

## Automated Weight Painting: Using Deep Neural Networks to Adjust 3D Mesh Skeletal Weights

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**Abstract :** Weight Painting-adjusting the influence a skeletal joint has on a given vertex in a character mesh-is an arduous and time consuming part of the 3D animation pipeline. This process generally requires a trained technical animator and many hours of work to complete. Our skiNNer plug-in, which works within Autodesk's Maya 3D animation software, uses Machine Learning and data processing techniques to create a deep neural network model that can accomplish the weight painting task in seconds rather than hours for bipedal quasi-humanoid character meshes. In order to create a properly trained network, a number of challenges were overcome, including curating an appropriately large data library, managing an arbitrary 3D mesh size, handling arbitrary skeletal architectures, accounting for extreme numeric values (most data points are near 0 or 1 for weight maps), and constructing an appropriate neural network model that can properly capture the high frequency alteration between high weight values (near 1.0) and low weight values (near 0.0). The arrived at neural network model is a cross between a traditional CNN, deep residual network, and fully dense network. The resultant network captures the unusually hard-edged features of a weight map matrix, and produces excellent results on many bipedal models.

**Keywords :** 3d animation, animation, character, rigging, skinning, weight painting, machine learning, artificial intelligence, neural network, deep neural network

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