INSTITUTE OF SONOLOGY

Royal Conservatoire The Hague

Selective Retention: Sound and Process

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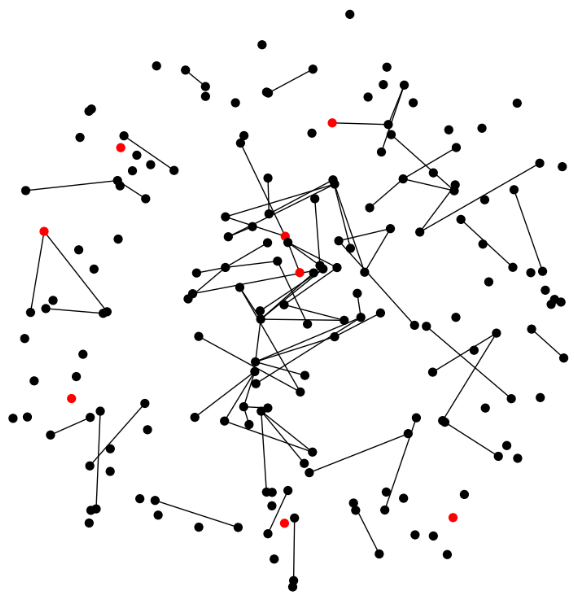
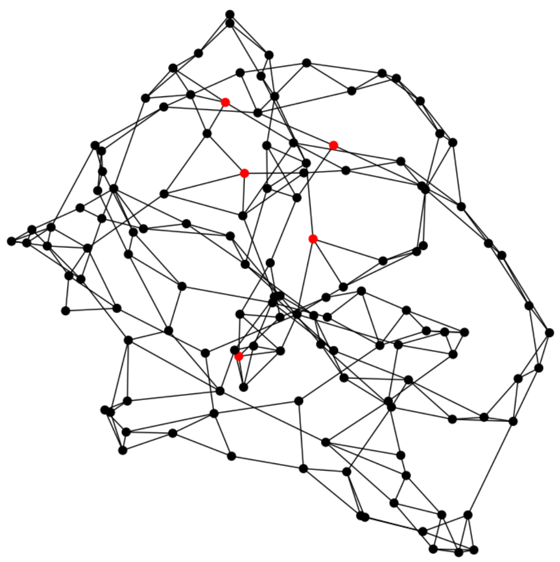
SELECTIVE RETENTION

In his book **The Wandering Mind**, Michael C. Corballis reflects on the *"default-mode networks"* of our minds and how the essence of creativity takes place through *"blind variation"* a transition from a set path to something unknown, where what we do stumble across is recognised and labelled as a ***"selective retention"*** (Corballis 2015).

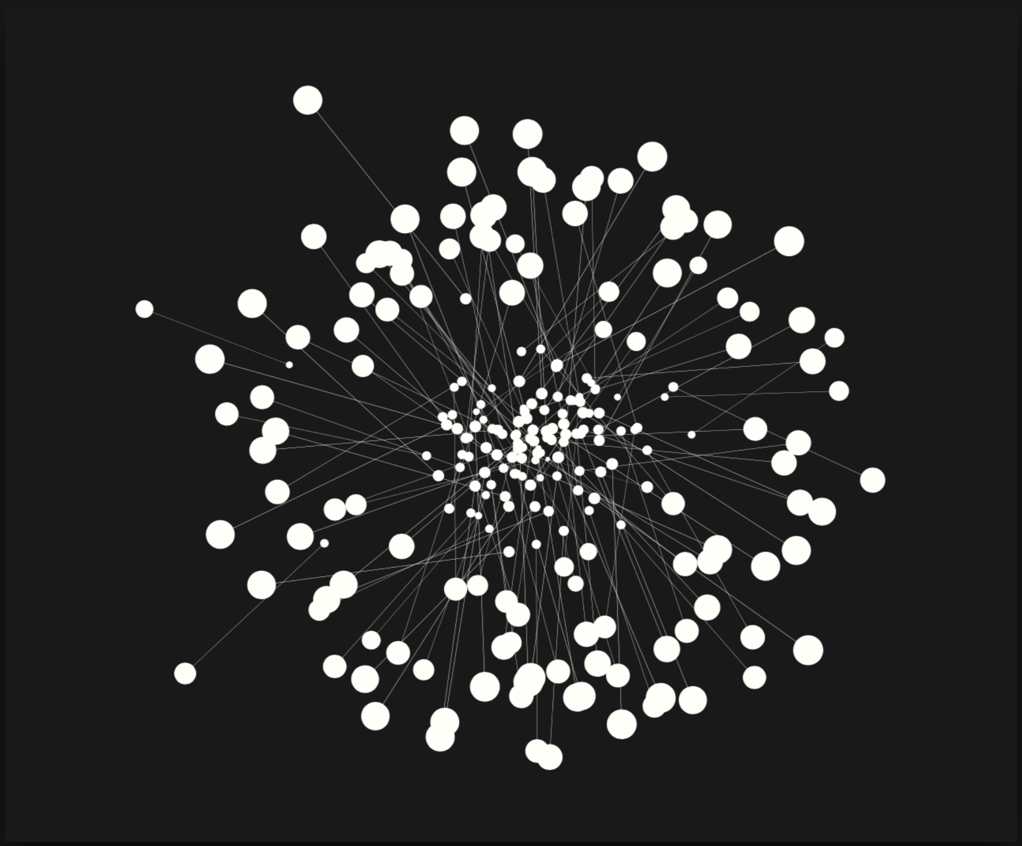
His idea of wandering is not concerned with a specific problem-solving goal but rather with something more uncharted or exploratory. It starts at a certain point, and then ventures along different paths. The relationship between these points can be constantly changing and shaped by the interaction with past points of connection. What stands out are the retentive moments that occur during that process.





A computer program can act as an interface to **existing material** where the tool is viewed as a method for understanding and informing the use of that material. As the tool proceeds towards **exploration**, it also undergoes **evolution**, a dynamic relationship between the tool and the material it interacts with. This process is used not only as a way of understanding the material under examination but also as a way to see it differently based on its **context**.

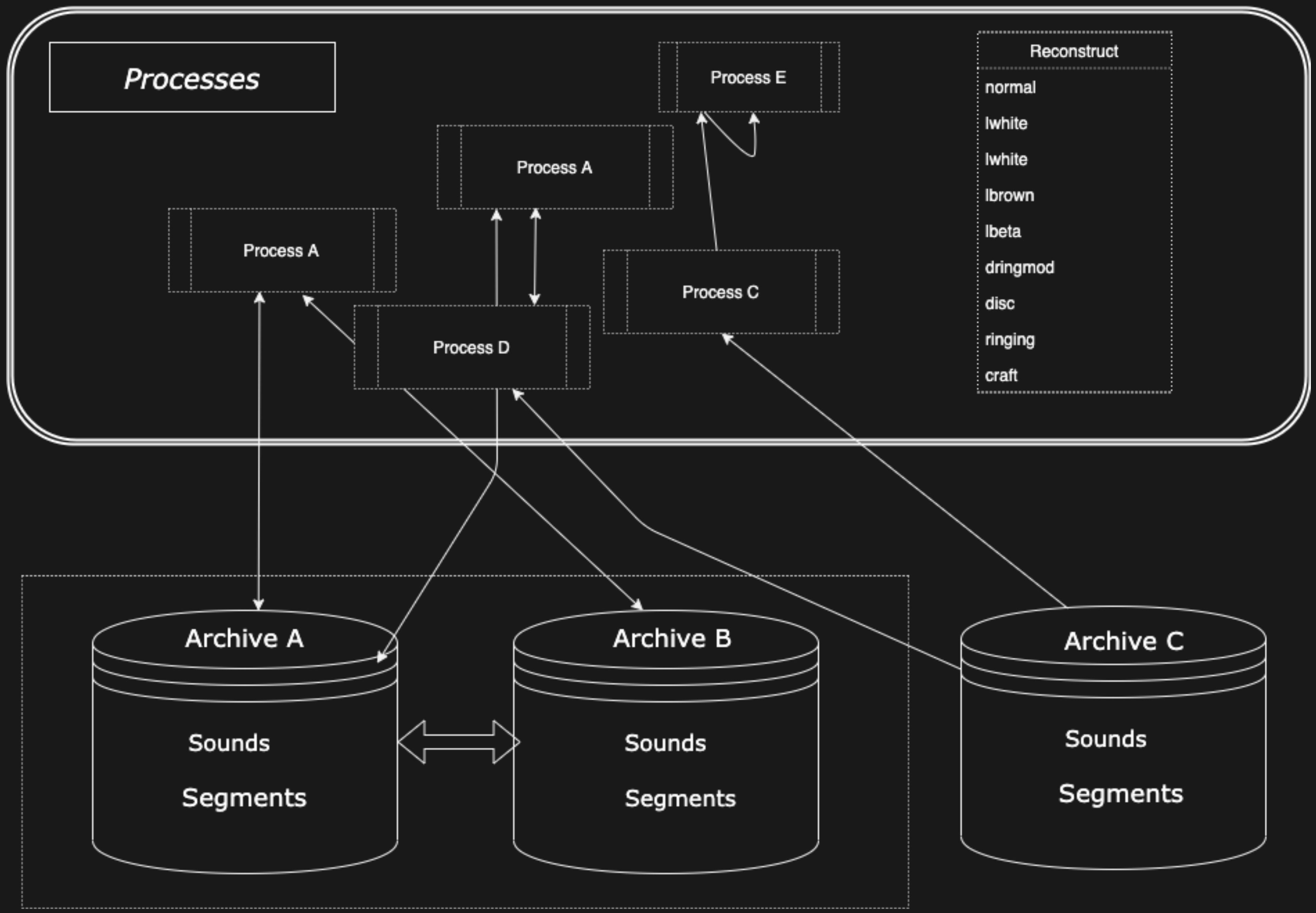
In his classic criticism of programming approaches in the mid-70s, the American computer architect Frederick Brooks remarked how deep involvement with a particular problem enlightens it and how *"the incompleteness and inconsistencies of our ideas become clear only during implementation."* He further adds that therefore *"the writing, experimentation, 'working out' are essential disciplines for the theoretician"* (Brooks, 1982).



