

# A SUPPLEMENTARY MATERIAL FOR “CNN-BASED IMAGE MODELS VERIFY A HYPOTHESIS THAT THE WRITERS OF CUNEIFORM TEXTS IMPROVED THEIR WRITING SKILLS WHEN STUDYING AT THE AGE OF HITTITE EMPIRE”

DAICHI KOHMOTO, KATSUTOSHI FUKUDA, DAISUKE YOSHIDA, TAKAFUMI MATSUI, AND SACHIHIRO OMURA

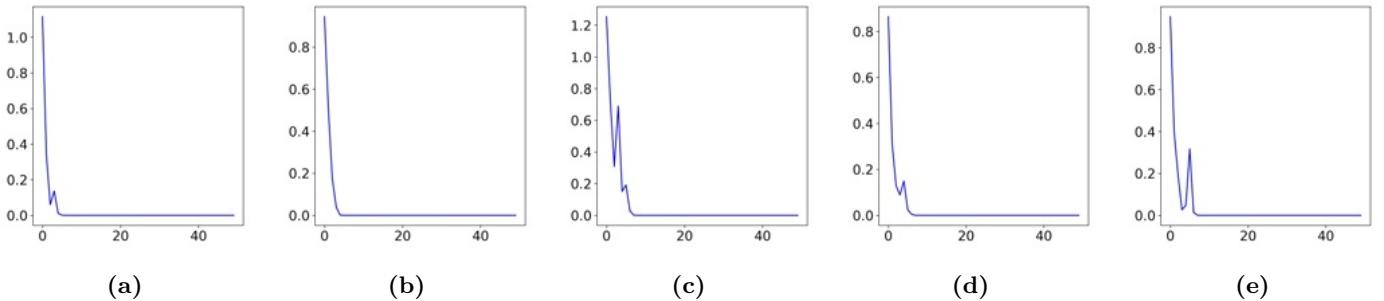
This document is prepared for providing detailed results on our main paper *CNN-based Image Models Verify a Hypothesis that The Writers of Cuneiform Texts Improved Their Writing Skills When Studying at the Age of Hittite Empire*. We present all results of our analysis concerning tablets KBo 23.1 ++/KUB 30.38. Our methodology and related discussions are described in details in our main paper. All codes for demonstrating the following results are available at a GitHub repository<sup>1</sup>.

Results are displayed via classifying by dataset types v01 ~ v004 with seeds 1033, 1931, 2201, 4179, and 9325, and CNN-based image models VGG19, ResNet50, and InceptionV3. Please refer Section 2 in our main paper for details of making these main datasets.

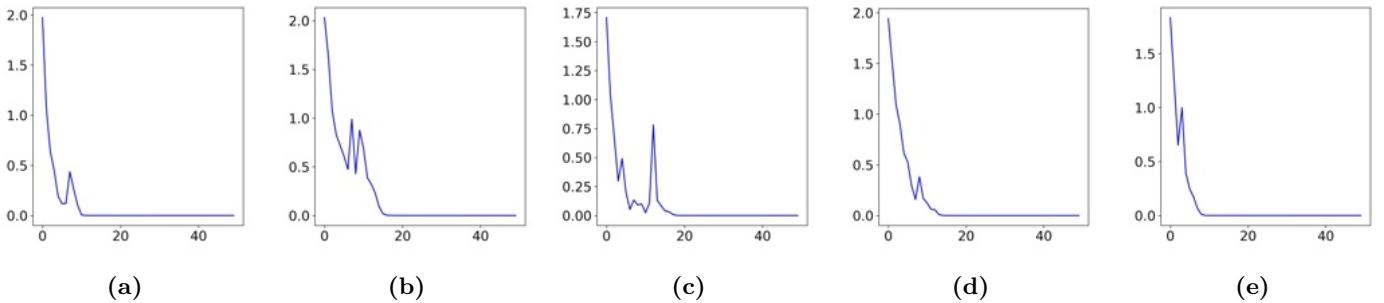
Corresponding subsection numbers in our main paper are attached to each section title in the below.

## A. LEARNING CURVES ON FINE-TUNING IMAGE MODELS (SUBSECTIONS 2.3 & 3.1)

120 learning curves obtained when we fine-tune three CNN-based image models (VGG19, ResNet50, and InceptionV3) for all 40 main datasets are presented in Figure 1 ~ 24. In each picture, the vertical axis represents the value of calculated loss at each epoch, and the horizontal axis represents the number of epochs. All procedures of fine-tuning image models are done in 50 epochs with optimizer Adam, learning rate 0.0001, batch size 16, and fixed random seed 1.

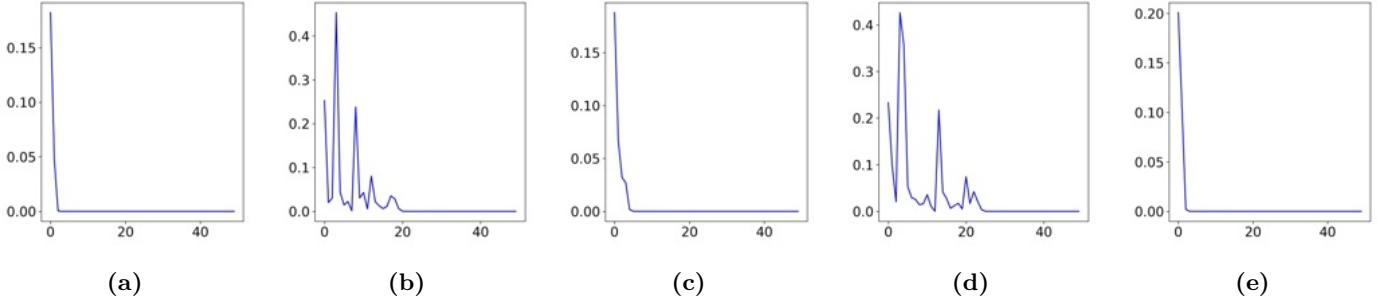


**Figure 1.** Learning Curves for Fine-Tuned VGG19 Models on v01 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.

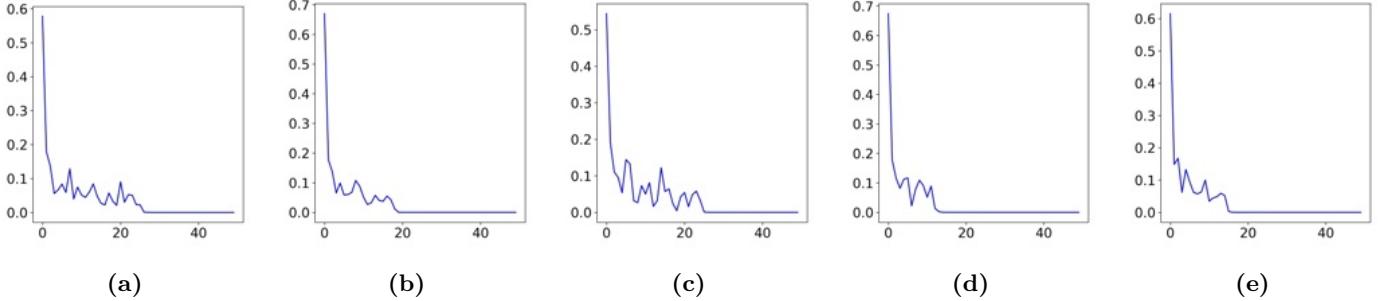


**Figure 2.** Learning Curves for Fine-Tuned VGG19 Models on v001 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.

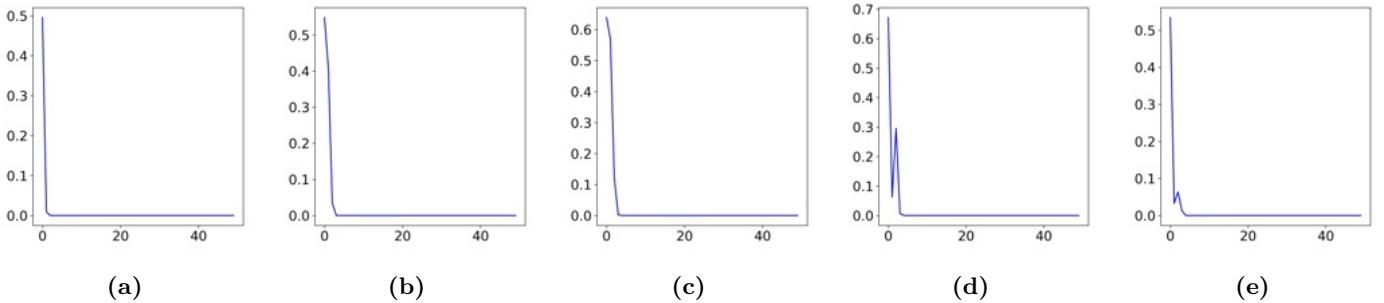
<sup>1</sup>Our repository URL: [https://github.com/barrejant/Tablet\\_CNN\\_Analysis\\_2022](https://github.com/barrejant/Tablet_CNN_Analysis_2022)



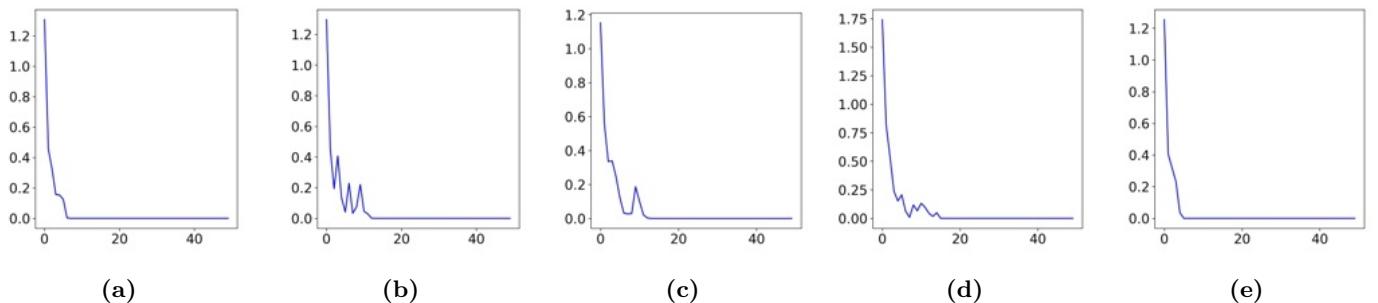
**Figure 3.** Learning Curves for Fine-Tuned VGG19 Models on v02 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



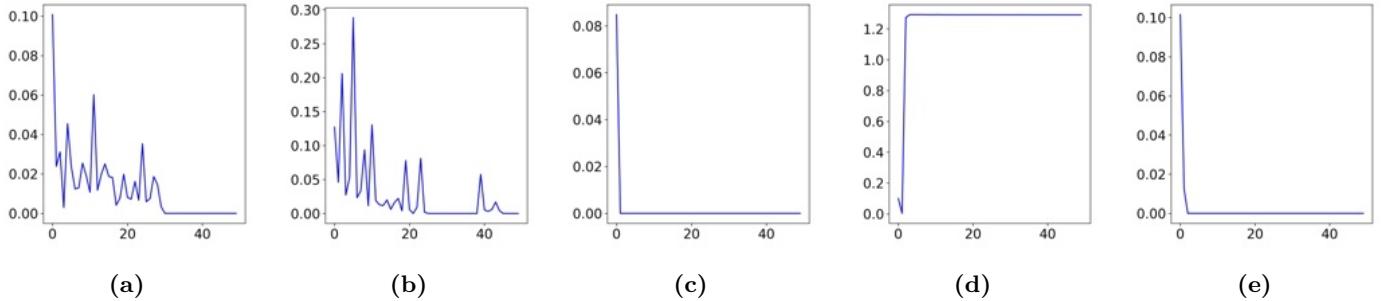
**Figure 4.** Learning Curves for Fine-Tuned VGG19 Models on v002 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



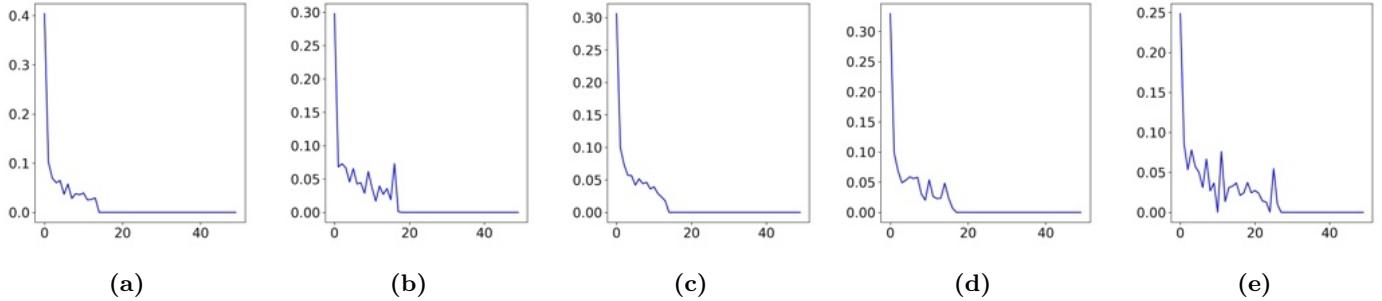
**Figure 5.** Learning Curves for Fine-Tuned VGG19 Models on v03 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



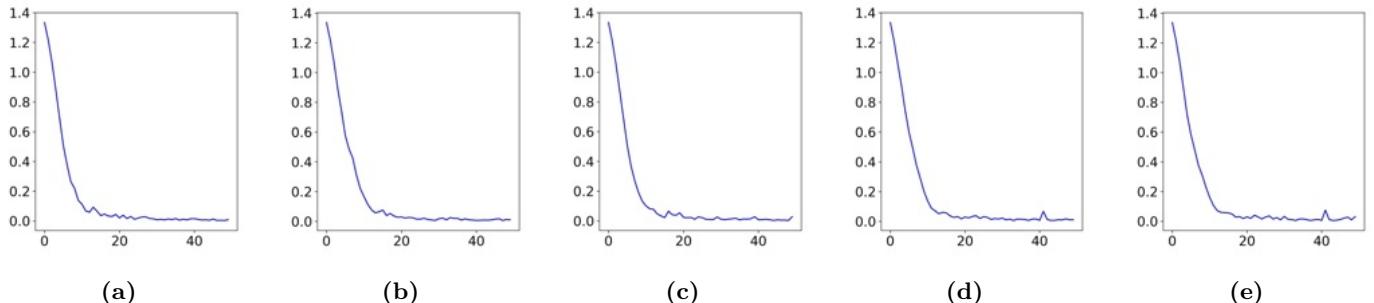
**Figure 6.** Learning Curves for Fine-Tuned VGG19 Models on v003 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



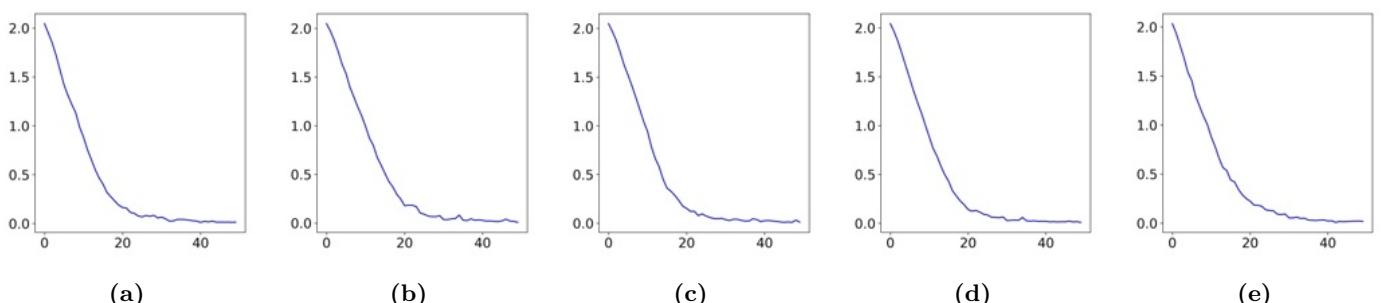
**Figure 7.** Learning Curves for Fine-Tuned VGG19 Models on v04 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



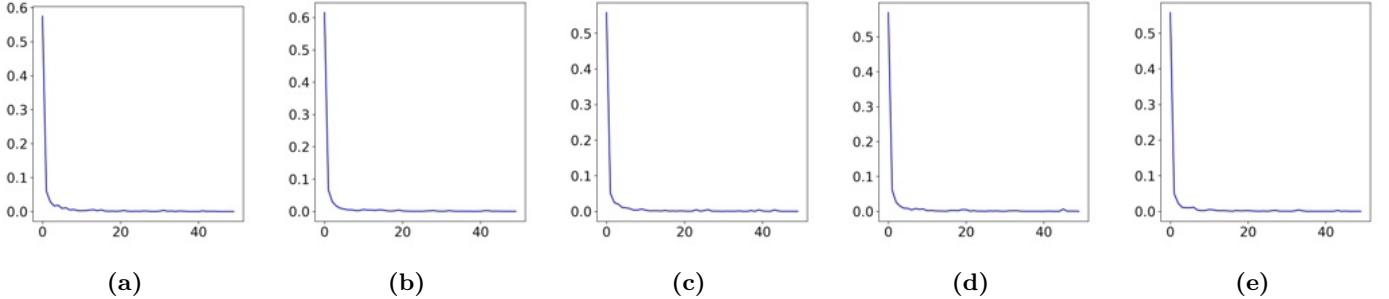
**Figure 8.** Learning Curves for Fine-Tuned VGG19 Models on v004 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



