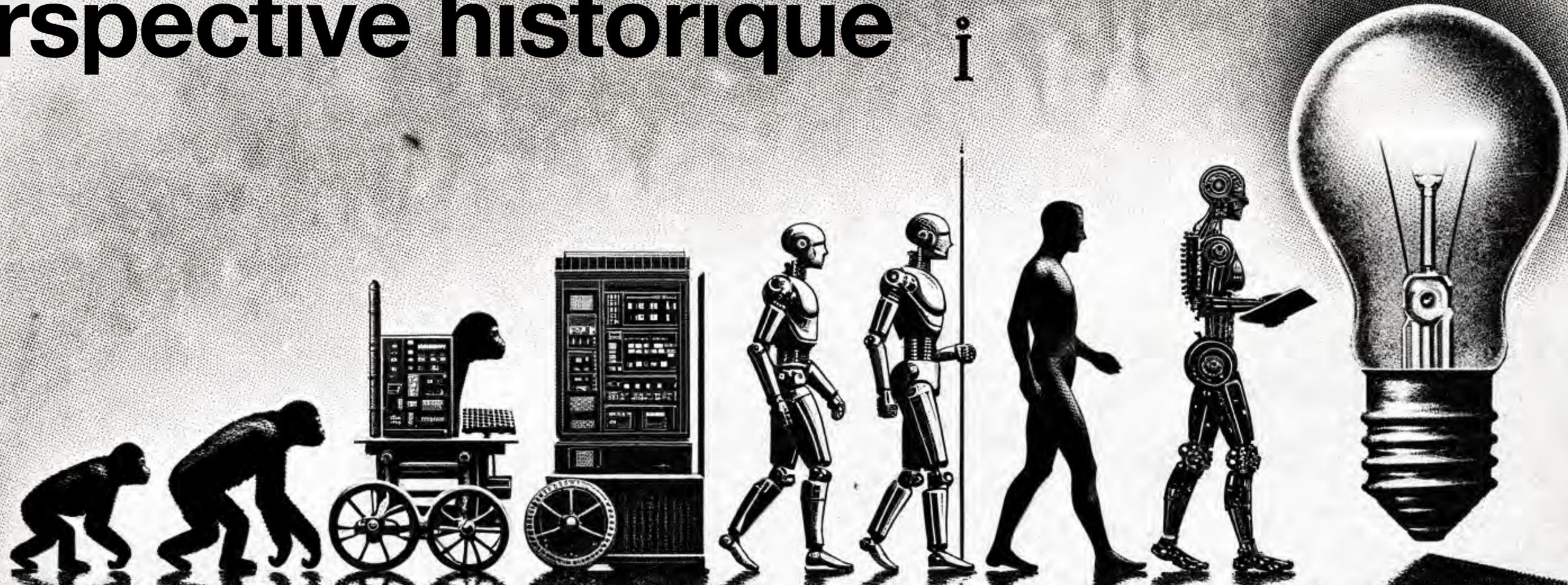


# Intelligence artificielle et musique

- **Perspectives historiques et état des lieux**
- **Créer et composer avec l'IA**
  - Explorer les principes de l'intelligence artificielle générative et ses implications dans le domaine musical.
  - Les outils d'IA générative dédiés à la création musicale, avantages, opportunités, limites, notamment d'un point de vue éducatif.
- **Enseigner la musique avec l'IA**
  - Découvrir et analyser des outils d'IA générative appliqués à l'enseignement et à l'apprentissage de la musique, en évaluant leurs intérêts, leurs potentialités et leurs limites.
  - Examiner les effets de l'IA générative sur les pratiques pédagogiques en musique.
  - Les outils d'IA générative dédiés à la création musicale : point de vue éducatif.
- **IA générative et évolution des métiers liés à la musique**



# IA Perspective historique



# De la création de l'univers à l'IA

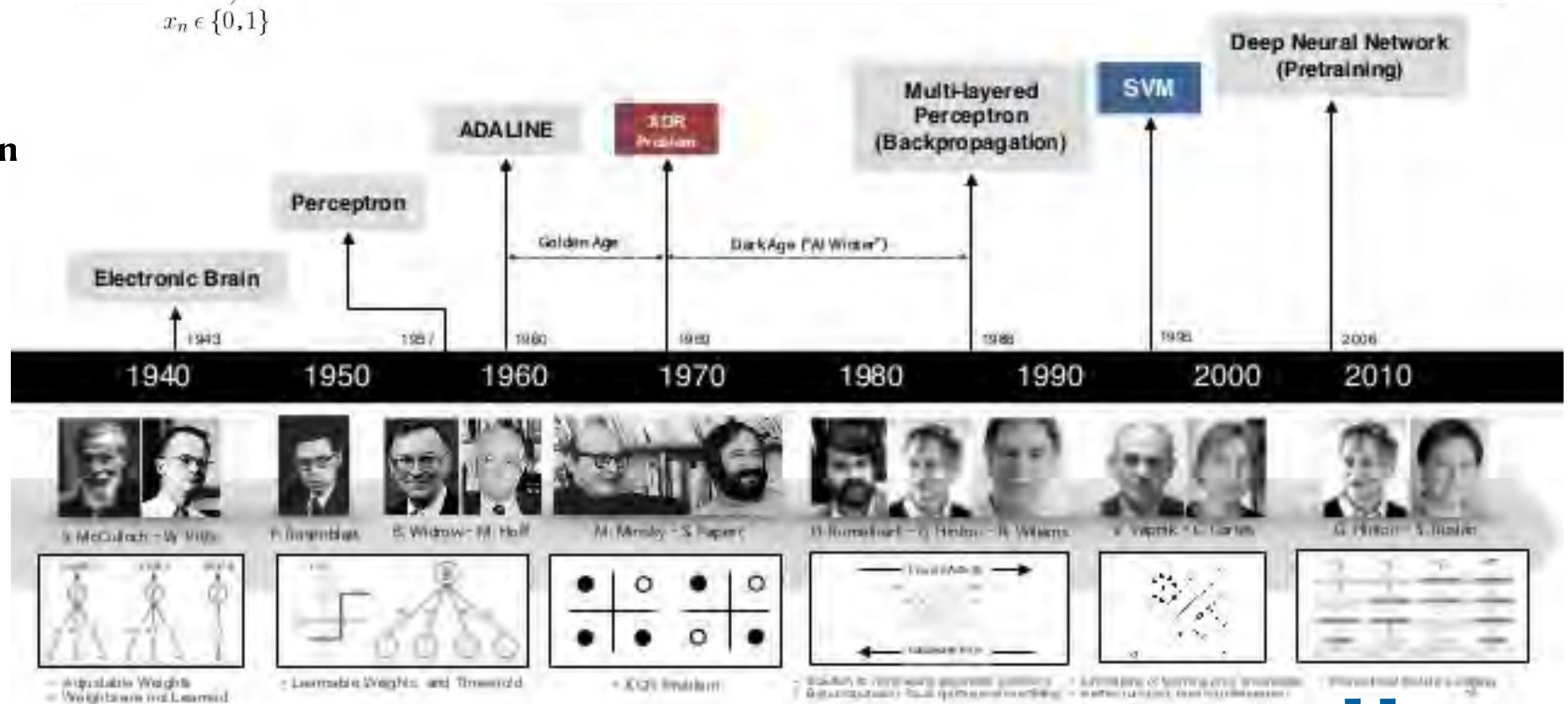
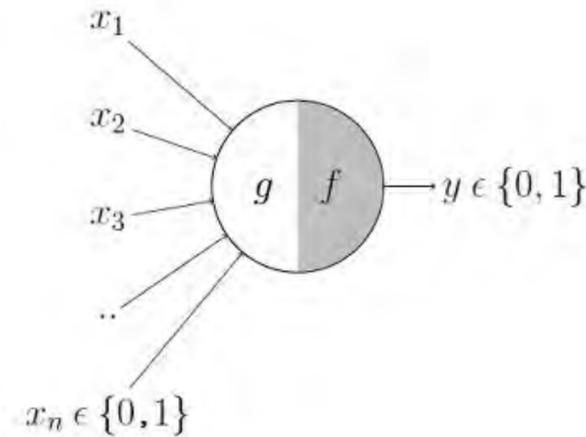
ANACHOUSTIC AI

