Genetic Algorithms to create Blues Riffs

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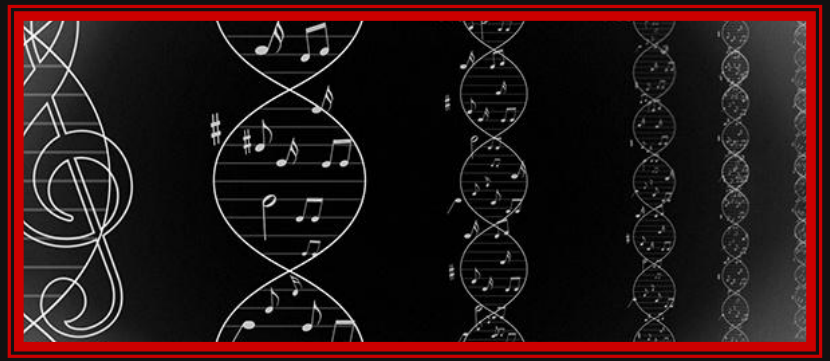

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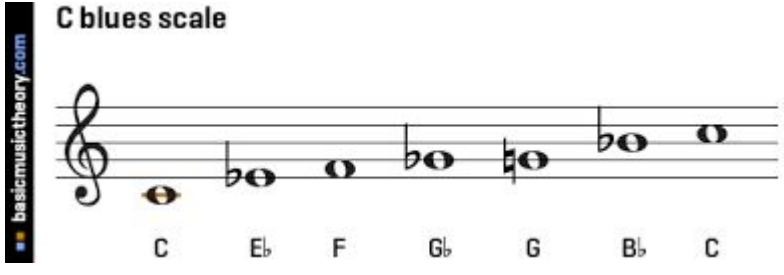
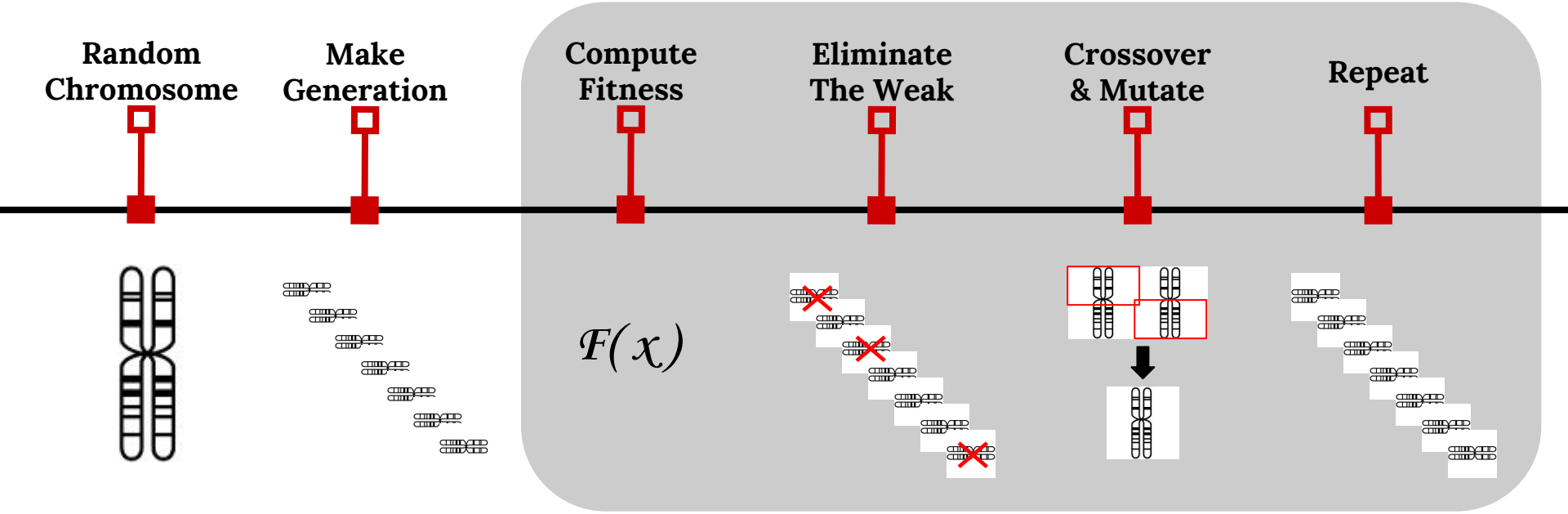
Goal