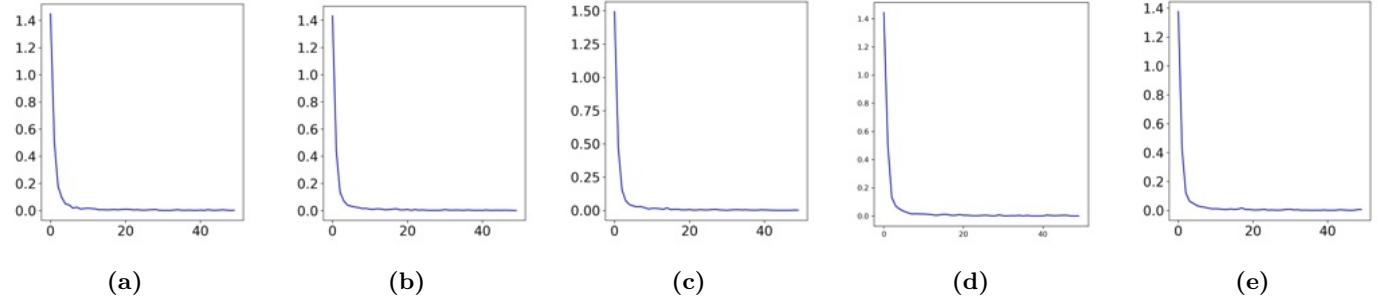
**Figure 9.** Learning Curves for Fine-Tuned ResNet50 Models on v01 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



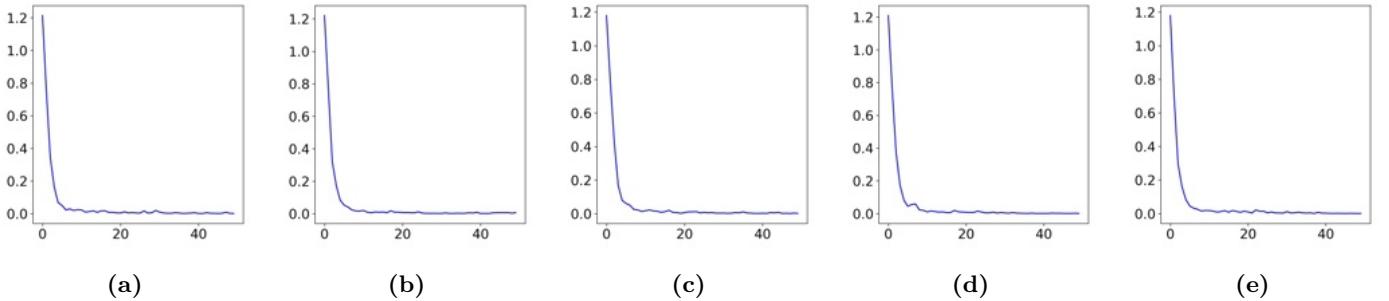
**Figure 10.** Learning Curves for Fine-Tuned ResNet50 Models on v001 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



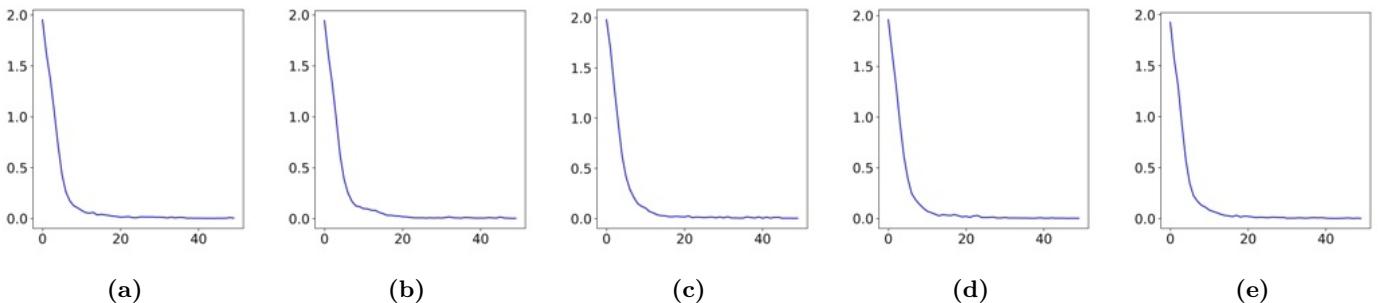
**Figure 11.** Learning Curves for Fine-Tuned ResNet50 Models on v02 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



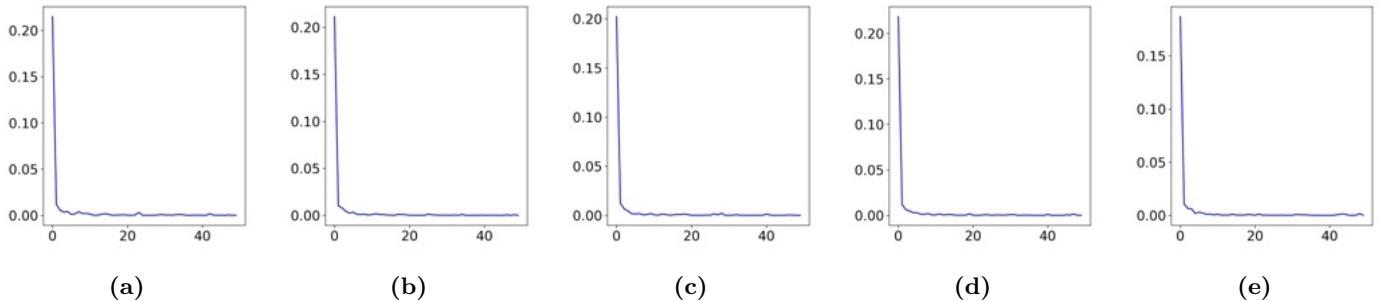
**Figure 12.** Learning Curves for Fine-Tuned ResNet50 Models on v002 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



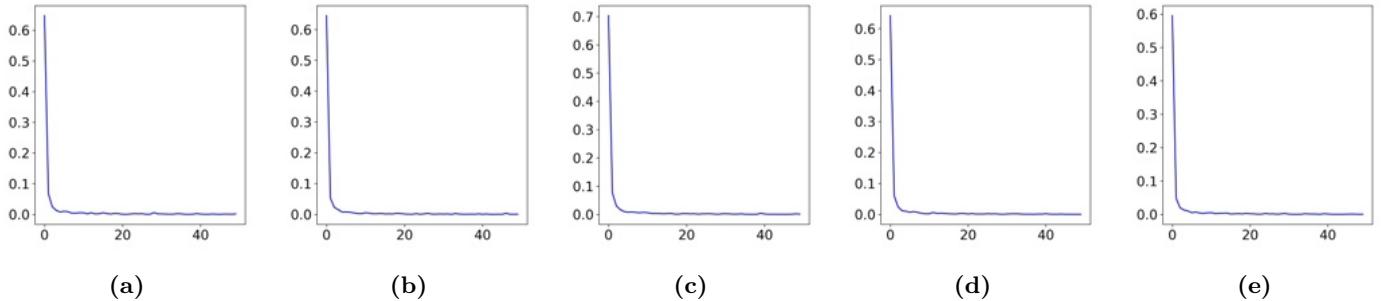
**Figure 13.** Learning Curves for Fine-Tuned ResNet50 Models on v03 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



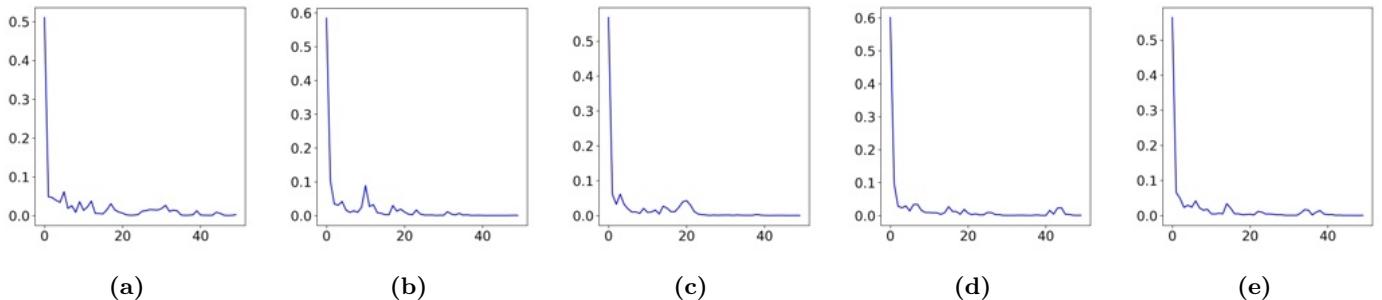
**Figure 14.** Learning Curves for Fine-Tuned ResNet50 Models on v003 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



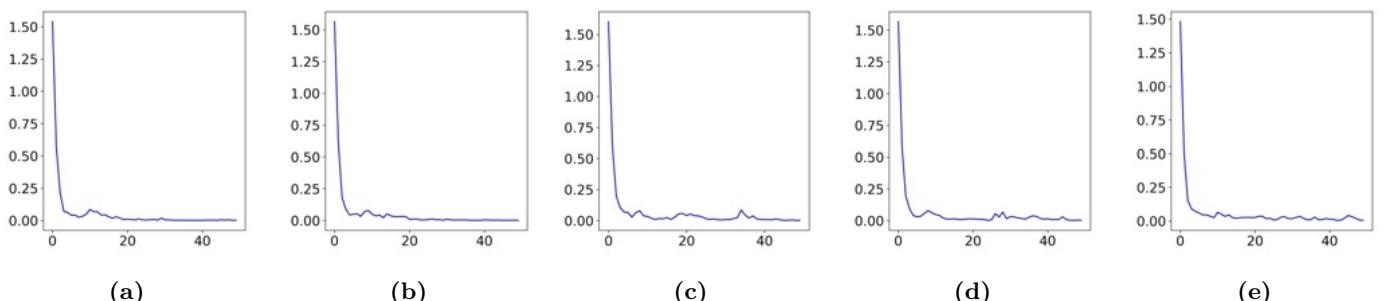
**Figure 15.** Learning Curves for Fine-Tuned ResNet50 Models on v04 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



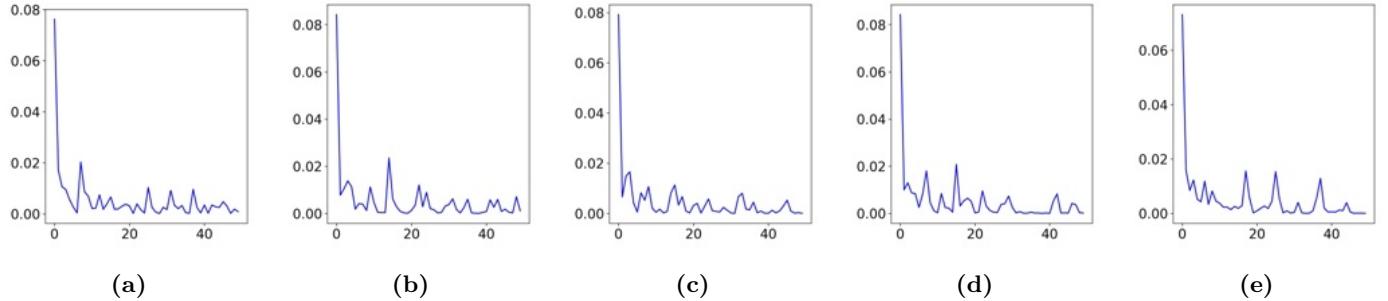
**Figure 16.** Learning Curves for Fine-Tuned ResNet50 Models on v004 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



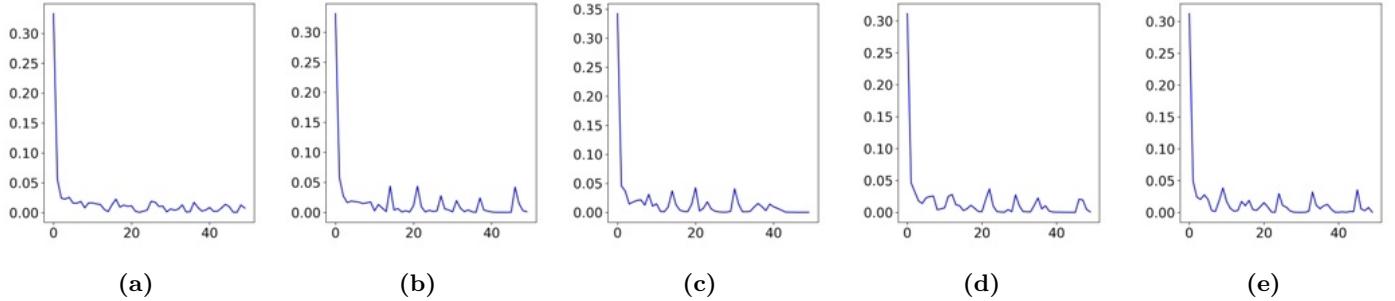
**Figure 17.** Learning Curves for Fine-Tuned InceptionV3 Models on v01 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



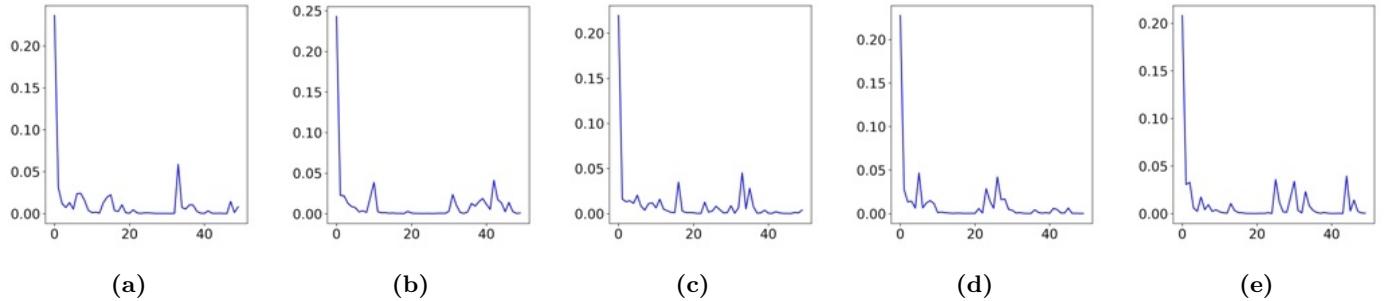
**Figure 18.** Learning Curves for Fine-Tuned InceptionV3 Models on v001 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



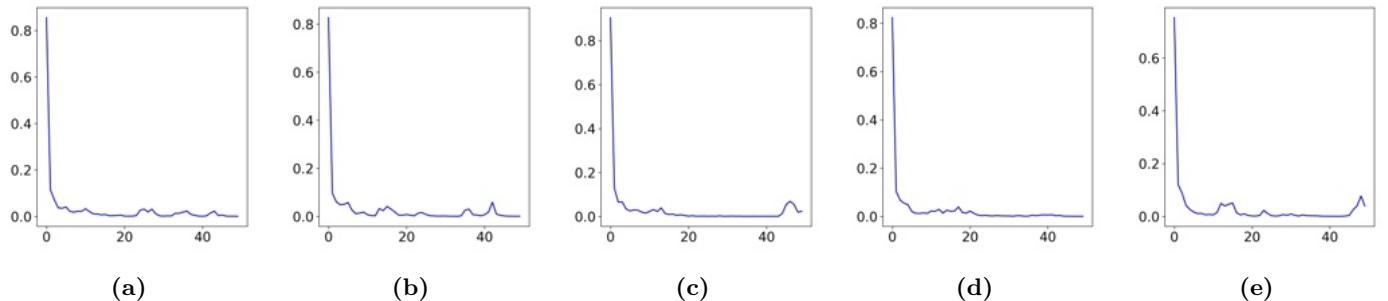
**Figure 19.** Learning Curves for Fine-Tuned InceptionV3 Models on v02 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



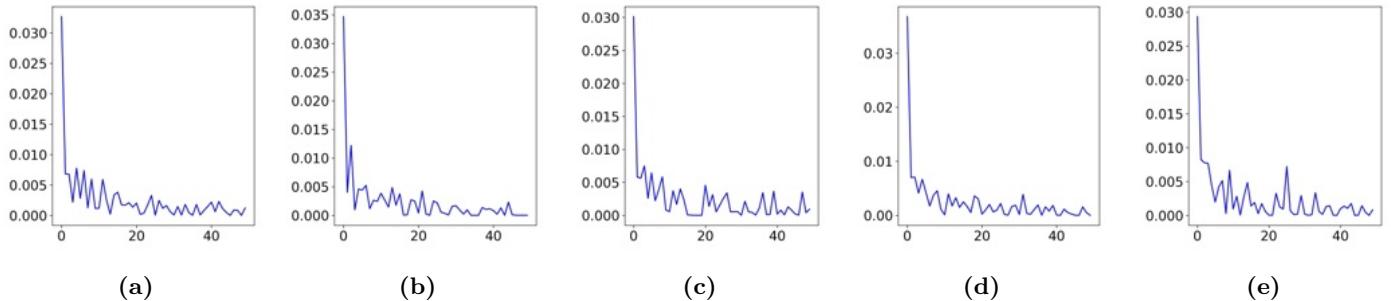
**Figure 20.** Learning Curves for Fine-Tuned InceptionV3 Models on v002 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