Exploratory data analysis *is an attitude, a state of flexibility, a willingness to look for those things that we believe are not there, as well as the things we believe might be there.*

Experiments *and certain planned inquiries provide some exceptions and partial exceptions to this rule. They do this because one line of data analysis was planned as part of the experiment or inquiry. Even here, however, restricting one's self to the planned analysis--failing to accompany it with exploration--loses sight of the most interesting results too frequently to be comfortable. Exploratory data analysis can never be the whole story, but nothing else can serve as the foundation stone--as the first step.* ***John Turkey****.*

SNDArchive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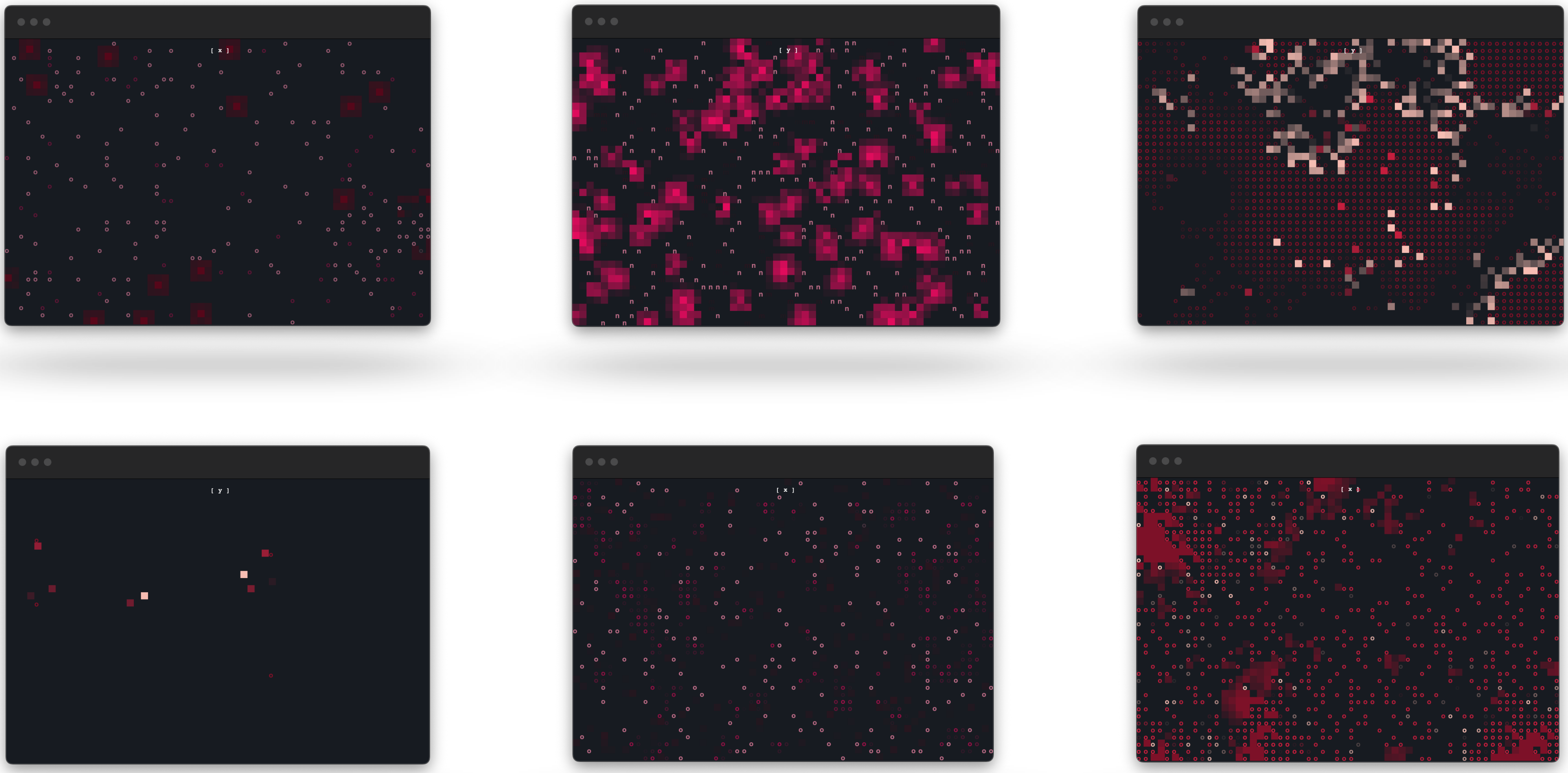
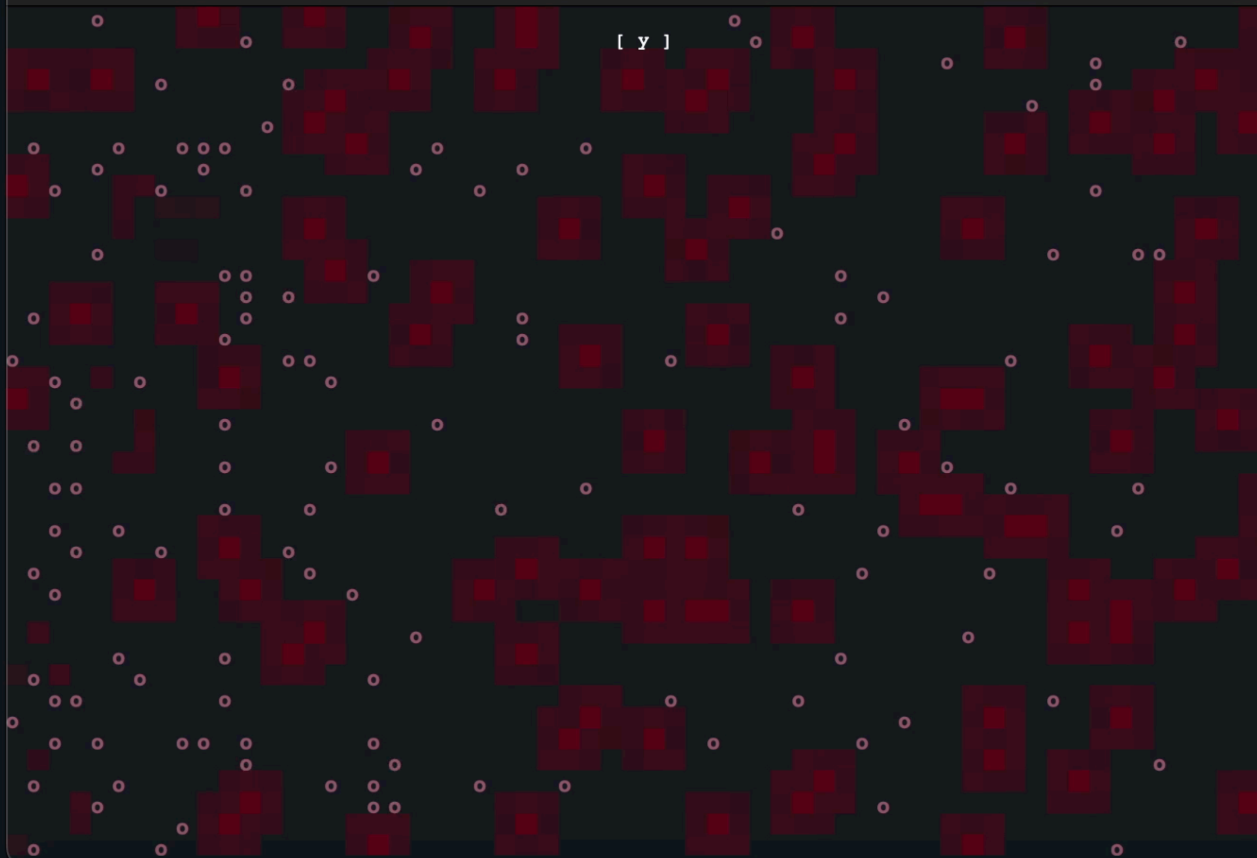


