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Winter of Code

Proposal

for the project

**“Enhanced Hair Type Classification
using Multi-Model Ensemble”**

Under



DEEP LEARNING SIMPLIFIED

For the Contributors, by the Contributors!

An @abhisheks008 project repo

About Me

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Synopsis

The project aims to build an advanced hair type classification system using an ensemble of three popular deep learning models (ResNet50, MobileNetV2, and VGG16) to achieve higher accuracy through weighted voting mechanisms and model diversity.

Purpose: To create a robust, high-accuracy hair classification system that leverages multiple models' strengths while providing flexibility to choose between speed and accuracy based on use-case requirements.

Benefits to the Community

- Higher classification accuracy through ensemble learning
- Documented comparison of different model performances
- Flexible implementation allowing single or multi-model usage

- Reusable ensemble architecture for similar computer vision tasks
- Comprehensive benchmarking data for future improvements

Project Plan

Phase 1: Foundation

- Setup preprocessing pipeline
- Prepare CelebA dataset for hair type classification
- Implement data augmentation techniques

Phase 2: Model Implementation

- Individual model implementation and training
- Ensemble architecture development
- Voting mechanism implementation

Tech Stack

- Python
- PyTorch/TorchVision
- OpenCV for image processing
- Weights & Biases for experiment tracking
- pytest for testing

Milestones

Milestone	Tentative Date	KPI
Week 1	Jan 20 - Jan 26	Achieving dataset cleaning accuracy of over 90%, ensuring the preprocessing pipeline is fully implemented, and getting the base models to run with an accuracy of at least 65%.
Week 2	Jan 27 - Feb 2	Achieving individual model accuracies: ResNet50 should surpass 80%, MobileNetV2 should exceed 78%, and VGG16 should achieve more than 80% accuracy.
Week 3	Feb 3 - Feb 9	The ensemble model will be the primary focus, with a target accuracy of over 87%. Additionally, the inference time should be optimized to remain below 400ms, and the model size should be reduced for better efficiency.
Week 4	Feb 10 - Feb 16	Testing and debugging will take priority, with the goal of reaching test coverage of over 80%, completing 70% of the documentation, and fixing all major bugs in the code.
Week 5	Feb 17 - Feb 20	Completing the code review, ensuring all tests are passing, and finalizing the documentation to 95% before submitting the pull request.

Deliverables

Code:

- Preprocessing pipeline
- Three model implementations
- Ensemble architecture
- Voting mechanisms
- Training scripts
- Evaluation metrics

Documentation:

- Setup guide
- Model architecture details
- Performance benchmarks
- API documentation
- Usage examples

Acknowledgement

I would like to express my gratitude to the DL-Simplified team for their efforts in fostering a collaborative environment for machine learning enthusiasts. This proposal is inspired by the team's dedication to simplifying complex concepts and the open-source community's invaluable contributions, which serve as the foundation for this project idea.