DS 6050: Deep Learning
Course Project Plan

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genda

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2. Dataset Requirements
3. Project Timeline
4. Milestone I: Literature Review & Proposal
5. Milestone II: rchitecture & Experiments
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10. Q&

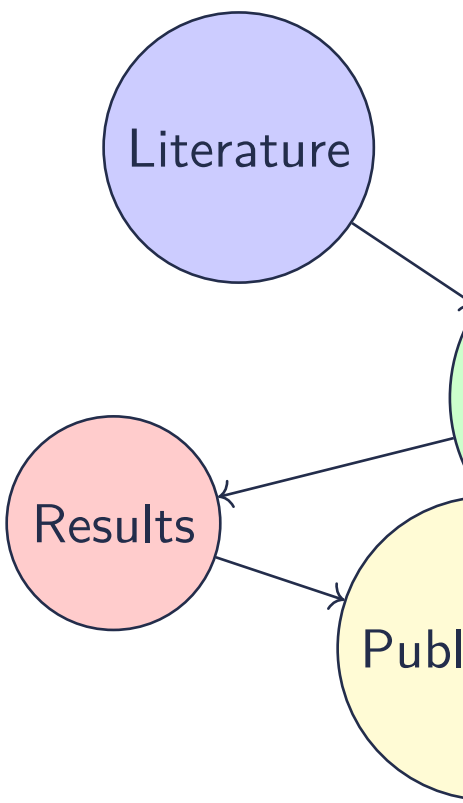
Course Project: Grand Challenge

Objective:

- pply deep learning concepts to solve real-world problems
- Conduct rigorous research with ablation studies
- Produce publication-quality work

Team Size:

- 2-3 members per team



Critical: Dataset Requirements

Public Dataset Requirement

! Your d t set MUST be publicly v il ble

Why Public Datasets?

- Enable paper publication
- llow result reproduction
- Foster academic transparency
- Build your portfolio

Not cceptabl

- ND -pro
- Proprieta
- Private c
- Restricte

Recommendation

Choose well-documented benchmark datasets or create your
dataset with proper documentation.

Recommended Dataset Sources

Computer Vision:

- ImageNet, COCO, CIF R
- Medical: NIH Chest X-ray, ISIC
- Kaggle Vision Competitions
- Hugging Face Datasets

NLP & Text:

- GLUE, SuperGLUE
- Common Crawl
- WikiText, BookCorpus
- arXiv papers dataset

Time Series & u

- UCI ML Reposi
- Google Speech
- LibriSpeech, u
- Financial data

Multimodal:

- MS-COCO Cap
- Visual Question
- CLIP datasets
- Video datasets Kinetics)

Pro Tip: Include dataset URL in your propos

Project Timeline & Milestones

Milestone	Due (Module)
I: Literature Review & Proposal	Module 8
II: rchitecture & Preliminary Results	Module 10
III: Final Report & Presentation	fter Module 12

Milestone I: Literature Review & Proposal

Due: End of Module 8 (ttention & Seq2Seq)

Deliverables:

1. **Motivation:** Problem statement
2. **Dataset:** Public URL required
3. **Literature Review:**
   - Minimum 3 papers
   - Prior methodologies
   - Identify gaps
4. **Proposed Method:** Initial approach
5. **Experiments:** Evaluation plan

Format Requireme

- Use arXiv temp
- 2-3 pages (excl
- Proper citation
- Clear research

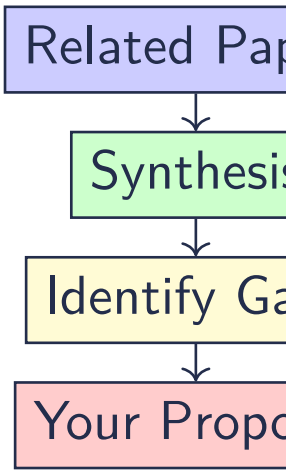
Submission:

- Format: `GroupID_prop`
- Submit via Can

Literature Review Best Practices

What Makes a Good Literature Review?

