Deep Neural Networks applied in computer vision are often compared to the architecture of the ventral stream; but they typically disregard the temporal dynamics experimentally observed in the visual system. For instance, alpha oscillations (8-12Hz) dominate the temporal dynamics of the human visual cortex; yet, oscillations are rarely considered in ANNs. We propose a fully connected network that embraces oscillatory dynamics, to convert spatial information into a temporal code. The network was trained end-to-end to classify three letters in four quadrants. We then added semi-realistic temporal dynamics to the hidden layer, based on differential equations, where we introduced relaxation and a 10Hz inhibition mimicking neuronal alpha oscillations. The relaxation term was added to each hidden unit to ensure a non-sustained activation. Attention was implemented by increasing the input of one letter. The trained network correctly classified individual letters but showed high uncertainty when presented with two stimuli, indicating the bottleneck problem. When introducing pulsed inhibition, the output nodes activated sequentially, generating a temporal code. Our model provides a novel approach for solving the bottleneck problem when multiple objects are presented, suggesting a computational benefit for oscillations in ANNs. Future work will expand to networks with multiple layers and relate the dynamics to electrophysiological observations to further constrain the implementation.