- **Création de l'univers, il y a 13.8 milliards d'années**
- **Création de la terre, il y a 4.56 milliards d'années**
- **Apparition du genre humain, il y a 2,5 millions d'années**
- **Homme moderne (Homo Sapiens), il y a 300 000 ans**
- **Civilisation, il y a 12000 ans**
- **Écriture, il y a 5000 ans**



# L'IA : de 1940 à nos jours

- 1940 - Electronic Brain
- 1950 - Perceptron
- 1960 - ADALINE (Adaptive Linear Neuron)
- 1970 - XOR Problem
- 1980 - Multi-Layered Perceptron (algorithme de "Back Propagation")
- 1990 - SVM (algorithm de Machine Learning avec supervision)
- 2000 - Deep Neural Network (modèles d'IA pré-entraînés ou "Pre-Trained")



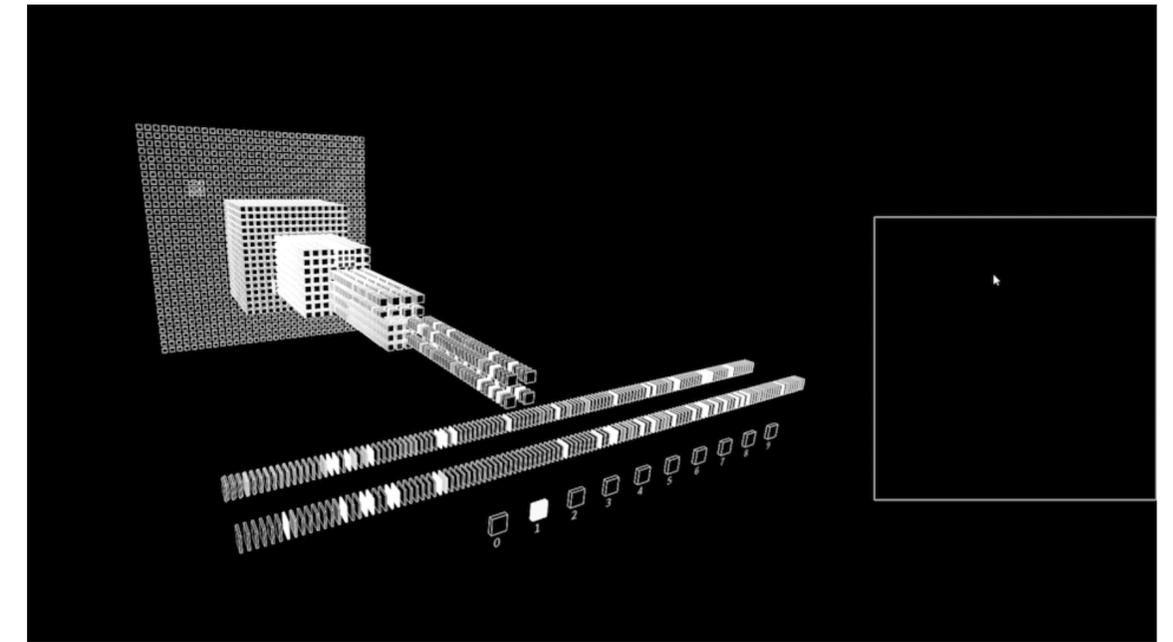


Fig. 1 — Organization of a biological brain. (Red areas indicate active cells, responding to the letter X.)

- Le **perceptron (1957)**, modèle d'apprentissage automatique. Cet algorithme est le précurseur des réseaux neuronaux modernes, mis au point par **Frank Rosenblatt (1928-1971)** dans les années 1950.

