We argue that the SYK model leads to a three dimensional dual theory in a suitable background. At strong coupling, a Horava-Witten compactification of one of the dimensions reproduces the SYK spectrum exactly, and a non-standard propagator of the 3D theory reproduces the two point function of the bilocal fields exactly. Furthermore, this three dimensional picture reproduces the leading finite coupling correction to the "zero mode" contribution. However the space-time on which the bilocal fields live should not be identified with the dual space-time in the sense of AdS/CFT duality - rather the bilocals are related to the dual fields by an integral transform.