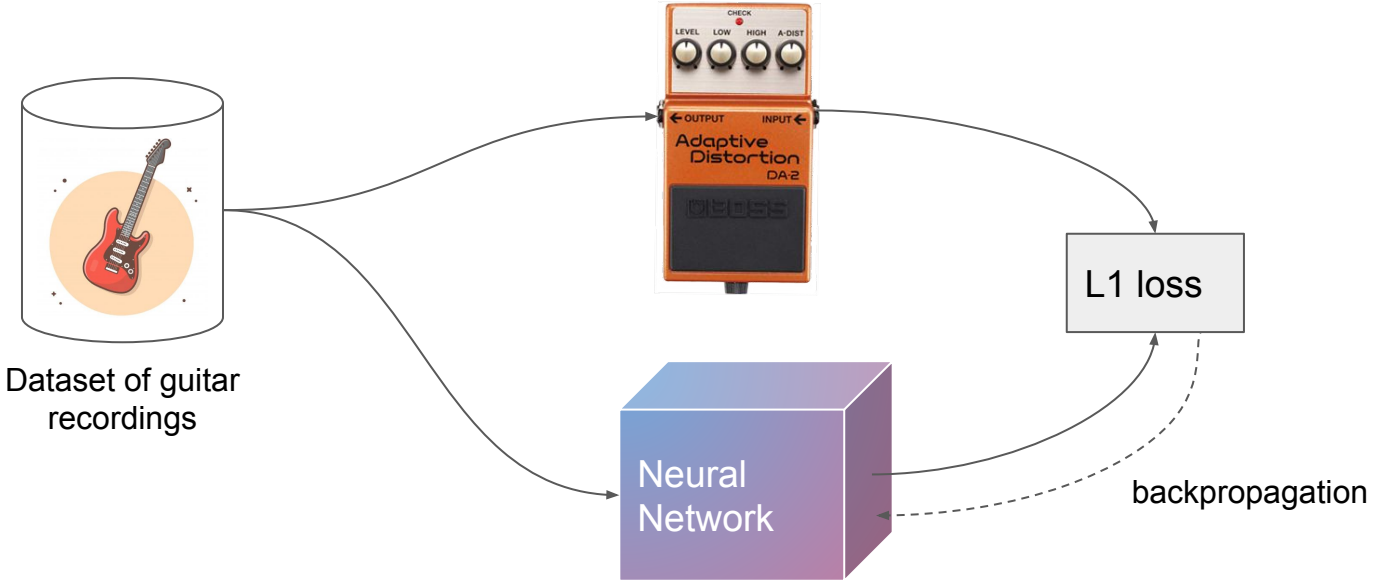
ronn: Randomized overdrive neural networks

Christian J. Steinmetz and Joshua D. Reiss

4th Workshop on Machine Learning for Creativity and Design at NeurIPS 2020

Audio effects

Audio effect modeling with neural networks



There has already been a bit of work here...

Exploring quality and generalizability in parameterized neural audio effects
William Mitchell and Scott Hawley. In Audio Engineering Society Convention 149, October 2020.

Real-time modeling of audio distortion circuits with deep learning
Eero-Pekka Damskägg, Lauri Juvela, Vesa Välimäki, et al. In 16th Sound and Music Computing Conference, May 2019.

Modeling nonlinear audio effects with end-to-end deep neural networks
Marco A. Martínez Ramírez and Joshua D. Reiss. In 2019 IEEE ICASSP, May 2019.

Profiling audio compressors with deep neural networks
Scott Hawley, Benjamin Colburn, and Stylianos Ioannis Mimilakis. In Audio Engineering Society Convention 147, October 2019.

Nonlinear real-time emulation of a tube amplifier with a long short time memory neural-network
Thomas Schmitz and Jean-Jacques Embrechts. In Audio Engineering Society Convention 144., October 2018

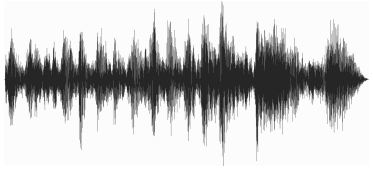
And more… see below for a full review of audio effect modeling with deep learning.