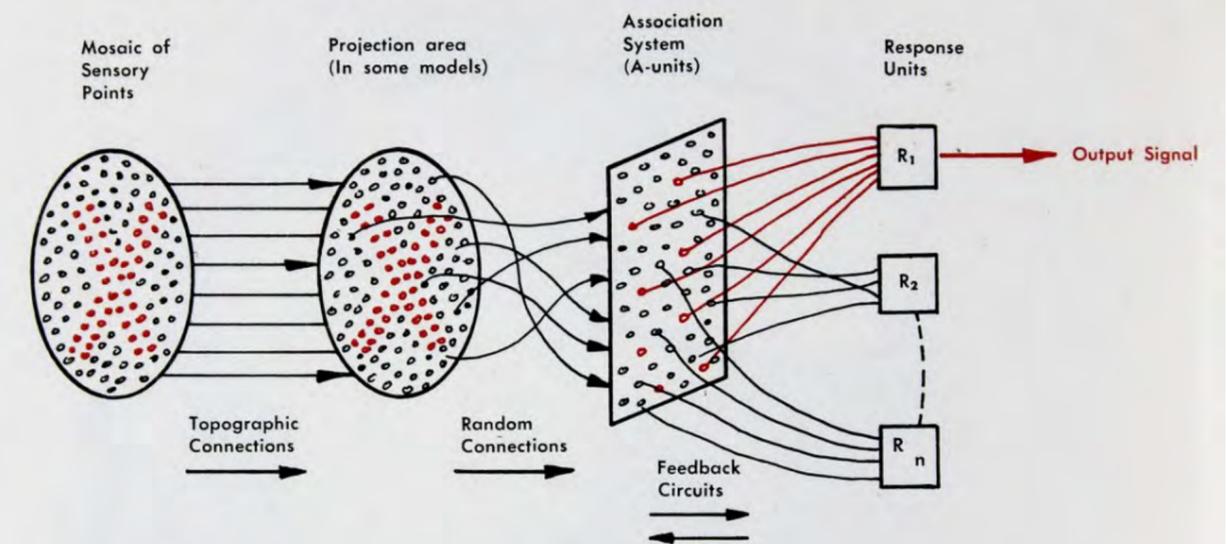


FIG. 2 — Organization of a perceptron.

# IA et musique



# IA et musique état des lieux

Un sondage parmi les artistes et musiciens réalisé par la société musicale Ditto

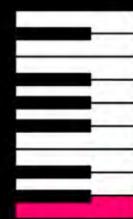
Ditto Music surveyed 1,299 independent artists actively releasing music in 2023

DITTO

## Is AI the future of music? We asked the artists...



**59.5%**  
of artists **already**  
use AI within their  
music projects



**11%**  
of artists have  
used AI for their  
songwriting



**20.3%**  
of artists have  
used AI for music  
production



**30.6%**  
of artists  
have used AI  
for **mastering**  
music



**38%**  
of artists have  
used AI for  
music artwork

## Would you consider using AI in future music projects?



**47.1%**  
of artists would  
use AI for their  
songwriting



**61.5%**  
of artists would  
use AI for music  
production



**66%**  
of artists  
would use AI  
for **mastering**  
music



**76.5%**  
of artists  
would use AI for  
music artwork

**28.5%**

of artists say they  
would **never** use AI



What has put artists off using AI?



# IA et Musique

## La voix d'Edith Piaf

**Orchestration**  
**Nathan Stornetta**



# Time travel . . . avec les Beatles



*Time travel . . . avec les Beatles*

# *NOW AND THEN*

THE LAST BEATLES SONG

# Création musicale et IA



# Typologie des outils d'IA pour la création musicale

## • Composition et Génération de Musique

- aide à l'orchestration : Orchidea
- Arrangement Intelligents : RipX , lalal.ai
- Outils de composition assistée par IA : Los Angeles Composers
- Plugins VST basés sur l'IA
- IA générative pour la musique et les processus créatif : Bandlab, Udio, Suno, AIVA etc.

## • Production musicale, Mastering

- Traitement du son : utilisation de l'IA pour la suppression de bruit, la restauration d'enregistrements, améliorations du signal pour le mixage et le mastering
- Création et Synthèse : RipX, Synthplant, Fluid Corpus Manipulation



RipX

Lalal.ai

Handwritten musical score for Viola and Piano. The score consists of several systems of staves. The top system includes a treble clef staff with notes and rests, and a bass clef staff with notes and rests. The middle system shows a treble clef staff with notes and rests, and a bass clef staff with notes and rests. The bottom system shows a treble clef staff with notes and rests, and a bass clef staff with notes and rests. The handwriting is in brown ink on aged paper.

*Beethoven  
Violoncello  
Quintett  
in B*

**BEETHOVEN**  
by Arrangement  
Volume One  
Works for Viola and Piano

Viola Sonata in A; fragment  
Horn Sonata, Op. 17  
arr. Paul Silverthorne  
Notturmo, Op. 42  
arr. Karl Xaver Kleinheinz  
Grand Duo in E flat (Septet), Op. 20  
arr. Friedrich Hermann

Includes first recordings

Aut. des Herren Loeffmann.

# Beethoven Sonate pour Alto

Sonate für Clarinette und Viola.

D'après un fragment retrouvé par Karl Holz,  
Secrétaire de Beethoven et second violon du quatuor Schuppanzigh Quartet

(Archive Beethovenhaus Bonn)