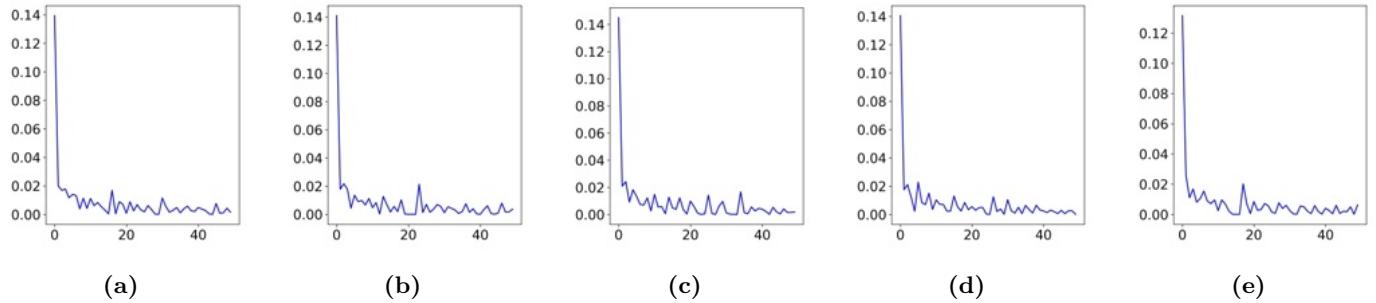
**Figure 21.** Learning Curves for Fine-Tuned InceptionV3 Models on v03 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



**Figure 22.** Learning Curves for Fine-Tuned InceptionV3 Models on v003 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



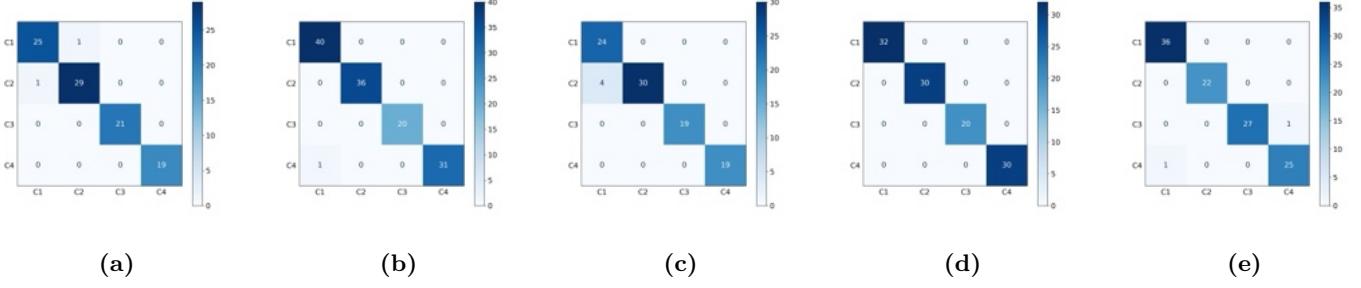
**Figure 23.** Learning Curves for Fine-Tuned InceptionV3 Models on v04 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



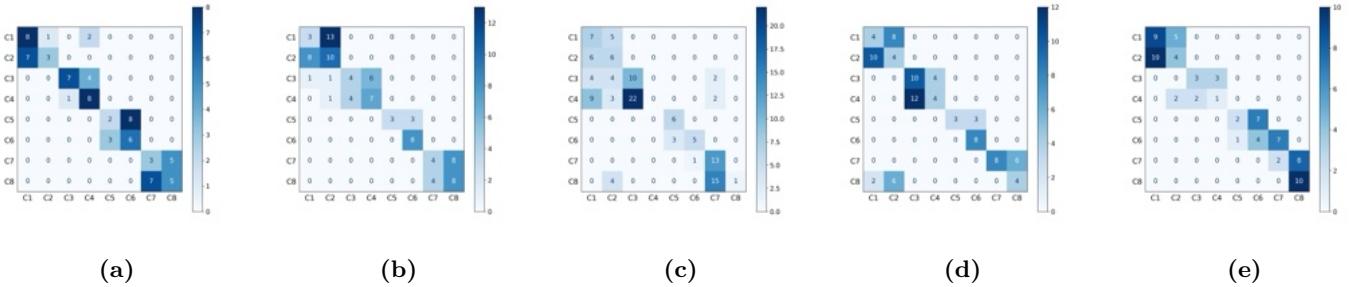
**Figure 24.** Learning Curves for Fine-Tuned InceptionV3 Models on v004 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.

## B. CONFUSION MATRICES FOR FINE-TUNED IMAGE MODELS (SUBSECTIONS 2.2 & 3.2)

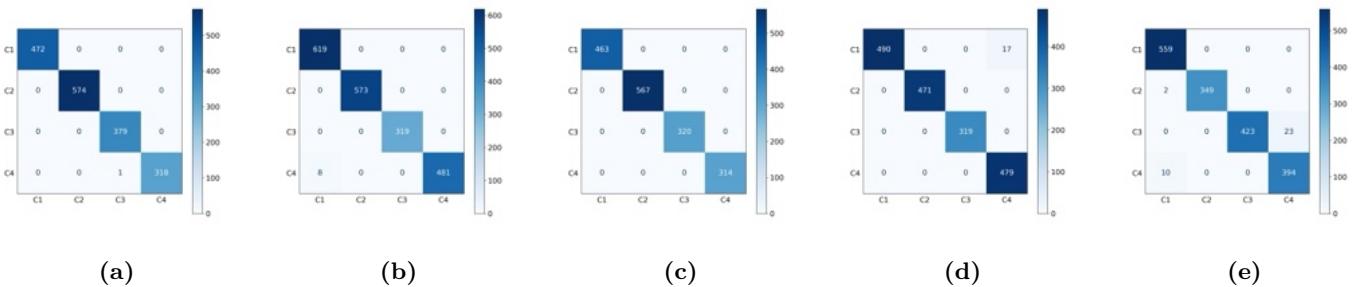
Confusion matrices obtained in fine-tuning image models as results of matching between true labels and predicted classes are presented in Figure 25 ~ 48. In each picture, the vertical axis represents true labels, and the horizontal axis represents predicted classes by a fine-tuned model. Each element in a confusion matrix represents the number of samples with prescribed label which is predicted to be a class.



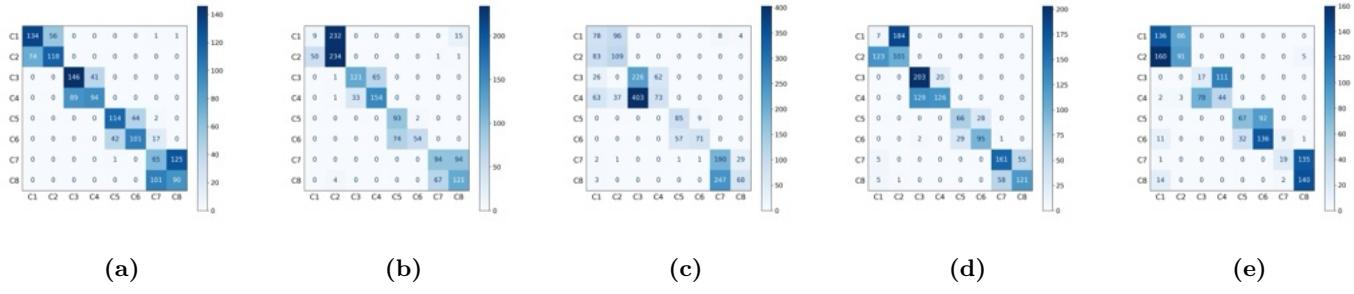
**Figure 25.** Confusion Matrices for Fine-Tuned VGG19 Models on v01 Dataset. C1 ~C4 represent Class 1 ~Class 4, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



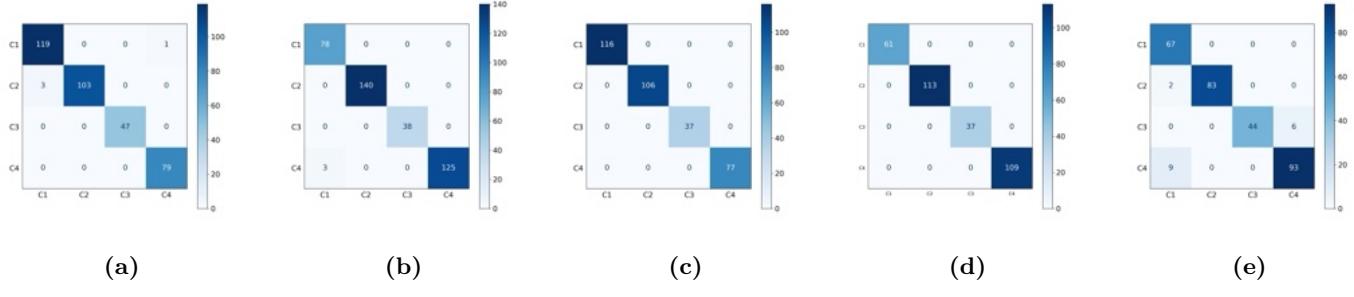
**Figure 26.** Confusion Matrices for Fine-Tuned VGG19 Models on v001 Dataset. C1 ~C8 represent Class 1 ~Class 8, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



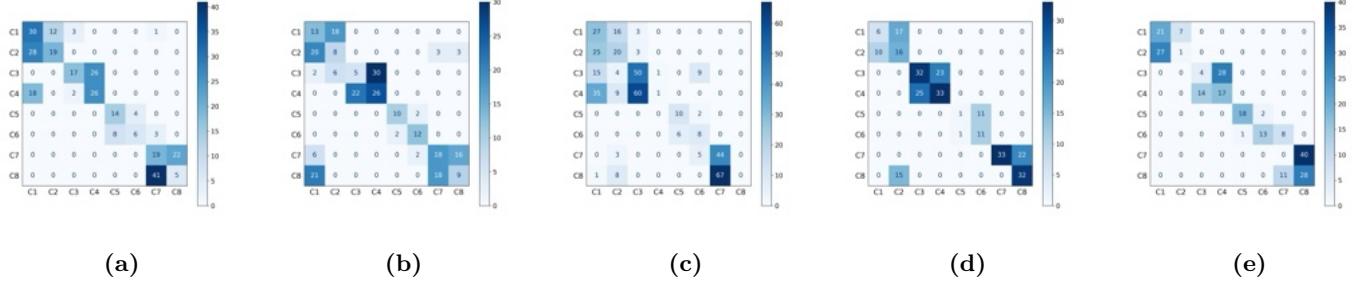
**Figure 27.** Confusion Matrices for Fine-Tuned VGG19 Models on v02 Dataset. C1 ~C4 represent Class 1 ~Class 4, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



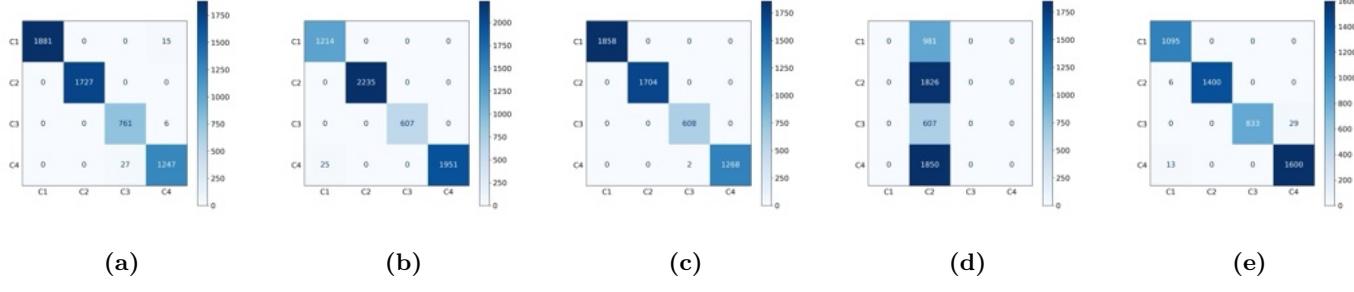
**Figure 28.** Confusion Matrices for Fine-Tuned VGG19 Models on v002 Dataset. C1 ~C8 represent Class 1 ~Class 8, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



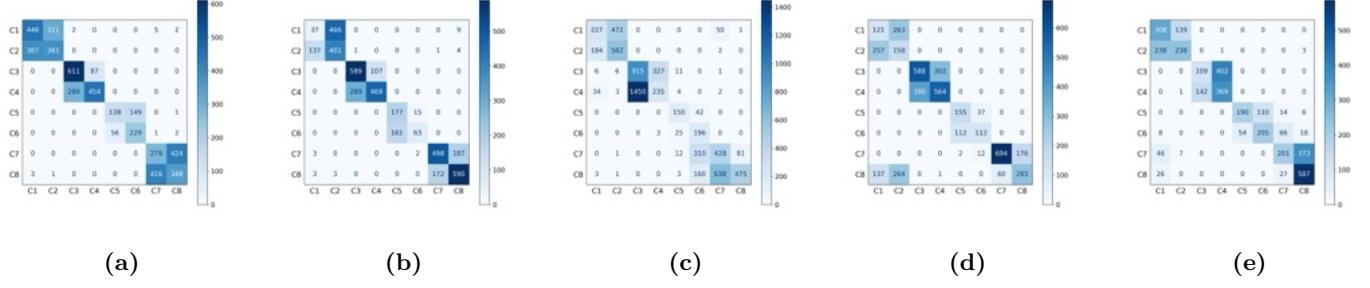
**Figure 29.** Confusion Matrices for Fine-Tuned VGG19 Models on v03 Dataset. C1 ~C4 represent Class 1 ~Class 4, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



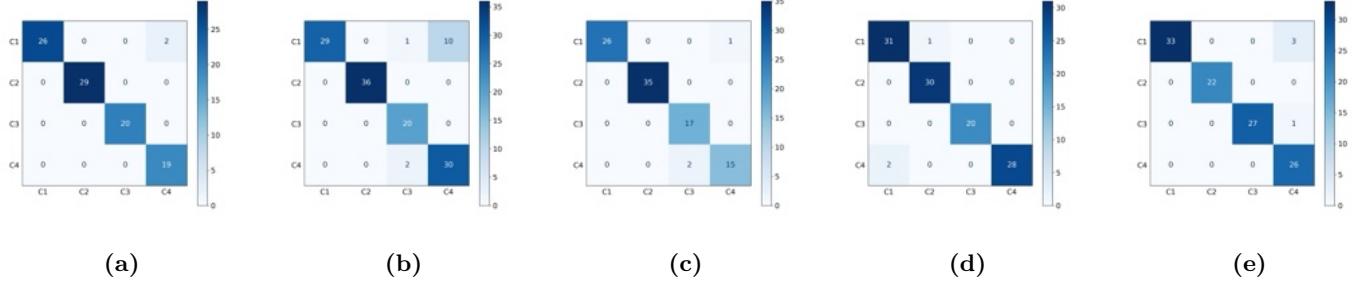
**Figure 30.** Confusion Matrices for Fine-Tuned VGG19 Models on v003 Dataset. C1 ~C8 represent Class 1 ~Class 8, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



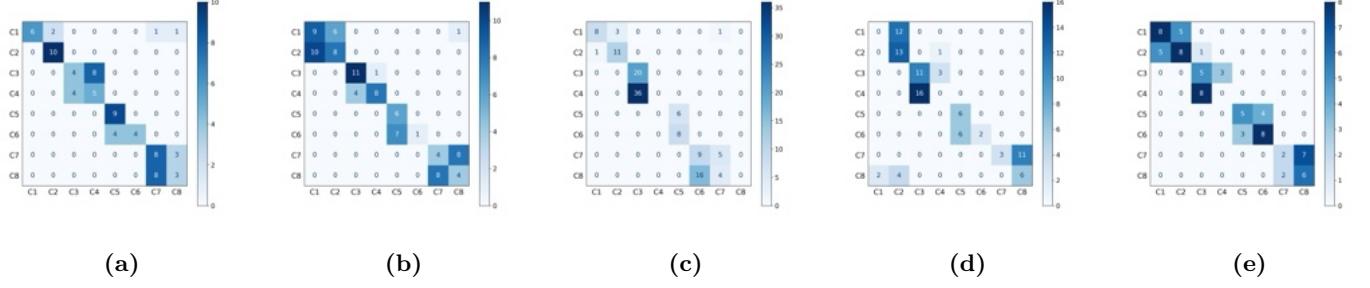
**Figure 31.** Confusion Matrices for Fine-Tuned VGG19 Models on v04 Dataset. C1 ~C4 represent Class 1 ~Class 4, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



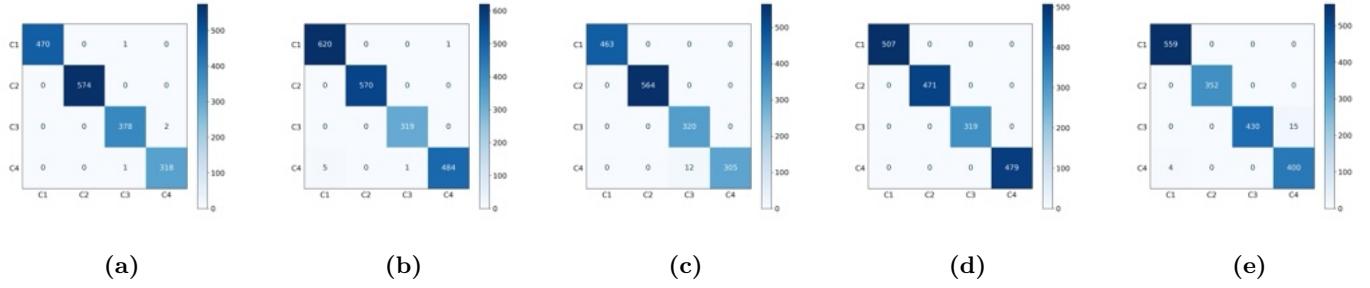
**Figure 32.** Confusion Matrices for Fine-Tuned VGG19 Models on v004 Dataset. C1 ~C8 represent Class 1 ~Class 8, respectively. The symbol S in each caption represents 'seed': (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