“Mirroring nature involves interpretation and ordering by the artist. As simulacra or simulation, a computer process is not the same as what it seeks to mirror. ” (Mccormack 2013)

The dynamic relationship between digital environments and generative algorithms allows for an exchange, or **mediation** between these two that could be described as *“not a flow between two preexistent entities; rather, it is a process that re-presents or reconstitutes entities.”* (Barker 2012).



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__.scd

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~sim.attach("x", \pointb, "maxAge", \ffrom, 1900, 2000);

~sim.bind(\pointa)

~sim.bind(\pointb)

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~sim.focus("x", 9); ~sim.focus("y", 10);
~of.action.interrupt(\pointa); ~of.action.interrupt(\pointb); ~of.action.interrupt(\pointc);

NF(\leaf, {|sdm=1,repeats=2,from=1,to=20,mod=40,amp=0.7,mf=0.03|
    var sd = SampleDur.ir * sdm;
    HPF.ar(DemandEnvGen.ar(
        Dseq([Dseries(-1.0, Array.rand(4,0.01,0.1), 30)], inf),
        Dseq([
            Dwhite(from, to, repeats),
            Dwhite(from/1.5, to*3, repeats)
        ], inf) * sd
    ).clip(SinOsc.ar(Array.rand(4,mod,mod*0.9))) * mf * amp, 50);
}).play;
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a BrutesAndBullies

a BrutesAndBullies

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NF('learub')
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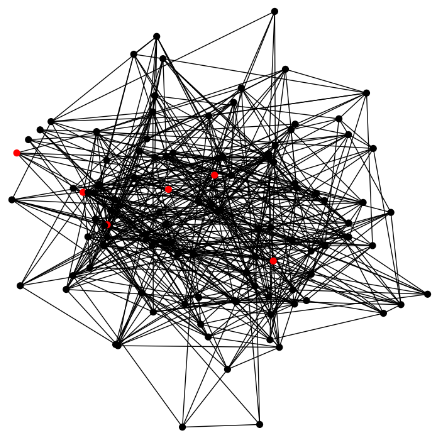
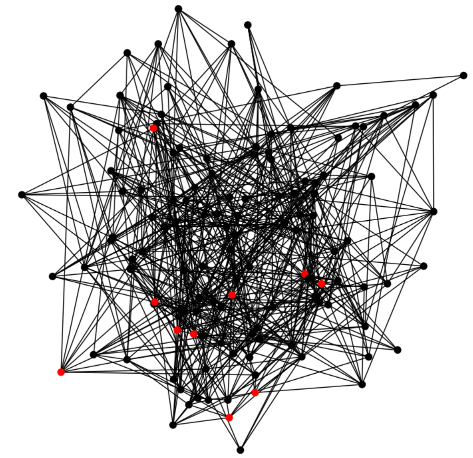
HOLDING PATTERN

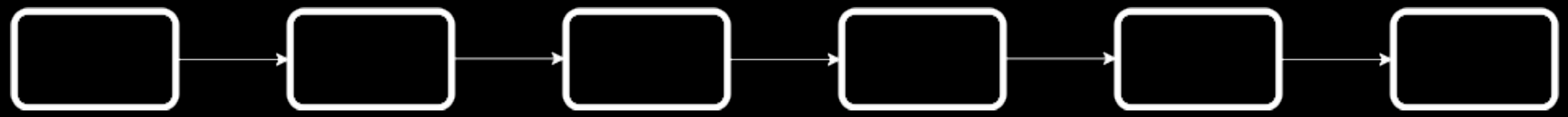




"**Relationality** is the experience of passage a vague edging with, against, between, away from—that actualizes the related things. It is experience as conjoining/disjoining. To take the edge seriously means to also value the force of relation—its capacity to change the things in relation at the very moment change itself relationally occurs."

(Munster 2013)

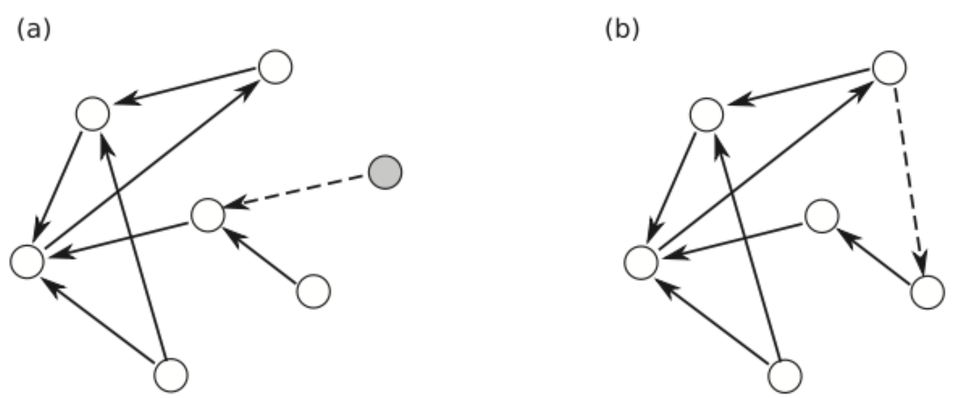
Musical material as nodes in a network. Nodes that are composed before being and independently of each other, developed with the network behaviour in mind from the start.

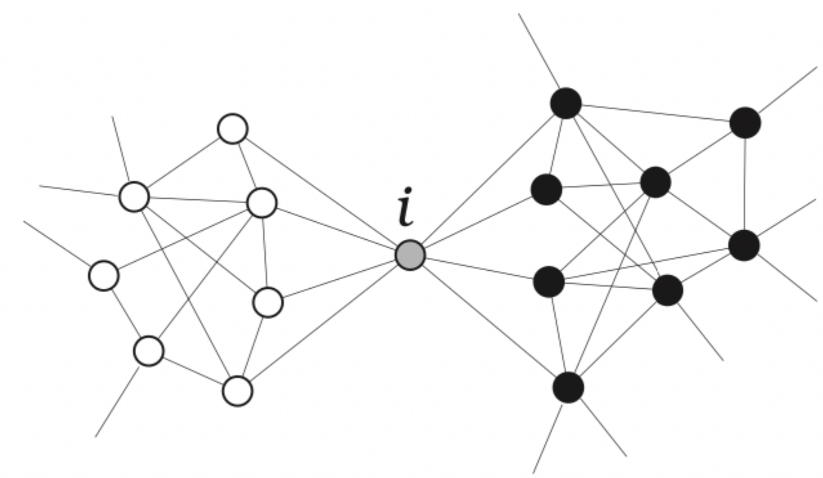


The algorithms unfold through the activation of the connected blocks where the speed and nature of the switching are put to the foreground.

The duration of each block is important but even more the difference from one to the next.