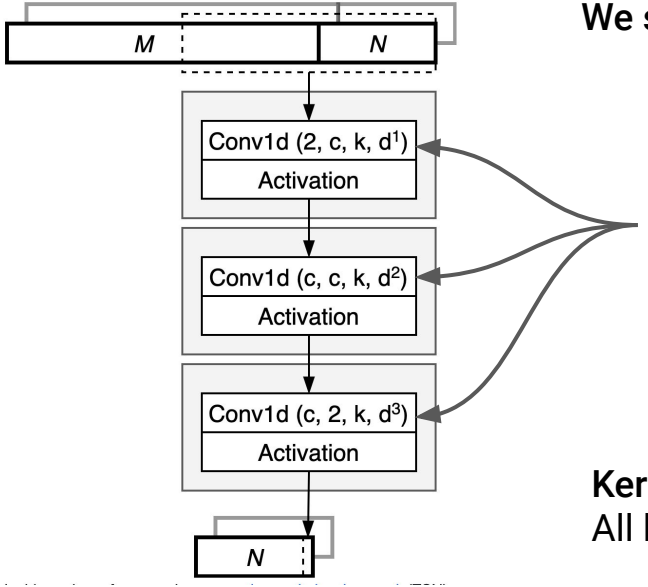
Learning to mix using neural audio effects in the waveform domain
Christian J. Steinmetz
https://zenodo.org/record/4091203

But this requires that we have **data**,
and that we **train** the model...

What if we could design new audio effects without any data and without training???

That’s what we achieve with **ronn:**
Randomized overdrive neural networks

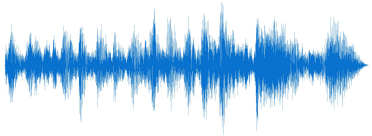


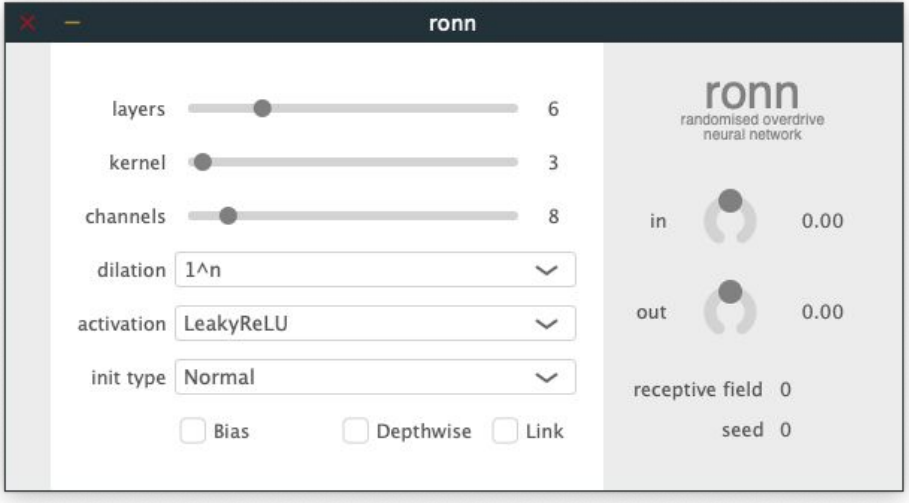


We start with a basic temporal convolutional network (TCN)...

Then set the weights of each layer to random values

Kernel size, dilation, activation, in/out channels
All become new knobs for the user to control the sound





Real-time plugin built using JUCE and PyTorch C++ API (libtorch)

How does it sound?

Shallow network	=>	strong overdrive
Deep network	=>	reverb and delay

Sigmoid	=>	aggressive, harsh
ReLU	=>	smooth and rolled-off

Demonstration

paper, **code**, **demo**, and **plugin** (VST)

available at
https://csteinmetz1.github.io/ronn/

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