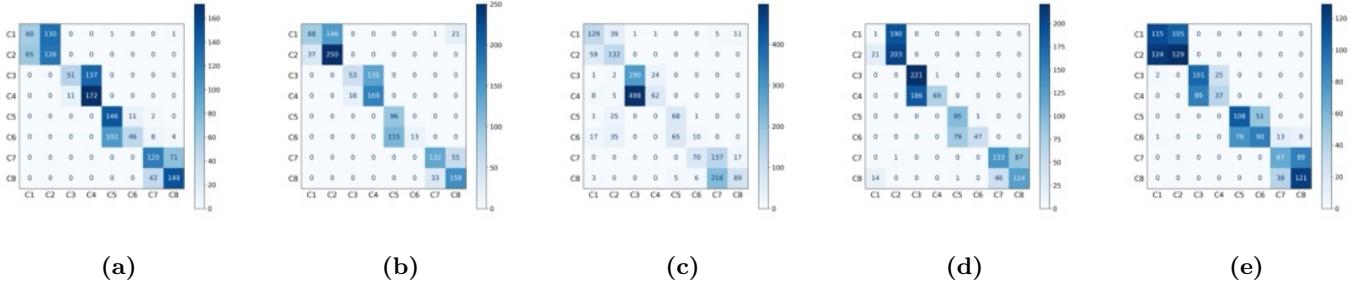
**Figure 33.** Confusion Matrices for Fine-Tuned ResNet50 Models on v01 Dataset. C1 ~C4 represent Class 1 ~Class 4, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



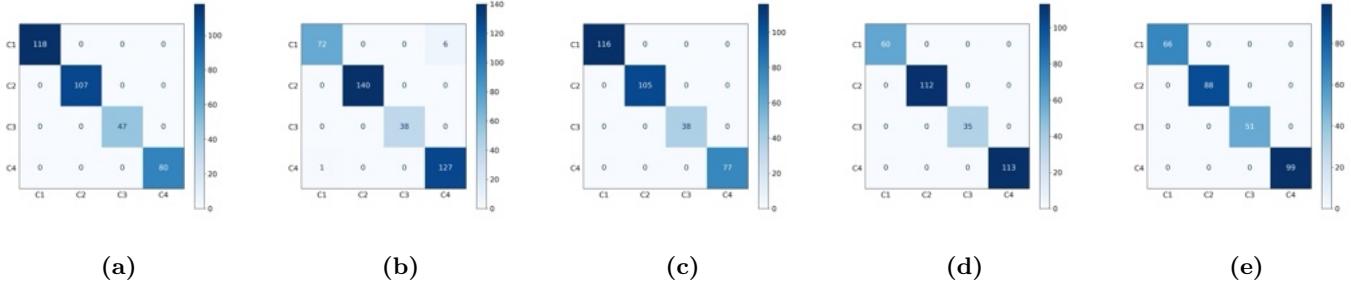
**Figure 34.** Confusion Matrices for Fine-Tuned ResNet50 Models on v001 Dataset. C1 ~C8 represent Class 1 ~Class 8, respectively. The symbol S represents a seed:(a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



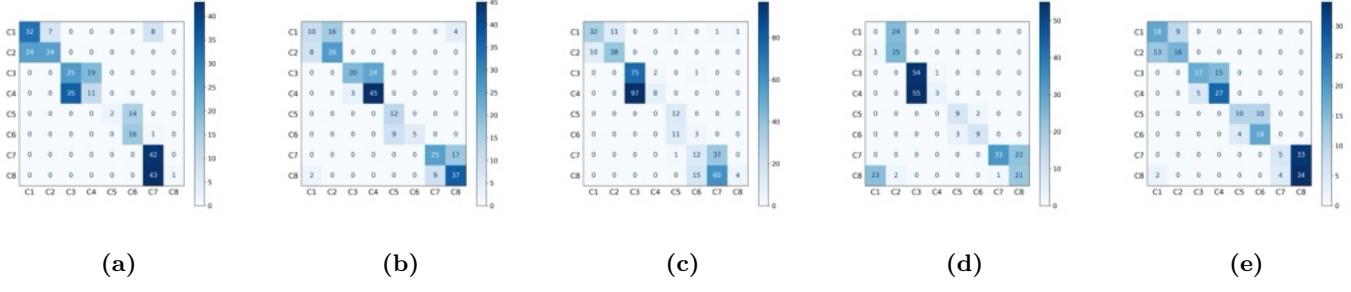
**Figure 35.** Confusion Matrices for Fine-Tuned ResNet50 Models on v02 Dataset. C1 ~C4 represent Class 1 ~Class 4, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



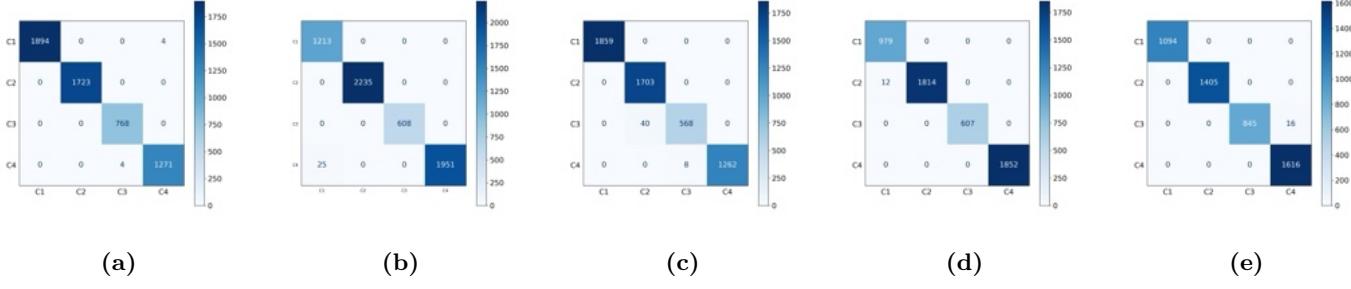
**Figure 36.** Confusion Matrices for Fine-Tuned ResNet50 Models on v002 Dataset. C1 ~C8 represent Class 1 ~Class 8, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



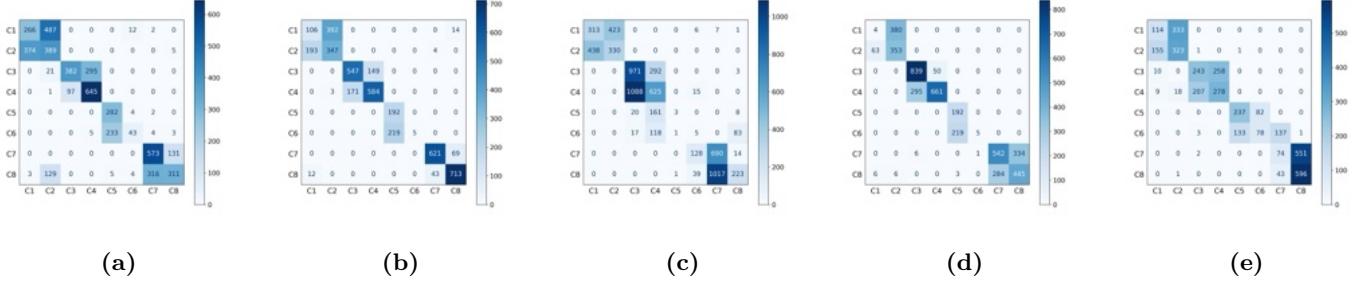
**Figure 37.** Confusion Matrices for Fine-Tuned ResNet50 Models on v03 Dataset. C1 ~C4 represent Class 1 ~Class 4, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



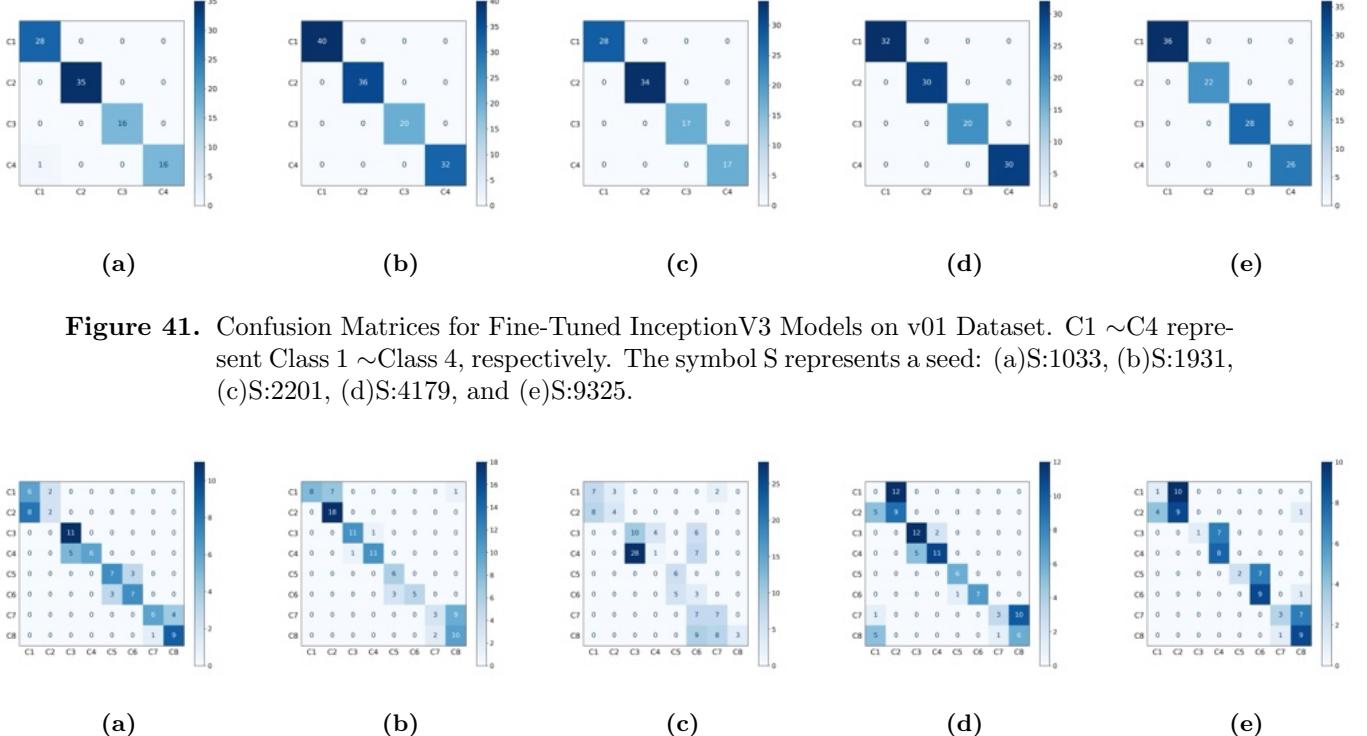
**Figure 38.** Confusion Matrices for Fine-Tuned ResNet50 Models on v003 Dataset. C1 ~C8 represent Class 1 ~Class 8, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



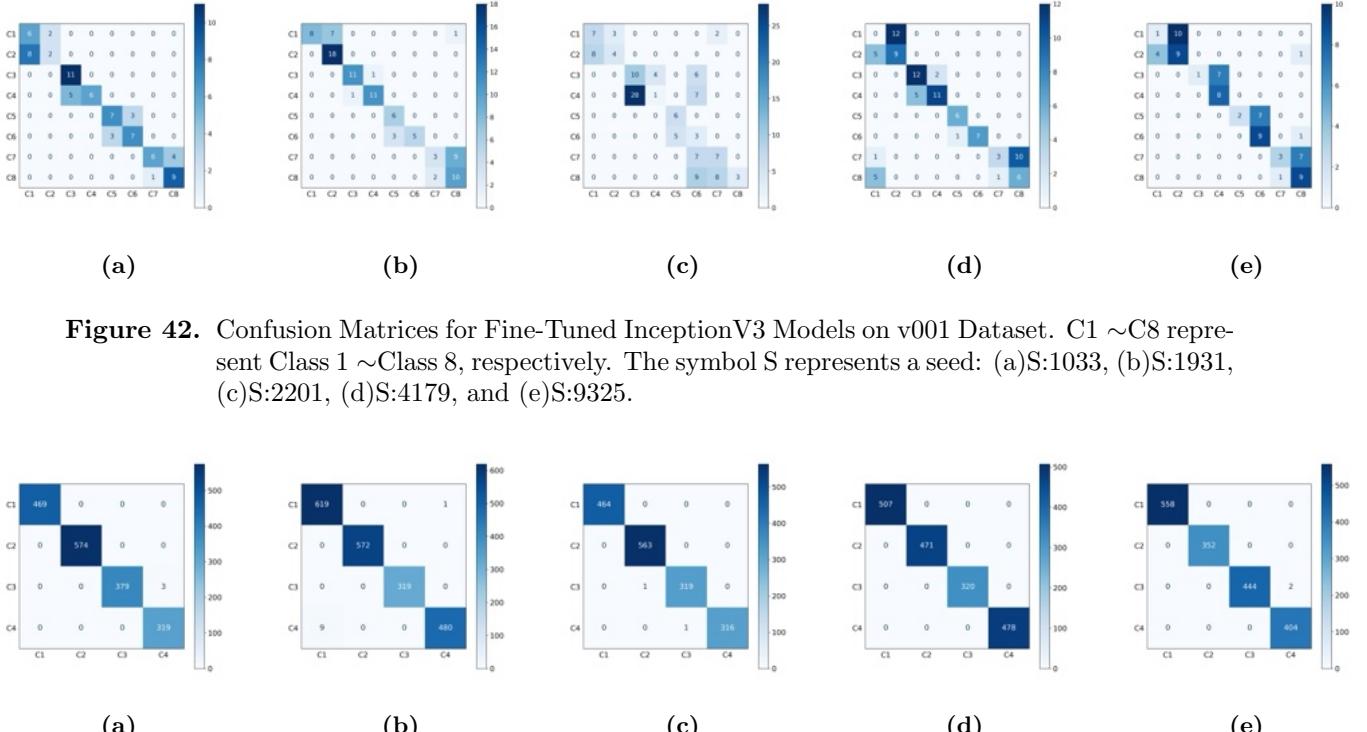
**Figure 39.** Confusion Matrices for Fine-Tuned ResNet50 Models on v04 Dataset. C1 ~C4 represent Class 1 ~Class 4, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



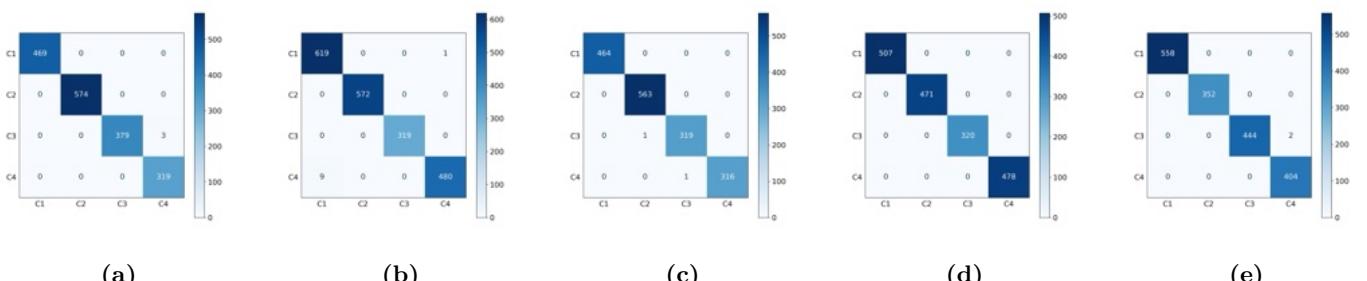
**Figure 40.** Confusion Matrices for Fine-Tuned ResNet50 Models on v004 Dataset. C1 ~C8 represent Class 1 ~Class 8, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



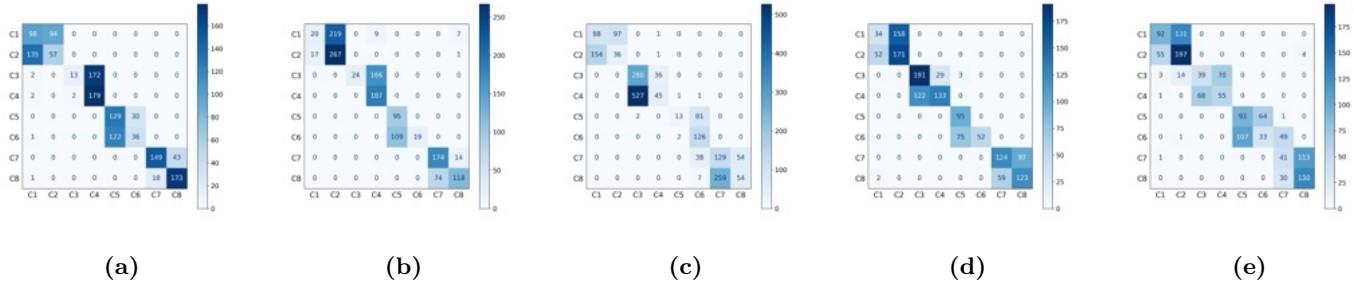
**Figure 41.** Confusion Matrices for Fine-Tuned InceptionV3 Models on v01 Dataset. C1 ~C4 represent Class 1 ~Class 4, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



