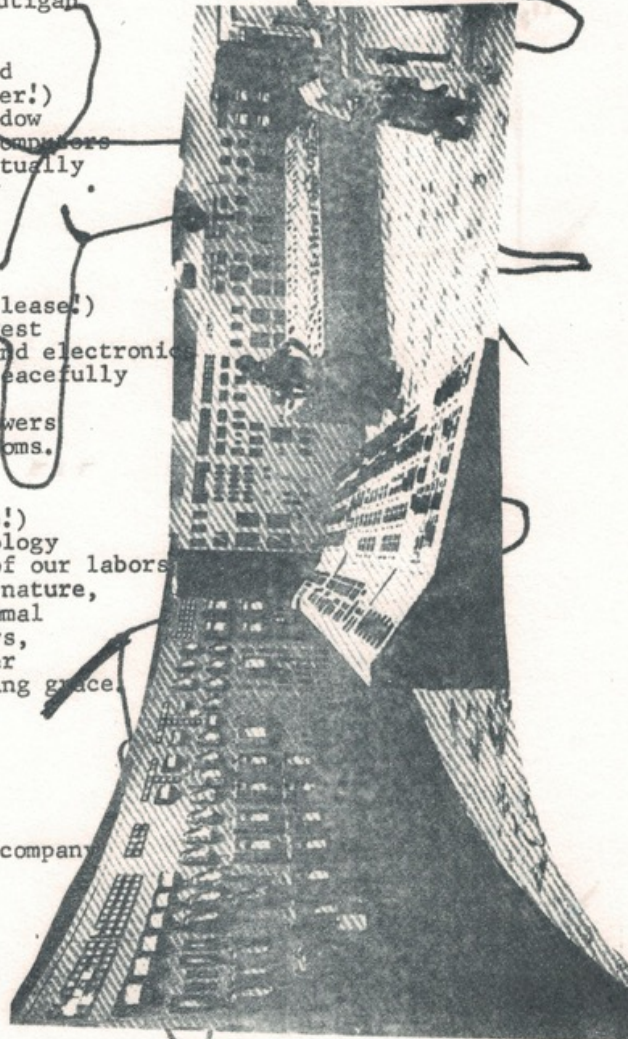
by Richard Brautigan

I like to think (and
the sooner the better!)
of a cybernetic meadow
where mammals and computers
live together in mutually
programming harmony
like pure water
touching clear sky.

I like to think
(right now, please!)
of a cybernetic forest
filled with pines and electronic
where deer stroll peacefully
past computers
as if they were flowers
with spinning blossoms.

I like to think
(it has to be!)
of a cybernetic ecology
where we are free of our labors
and joined back to nature,
returned to our mammal
brothers and sisters,
and all watched over
by machines of loving grace.

communication company



Partager le même monde