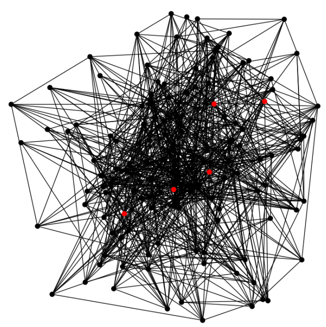
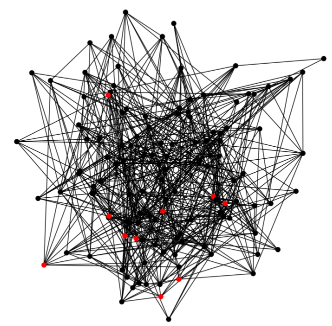
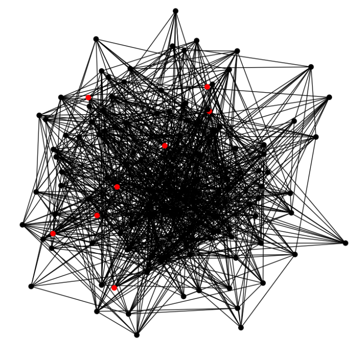
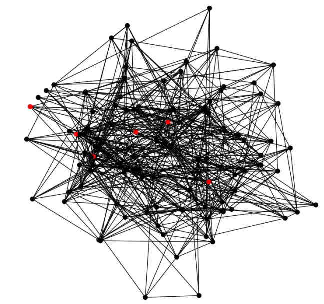
Audio analysis data is used to train node selection with a regression mapping of analysis to network representation.





The **Watts–Strogatz** model attempts to balance the best of high clustering coefficients and average path length by starting from a highly clustered ring network but then introduce random edges using a probability factor for all the nodes in the ring.

The **Barabási–Albert** model is designed to capture the growth and preferential attachment mechanisms observed in many real-world networks, where a few nodes accumulate a disproportionately large number of connections while most nodes have only a few connections.

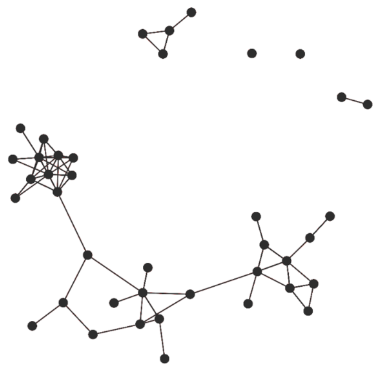





Using the different graph algorithms developed alongside the music, one can build up strategies for exploring the material in various ways. The graphs can be constructed while the music is playing and the selection can occur quite rapidly. Many of the initial experiments took advantage of this by iterating repeatedly and in short steps. This resulted in a strong focus on rhythmic material and their forward-flowing behaviour.

The music is mostly relational, in the sense that any notion of 'sections' or 'transitions' is caused by the properties and details of the nodes. Additionally, all source processes are defined concerning other parts, resulting in a 'material network' or 'sound configuration' that can be activated in various ways.

Such a relational approach means that sounds appear in time due to their relation to other sounds. Emphasising further a causality that is based on the characteristics of its sound material.