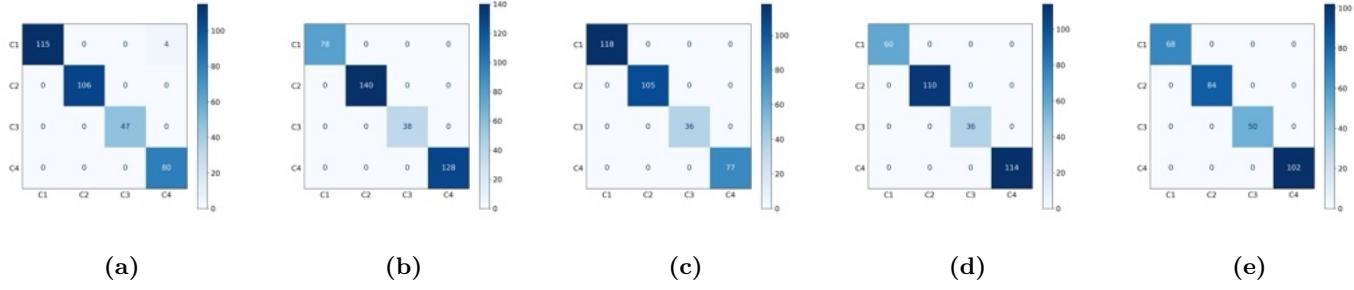
**Figure 42.** Confusion Matrices for Fine-Tuned InceptionV3 Models on v001 Dataset. C1 ~C8 represent Class 1 ~Class 8, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



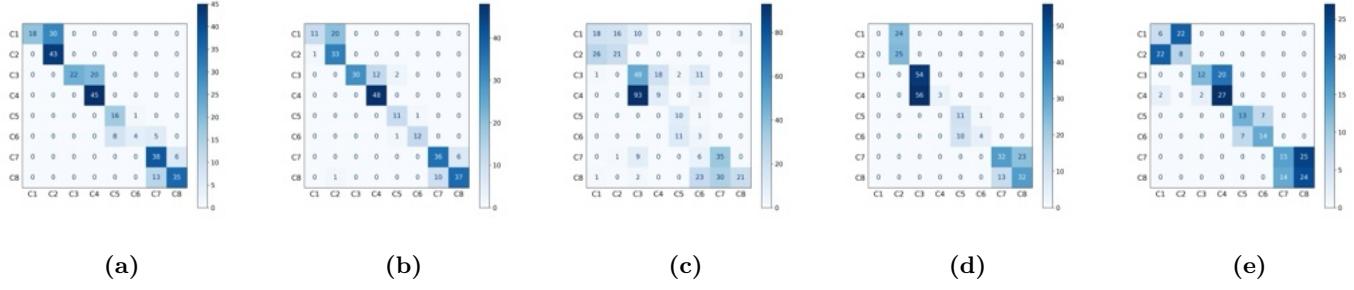
**Figure 43.** Confusion Matrices for Fine-Tuned InceptionV3 Models on v02 Dataset. C1 ~C4 represent Class 1 ~Class 4, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



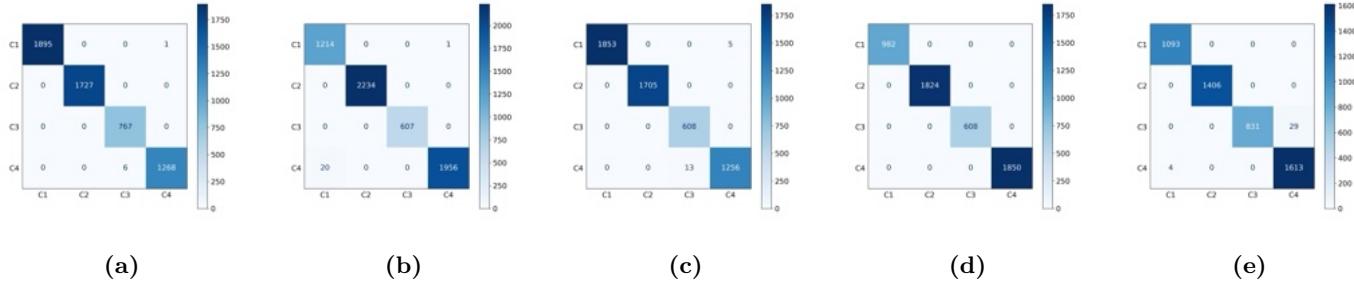
**Figure 44.** Confusion Matrices for Fine-Tuned InceptionV3 Models on v002 Dataset. C1 ~C8 represent Class 1 ~Class 8, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



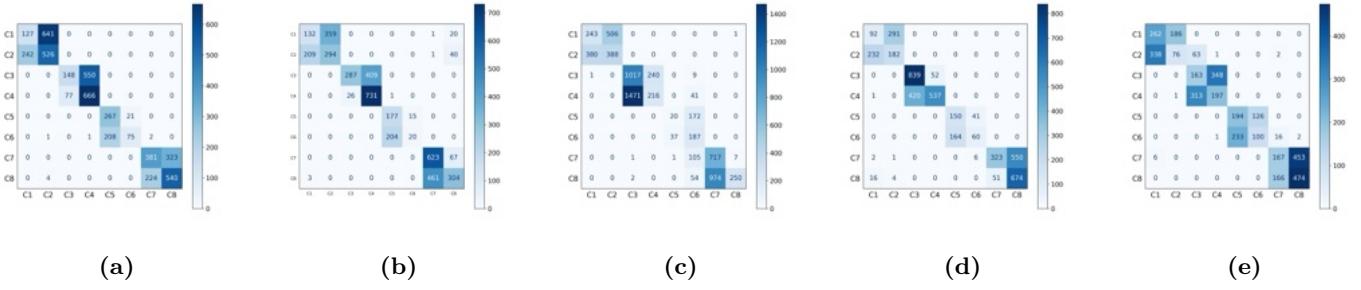
**Figure 45.** Confusion Matrices for Fine-Tuned InceptionV3 Models on v03 Dataset. C1 ~C4 represent Class 1 ~Class 4, respectively. The symbol S represents a seed:(a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



**Figure 46.** Confusion Matrices for Fine-Tuned InceptionV3 Models on v003 Dataset. C1 ~C8 represent Class 1 ~Class 8, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



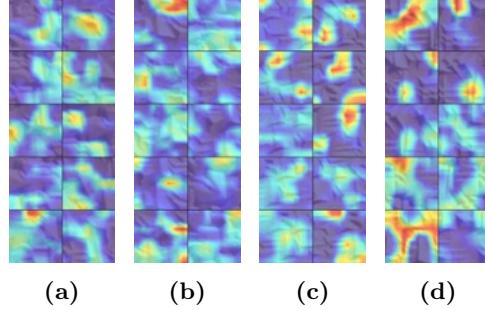
**Figure 47.** Confusion Matrices for Fine-Tuned InceptionV3 Models on v04 Dataset. C1 ~C4 represent Class 1 ~Class 4, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



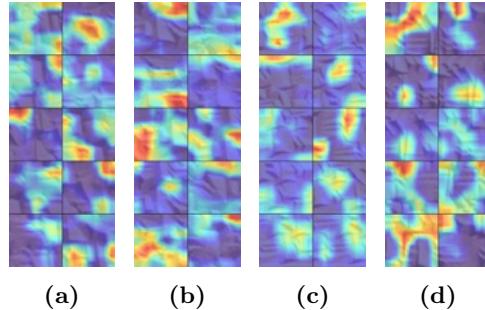
**Figure 48.** Confusion Matrices for Fine-Tuned InceptionV3 Models on v004 Dataset. C1 ~C8 represent Class 1 ~Class 8, respectively. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.

### C. CLASS ACTIVATION MAPPING (SUBSECTIONS 2.4 & 3.3)

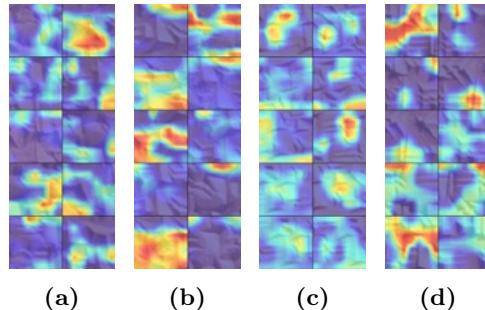
Results that three algorithms of class activation mapping (Grad-CAM, Eigen-CAM, and Layer-CAM) are applied to fine-tuned VGG19 models are presented in this section. Here, we present only the cases concerning the seed 1033 in Figure 49 ~ 72, as examples. Background images consist of a batch of 10 square cropped image samples of the prescribed class. Results of Grad-CAM, Eigen-CAM, and Layer-CAM on the same batch via color temperature are visualized. Red-color parts represent heavy weights on which fine-tuned models put for their classification, and blue-color parts represent the inverse meanings.



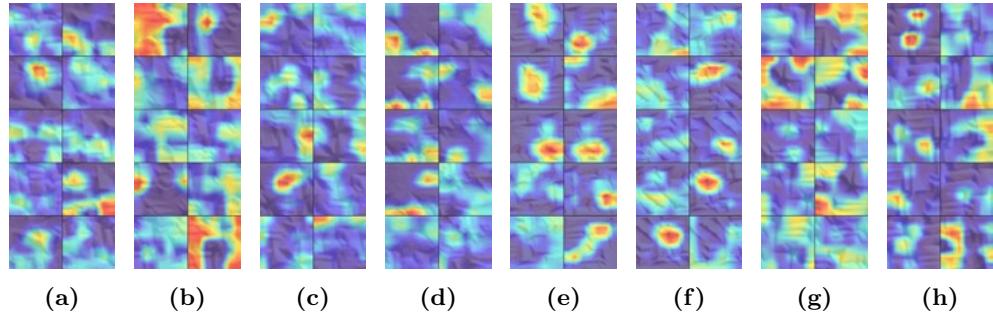
**Figure 49.** Results of Grad-CAM for v01 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4.



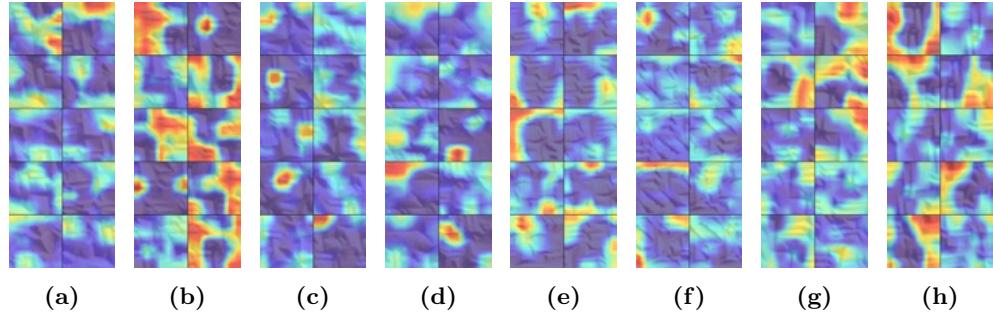
**Figure 50.** Results of Eigen-CAM for v01 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4.



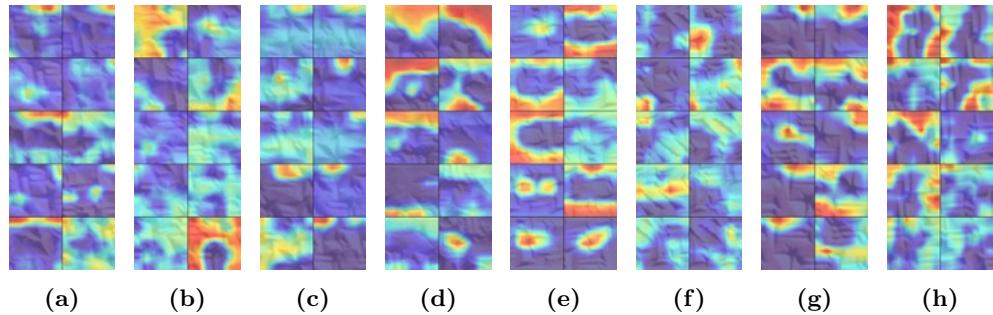
**Figure 51.** Results of Layer-CAM for v01 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4.



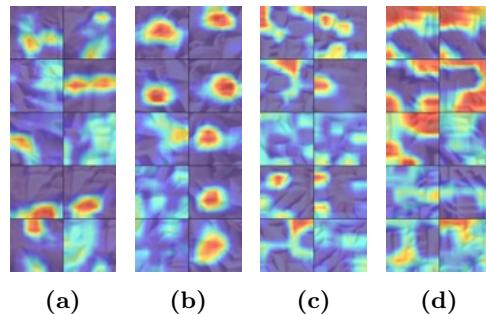
**Figure 52.** Results of Grad-CAM for v001 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4, (e)Class 5, (f)Class 6, (g)Class 7, and (h)Class 8.



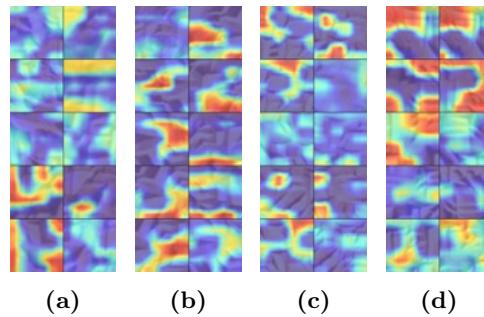
**Figure 53.** Results of Eigen-CAM for v001 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4, (e)Class 5, (f)Class 6, (g)Class 7, and (h)Class 8.



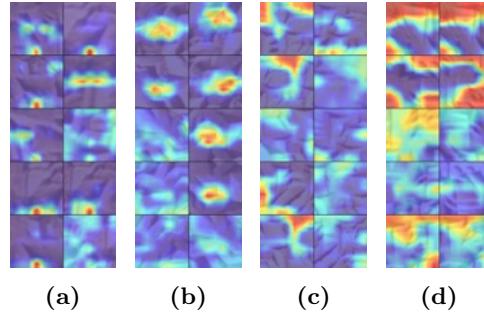
**Figure 54.** Results of Layer-CAM for v001 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4, (e)Class 5, (f)Class 6, (g)Class 7, and (h)Class 8.



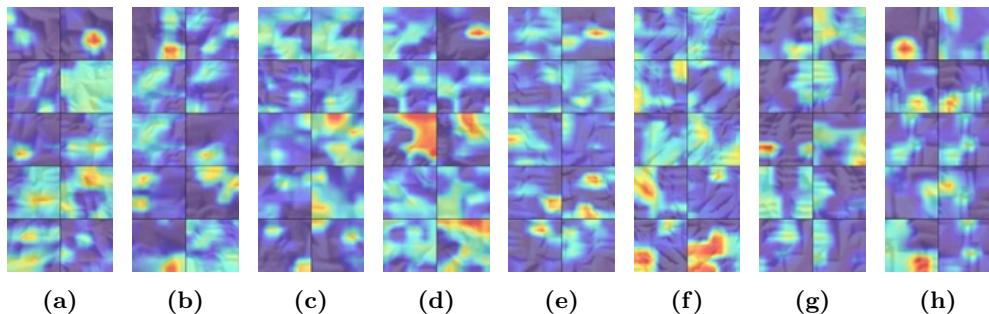
**Figure 55.** Results of Grad-CAM for v02 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4.



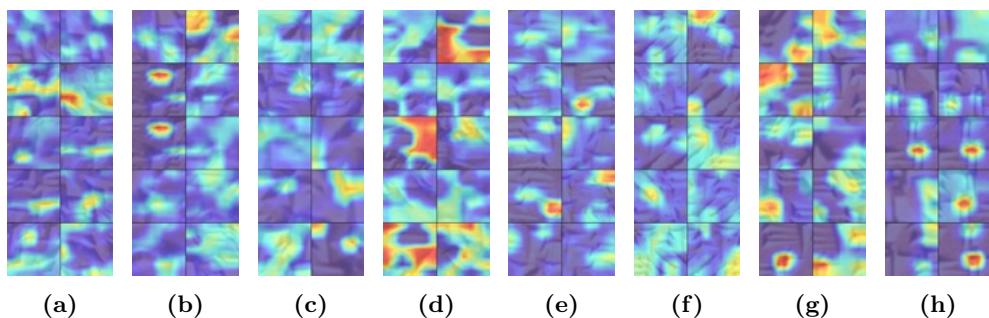
**Figure 56.** Results of Eigen-CAM for v02 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4.



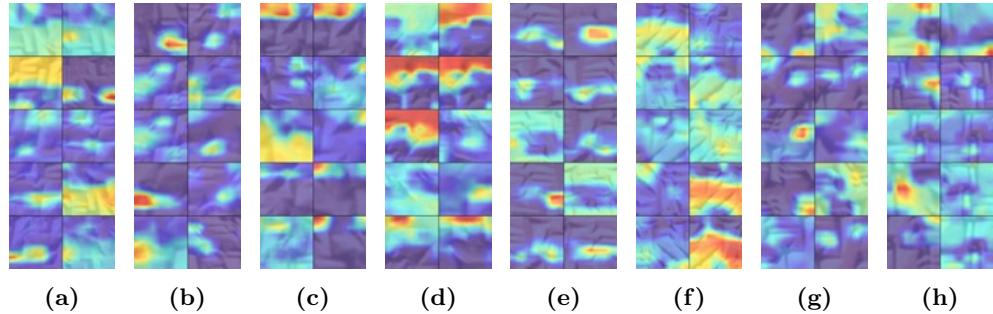
**Figure 57.** Results of Layer-CAM for v02 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4.