*Allegro*

Clarinete

The image shows a handwritten musical score for Clarinet and Viola. The tempo is marked 'Allegro'. The score consists of two staves. The top staff is for the Clarinet and the bottom staff is for the Viola. The music begins with a treble clef and a key signature of one sharp (F#). The first measure shows a series of notes in the clarinet part, followed by rests in both parts. The second measure continues the clarinet line. The third measure shows a rest in the clarinet part and a note in the viola part. The fourth measure continues the clarinet line. The fifth measure shows a rest in the clarinet part and a note in the viola part. The sixth measure continues the clarinet line. The seventh measure shows a rest in the clarinet part and a note in the viola part. The eighth measure continues the clarinet line. The ninth measure shows a rest in the clarinet part and a note in the viola part. The tenth measure continues the clarinet line. The eleventh measure shows a rest in the clarinet part and a note in the viola part. The twelfth measure continues the clarinet line. The thirteenth measure shows a rest in the clarinet part and a note in the viola part. The fourteenth measure continues the clarinet line. The fifteenth measure shows a rest in the clarinet part and a note in the viola part. The sixteenth measure continues the clarinet line. The seventeenth measure shows a rest in the clarinet part and a note in the viola part. The eighteenth measure continues the clarinet line. The nineteenth measure shows a rest in the clarinet part and a note in the viola part. The twentieth measure continues the clarinet line. The twenty-first measure shows a rest in the clarinet part and a note in the viola part. The twenty-second measure continues the clarinet line. The twenty-third measure shows a rest in the clarinet part and a note in the viola part. The twenty-fourth measure continues the clarinet line. The twenty-fifth measure shows a rest in the clarinet part and a note in the viola part. The twenty-sixth measure continues the clarinet line. The twenty-seventh measure shows a rest in the clarinet part and a note in the viola part. The twenty-eighth measure continues the clarinet line. The twenty-ninth measure shows a rest in the clarinet part and a note in the viola part. The thirtieth measure continues the clarinet line. The thirty-first measure shows a rest in the clarinet part and a note in the viola part. The thirty-second measure continues the clarinet line. The thirty-third measure shows a rest in the clarinet part and a note in the viola part. The thirty-fourth measure continues the clarinet line. The thirty-fifth measure shows a rest in the clarinet part and a note in the viola part. The thirty-sixth measure continues the clarinet line. The thirty-seventh measure shows a rest in the clarinet part and a note in the viola part. The thirty-eighth measure continues the clarinet line. The thirty-ninth measure shows a rest in the clarinet part and a note in the viola part. The fortieth measure continues the clarinet line. The forty-first measure shows a rest in the clarinet part and a note in the viola part. The forty-second measure continues the clarinet line. The forty-third measure shows a rest in the clarinet part and a note in the viola part. The forty-fourth measure continues the clarinet line. The forty-fifth measure shows a rest in the clarinet part and a note in the viola part. The forty-sixth measure continues the clarinet line. The forty-seventh measure shows a rest in the clarinet part and a note in the viola part. The forty-eighth measure continues the clarinet line. The forty-ninth measure shows a rest in the clarinet part and a note in the viola part. The fiftieth measure continues the clarinet line. The fifty-first measure shows a rest in the clarinet part and a note in the viola part. The fifty-second measure continues the clarinet line. The fifty-third measure shows a rest in the clarinet part and a note in the viola part. The fifty-fourth measure continues the clarinet line. The fifty-fifth measure shows a rest in the clarinet part and a note in the viola part. The fifty-sixth measure continues the clarinet line. The fifty-seventh measure shows a rest in the clarinet part and a note in the viola part. The fifty-eighth measure continues the clarinet line. The fifty-ninth measure shows a rest in the clarinet part and a note in the viola part. The sixtieth measure continues the clarinet line. The sixty-first measure shows a rest in the clarinet part and a note in the viola part. The sixty-second measure continues the clarinet line. The sixty-third measure shows a rest in the clarinet part and a note in the viola part. The sixty-fourth measure continues the clarinet line. The sixty-fifth measure shows a rest in the clarinet part and a note in the viola part. The sixty-sixth measure continues the clarinet line. The sixty-seventh measure shows a rest in the clarinet part and a note in the viola part. The sixty-eighth measure continues the clarinet line. The sixty-ninth measure shows a rest in the clarinet part and a note in the viola part. The seventieth measure continues the clarinet line. The seventy-first measure shows a rest in the clarinet part and a note in the viola part. The seventy-second measure continues the clarinet line. The seventy-third measure shows a rest in the clarinet part and a note in the viola part. The seventy-fourth measure continues the clarinet line. The seventy-fifth measure shows a rest in the clarinet part and a note in the viola part. The seventy-sixth measure continues the clarinet line. The seventy-seventh measure shows a rest in the clarinet part and a note in the viola part. The seventy-eighth measure continues the clarinet line. The seventy-ninth measure shows a rest in the clarinet part and a note in the viola part. The eightieth measure continues the clarinet line. The eighty-first measure shows a rest in the clarinet part and a note in the viola part. The eighty-second measure continues the clarinet line. The eighty-third measure shows a rest in the clarinet part and a note in the viola part. The eighty-fourth measure continues the clarinet line. The eighty-fifth measure shows a rest in the clarinet part and a note in the viola part. The eighty-sixth measure continues the clarinet line. The eighty-seventh measure shows a rest in the clarinet part and a note in the viola part. The eighty-eighth measure continues the clarinet line. The eighty-ninth measure shows a rest in the clarinet part and a note in the viola part. The ninetieth measure continues the clarinet line. The ninety-first measure shows a rest in the clarinet part and a note in the viola part. The ninety-second measure continues the clarinet line. The ninety-third measure shows a rest in the clarinet part and a note in the viola part. The ninety-fourth measure continues the clarinet line. The ninety-fifth measure shows a rest in the clarinet part and a note in the viola part. The ninety-sixth measure continues the clarinet line. The ninety-seventh measure shows a rest in the clarinet part and a note in the viola part. The ninety-eighth measure continues the clarinet line. The ninety-ninth measure shows a rest in the clarinet part and a note in the viola part. The hundredth measure continues the clarinet line.

# Musique Générative

## Los Angeles Music Composer

Los\_Angeles\_Music\_Composer\_Edition.ipynb  
File Edit View Insert Runtime Tools Help

+ Code + Text Copy to Drive

Los Angeles Music Composer Edition (ver. 4.0)

Powered by tegriddy-tools: <https://github.com/asigalov61/tegridy-tools>

WARNING: This complete implementation is a functioning model of the Artificial Intelligence. Please exercise great humility, care  
<https://www.nscail.gov/>

Project Los Angeles  
Tegriddy Code 2023

∨ (GPU CHECK)

> NVIDIA GPU check  
Show code

∨ (SETUP ENVIRONMENT)

> Install dependencies  
Show code

> Import modules  
Show code

∨ (LOAD MODEL)

# How to Use

# Los Angeles Music Composer

*In memory of  
MuseNet*

A tutorial by Timzart7  
on the Python/Jupyter AI program  
running in Colab notebook  
on GitHub, Composer Version

This tutorial posted on July 9, 2023

Program written by  
Aleksandr Sigalov

# Musique Générative

ChatGPT + Claude.ai + Gemini

**Movement 1:  
Prelude - “Tears of Dawn”  
(Adagio Molto)**

## IA générative

Les générateurs de musique par IA sont particulièrement aptes à créer des pistes dans des genres tels que l'électronique, la pop, le hip-hop etc.