Use a Genetic Algorithm to aid in the discovery of Blues Riffs



Genetic Algorithm Review



Representing Music

Challenges

- Note, Time, Duration
- Integer Pairs
- A, C#, B ♭ ...
- Multi-note
- Ease of use

Approach

- Read Midi file
- Extract monophonic Notes
- [‘67’, ‘58’, ‘51’]
- Use MidiString as Target
- Gene_pool = notes from song
- Write midi - DAW

Fitness Function: Score Closeness to Target

Normalized Information Distance

$$NID(x,y) = \frac{\max\{K(x \mid y), K(y \mid x)\}}{\max\{K(x), K(y)\}},$$

Normalized Compression Distance [1]

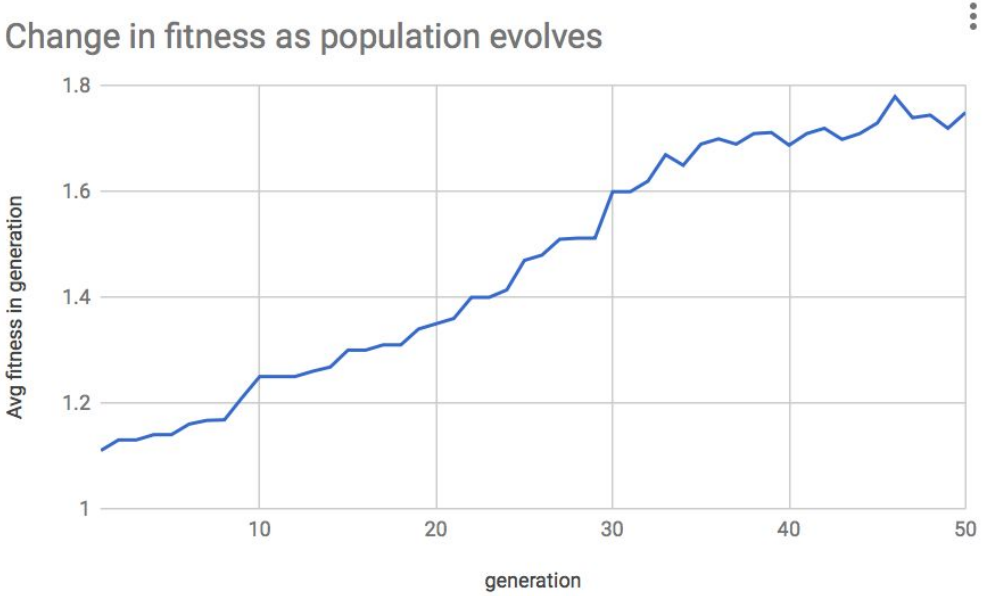
$$\mathrm{NCD}(x,y) = \frac{\max\{C(xy) - C(x), C(yx) - C(y)\}}{\max\{C(x), C(y)\}}$$

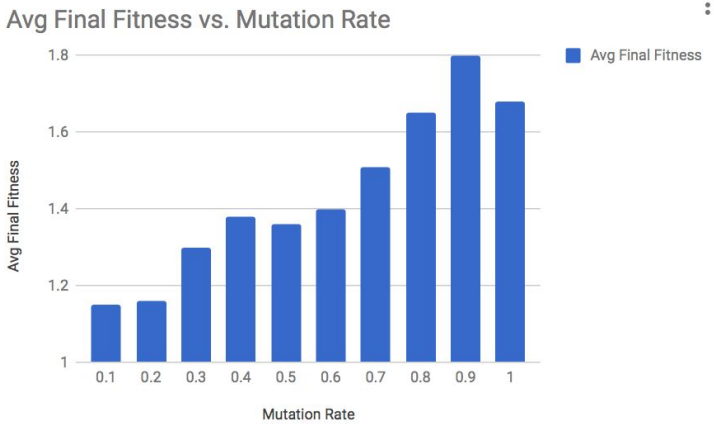
NCD: 0-1, Values closer to 0 = similarity to the target, avg: 0.5-1.0