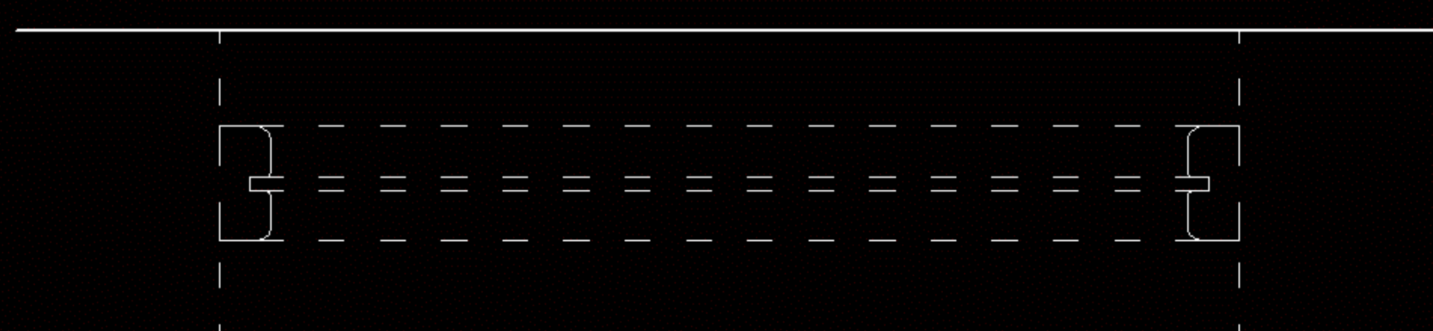
HOLDING PATTERN



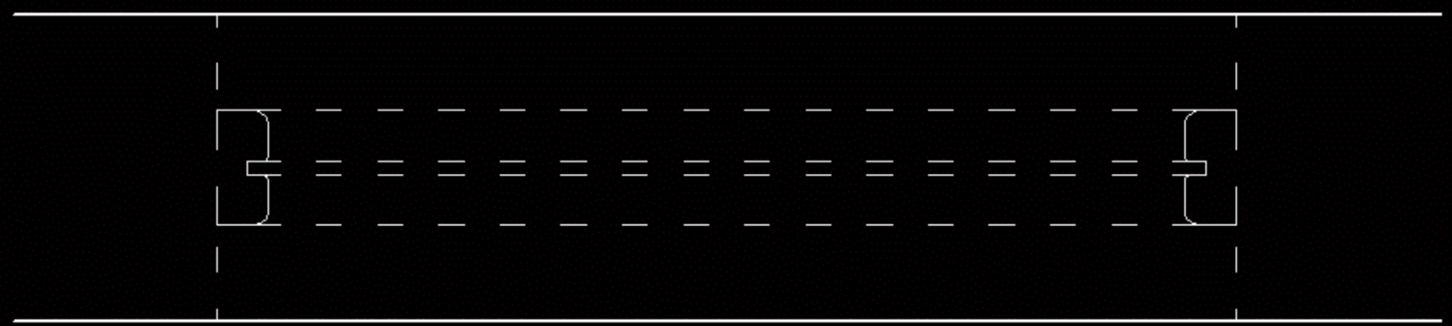
EVER-PRESENT CHANGE

EPC

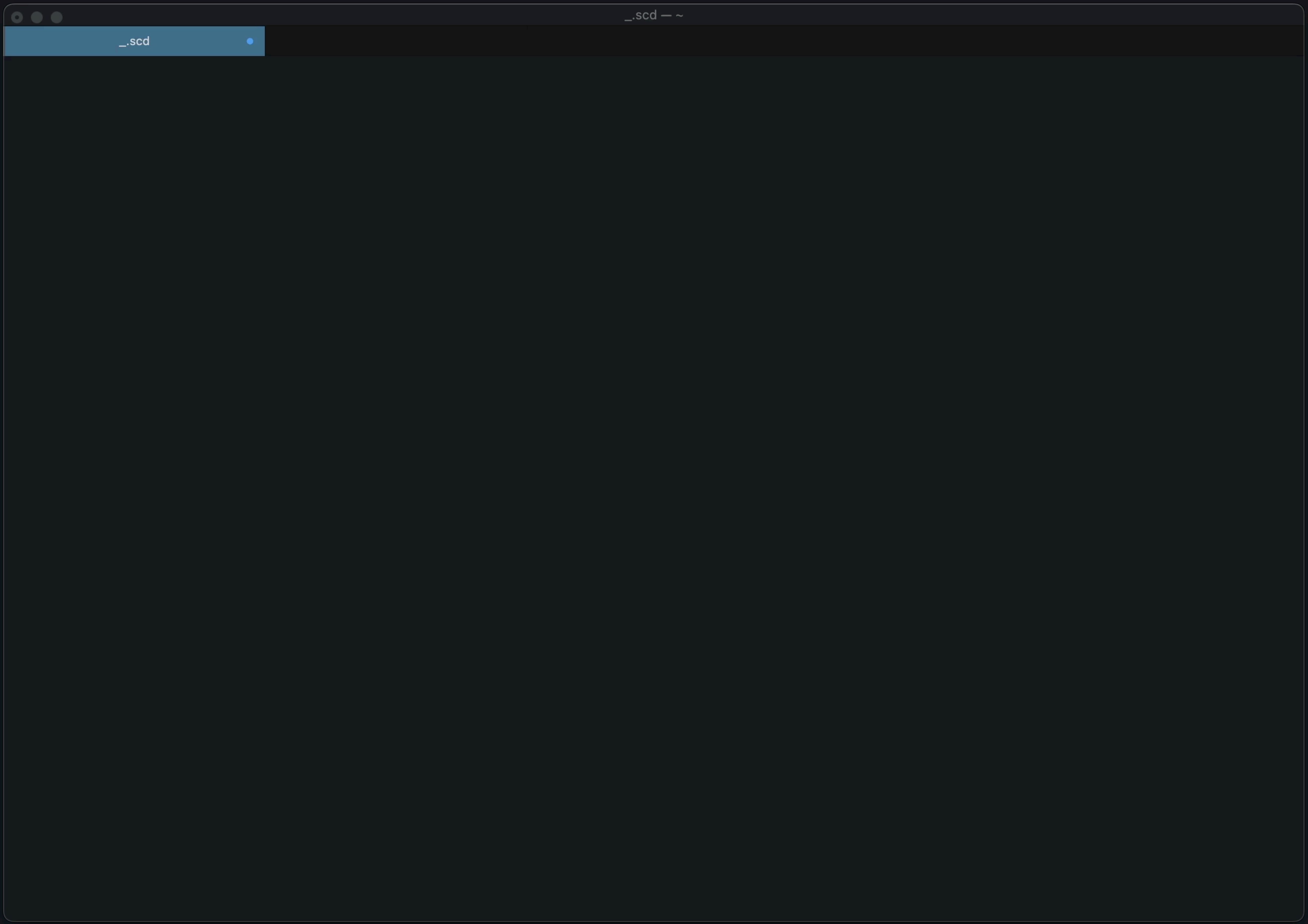
Developed as an experiment in dynamically evolving networks, ***Ever-Present Change*** *merges live coded sound with generative processes, creating a piece that evolves through continuous interaction between algorithmic activity and manual intervention. Rather than simply presenting collections of successive sounds, the work delves into formative principles, emphasizing how sonic elements develop relationships through the technical processes that shape them. This exploration responds to synthetic sound sources, observing the interplay between human agency and automated systems.*



EPC



Ever-Present Change *seeks to explore the underlying principles that drive the flow of events in time. The work questions how listeners attribute order and control, revealing that what seems like a predetermined sequence may actually emerge from the fluid, real-time interaction of the processes themselves. In this way, the piece not only comments on its own formation but also invites to engage with the unfolding relationships that give rise to a sense of causality and structure.*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STREAMLINES

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Streamlines.behaviour(\stress);

Streamlines.behaviour(\drift);

Streamlines.interrupt([\slapoint,\slarolls,\slatacs,\slatics]);

(

 NF(\cranivite, {|rate=12,bfmin=400,bfmax=1000,amp=0.8,bw=12,freq=10,hpf=40|
     RLPF.ar(
         BPeakEQ.ar( HPF.ar(
         BBandStop.ar(LeastChange.ar(
             GravityGrid.ar(0, Array.fill(2, { freq * rrand(0.25,1.2) }) ),
             LoFM.ar(freq)), LFNoise1.ar(0.1).range(bfmin,bfmax), bw),
     hpf), 60, 2, -9) * amp
     , 8500, 0.75, 1.8)
     }).play;
)

(

 NF(\crinop, {|modFreq=18, feedb=0.2, amp=0.1, ffrom=20, fto=40|
     SinOscFB.ar(LFNoise1.ar(0.01).range(ffrom, fto)*1.2, feedb).
 fold2(SinOsc.ar( modFreq / [1,1.2])) * amp
 }).play;

)

(

 NF(\crjonvmar, {|fspeed=10,fcenter=4000,wfmult=1,filtbw=12,lpf=1500,amp=0.3|
     var a = 1, b = 35, min=0.01, max=0.8;
     var sd = SampleDur.ir * wfmult;
     var size = 3, from = 1, to = 15;
     var mfreq = 10, mfrom = 1, mto = 28;
     var snd = DemandEnvGen.ar(
         Dseq([min, min.neg, [max.neg, max]], inf),
         Dbrown(sd * a, sd * b, sd*2);
     ).fold2(SinOsc.ar([0.01, 0.012])) * amp;
     snd = LPF.ar(snd, lpf);
     snd = snd.mod(SinOsc.ar(LFNoise0.ar(mfreq).range(mfrom, mto)));
     snd = HPF.ar(BBandStop.ar(snd,
     Lag.ar(LFNoise1.ar( [fspeed,fspeed*2]).range(fcenter * 0.2, fcenter * 2), 0.05), filtbw)).sum;
     2.collect{|i| BBandPass.ar(snd, 150 * (i + rrand(1,10)), 0.4, SinOsc.ar(0.1.rand).range(0.0,3.
 }).play;