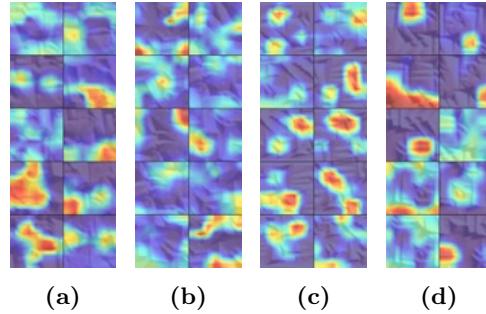
**Figure 58.** Results of Grad-CAM for v002 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4, (e)Class 5, (f)Class 6, (g)Class 7, and (h)Class 8.



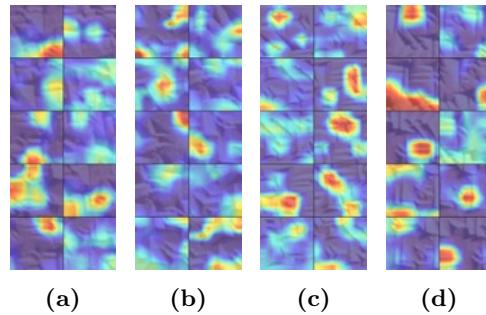
**Figure 59.** Results of Eigen-CAM for v002 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4, (e)Class 5, (f)Class 6, (g)Class 7, and (h)Class 8.



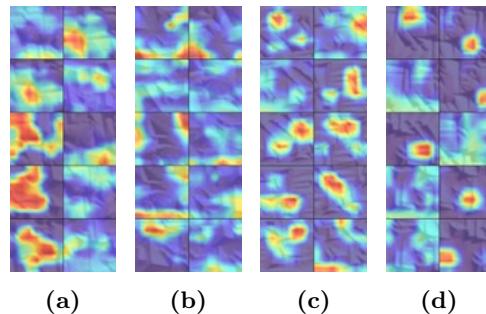
**Figure 60.** Results of Layer-CAM for v002 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4, (e)Class 5, (f)Class 6, (g)Class 7, and (h)Class 8.



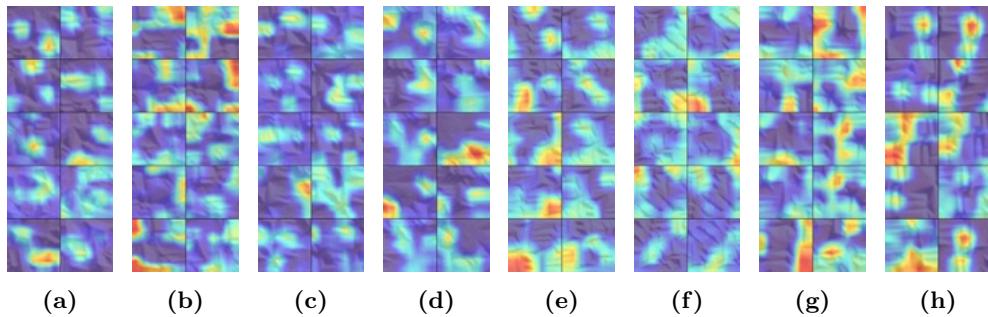
**Figure 61.** Results of Grad-CAM for v03 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4.



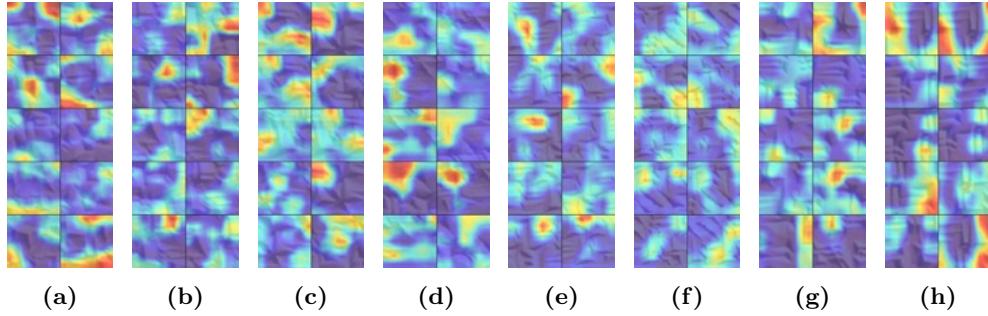
**Figure 62.** Results of Eigen-CAM for v03 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4.



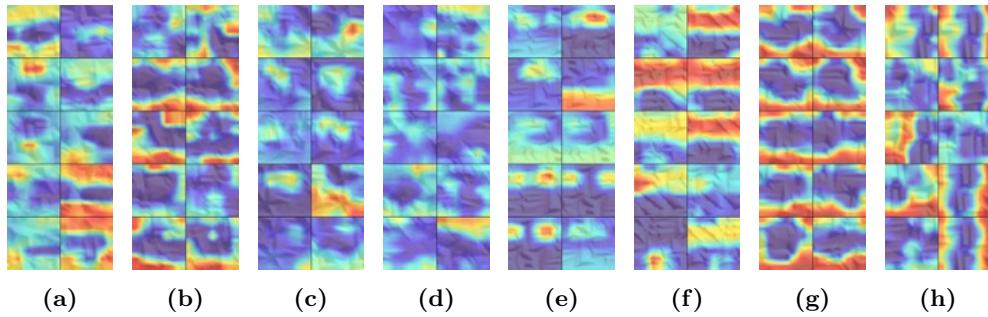
**Figure 63.** Results of Layer-CAM for v03 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4.



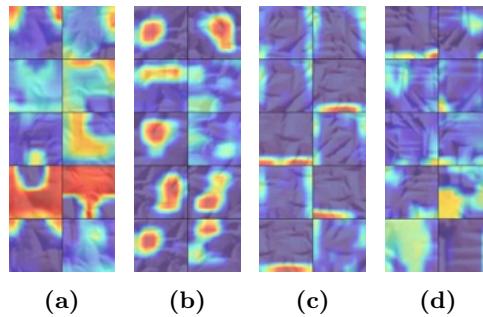
**Figure 64.** Results of Grad-CAM for v003 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4, (e)Class 5, (f)Class 6, (g)Class 7, and (h)Class 8.



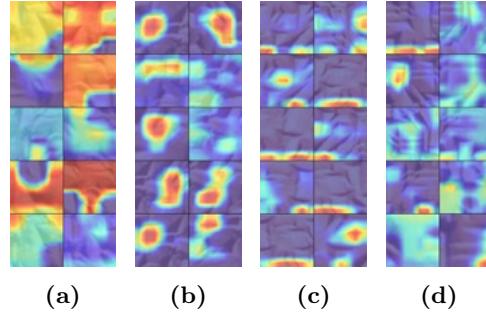
**Figure 65.** Results of Eigen-CAM for v003 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4, (e)Class 5, (f)Class 6, (g)Class 7, and (h)Class 8.



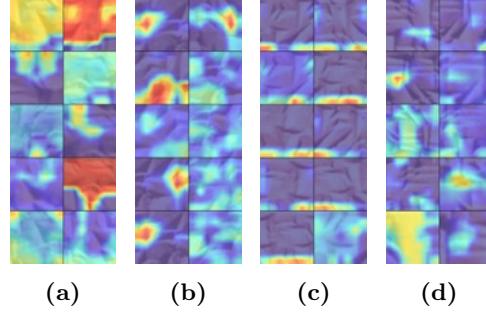
**Figure 66.** Results of Layer-CAM for v003 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4, (e)Class 5, (f)Class 6, (g)Class 7, and (h)Class 8.



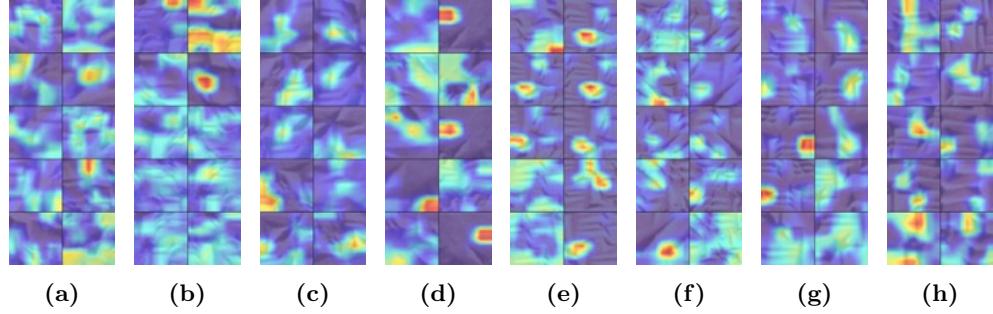
**Figure 67.** Results of Grad-CAM for v04 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4.



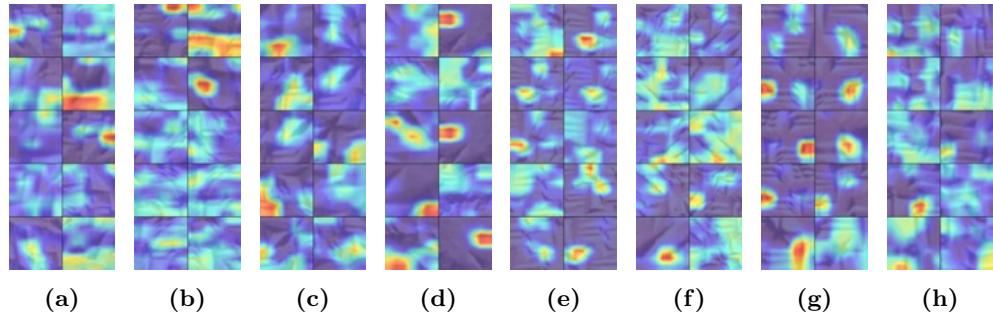
**Figure 68.** Results of Eigen-CAM for v04 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4.



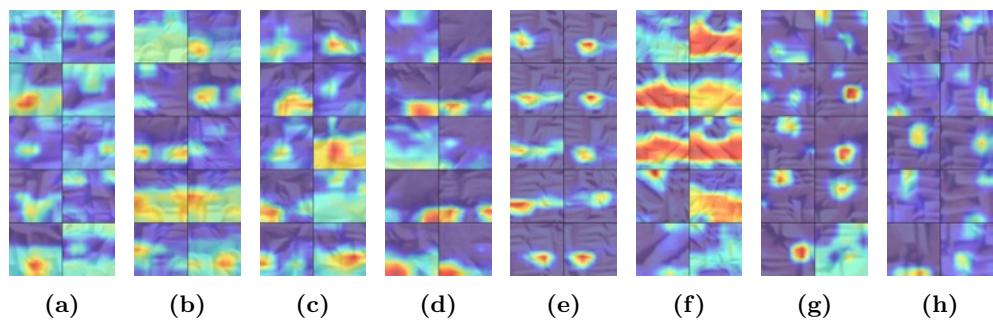
**Figure 69.** Results of Layer-CAM for v04 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4.



**Figure 70.** Results of Grad-CAM for v004 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4, (e)Class 5, (f)Class 6, (g)Class 7, and (h)Class 8.



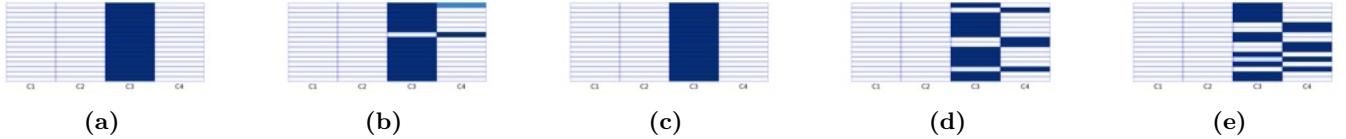
**Figure 71.** Results of Eigen-CAM for v004 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4, (e)Class 5, (f)Class 6, (g)Class 7, and (h)Class 8.



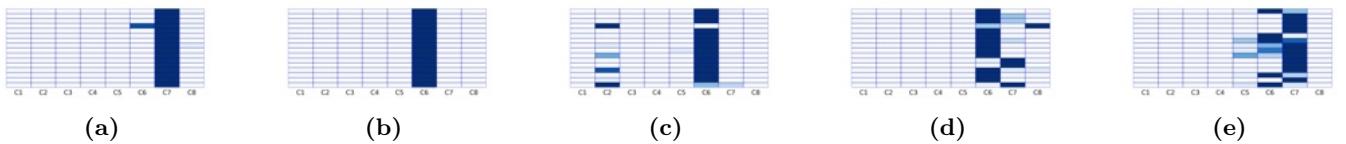
**Figure 72.** Results of Layer-CAM for v004 Dataset and Seed 1033: (a)Class 1, (b)Class 2, (c)Class 3, and (d)Class 4, (e)Class 5, (f)Class 6, (g)Class 7, and (h)Class 8.

#### D. DEMONSTRATING FINE-TUNED MODELS FOR OTHER CUNEIFORM SENTENCES (1): FRONT-BOTTOM PART (SUBSECTIONS 2.5 & 3.4)

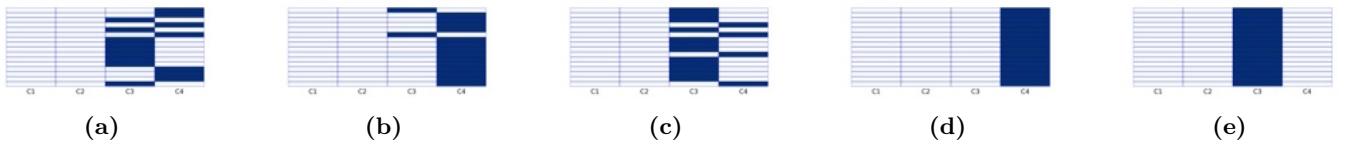
Results on predicting who wrote other cuneiform sentences in the front-bottom of tablets are presented in Figure 73 ~ 96. In each picture, the vertical axis represents square-cropped samples of the target cuneiform sentences, and the horizontal one represents candidate authors, i.e., prescribed classes in each dataset. Bold color means the probability is near 1.0, and white color means it is near 0.0.



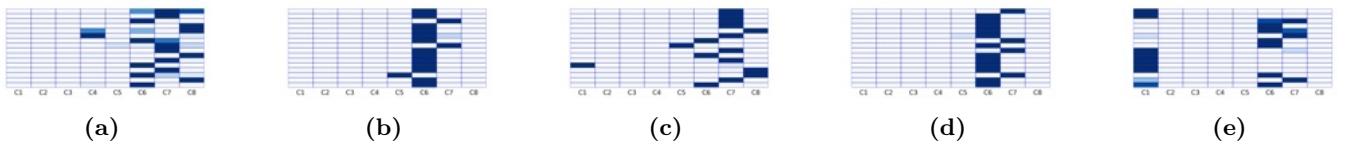
**Figure 73.** Which Author Wrote This Sentence?: Via Fine-Tuned VGG19 Models on v01 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and  
(e)S:9325.



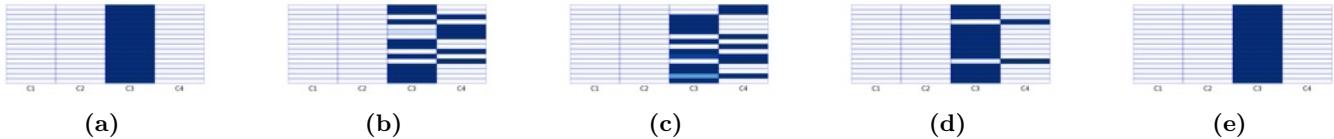
**Figure 74.** Which Author Wrote This Sentence?: Via Fine-Tuned VGG19 Models on v001 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and  
(e)S:9325.



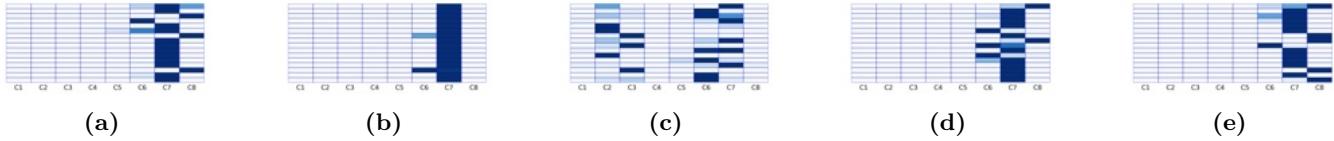
**Figure 75.** Which Author Wrote This Sentence?: Via Fine-Tuned VGG19 Models on v02 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and  
(e)S:9325.



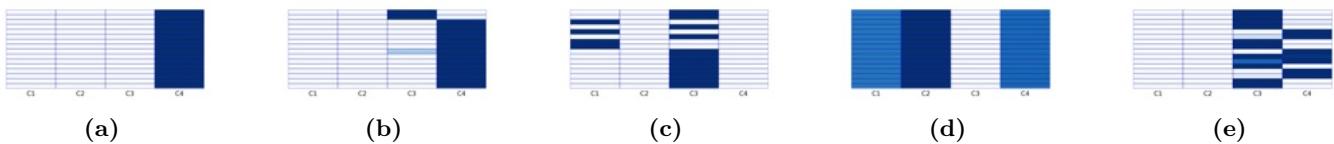
**Figure 76.** Which Author Wrote This Sentence?: Via Fine-Tuned VGG19 Models on v002 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and  
(e)S:9325.



