**Deep Learning for Automated Deformity Correction Planning in the Setting of Prior Arthroplasty**

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**Purpose:** Posttraumatic deformity is a common and complex challenge in orthopaedic trauma practice, resulting in misalignment, joint incongruities, and functional impairment. This study aimed to develop a deep learning computer vision model to autonomously generate anatomic "key points" from hip and knee radiographs, facilitating the calculation of patients' coronal alignment. Prior studies generating automated coronal alignment published in arthroplasty literature have excluded images with prior implants. The objective was to develop an algorithm that streamlines deformity correction planning via automated generation of requisite coronal alignment parameters.

**Methods:** A ResNet-101 based model was adapted for the task of identifying anatomic key points from hip and knee radiographs. The training involved a dataset annotated by orthopaedic surgeons who labeled pertinent anatomic key points to ensure clinical applicability. We customized the prediction head of the model to recognize 14 specific anatomic key points on both the left and right sides. The model's accuracy was determined by calculating the mean squared error (MSE) between the key points as identified by the model and the ground truth established by the annotations using Euclidean distance.

**Results:** The model was trained and tested on 441 and 111 radiographs, respectively, and had a test MSE at 9783.90. The model effectively identified key points in patients lacking hardware as well as in the setting of prior orthopaedic implants.

**Conclusion:** Integrating this deep learning model into trauma care workflows could enhance the accuracy and speed of preoperative planning for limb deformity correction. The model's ability to automate key point identification even in the presence of implants demonstrates strong real-world applicability and has the potential to simplify the complex and labor-intensive task of determining natural limb alignment.