**CS 8267: Advanced Machine Learning Project**

**Step1: Proposed topic/title**

**Multimodal Fake News Detection with Transformer and Graph-based Models**

**Step2: Core idea**   
Leverages both textual and visual content (and optionally social context) to detect misinformation using advanced architectures like BERT, CLIP, GNN, and multimodal fusion.

**Idea 1: Comparison**

* Implement **3 models** (from selected papers).
* Train & test them on **at least 2 datasets** (e.g. FakeNewsNet + Fakeddit).
* Compare metrics (Accuracy, F1, runtime).
* Bonus: add ISOT for generalization.

**Idea 2: Improvement**

* Pick one model (say, BERT or OCR fusion)
* Proposal and improvement (e.g. entity level reasoning linking OCR entities with claims).
* Implement baseline + improve version.

**Beginner:** Easy to start with the **Idea 1** since it is our initial research.  
**Advance:** If we have more advance desire, then **Idea 2** would be better.

**Step 3: Data sources**

We need large, public datasets. Some sources that can we use

1. [FakeNewsNet](https://github.com/KaiDMML/FakeNewsNet)
   1. New articles, images, and social context
   2. Around 23k pieces (PolitiFact, GossipCop)
2. [Fakeddit](https://github.com/entitize/fakeddit)
   1. Reddit-based dataset with text, image, multimodal.
   2. Over 1M samples, binary & multi-class labels.
3. [ISOT](https://www.kaggle.com/datasets/csmalarkodi/isot-fake-news-dataset) Fake News
   1. Political news dataset. Text-only, good as baseline.
   2. Around 45k articles.

We can use FakeNewsNet + Fakeddit as the large multimodal set, and ISOT as a baseline.

1. **Three Recent Papers (2021–2025)**

From the 10, we can pick 3 to implement/compare (based on novelty + dataset availability):

1. **GNN + Multimodal Fusion**

* Graph-based modeling of users + posts, attention-based multimodal fusion.
* Social + multimodal → implement as **Model A**.

1. **BERT + OCR Fusion**

* Text (BERT) + OCR-extracted text from images + cross-attention.
* Explores OCR + multimodal → implement as Model B.

1. **MAGIC Model**

* Transformer (text) + ResNet (image) + Adaptive GNN fusion.
* Strong hybrid baseline → implement as **Model C**.

These three give a coverage of graph-based, transformer-based, and OCR-enhanced multimodal fusion.

1. **Responsibilities (4 Members)**

* **Member 1** – Literature Review (10 papers), dataset management & preprocessing; contributes writing for Related Work + Datasets sections.
* **Member 2** – Implements Model A; contributes writing for Methods (Model A) and part of Experiments.
* **Member 3** – Implements Model B; contributes writing for Methods (Model B), Experiments, and Bonus improvement section.
* **Member 4** – Implements Model C, coordinates comparative evaluation, plus writing Introduction, Methods C, Experiments, Conclusion, Responsibilities & Contributions sections, and formatting the Bonus/Conference submission.

All members should review and edit the full report to ensure consistent style.

1. **Full Report Structure**
   1. **Title**
   2. **Abstract**
   3. **Introduction**
   4. **Related Work** – summarize all 10 papers (each 2–3 sentences)
   5. **Datasets** – include table (name, size, modality, number of samples)
   6. **Methods**:
      1. Model A (GNN + attention + social)
      2. Model B (BERT + OCR/text fusion)
      3. Model C (SAFE-style similarity-aware fusion)
      4. Note clearly the option: **Comparison/Improvement**
   7. **Experiments** – Setup, Metrics, Results (tables/plots)
   8. **Responsibilities of Group Members**
   9. **Major Contributions by Each Member** – each states a creative or design idea, not just tasks.
   10. **Conclusion** – insights, limitations, future direction.
   11. **Bonus Section (clearly marked)** – target conference formatting and proposed improvement.
   12. **References** – all 10 papers + any other.
   13. **Appendix** – Meeting **log table (dates**, attendance, topics), Contribution log.
2. **Bonuses deadline**
   1. **10% Bonus**: Submit the paper to **a conference** like IEEE DAI or ACM Multimedia.
   2. **Extra Bonus 3%**: Present at Analytics Day (CCSE) on November 21, 2025. ***Need to note it on our timeline and plan accordingly.***
3. **Timeline and project planning**
   1. **Sept 1-7**: Form group, pick leader, assign roles
   2. **Sept 15**: Select 10 papers, top 3 finalized
   3. **Sept 22:** Submit project title [If selected earlier, we can start the next stage]
   4. **Sept 29:** Download datasets
   5. **Oct 1:** Draft dataset descriptions
   6. **Oct 29:** Complete related work write-up
   7. **Oct - Nov:** Implement models & experiments
   8. **Nov 10:** Draft report, and start slide preparing
   9. **Nov 21(Analytics day):** Present project at CCSE (Extra Bonus)
   10. **Nov 25 - Dec1:** Final edits, bonus improvements, finalize report
   11. **Dec 1-3:** Submit final report and formal presentation