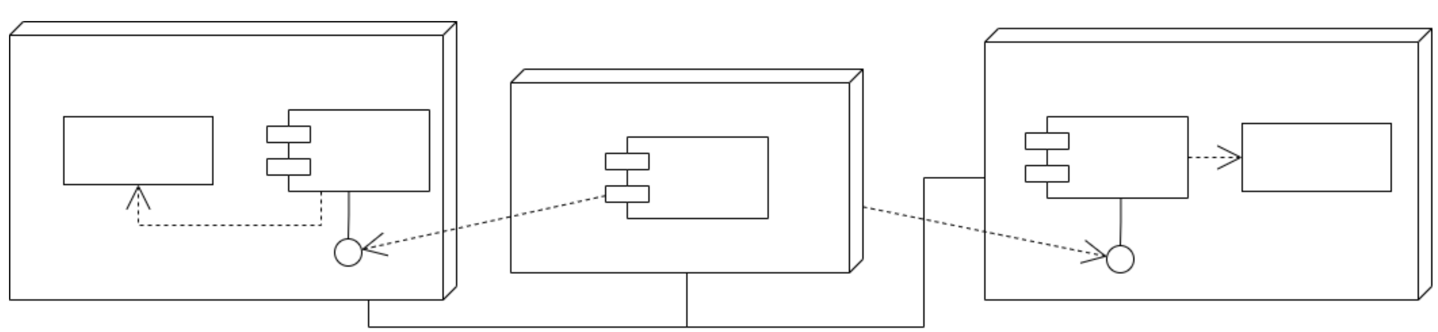
)
```

“We aim to challenge common understandings of data collection and the training and application of ML algorithms as “neutral” technical procedures; instead, we emphasize the inherently aesthetic, encultured, and material nature of these practices.”

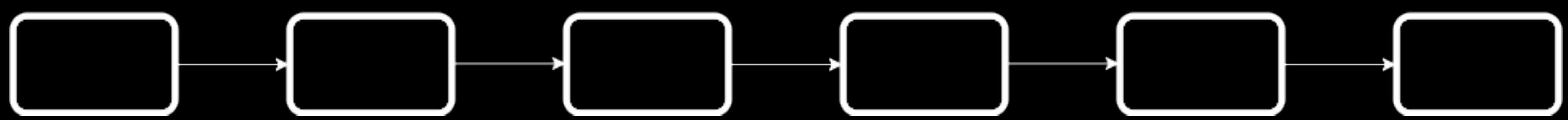
“I examine the aesthetic dimensions of material contingencies of the data creation process, and use Poirier’s (2021) denotative, connotative, and deconstructive readings of datasets to explore data-making as itself an encultured compositional act. (composing the assemblage)

In contrast to the common usage and understanding of the term, data do not exist in nature, neither can they be “collected” (Markham 2013).”

Composing the Assemblage: Probing Aesthetic and Technical Dimensions of Artistic Creation with Machine Learning. Artemi-Maria Gioti, Aaron Einbond, Georgina Born. 2022.



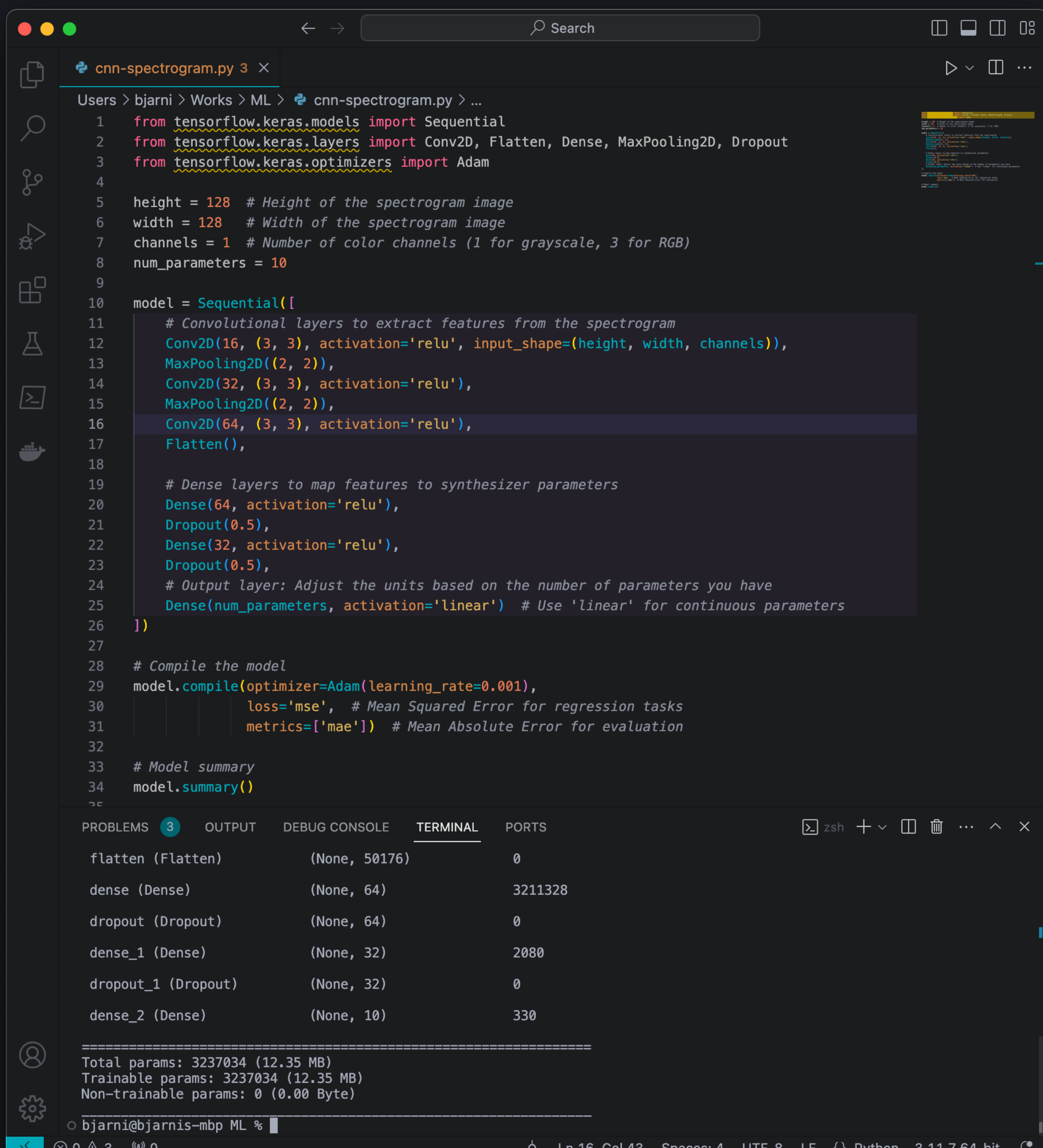
"When working with machine learning, one does not attempt to directly implement a solution to the problem at hand but rather to create the right conditions for the machine learning system to accomplish target tasks. This requires an intuitive comprehension of the problem and involves putting the right things together through trial and error."

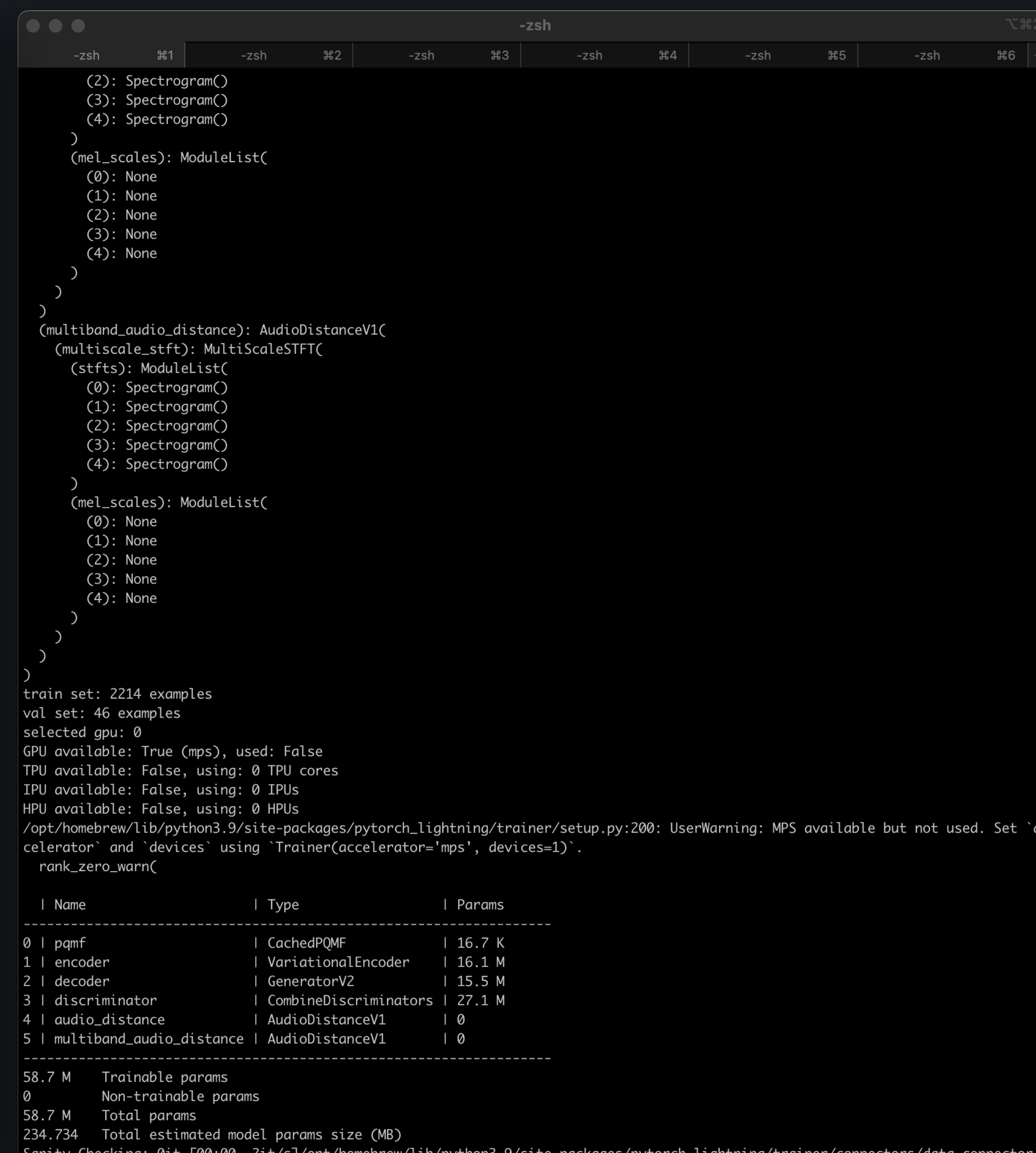


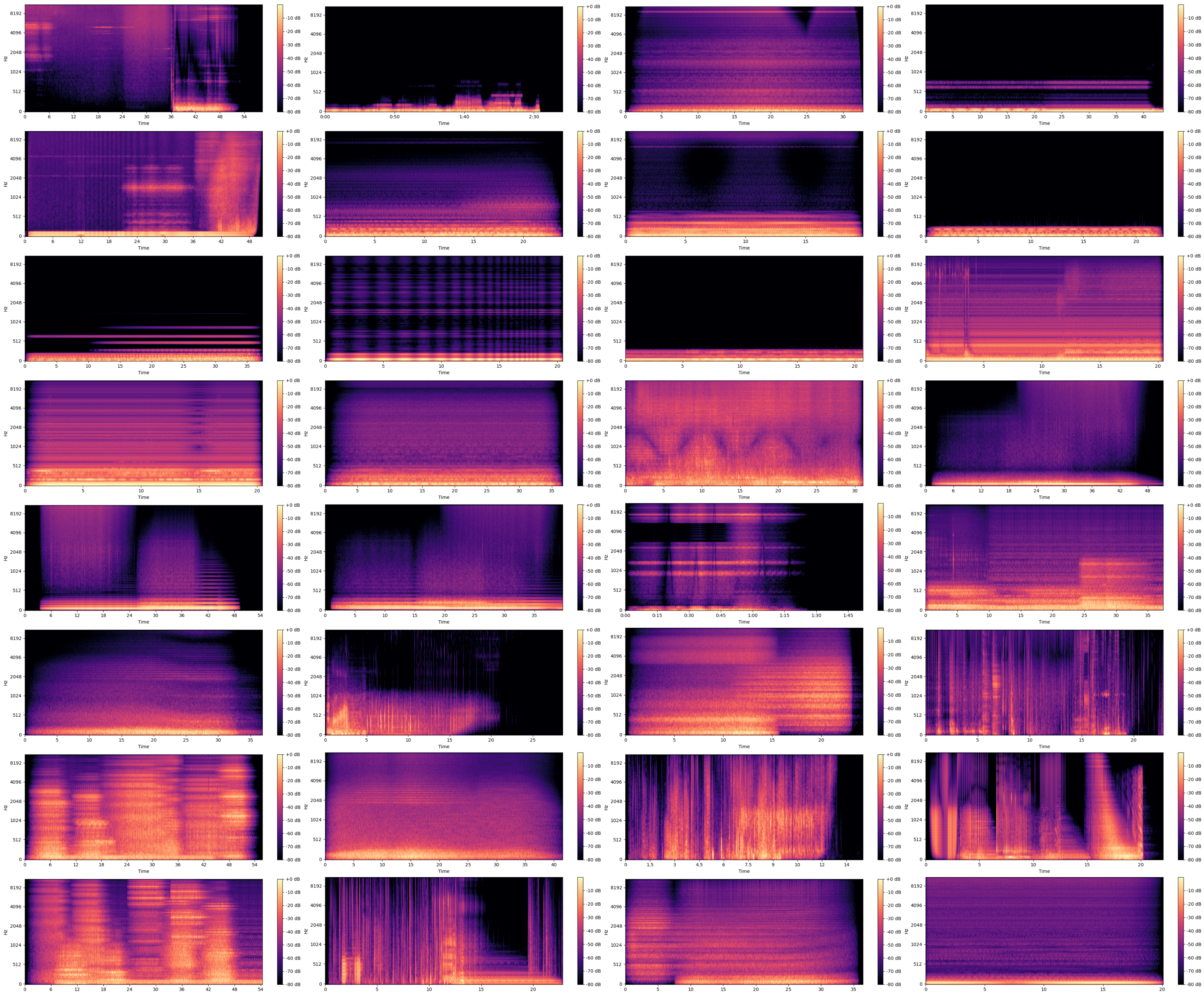
"After training, the learning algorithm and the data set become unnecessary: the trained model can be used directly, as it has absorbed all of the relevant information to accomplish its duty. As a result, models are all that remains after the training process: they are the true output of a machine learning system."

Art in the Age of Machine Learning, Sofian Audry, 2021.

