# Hybrid Convolution Kernel: Optimized CT of the Head, Neck, and Spine

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**Background and Purpose**:
Conventional CT requires generation of separate images utilizing different convolution kernels to optimize lesion detection. Our goal was to develop and test a hybrid CT algorithm to simultaneously optimize bone and soft tissue characterization, potentially halving the number of images that need to be stored, transmitted, and reviewed.

**Methods:**
CT images generated with separate bone and soft tissue kernels were retrospectively combined so that soft tissue algorithm pixels less than -150 HU or greater than 150 HU are substituted with corresponding bone kernel reconstructed pixels. A total of 38 CT examinations were reviewed using the hybrid technique, including 20 head, 8 spine, and 10 head and neck cases. Three neuroradiologists independently reviewed all 38 hybrid cases, comparing them to both standard soft tissue and bone kernel convolved images for characterization of anatomy and pathology. The conspicuity of bone, soft tissue, and related anatomy were compared for each CT reconstruction technique.

**Results:**
For the depiction of bone, in all 38 cases, the three neuroradiologists scored the hybrid images as being equivalent to bone kernel reconstructions but superior to the standard kernel. For depiction of extra-cranial soft tissues and brain, the hybrid kernel was rated equivalent to the standard kernel but superior to that of the bone kernel.

**Conclusions:**
The hybrid convolution kernel is a promising technique affording optimized bone, soft tissue evaluation while potentially halving the number of images needed to be transmitted, stored, and reviewed.

Citation:
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