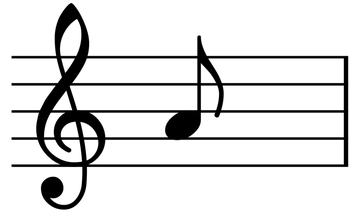
# The MelodySmith:
# An algorithmic approach to composition



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## What is it?

The MelodySmith is an algorithmic composition tool which music producers can use to generate musical ideas. The core of this tool is an algorithmic composer which uses data-driven techniques to come up with new melodies. With a host of controls which customize how the algorithm works, the MelodySmith offers fine grain control over important musical elements, like rests or note lengths. More importantly, the user is responsible for providing the music which the MelodySmith uses to build its models, attempting to capture the style of the songs and artists therein.

How can a computer write original music? How can musical style be captured without copying? These are the questions our team attempted to answer. The MelodySmith brings algorithmic composition to the modern music producer's workbench with a powerful VST plugin, and to the music enthusiast within us all with a simple and interactive website.


## How do I use it?

Music producers can use the MelodySmith VST plugin within most DAW's including Ableton and Logic Pro. Non-savvy music enthusiasts can visit https://melodysmith.herokuapp.com to play around with different algorithms and corpora.

## How does it work?

The MelodySmith is a three part system, consisting of an N-gram language model, an association network, and a composer. Changing how any one of these components works can have significant effect on the melody which will be produced, and users are able to alter all three components using a powerful set of controls. Figure 1 shows how information is exchanged around the three components

N-Gram Language Model

In computational linguistics, N-grams are structures which describe a sequence of events. In music, N-grams are sequences of rests and notes (Figure 2), and the N-gram language model keeps tracks of how many times each sequence has occurred in a collection of music. Given N-1 musical events, this language model can be used to decide the most likely $N^{th}$ event.

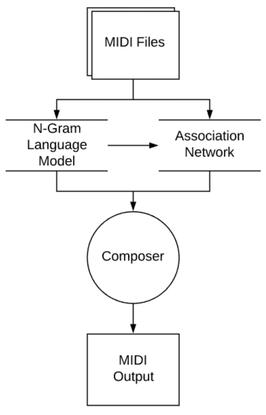
Association Network

An association network is like a big web of events. Every single musical event in the MelodySmith's input is stored in this web, and every event is linked to every other event with a weight. The higher the weight from event A to event B, the more likely the transition from event A to event B when the network is used to compose new music. These weights are based on things like the interval between the two events and many of the user controls.

Composer

The composer brings everything together to write an original melody. For each event the composer writes, it uses the association network to find relevant decisions given the most recent note it played, and then each of those decisions is compared to the N-gram language model to decide which one fits best in the current composition.

**Figure 1 –** MelodySmith Data Flow



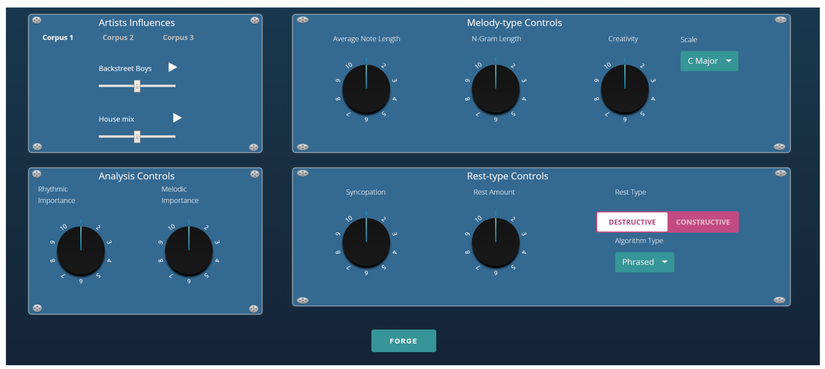
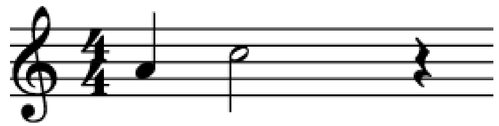




**Figure 2** – Musical N-Grams



Note name 2-grams: (A→C), (C→Rest)
Scale degree 2-grams: (1→3), (3→Rest)
Duration 2-grams: (1/4→1/2), (1/2→1/4)