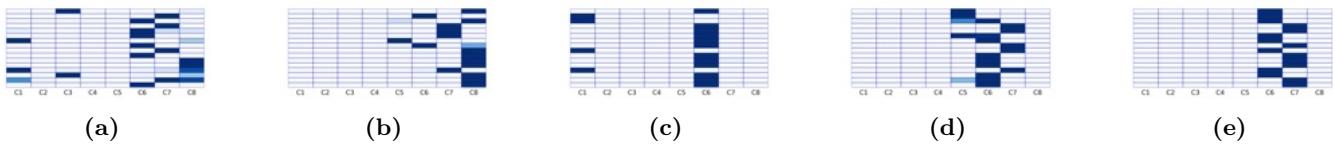
**Figure 77.** Which Author Wrote This Sentence?: Via Fine-Tuned VGG19 Models on v03 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



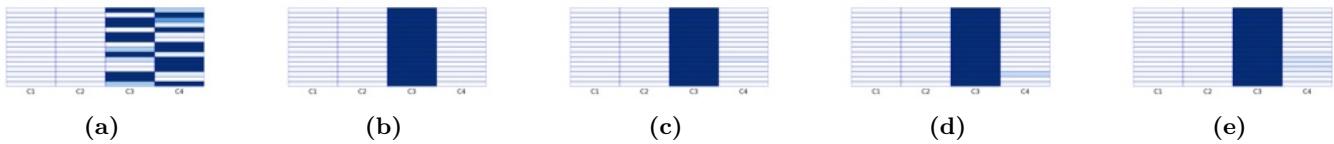
**Figure 78.** Which Author Wrote This Sentence?: Via Fine-Tuned VGG19 Models on v003 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



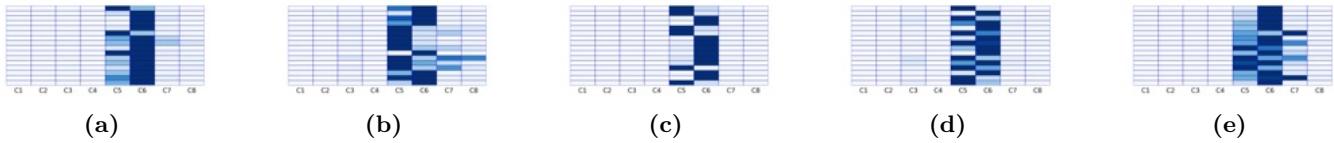
**Figure 79.** Which Author Wrote This Sentence?: Via Fine-Tuned VGG19 Models on v04 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



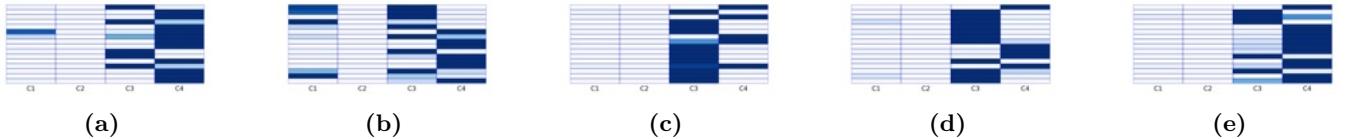
**Figure 80.** Which Author Wrote This Sentence?: Via Fine-Tuned VGG19 Models on v004 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



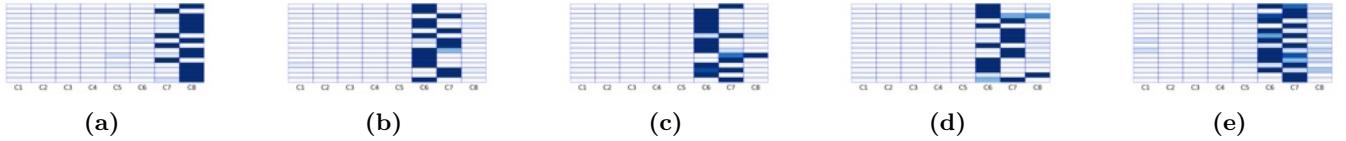
**Figure 81.** Which Author Wrote This Sentence?: Via Fine-Tuned ResNet50 Models on v01 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



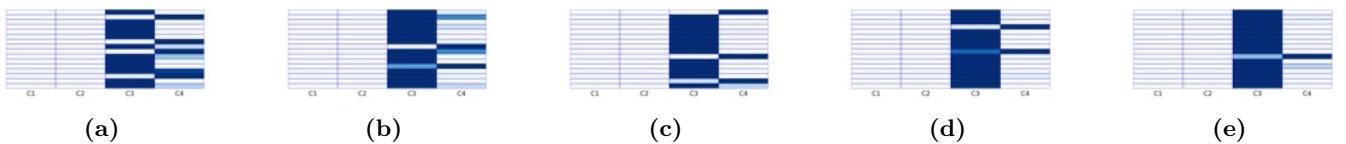
**Figure 82.** Which Author Wrote This Sentence?: Via Fine-Tuned ResNet50 Models on v001 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



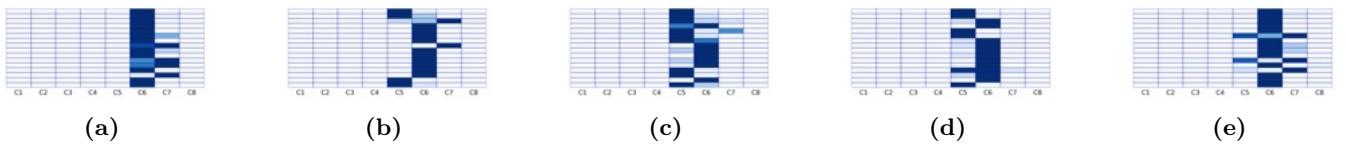
**Figure 83.** Which Author Wrote This Sentence?: Via Fine-Tuned ResNet50 Models on v02 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



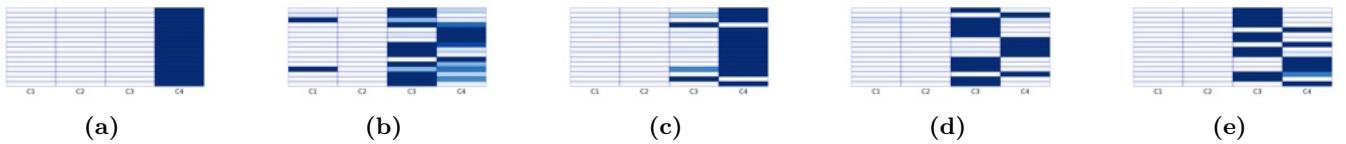
**Figure 84.** Which Author Wrote This Sentence?: Via Fine-Tuned ResNet50 Models on v02 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



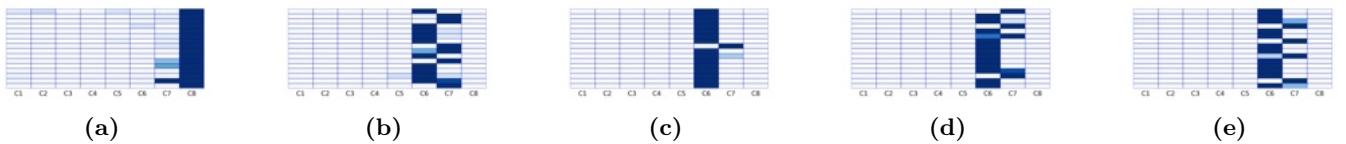
**Figure 85.** Which Author Wrote This Sentence?: Via Fine-Tuned ResNet50 Models on v03 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



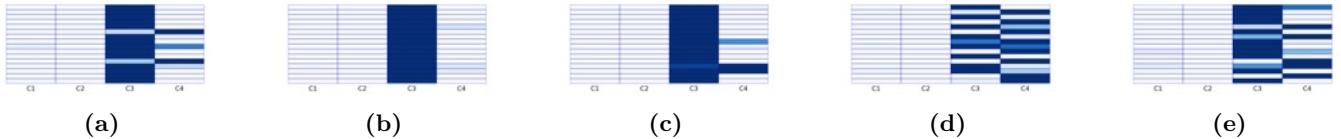
**Figure 86.** Which Author Wrote This Sentence?: Via Fine-Tuned ResNet50 Models on v003 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



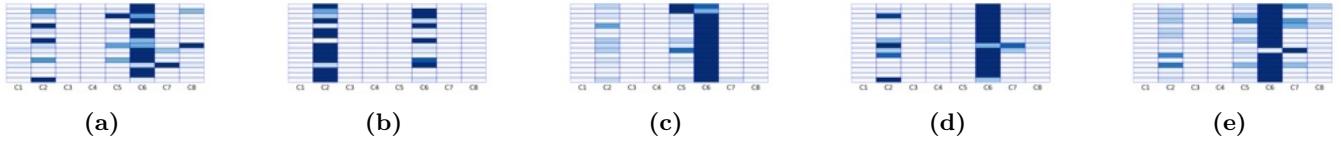
**Figure 87.** Which Author Wrote This Sentence?: Via Fine-Tuned ResNet50 Models on v04 Dataset.  
The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



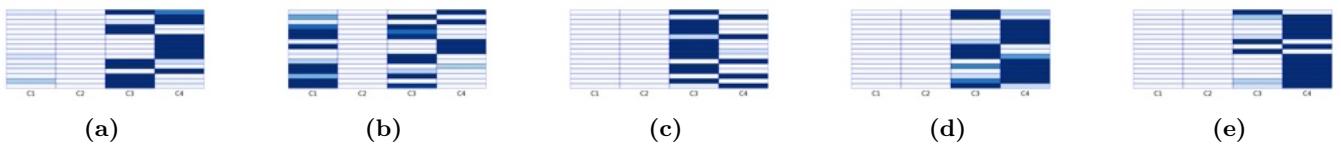
**Figure 88.** Which Author Wrote This Sentence?: Via Fine-Tuned ResNet50 Models on v004 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



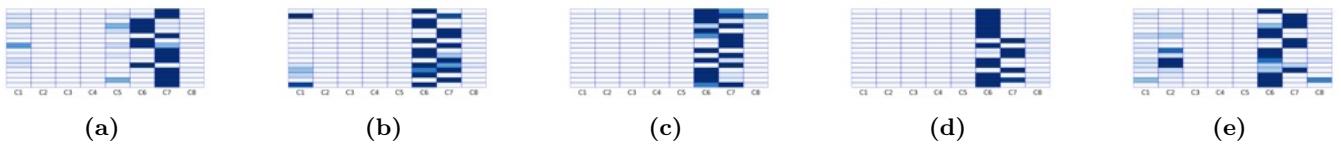
**Figure 89.** Which Author Wrote This Sentence?: Via Fine-Tuned InceptionV3 Models on v01 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



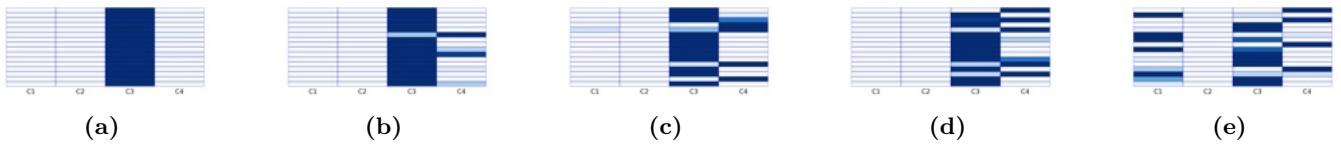
**Figure 90.** Which Author Wrote This Sentence?: Via Fine-Tuned InceptionV3 Models on v001 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



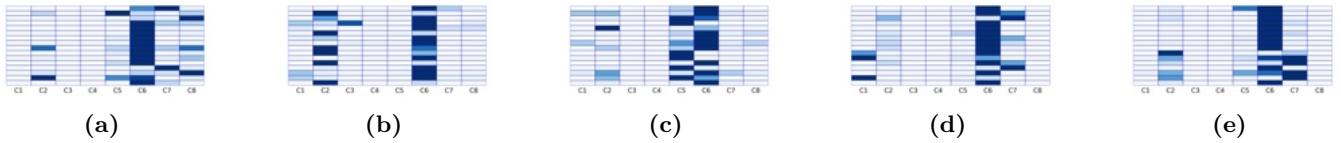
**Figure 91.** Which Author Wrote This Sentence?: Via Fine-Tuned InceptionV3 Models on v02 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



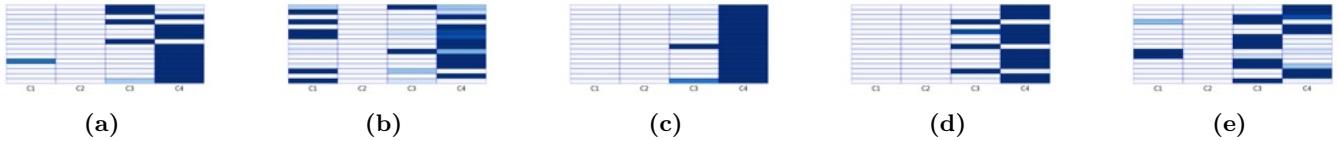
**Figure 92.** Which Author Wrote This Sentence?: Via Fine-Tuned InceptionV3 Models on v002 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



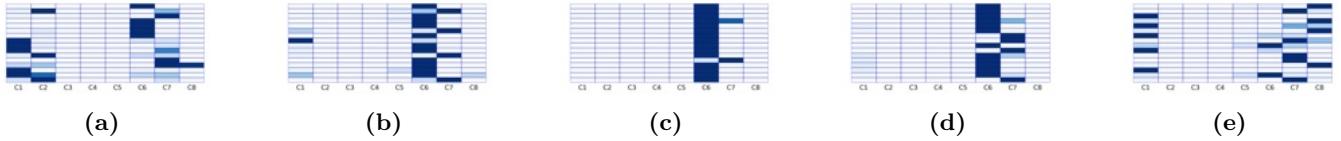
**Figure 93.** Which Author Wrote This Sentence?: Via Fine-Tuned InceptionV3 Models on v03 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



**Figure 94.** Which Author Wrote This Sentence?: Via Fine-Tuned InceptionV3 Models on v003 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



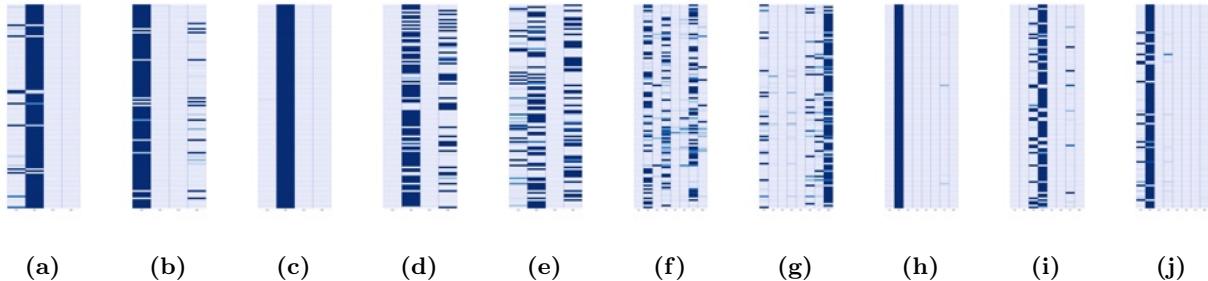
**Figure 95.** Which Author Wrote This Sentence?: Via Fine-Tuned InceptionV3 Models on v04 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.



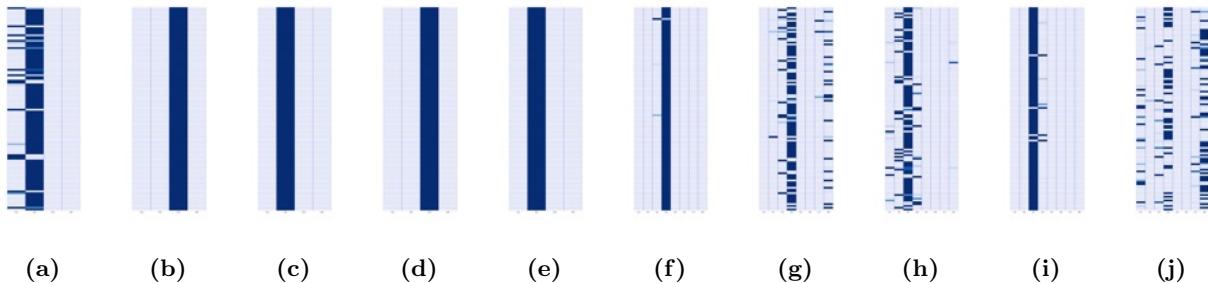
**Figure 96.** Which Author Wrote This Sentence?: Via Fine-Tuned InceptionV3 Models on v004 Dataset. The symbol S represents a seed: (a)S:1033, (b)S:1931, (c)S:2201, (d)S:4179, and (e)S:9325.