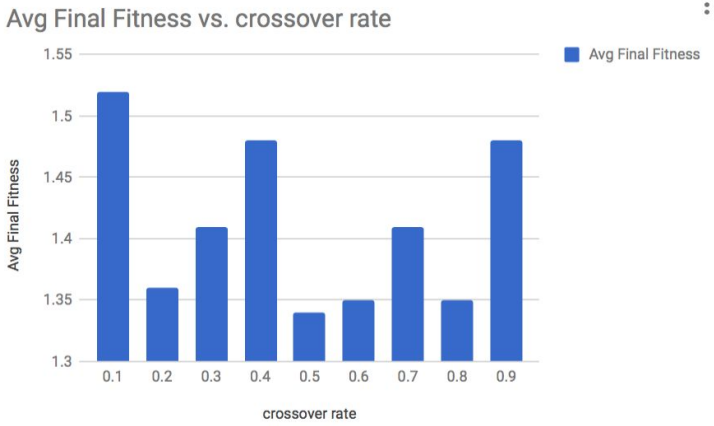
Fitness = NCD(X,Y) $^{-1}$ $\rightarrow$ higher values = greater fitness, avg: 1.1-2.5

LZ77 compression [2]: Avg Compression: 0.6% - 0.8%

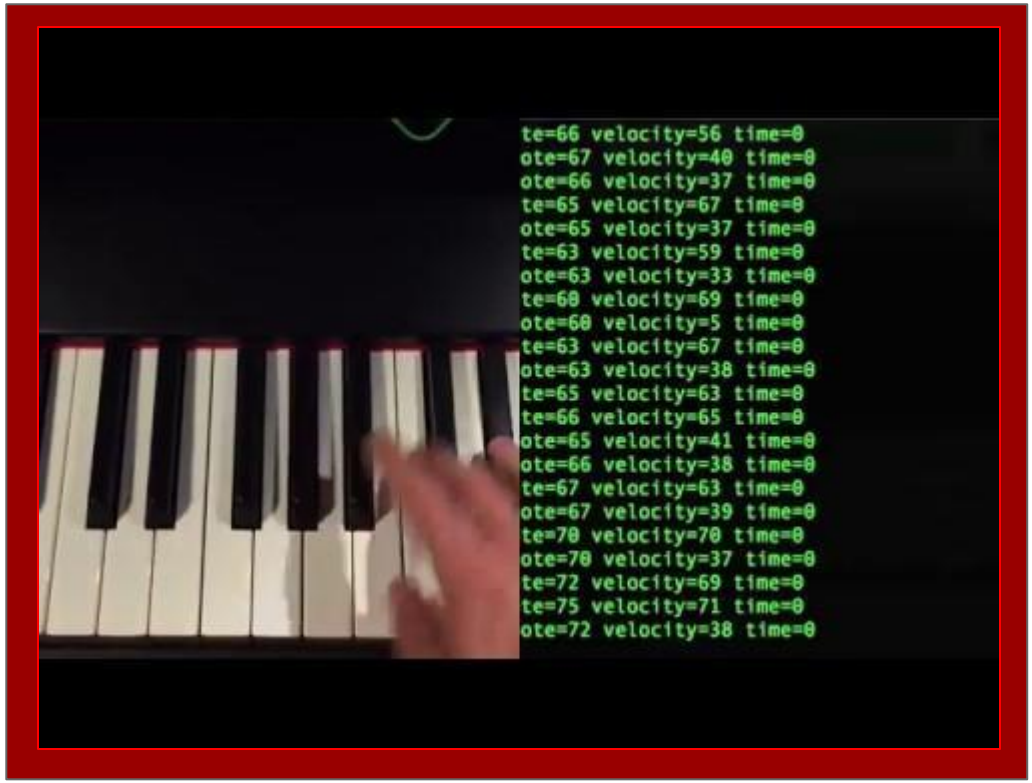
Results and Tuning Parameters







Interactive Mode



Works Cited

1. M. Alfonseca, M. Cebrian and A. Ortega, "A simple genetic algorithm for music generation by means of algorithmic information theory," *2007 IEEE Congress on Evolutionary Computation*, Singapore, 2007, pp. 3035-3042. doi: 10.1109/CEC.2007.4424858https://ieeexplore.ieee.org/document/4424858/
2. Compression: https://github.com/LLcoolNJ/LZ77
3. Pygame: https://www.pygame.org/news
4. Mido: https://mido.readthedocs.io/en/latest/