Suno

Udio

Runway



# Fluid Corpus Manipulation

***FluCoMa est un ensemble d'outils de ML et d'IA pour la synthèse et la création sonore***

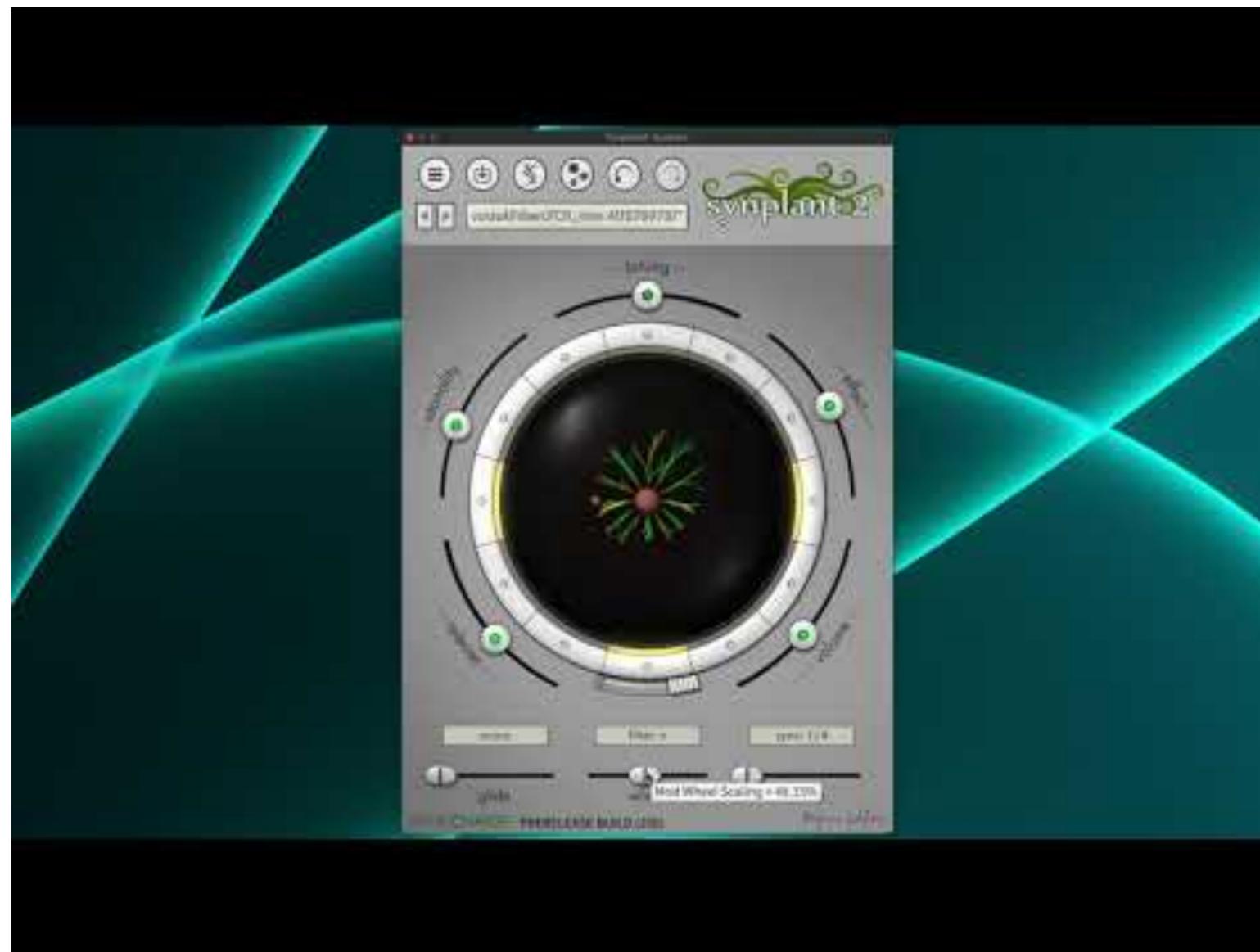
**SP-Tools**  
(alpha teaser video)



**Machine Learning Tools  
for Drums and Percussion**

# Synthplant

***“Synplant donne une tournure génétique à la conception sonore en allant au-delà des traditionnelles manipulations de boutons et des réglages, en mettant l'accent sur l'exploration et la découverte. Ici, vos oreilles vous guident à travers une forêt de textures organiques et de timbres évolutifs.”***



# Enseigner avec l'IA

- **Défis et opportunités dans le domaine de la musique**
- **l'IA et :**
  - **Les processus d'apprentissage des élèves en musique**
  - **Le rôle et les méthodes de l'enseignant·e / musicien·ne ?**
  - **Les pratiques de création artistique**
  - **L'évolution des métiers liés à la musique**



# Typologie des outils d'IA pour l'enseignement

- Outils d'analyse pour la composition, l'écriture, l'écoute
- Pratique instrumentale et formation musicale
- Suivi des étudiants