### E. DEMONSTRATING FINE-TUNED MODELS FOR OTHER CUNEIFORM SENTENCES (2): SIDE PARTS (SUBSECTIONS 2.5 & 3.4)

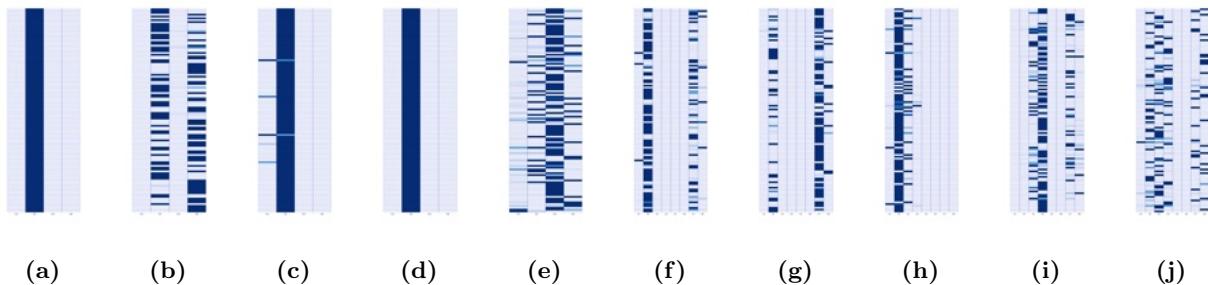
In this section, results on predicting who wrote other cuneiform sentences in the side part of tablets are presented in Figure 97 ~ 108. As the same manner, in each picture, the vertical axis represents square-cropped samples of the target cuneiform sentences, and the horizontal one represents candidate authors, i.e., prescribed classes in each dataset. Bold color means the probability is near 1.0, and white color means it is near 0.0.



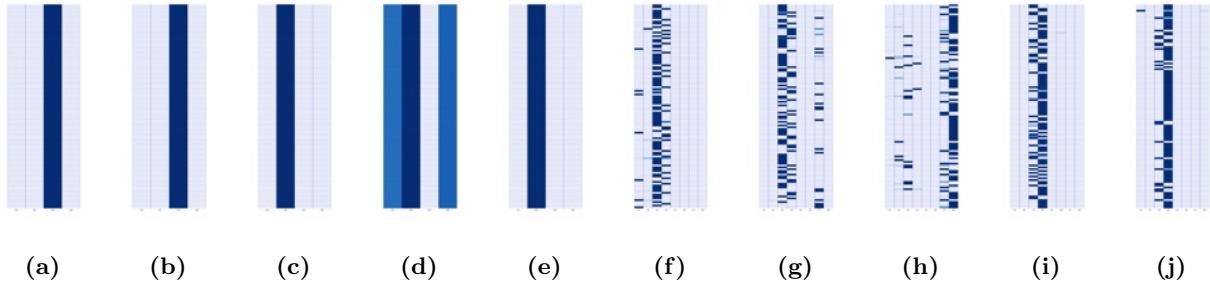
**Figure 97.** Which Author Wrote This Sentence?: Via Fine-Tuned VGG19 Models. The symbol D represents a dataset type, and S represents a seed: (a)D:v01 & S:1033, (b)D:v01 & S:1931, (c)D:v01 & S:2201, (d)D:v01 & S:4179, (e)D:v01 & S:9325, (f)D:v001 & S:1033, (g)D:v001 & S:1931, (h)D:v001 & S:2201, (i)D:v001 & S:4179, and (j)D:v001 & S:9325.



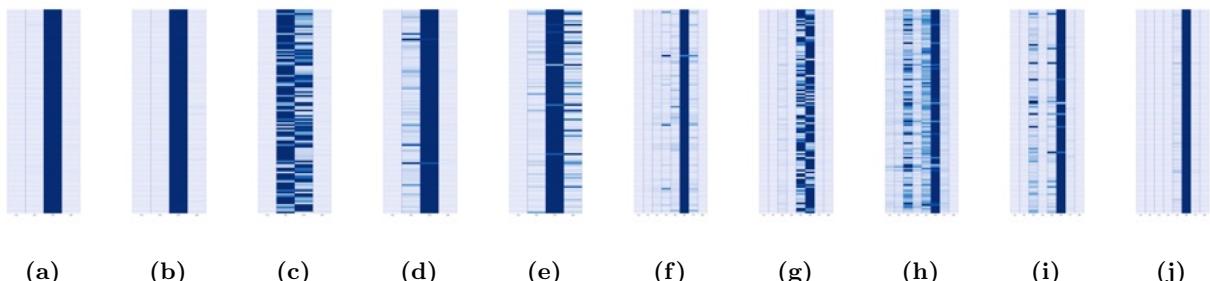
**Figure 98.** Which Author Wrote This Sentence?: Via Fine-Tuned VGG19 Models. The symbol D represents a dataset type, and S represents a seed: (a)D:v02 & S:1033, (b)D:v02 & S:1931, (c)D:v02 & S:2201, (d)D:v02 & S:4179, (e)D:v02 & S:9325, (f)D:v002 & S:1033, (g)D:v002 & S:1931, (h)D:v002 & S:2201, (i)D:v002 & S:4179, and (j)D:v002 & S:9325.



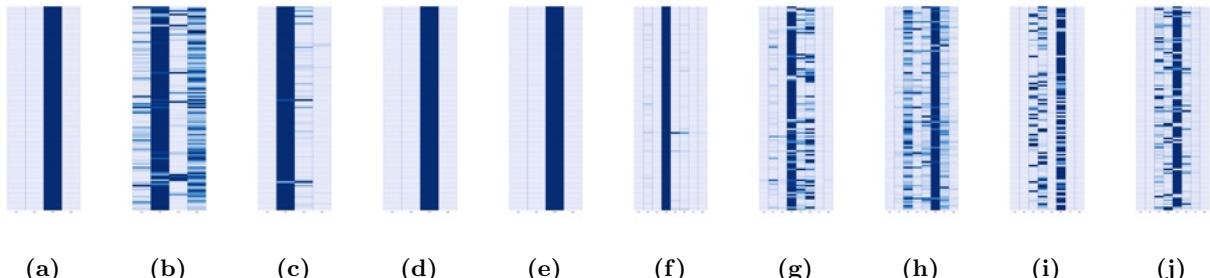
**Figure 99.** Which Author Wrote This Sentence?: Via Fine-Tuned VGG19 Models. The symbol D represents a dataset type, and S represents a seed: (a)D:v03 & S:1033, (b)D:v03 & S:1931, (c)D:v03 & S:2201, (d)D:v03 & S:4179, (e)D:v03 & S:9325, (f)D:v003 & S:1033, (g)D:v003 & S:1931, (h)D:v003 & S:2201, (i)D:v003 & S:4179, and (j)D:v003 & S:9325.



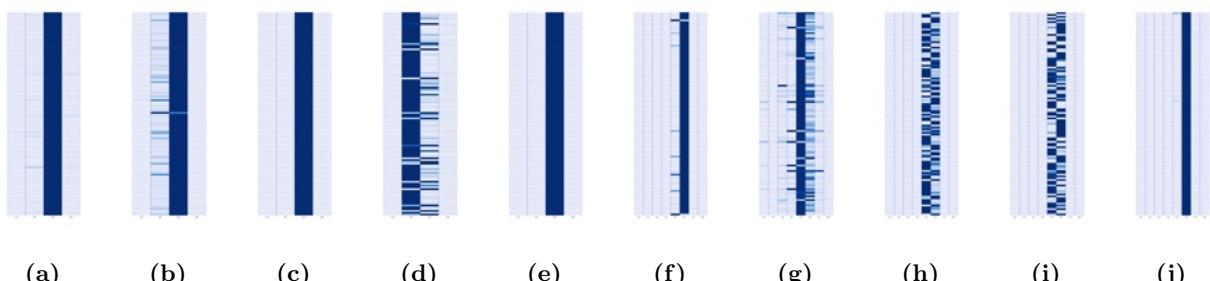
**Figure 100.** Which Author Wrote This Sentence?: Via Fine-Tuned VGG19 Models. The symbol D represents a dataset type, and S represents a seed: (a)D:v04 & S:1033, (b)D:v04 & S:1931, (c)D:v04 & S:2201, (d)D:v04 & S:4179, (e)D:v04 & S:9325, (f)D:v004 & S:1033, (g)D:v004 & S:1931, (h)D:v004 & S:2201, (i)D:v004 & S:4179, and (j)D:v004 & S:9325.



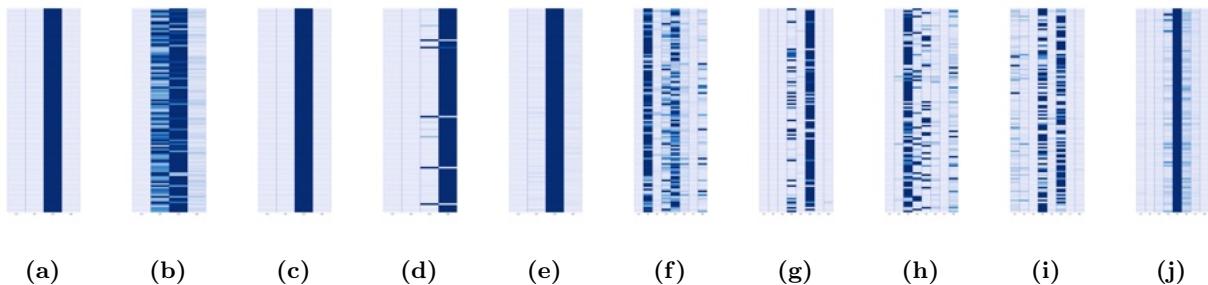
**Figure 101.** Which Author Wrote This Sentence?: Via Fine-Tuned ResNet50 Models. The symbol D represents a dataset type, and S represents a seed: (a)D:v01 & S:1033, (b)D:v01 & S:1931, (c)D:v01 & S:2201, (d)D:v01 & S:4179, (e)D:v01 & S:9325, (f)D:v001 & S:1033, (g)D:v001 & S:1931, (h)D:v001 & S:2201, (i)D:v001 & S:4179, and (j)D:v001 & S:9325.



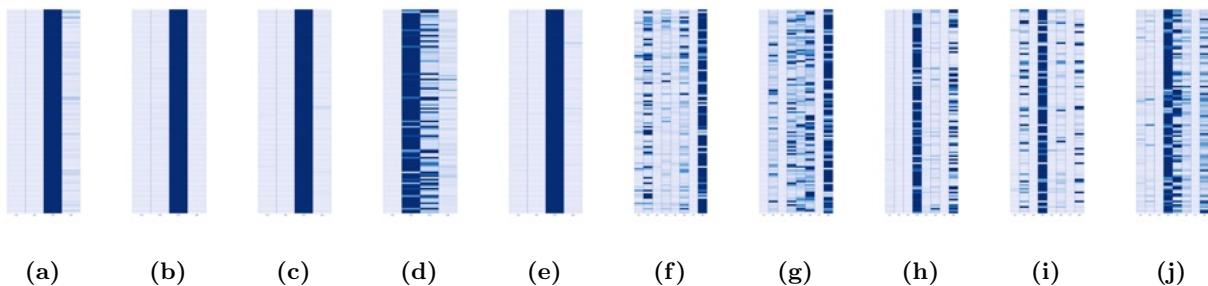
**Figure 102.** Which Author Wrote This Sentence?: Via Fine-Tuned ResNet50 Models. The symbol D represents a dataset type, and S represents a seed: (a)D:v02 & S:1033, (b)D:v02 & S:1931, (c)D:v02 & S:2201, (d)D:v02 & S:4179, (e)D:v02 & S:9325, (f)D:v002 & S:1033, (g)D:v002 & S:1931, (h)D:v002 & S:2201, (i)D:v002 & S:4179, and (j)D:v002 & S:9325.



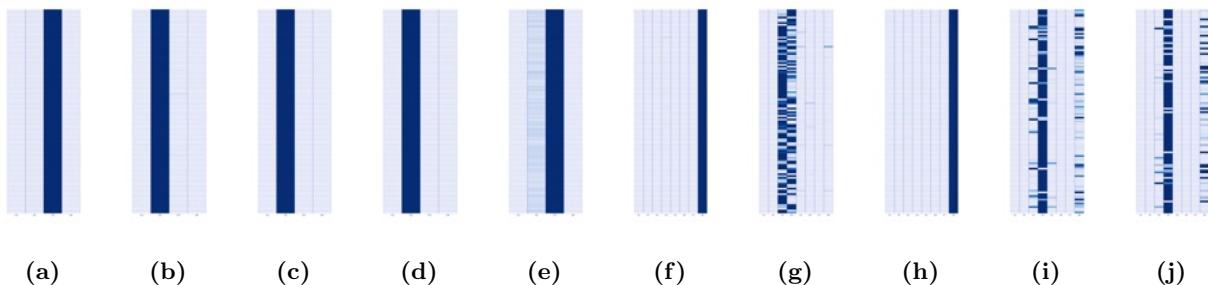
**Figure 103.** Which Author Wrote This Sentence?: Via Fine-Tuned ResNet50 Models. The symbol D represents a dataset type, and S represents a seed: (a)D:v03 & S:1033, (b)D:v03 & S:1931, (c)D:v03 & S:2201, (d)D:v03 & S:4179, (e)D:v03 & S:9325, (f)D:v003 & S:1033, (g)D:v003 & S:1931, (h)D:v003 & S:2201, (i)D:v003 & S:4179, and (j)D:v003 & S:9325.



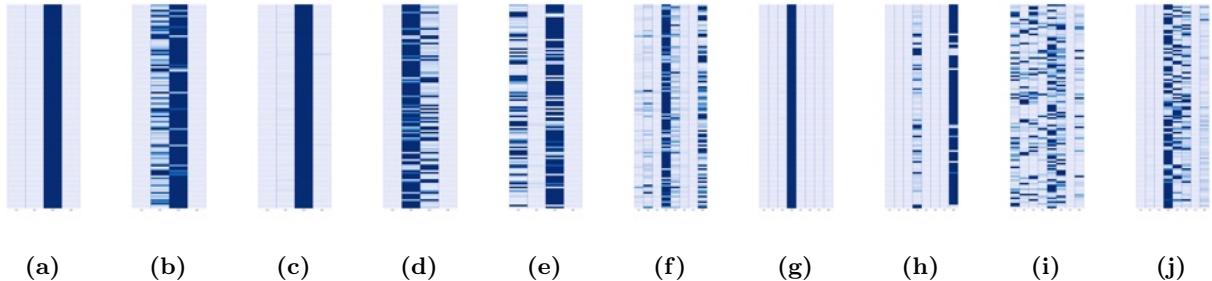
**Figure 104.** Which Author Wrote This Sentence?: Via Fine-Tuned ResNet50 Models. The symbol D represents a dataset type, and S represents a seed: (a)D:v04 & S:1033, (b)D:v04 & S:1931, (c)D:v04 & S:2201, (d)D:v04 & S:4179, (e)D:v04 & S:9325, (f)D:v004 & S:1033, (g)D:v004 & S:1931, (h)D:v004 & S:2201, (i)D:v004 & S:4179, and (j)D:v004 & S:9325.



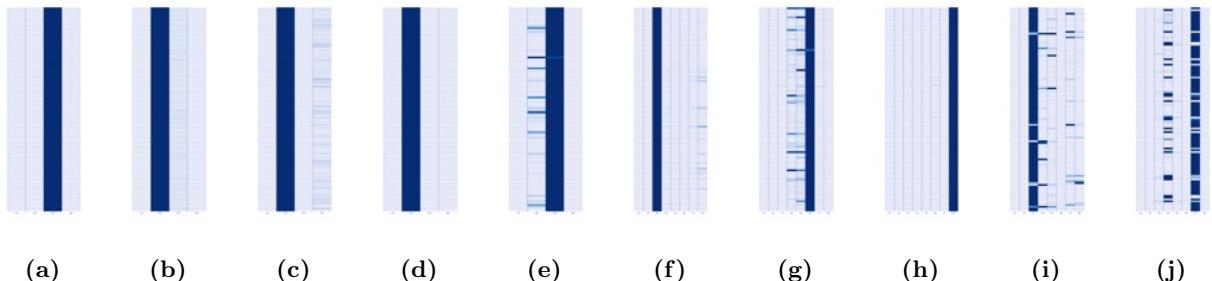
**Figure 105.** Which Author Wrote This Sentence?: Via Fine-Tuned InceptionV3 Models. The symbol D represents a dataset type, and S represents a seed: (a)D:v01 & S:1033, (b)D:v01 & S:1931, (c)D:v01 & S:2201, (d)D:v01 & S:4179, (e)D:v01 & S:9325, (f)D:v001 & S:1033, (g)D:v001 & S:1931, (h)D:v001 & S:2201, (i)D:v001 & S:4179, and (j)D:v001 & S:9325.



**Figure 106.** Which Author Wrote This Sentence?: Via Fine-Tuned InceptionV3 Models. The symbol D represents a dataset type, and S represents a seed: (a)D:v02 & S:1033, (b)D:v02 & S:1931, (c)D:v02 & S:2201, (d)D:v02 & S:4179, (e)D:v02 & S:9325, (f)D:v002 & S:1033, (g)D:v002 & S:1931, (h)D:v002 & S:2201, (i)D:v002 & S:4179, and (j)D:v002 & S:9325.



**Figure 107.** Which Author Wrote This Sentence?: Via Fine-Tuned InceptionV3 Models. The symbol D represents a dataset type, and S represents a seed: (a)D:v03 & S:1033, (b)D:v03 & S:1931, (c)D:v03 & S:2201, (d)D:v03 & S:4179, (e)D:v03 & S:9325, (f)D:v003 & S:1033, (g)D:v003 & S:1931, (h)D:v003 & S:2201, (i)D:v003 & S:4179, and (j)D:v003 & S:9325.



**Figure 108.** Which Author Wrote This Sentence?: Via Fine-Tuned InceptionV3 Models. The symbol D represents a dataset type, and S represents a seed: (a)D:v04 & S:1033, (b)D:v04 & S:1931, (c)D:v04 & S:2201, (d)D:v04 & S:4179, (e)D:v04 & S:9325, (f)D:v004 & S:1033, (g)D:v004 & S:1931, (h)D:v004 & S:2201, (i)D:v004 & S:4179, and (j)D:v004 & S:9325.

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