

Tropical Algebra

Tropical algebraic operators:

$$\begin{aligned}x \odot y &= x + y, & x \oplus y &= \max\{x, y\}, \\x \oslash y &= x - y, & x^{\odot a} &= ax.\end{aligned}$$

Represent a neural net,

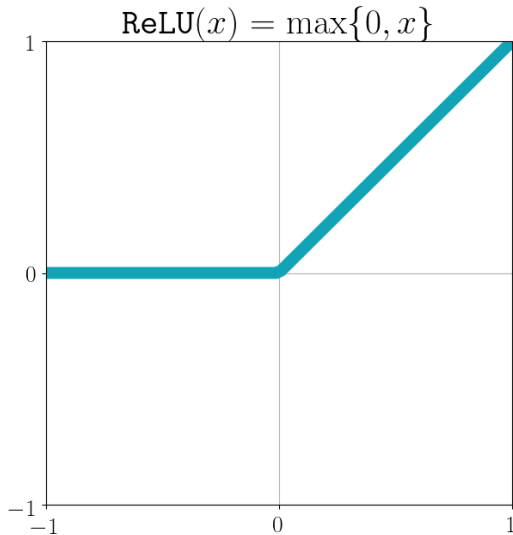
$$f(x) = A^{(2)} \text{ReLU}(A^{(1)}x + b^{(1)}) + b^{(2)},$$

using tropical operators:

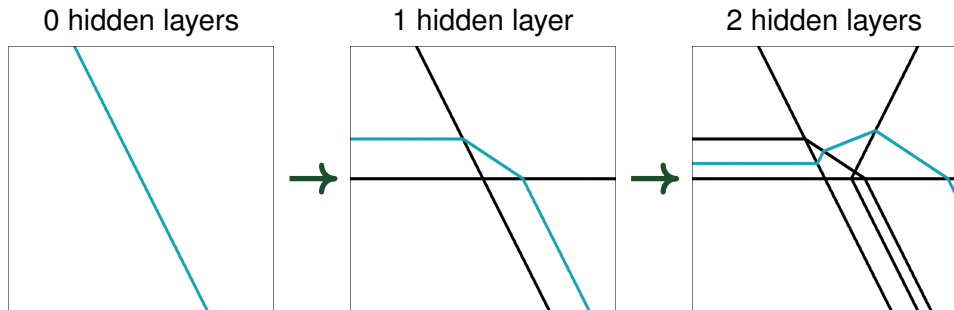
$$f(x) = F(x) \oslash G(x)$$

with tropical polynomials

$$F(x) = c_1 \odot x^{\odot \alpha_1} \oplus \dots \oplus c_r \odot x^{\odot \alpha_r}.$$



Results



Alternative proof for a bound on the number of linear regions:

$$\prod_{l=1}^{L-1} \sum_{i=0}^d \binom{n_l}{i}$$