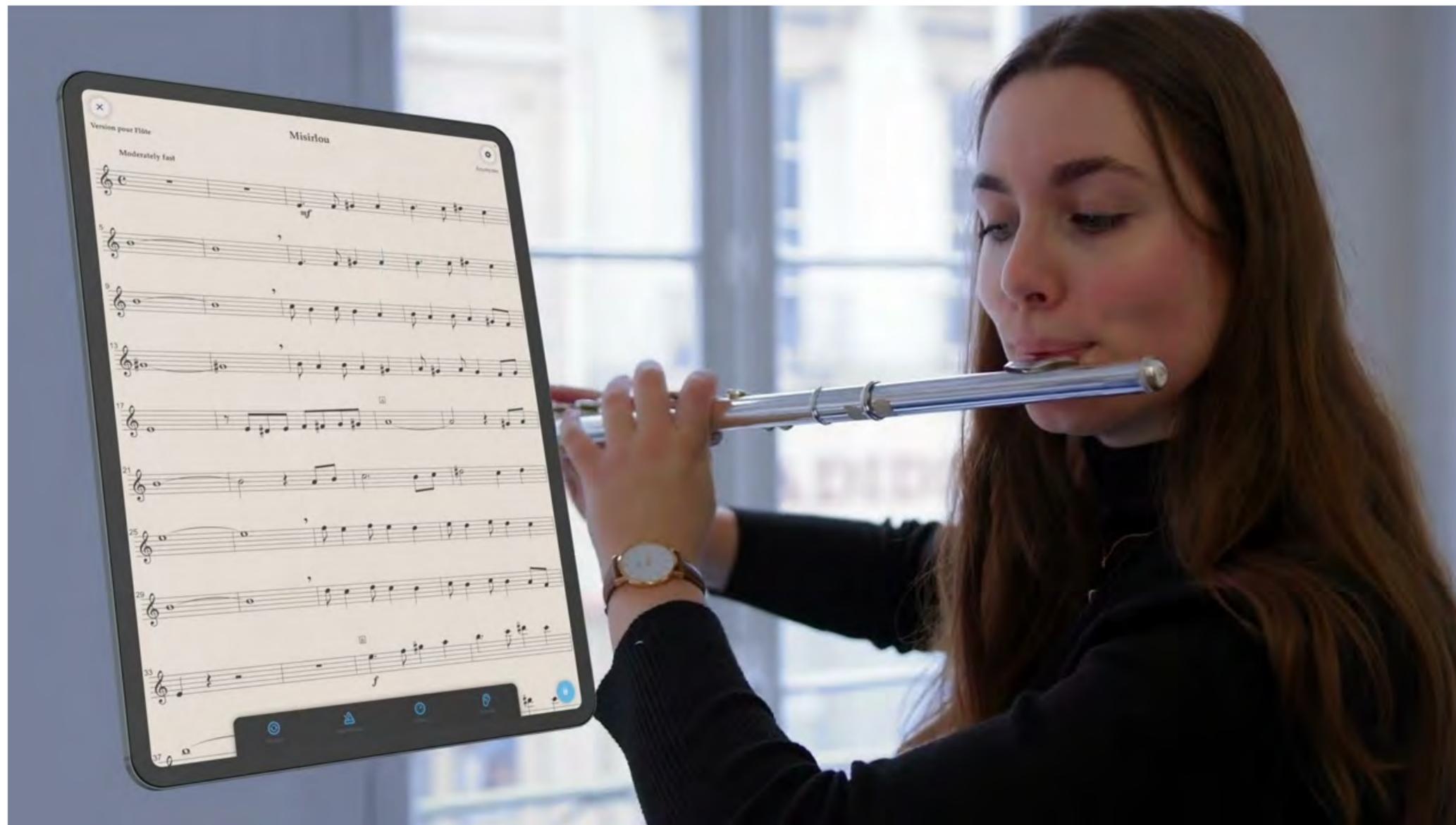


# Enseigner et apprendre la musique avec l'IA ?

- **Pratique instrumentale et feedback instantané** ([Metronaut](#))
- **Outils de Pratique Augmentée: transformer l'apprentissage théorique de la musique et la formation de l'oreille en jeux interactifs.** ([Chrome MusicLab](#) , [Duolingo](#))
- **Mentors virtuels de musique : l'IA pour les suivis, l'évaluation et les cours personnalisés** ([musicmentor.ai](#))
- **Outils d'aide à l'analyse** ([RipX](#), [Moises](#) , [Fadr](#))
- **Outils permettant de générer des propositions sur lesquelles on construit un retour analytique** ([Orchidea](#))

# Metronaut / Antescofo (IA)

**Une application pour jouer avec un accompagnement**





# IA

## Analyse, mixage & démixage

### RipX

- Analyse de timbre
- Travail de l'écoute
- Décomposition instrumentale
- Transcription
- Accompagnement réel

# Moises

Bien plus

Ta bib

 Séparation audio par l'IA

 Métronome Intelligent et  
Modificateur de vitesse  
audio

 Changement et détection  
de tonalité par IA

 Détection d'accords

 Toutes les fonctionnalités

ation : un partenaire de musique.

es n'importe quel appareil, stockée dans le cloud en toute  
sécurité.



The screenshot displays the Moises app interface. At the top, the project name is "Fillmore - Kiss to kill". The interface shows a list of tracks on the left: Kick Drum, Snare, Hi-Hat, Toms, and Cymbals. The main area displays a piano roll with a chord progression: G<sup>add9</sup>, C<sup>add9</sup>, G, and A<sup>m7(9)</sup>. The bottom right corner shows a snippet of the song "A Real Bad" with a G<sup>m</sup> chord. The bottom right corner also features the "Hes·SO" logo.

# Orchidea

- Un outil d'orchestration et d'analyse de l'orchestration
- Pouvoir faire des propositions et les discuter

The screenshot displays the Orchidea software interface. The window title is "preferido nov 23 B.orchidea". The interface is divided into several sections:

- TARGET AUDIO SOURCE:** A section for selecting and processing the audio source.
- PROPERTIES:** A section for configuring the analysis parameters, including "Use", "Solve From Script", "Target", "OPTIMIZATION", "ANALYSIS", and "SEGMENTATION".
- EFFECTS, FILTERS, ORCHESTRA:** Sections for applying effects, filters, and managing the orchestration.

The right side of the interface shows a musical score with multiple staves for different instruments:

- Fl (Flute):** Two staves showing musical notation and dynamics like *ppf*.
- Ob (Oboe):** Two staves showing musical notation and dynamics like *f*.
- CIBb (Clarinet in B-flat):** Two staves showing musical notation and dynamics like *ppp*.
- Bn (Bassoon):** Two staves showing musical notation and dynamics like *mf*.

The score includes various musical notations such as notes, rests, and dynamic markings. A vertical yellow bar highlights a specific time range in the score.

# Orchidea

- une application d'aide à l'orchestration
- Paramètres de contrôle
- Segmentation
- Orchestration statique et dynamique

The screenshot displays the Orchidea software interface. The title bar reads "preferido nov 23 B.orchidea". The interface is divided into several sections:

- TARGET AUDIO SOURCE**: Includes a play button and a "Solve From Script" button.
- PROPERTIES**: Contains "Use" (Target Sample), "Solve From Script" (Open), and "Target" (Close).
- OPTIMIZATION**: Includes "Quality" (High), "Initialization" (Random), "Normalization" (Max Abs), "Diversity" (0.01), and "Sparsity" (0.000).
- ANALYSIS**: Includes "Partial Filtering" (Enable), "Threshold (dB)" (4.00), "Damp Cutoff (Hz)" (5000), "Damp Exponent" (2.0), and "SEGMENTATION" (Threshold: 0.58, Timegate: 100).
- EFFECTS**: A section for applying audio effects.
- FILTERS**: A section for applying filters.
- ORCHESTRA**: A section for managing the orchestration.

