Meeting Note

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Summary
Multi-label Classification with Transformer. [3]
CLIP-Adapter. [4, 5]
Basic Knowledge of Electronic Paper. [1, 2]
Full-color Electronic Paper. [6]

Plan for Next Week
Time Series Data Decomposition.

Details
Liu et al. [3] introduced an effective approach for multi-label classification. They first use an extractor to extract the image spatial features; second, use the features as keys and values, and the labels as queries to calculate the cross attention. This architecture is based on Transformer decoder, and the sequence of labels (e.g. "person, car, cat, etc.") is embedded into a representation of size K * d, where the K is the numbers of class and d is the embedding dimension.

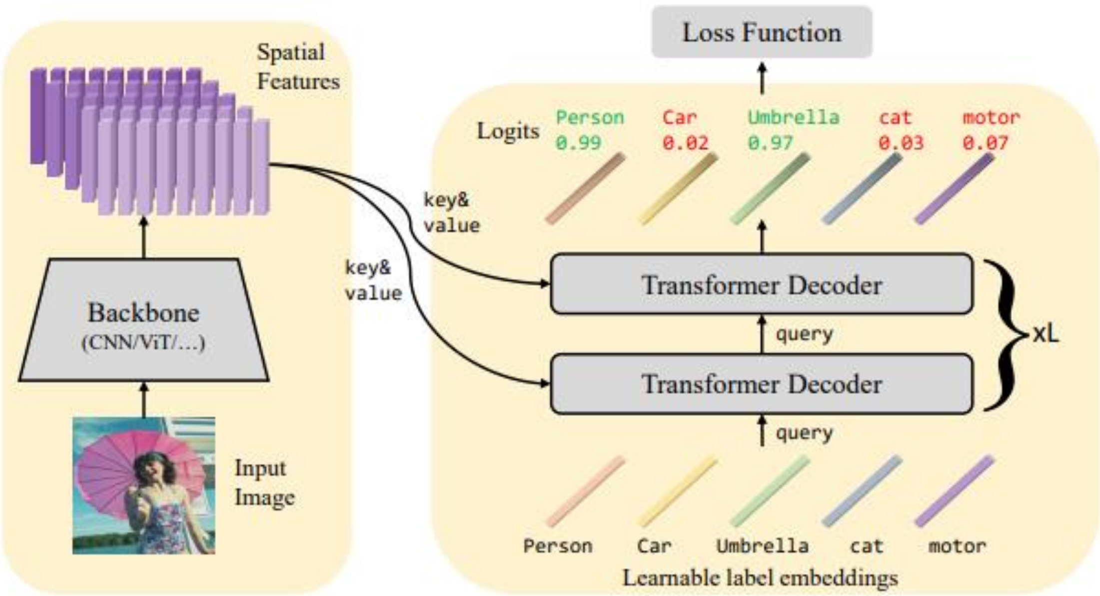

Figure 1. The architecture of Query2Label.

Gao et al. [4] introduced an adapter to improve the performance of CLIP on few-shot classification tasks. This simple architecture is a tow-layer fully-connected layer contains bottleneck and residual connection. First, they obtain the features from frozen image and text encoders in CLIP, then input the features into the adapters respectively. Finally, add the original outputs of encoders with the outputs of adapters as the final outputs. The authors claim that the bottleneck helps the adapter to learn the features more efficiently and the residual connection addresses the problem of over-fitting.

Based on the previous work, Zhang et al. [5] introduced a training-free adapter. In this study, they proposed a key-value “cache model” which store the feature information of the few-shot training data. First, they extract the feature maps of image training data from the image encoder of CLIP and convert the labels into one-hot encoded format. Then, transform the cache into the weights of the adapter in a non-parametric manner.

Joseph [1] introduced the basic technology and features of electronic paper (e-paper) of recent years. An e-paper consists of a plastic substrate and small beads, each bead is composed of negatively charged black plastic and positively charged white plastic. Then the controller uses two electrodes on the top and bottom of plastic substrate to control the color of e-paper, when the electrode is charged by one polarity, the colored plastic with opposite polarity will be moved to the top.

There are two types of full-color electronic paper [6]. The first type of full-color E Ink is to use the RGB color filter combined with the traditional monochrome E Ink panel. In this approach, three beads with white and black plastic balls are regarded as a unit, each bead will turn light reflected from white into red, green, and blue. But the resolution and brightness will be reduced under this architecture, so the second approach are developed. The second type of full-color E Ink called Advanced Color ePaper (ACEP), uses "microcups" contain four different colors (white, yellow, magenta and cyan) of pigment, each pigment particle has the different size and charge, making the moving speed of particles in the liquid different. And the controller applies a sequence of voltages to the microcup to move the particles up and down.

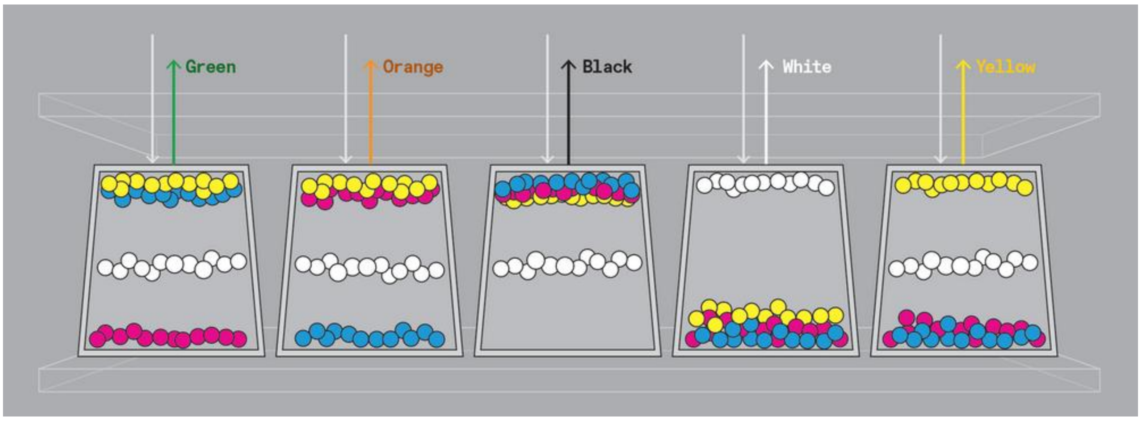

Figure 2. The architecture of ACEP.

References

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[4] P. Gao, S. Geng, R. Zhang, T. Ma, R. Fang, Y. Zhang, H. Li, and Y. Qiao, "CLIP-Adapter: Better Vision-Language Models with Feature Adapters," arXiv preprint arXiv:2110.04544, Oct. 2021.

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