Spectrogram and DL (Keras/Tensor Flow)







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-40 dB
-50 dB
-60 dB
-70 dB
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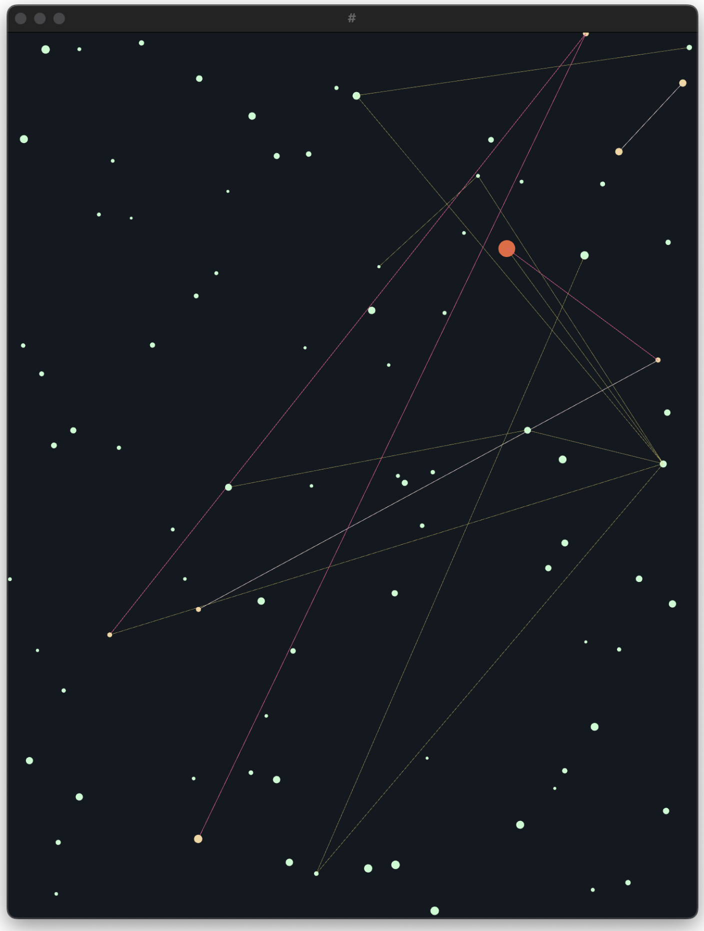
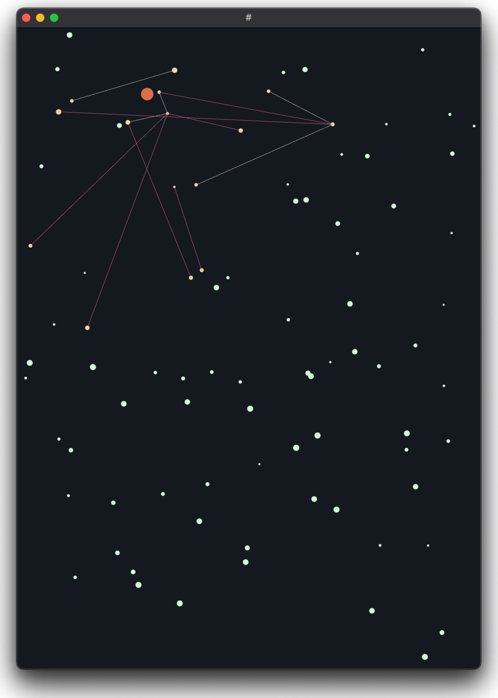
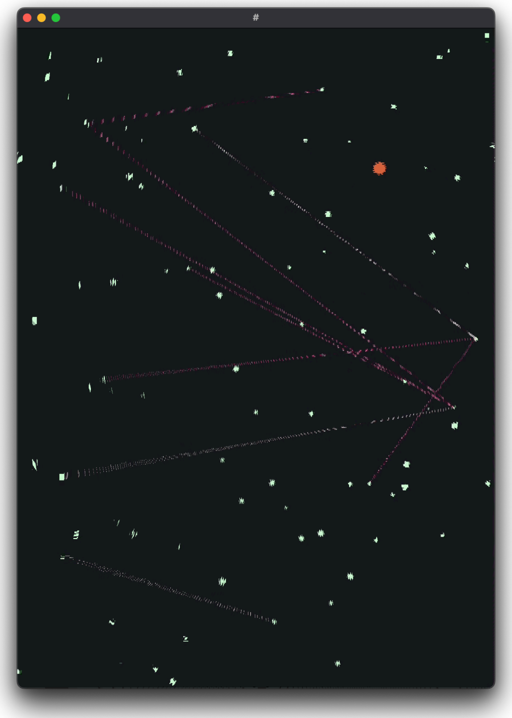
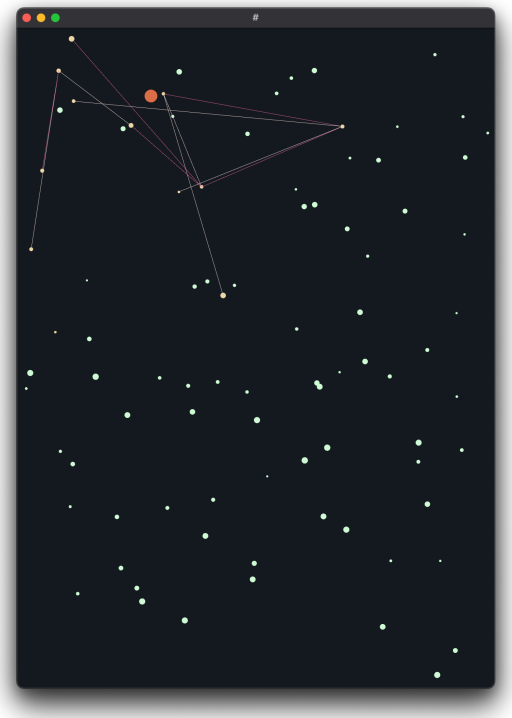


'**Streamlines**' is a software, piece and performance created using *SuperCollider*, the *Keras API* and *P5.js*. The piece is based on an **inference process** that has been trained using **synthetic sound sources** mapping to custom data structures that are designed to appear as nodes in a network. During a performance, a stream of **live-coded sonorities** is produced that is analyzed and then used to make predictions of suitable nodes. These then recall a dynamically **growing network of short, articulated sequences** that form a counterpart to the synthetic sound.







The idea is to critically question the use of **generative algorithms** within the creative process and how the training and **creating of data** for machine learning can become an important part of that process.

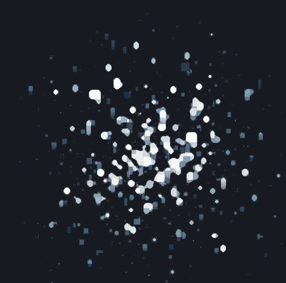
I try to think of the presented tools as a gateway to **access material** from different points in time. Defining such procedures involves an exploration of the intersection between **selection processes** and **generative means** for representing the selected as something original.

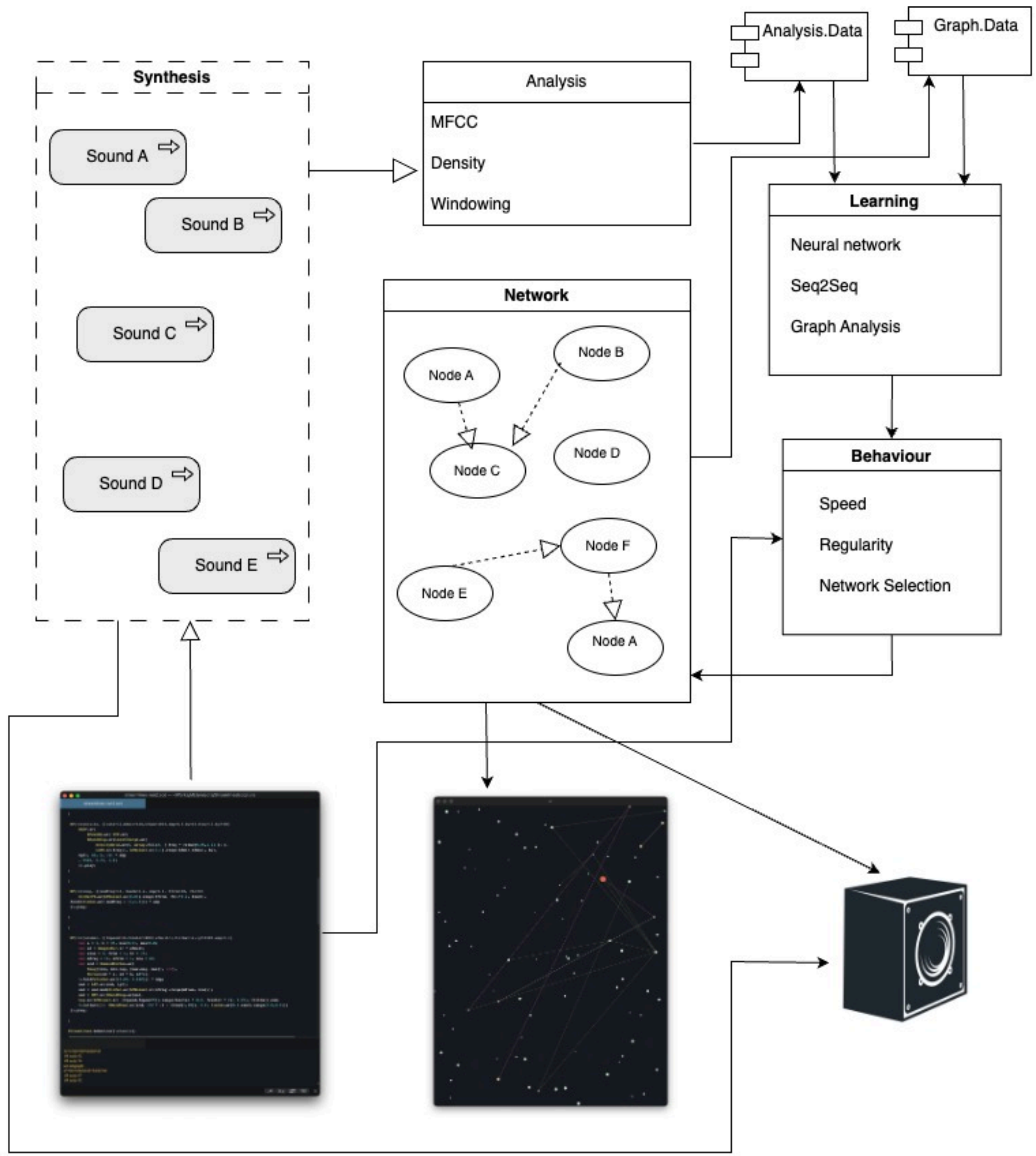
Learning Processes with Keras

During a training process a **mapping** is created between analysis data and a network representation

Current approaches used with Keras:

- Feedforward neural network with multiple hidden layers.