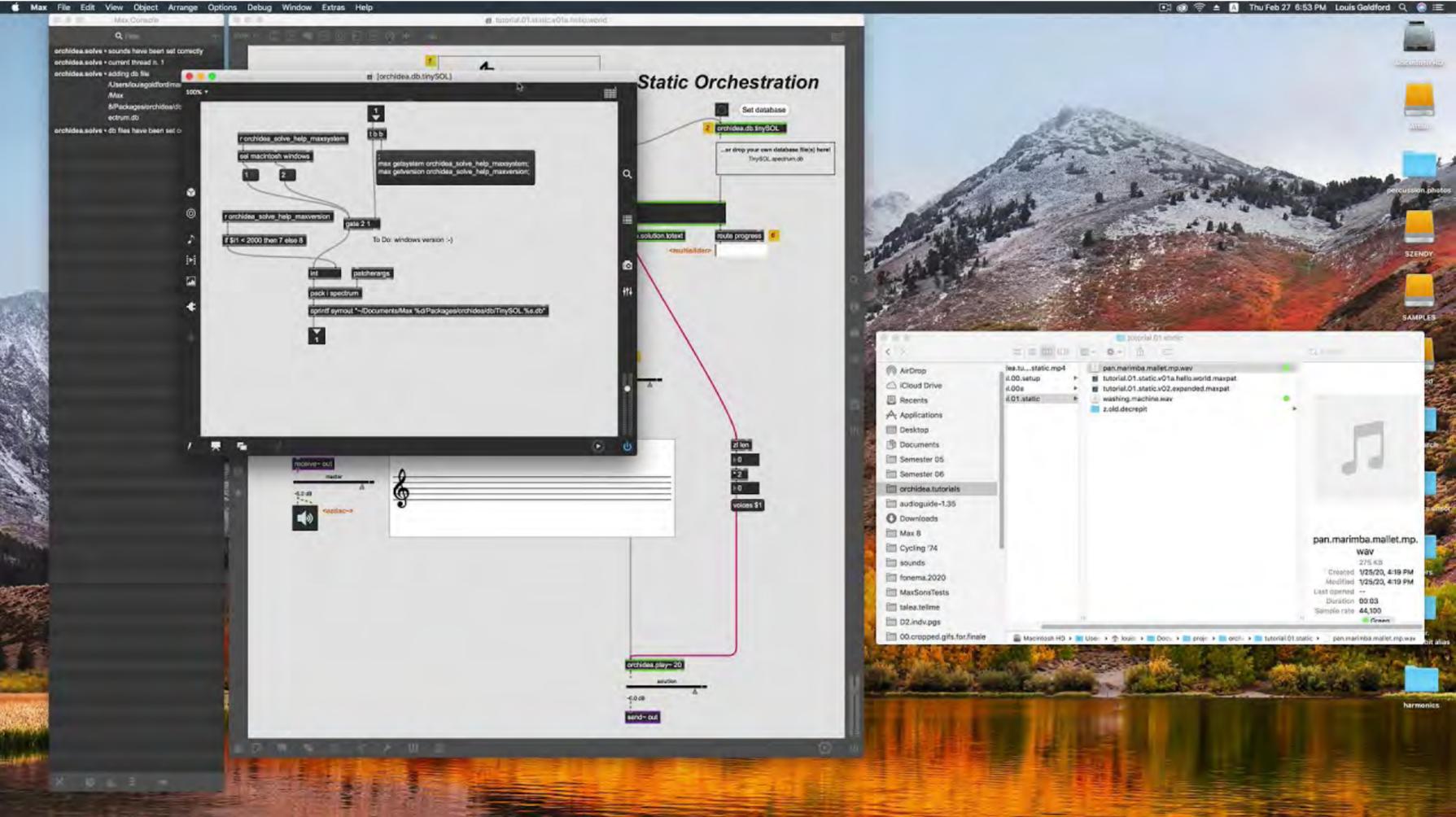
The right side of the interface shows a musical score for various instruments: Fl (Flute), Ob (Oboe), CIBb (Clarinet in Bb), Bn (Bassoon), and s/z (Saxophone/Trumpet). The score includes dynamic markings such as *ppf*, *mf*, *f*, and *ppp*, and articulation markings like *sfz* and *key\_cl*. A vertical yellow bar highlights a specific time range in the score.



# Orch-idea

Orchestration générative (Recherche /  
Création / Pédagogie)

- Dans l'environnement interactif  
Max8

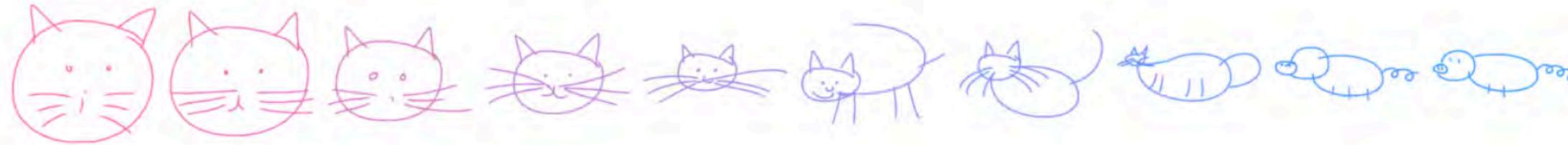


# Arrangement - Analyse - Ecriture

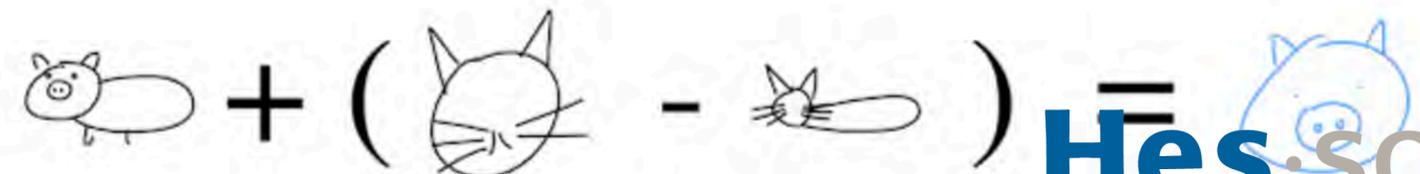
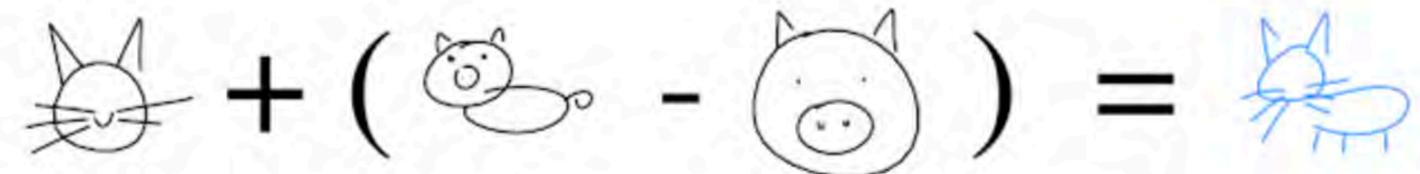