- **Organized:** Directly related to your research question
- **Synthesized:** Summary of known vs unknown
- **Critical:** Identify controversies and gaps
- **Forward-looking:** Formulate new research questions



Resources

- Google Scholar, arXiv, Papers with Code
- Conference proceedings: NeurIPS, ICML, CVPR, CL
- Focus on recent work (2020-2025)

Milestone II: Model rchitecture & Experime

Due: End of Module 10 (Vision Transformers)

Key Components

1. ** bstract:** Concise project summary
2. **Introduction:** Problem context and motivation
3. **Literature Survey:** Expanded from Milestone I
4. **Method:** Detailed architecture description
5. **Preliminary Experiments:** Initial results
6. **Next Steps:** Planned improvements
7. **Member Contributions:** Individual responsibilities

Required Elements:

- t least one baseline model
- Training curves & metrics
- Error analysis
- blation study plan

Submission Forma

- Compact, up to
- Include code re
- Jupyter notebo
- `GroupID_chec`

Experimental Design Guidelines

Baseline Selection:

- Start simple (e.g., ResNet for vision)
- Use pre-trained when applicable
- Document hyperparameters
- Ensure reproducibility

blation Studies:

- Vary one component at a time
- Document all changes
- Use consistent seeds
- Track with W&B or TensorBoard

Metrics to Report

- Task-specific m
- Training/valida
- Computational
- Parameter cour
- Inference time

Final Project Requirements

Due: fter Module 12 (Generative Models)

Deliverables:

1. **Final Report** (6-8 pages)
   - Full methodology
   - Comprehensive results
   - Thorough analysis
   - Future work
2. **Code Repository**
   - Clean, documented code
   - RE DME with instructions
   - Requirements file
3. **Presentation** (5 minutes)
   - Key findings
   - Live demo if applicable
   - Q& session

Evaluation Crit

- Technical d
- Innovation
- Experiment
- Result inter
- Presentatio
- Reproducib

Peer Review:

- Review 2 ot
- Provide cor
- Vote for "B

Project Ideas by Module Coverage

Computer Vision (Modules 4-5, 10):

- Medical image diagnosis
- Object detection improvements
- ViT vs CNN comparison
- Domain adaptation

NLP (Modules 6-9):

- Text summarization
- Question answering
- Code generation
- Sentiment analysis

Multimodal (Modu

- Image captionin
- Visual question
- CLIP-style train
- Video understa

Generative (Modu

- V E for data g
- G N improvem
- Diffusion mode
- Style transfer

Innovation Opportunities

- Combine architectures. Reproduce advanced SoT
- pply models to new domains
- Improve efficiency/speed
- ddress ethical considerations

Best Practices for Success

Team Collaboration:

- Use Overleaf for LaTeX
- GitHub for version control
- Regular team meetings
- Clear task division

Experiment Tracking:

- Use W&B or TensorBoard
- Document all hyperparameters
- Save model checkpoints
- Keep experiment logs

Code Quality:

- Modular design
- Clear document
- Unit tests for k
- Requirements.t

Time Managemen

- Start literature
- llocate time fo
- Plan for compu
- Buffer for write

Common Pitfalls to void

- Choosing overly complex problems
- Ignoring baseline comparisons
- Poor reproducibility documentation
- Last-minute dataset changes

Resources & Support

Technical Resources:

- UV Rivanna HPC cluster
- Google Colab (free GPU)
- PyTorch documentation
- D2L textbook examples

Office Hours:

- Dedicated project hours
- T support sessions
- Ed Discussion forum
- Peer collaboration

Writing Resources

- Overleaf templa
- arXiv paper for
- Citation manag
- cademic writi

Mentorship:

- Primary: Instru
- Based on proje
- Regular check-i
- Feedback on m

Note: This project is your opportunity to create portf
work!

Questions & Discussion

Go to the forum!

Next Steps:

1. Form te ms (2-4) members)
2. Explore d t set options
3. St rt liter ture review

Key Takeaways

Public Dataset ! No ND da

Follow Timeline 3 milestones

Research Quality blations requ

Reproducibility Clean code

Good luck with your projects