

Bezier Neural Networks

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1 Bezier Curves: Recursive Construction

quick check. We will first define and inspect the core object of study in our paper, the Bezier Curve. To my mind, the Bezier Curve is a function mapping from $R^{m \times n} \rightarrow R^{m \times t}$ parameterized by a real number $t \in [0, 1]$. In effect, we're mapping an m by n matrix $A^{m \times n}$ into a function of a single parameter t . One might write this relation in the function B as

$$B^{n-1}(A) = b(t|A) \quad (1)$$

where B is an operator on a matrix and b is a function $R^{m \times n} \rightarrow R^1 \rightarrow R^m$. With this abstraction, let us now define explicitly. We define an operator $B|R^{m \times m \times t} \rightarrow R^{m \times n-1 \times t}$ on a matrix $A^{m \times n}$ as

$$B(A^1) = A^2(t) \quad (2)$$

Particularly, this operation is a convolution of the column space of A_1 and comes in the form of

$$B(A^1)_i = A_i^1 + t(A_{:,i-1}^1 - A_{:,i}^1) \quad (3a)$$

$$B(A^1)_i = (1-t)A_{:,i}^1 + A_{:,i-1}^1 \quad (3b)$$

As you can see, the resulting matrix upon one operation results in a matrix $A^{n \times m-1|t}$. Suppose we apply this operation l times upon that same matrix where $l < n$. We would then arrive at the matrix

$$B^l(A)_{:,i} = (1-t)B^{l-1}(A)_{:,i} + B^{l-1}(A)_{:,i-1} \quad (4)$$

if $l = n$, we arrive at a vector valued function which is named a bezier curve.

$$b(t|A) = B^n(A)_{:,i} = (1-t)B^{n-1}(A)_{:,i} + B^{n-1}(A)_{:,i-1} \quad (5)$$

2 On the Resolution of Convolution Kernel Parameters

3 On the Synthesis of Bezier and Kernel Parameters