Human Input

Human Input



## Google Magenta Music Vae



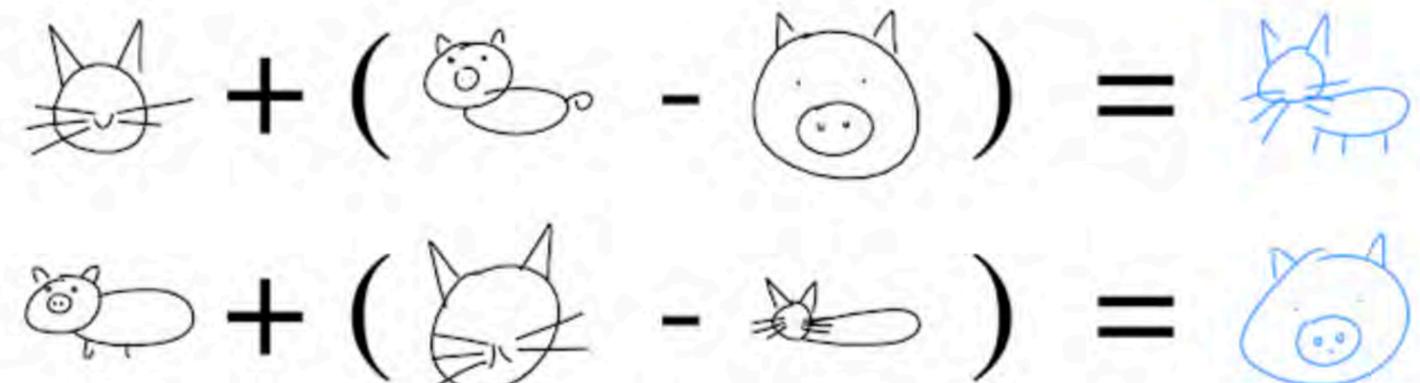
# IA générative et éducation



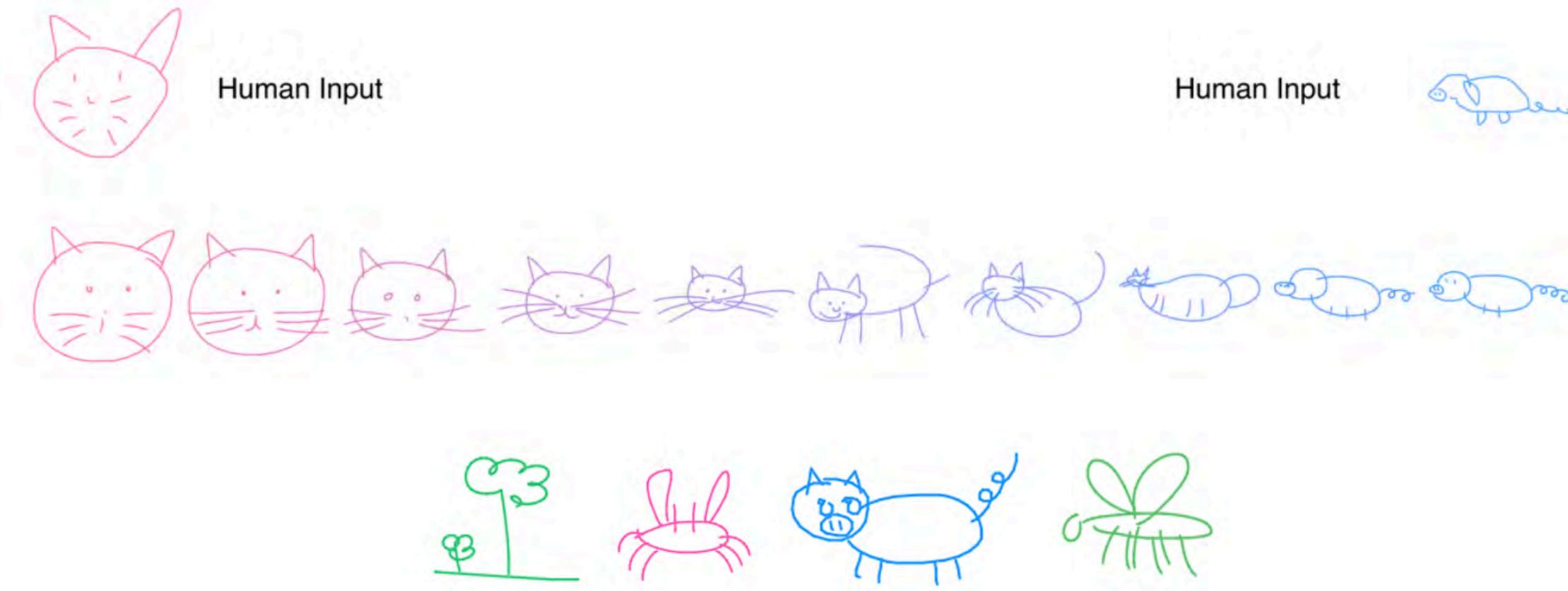
- Transformer l'éducation avec l'IA générative en offrant des outils d'assistance aux enseignants, tels que la création de plans de cours, de quiz et d'exercices personnalisés



- Différenciation pédagogique : l'IA générative peut aider à personnaliser l'apprentissage en s'adaptant aux besoins et aux rythmes de chaque élève



# IA générative et éducation .



- o **Formation : importance de la mise en place des formations pour les enseignants afin de comprendre et d'intégrer les potentialités et limites de l'IA générative, ainsi que les bonnes pratiques pour une utilisation en classe**

$$\begin{array}{l} \text{Cat face} + (\text{Pig body} - \text{Pig face}) = \text{Cat body with Pig face} \\ \text{Pig body} + (\text{Cat face} - \text{Cat body}) = \text{Pig face with Cat body} \end{array}$$