Here is a concise 3-paragraph summary of the paper:

<paragraph_1> This paper investigates potential racial biases in facial expression recognition models, specifically looking at skin tone biases in an action unit estimation network. The authors create a synthetic dataset of 840 facial expression images varying in skin tone and action unit activation levels. They evaluate the performance of an action unit estimation network across different skin tones, finding statistically significant differences that indicate the presence of skin tone biases in the model's predictions. </paragraph_1>

<paragraph_2> The authors conduct a series of experiments to further analyze these biases. They find that the biases vary across different action units, with some showing greater underestimation for darker skin tones while others show overestimation. Additional experiments training the model on subsets of the data representing different skin tone ranges reveal an interaction between the model biases and the training data distribution. Models trained only on lighter or darker faces exhibit diminished performance on the opposite skin tone range. </paragraph_2>

<paragraph_3> The key findings highlight the complexity of skin tone biases in facial expression models, demonstrating their presence, variability across facial movements, and interaction with the racial distribution in training data. The authors argue that these results are an important step towards ultimately understanding and removing such biases to develop fairer facial analysis models. They propose further investigation using synthetic data to pinpoint bias sources and develop debiasing techniques. </paragraph_3>