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(57) Abstract :
The present invention relates to system (100) and method for class adaptive conformal training of neural networks comprising a hardware processor (101), memory unit (102), and specialized computational modules. The system addresses unreliable probability estimates in deep neural networks by implementing class-wise constraint optimization through an augmented Lagrangian multiplier module (103) that adaptively learns class-specific penalty weights (104) without requiring prior knowledge of data distribution. A conformal prediction engine (105) constructs prediction sets with coverage guarantees while a class-conditional constraint processor (106) enforces size constraints per category. The system includes a differentiable quantile computation unit (107), smooth indicator function approximator (108), and penalty parameter adjustment controller (109) that dynamically scales penalty coefficients based on constraint satisfaction metrics. Technical effects include reduced prediction set sizes, improved coverage gap metrics across imbalanced datasets, and enhanced computational efficiency through hardware-accelerated optimization achieving measurable improvements in classification accuracy across image and text processing applications.

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