Why

[1]

Definition

A sequence of functions $(g_1, \ldots, g_\ell)$ is *composable* if g_i is composible with g_{i-1} for $i = 2, \ldots, \ell$. In this case we write $g_\ell \circ g_{\ell-1} \circ \cdots \circ g_2 \circ g_1$. For example, we write $g_3 \circ g_2 \circ g_1$ for (g_1, g_2, g_3).

A *neural network* (or *feedforward neural network*) from $\mathbf{R}^n$ to $\mathbf{R}^m$ is a sequence of composable functions $(g_1, \ldots, g_\ell)$, $\operatorname{dom} g_1 = \mathbf{R}^n$, $\operatorname{ran} g_\ell \subset \mathbf{R}^m$, satisfying

$$g_i(\xi) = h_i(A_i\xi + b_i)$$

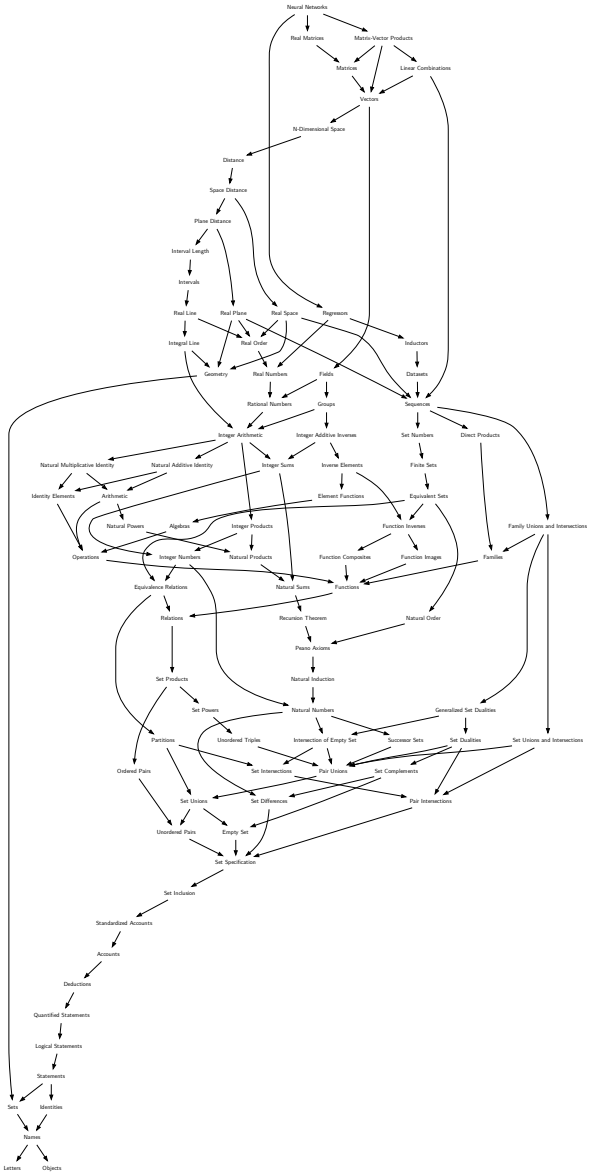
for some conforming matrices A_i, vectors b_i and functions h_i.

The ith *layer* of the neural network is the ith function g_i. The ith *activation* of the neural network is the function h_i. A *neural network* is called *deep* if its number of layers is larger than 3.

We call the composition of the layers of the neural network the *network predictor* (or just *predictor*). We also call it *the function* of the network.[2]

[1] Future editions will include. Future editions may change the name of this sheet to *computation networks*, or may add prerequisite sheet on computation graphs.

[2] Many authorities refer to a neural network as a function. Strictly speaking that is true for us, as well, since a sequence is a function. But the meaning of the common use is in reference to the *network predictor*.


Neural Networks
Real Matrices
Matrix-Vector Products
Matrices
Linear Combinations
Vectors
N-Dimensional Space
Distance
Space Distance
Plane Distance
Interval Length
Intervals
Real Line
Real Plane
Real Space
Regression
Integral Line
Real Order
Inductors
Geometry
Real Numbers
Fields
Datasets
Rational Numbers
Groups
Sequences
Integer Arithmetic
Integer Additive Inverses
Set Numbers
Direct Products
Natural Multiplicative Identity
Natural Additive Identity
Integer Sums
Inverse Elements
Finite Sets
Identity Elements
Arithmetic
Element Functions
Equivalent Sets
Natural Powers
Algebras
Integer Products
Function Inverses
Family Unions and Intersections
Operations
Integer Numbers
Natural Products
Function Composites
Function Image
Families
Equivalence Relations
Natural Sums
Functions
Relations
Recursion Theorem
Natural Order
Peano Axioms
Set Products
Natural Induction
Set Powers
Natural Numbers
Generalized Set Dualities
Partitions
Unordered Triples
Intersection of Empty Set
Successor Sets
Set Dualities
Set Unions and Intersections
Ordered Pairs
Set Intersections
Pair Unions
Set Complements
Set Differences
Pair Intersections
Set Unions
Unordered Pairs
Empty Set
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Sets
Identities
Names
Letters
Objects