Class 6: Project, Research, Writing

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Course project

- Choose the one or create your own about visual classification
- Project requirement list
  1. (20%) Various training tips and tricks to improve performance
  2. (5%) Transfer learning: fine-tune pretrained model
  3. (15%) Synthetic images for data aug: by GAN, diffusion, etc.
  4. (15%) ViT vs. CNN backbone: to effectively use ViT
  5. (15%) Explore vision-language model to improve performance
  6. (10%) Interpretability of model: e.g., by visualization methods
  7. (10%) Evaluate model robustness: adversarial attack
  8. (10%) Empirical evaluation: on multiple datasets/settings, hyper-parameter sensitivity, etc.
  9. (Optional 5%) try to improve robustness of model
  10. (Optional 5%) lightweight model with good performance
  11. (Optional 5%) ...
- See more infor in project pdf file

How to do the project?

- What you have to do for your project:
  1. Understand research problem, including task data;
  2. Start early!
  3. Try to make progress every week!
  4. Refer to course slides for each sub-task
  5. Discuss with your teammates, frequently!
  6. Smaller first: smaller model, smaller dataset, so faster iteration
  7. Overfitting first: train model overfitted to training set, then reduce overfitting with various strategies
  8. **Iterate**: implement idea, observe negative results (quantitative, visual), figure out causes (idea, hyper-param, bugs), refine/correct idea;

How to do the project?

- What you should do to get a higher score
  1. Think about new ideas and discuss with team members;
  2. Search for related work, find their strengths and weakness, inspire novel ideas for your project;
  3. Implement baselines (incl. SOTA) and achieve reported paper results, then obtain baseline results on your datasets;
  4. Design and develop your own method
     - novel: e.g., model structure, loss, fusion of existing methods
     - effectiveness: yours vs. baseline methods in experiments
     - ablation study: check effect of each method component
     - generalizability: on more model backbones and datasets, etc.
     - sensitivity study: robust to hyperparameter values?
- Suggestions
  - ensemble model for best performance
  - collaborate, especially for challenging sub-tasks
  - not select hyper-parameters on test dataset!
  - citation: refer to relevant papers if idea is not yours

Course project report: guideline

- Title; Team members
- Abstract: problem, challenge, method idea, key result.
- Introduction: application background, research problem, related existing methods, the paper's idea, main results,
- **Method**: basic idea, model, How and WHY, etc.
  - suggest: a subsection for each idea
- **Experiments**: experimental settings, various evaluations with tables/figures and corresponding summary + discussion.
  - note: organize evaluations clearly, ablation study, multiple datasets, multiple backbones
- Conclusion: summary, conclusion, future work.
- Appendix: others that you have tried but did not work well.
- Each member: **Source code** & running (e.g., Notebook) files!
- Latex template: https://cvpr2023.thecvf.com/Conferences/2023/AuthorGuidelines
- See more infor in supporting material.

No plagiarism!!