Current advances in deep learning and, in particular, convolutional neural networks (CNNs) have enabled automatic and scalable image analysis for, e.g., object detection[1-4], classification[5-10], and even image-based predictions[11-17]. Many CNN-based deep learning frameworks are effective because CNNs emulate the human brain’s natural visual perception mechanism by systematically learning features through multiple operational layers[18]. Image-based deep learning models can play a vital role in fully understanding boiling physics because boiling images are richly embedded with bubble statistics, which are quantitative measurements of the dynamic boiling phenomena.

Deep CNNs will be employed here, because they are known to learn more efficiently than shallow CNNs by naturally integrating incredibly enrichened image features[19]. A representative robust and easily-trainable deep CNN architecture, VGG16, is selected for this study[20].

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