- Sequence-to-Sequence Mapping: A Seq2Seq model
- Graph neural networks using Spektral




Synthesis
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Sound B
Sound C
Sound D
Sound E
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MFCC
Density
Windowing
Analysis.Data
Graph.Data
Learning
Neural network
Seq2Seq
Graph Analysis
Network
Node A
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Node C
Node D
Node E
Node F
Node A
Behaviour
Speed
Regularity
Network Selection

#

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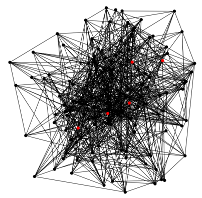
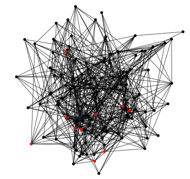
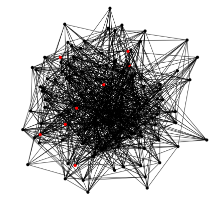
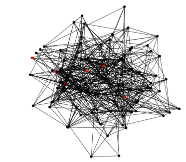
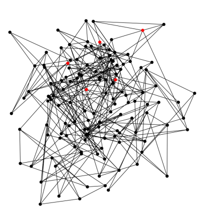
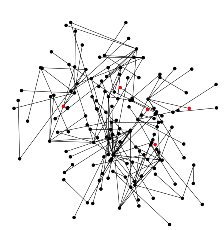
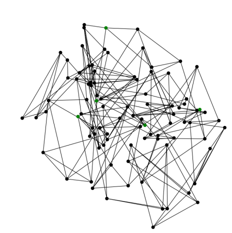
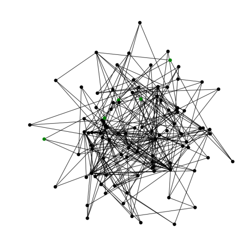





Computer music processes emerge within a given medium and the enclosing conditions it consists of. Similarly, generative processes come about within the boundaries imposed by a given computational context where "the context is the world-state data and arguments that the algorithm has access to" (Wooller et al. 2005).

The dynamic relationship between digital environments and generative algorithms allows for an exchange, or mediation between these two that could be described as "not a flow between two preexistent entities; rather, it is a process that re-presents or reconstitutes entities [...] it is a generative process, setting the conditions for the becoming of entities." (Barker 2012). Enabling the conditions for such exchanges can be seen as an important part of artistic approaches involving algorithms.

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THANK YOU!