MEGAMINDS IT SERVICES

Research-Based Technical Assignment

Megaminds IT Services - Research Associate Position

Assignment Overview

Structure: 3-Stage Progressive Research Assignment
Total Duration: 3 Days (1 day per stage + feedback time)
Evaluation Focus: Research thinking, implementation quality, and iterative improvement
Total Marks: 100 Points

Important: Your specific research title and questions will be provided separately. You may refine the research questions to improve quality and specificity.

Purpose

This assignment evaluates your ability to conduct independent research, design solutions iteratively, implement clean code, and incorporate feedback. This mimics real research workflows where you receive guidance at multiple stages rather than working in isolation.

Timeline & Feedback Process

Stage-by-Stage Process:

- **Day 1:** Submit Research Proposal → Receive feedback within 24 hours
- **Day 2:** Submit EDA & Findings (after receiving Day 1 feedback) → Receive feedback within 24 hours
- **Day 3:** Submit Final Implementation (after receiving Day 2 feedback)
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- **Feedback Policy:** You will receive feedback within 24 hours of each submission. If feedback is delayed beyond 24 hours, your deadline automatically extends by that delay time.
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- **If no feedback within 24h:** Ping on WhatsApp to follow up.

STAGE 1: Research Proposal (Day 1)

Objective: Demonstrate research thinking, literature analysis, and solution design capability.

What You Receive:

- Research Title (you may refine it)
- Sample Research Questions (RQ1, RQ2, RQ3) - you may modify/improve these
- Problem domain context

What You Must Submit:

1. Refined Research Title & Questions (if modified):

If you improved the provided RQs, explain why your version is better

2. Hypothesis:

What do you expect to find? State clear, testable hypotheses for each RQ

3. Research Objectives:

What are you trying to achieve? List 3-5 specific objectives

4. Literature Review (10 Papers):

Review 10 recent papers (2023-2026) from Q1/Q2 journals/conferences (Scopus, IEEE, ACM)
For each paper, provide:

- Full citation with DOI/link
- Core methodology
- Key findings
- Limitations/gaps
- How it relates to your RQs

5. Gap Analysis:

What do existing solutions miss? What will your work contribute?

6. Proposed Methodology:

High-level approach:

- Dataset you plan to use (with source)
- Proposed algorithms/models
- Evaluation metrics
- Expected architecture (brief description or simple diagram)

7. Reference Papers (ZIP file):

PDF copies of all 10 papers reviewed
Upload to Google Drive folder

Submission Format:

Document: PDF (5-8 pages)
Papers: ZIP file in Google Drive
Folder Name: [YourName]_Stage1_Proposal

What Happens Next: We will review your proposal and provide feedback on:

- Research question quality and clarity
- Literature review depth

- Methodology feasibility
- Suggested improvements before proceeding to Stage 2

STAGE 2: Exploratory Data Analysis & Findings (Day 2)

Objective: Demonstrate data understanding, initial experimentation, and analytical thinking.

Note: You can only start Stage 2 after receiving feedback on Stage 1. Incorporate the feedback into your work.

What You Must Submit:

1. Dataset Acquisition:

Confirm dataset source, size, and characteristics
Provide download link or description of how you obtained it
If dataset is small, include it in Drive folder

2. EDA Notebook:

Executable code file (.ipynb or .py) showing:

- Data loading and inspection
- Statistical analysis
- Visualizations (distributions, correlations, patterns)
- Data quality assessment (missing values, outliers, imbalance)
- Feature engineering ideas

3. Preliminary Findings Report:

Document (3-5 pages) discussing:

- What you discovered in the data
- Insights relevant to your RQs
- Challenges encountered
- Initial baseline results (if you started modeling)
- Refinements to your methodology based on EDA

4. Updated Methodology (if changed):

If EDA revealed issues/opportunities, explain how you adapted your approach

5. Questions/Blockers:

Any challenges you need guidance on before final implementation

Submission Format:

EDA Code: Executable notebook (.ipynb preferred)
Report: PDF (3-5 pages)
Dataset: Link or files in Drive
Folder Name: [YourName]_Stage2_EDA

What Happens Next: We will review your EDA and provide feedback on(if necessary):

- Data analysis quality

- Insights and findings
- Methodology adjustments
- Direction for final implementation

STAGE 3: Final Implementation & Report (Day 3)

Objective: Deliver complete, working solution with comprehensive documentation.

Note: Incorporate ALL feedback from Stage 1 and Stage 2. This is your final submission.

What You Must Submit:

1. Complete Implementation Code:

Organized code files showing:

- Data preprocessing
- Model training
- Evaluation (with proper metrics)
- All code must be executable and well-commented
- Include requirements.txt or environment.yml

2. Architecture Design Document:

Professional diagram + explanation showing:

- System architecture
- Data flow
- Model components
- Deployment considerations

3. Final Research Report:

Comprehensive document (10-15 pages) including:

- Executive Summary
- Refined Research Questions & Hypotheses
- Literature Review (updated from Stage 1)
- Methodology (detailed, incorporating feedback)
- Implementation Details
- Results & Analysis
- Comparison with baseline methods
- Discussion of RQ findings
- Limitations
- Future Work
- References (all 10+ papers)

4. Results Summary:

Tables/graphs showing:

- Performance metrics
- Comparison with state-of-the-art
- Ablation studies (if applicable)
- Answer to each RQ with evidence

5. Video Explanation (10-12 minutes):

Record a presentation covering:

- Problem overview (2 mins)
- Your approach and methodology (3 mins)
- Code walkthrough - key sections (3 mins)
- Results and RQ answers (2 mins)

- Limitations and learnings (2 mins)

Tips:

- Use screen recording (Loom, OBS, etc.)
- Show your face or use voiceover
- Demonstrate understanding, not just reading
- Share as link (YouTube unlisted, Loom, Drive - do NOT zip video)

Submission Format:

Folder Structure:

```
[YourName]_Stage3_Final/
├── Code/
│   ├── [all code files]
│   └── requirements.txt
├── Final_Research_Report.pdf
├── Architecture_Diagram.pdf (or .png)
├── Results_Summary.pdf
└── Video_Link.txt (containing the video URL)
```

Final Submission Instructions:

1. Organize all files in Google Drive with structure shown above
2. Set folder permissions to "Anyone with the link can VIEW"
3. Share the Drive link on WhatsApp
4. Message format: "Stage 3 Final Submission - [Your Name] - [Research Title]"

Evaluation Criteria (100 Points)

Category	What We Evaluate	Points
Research Depth	Literature review quality, RQ refinement, gap analysis	20
Hypothesis & Objectives	Clarity, testability, alignment with RQs	10
Methodology Design	Approach justification, algorithm choice, innovation	15
EDA Quality	Data understanding, insights, visualization	10
Implementation	Code quality, completeness, reproducibility	20
Results & Analysis	Metrics, comparison, RQ answers with evidence	15
Communication	Report quality, video explanation, clarity	10
TOTAL		**100**

Quality Standards

Research Rigor: Papers must be from Q1/Q2 journals/conferences (check Scopus rankings). No blog posts, Medium articles, or non-peer-reviewed sources.

Originality: All work must be your own. We verify understanding through video and may ask questions. Plagiarized work = immediate rejection.

Code Quality: Production-ready standards. Clean code, proper comments, modular structure, error handling, reproducibility.

Iteration: We expect to see improvements from Stage 1 → Stage 2 → Stage 3 based on our feedback. Ignoring feedback = lower score.

Honesty: If you face challenges or don't achieve expected results, be honest. We value transparent analysis over hiding limitations.

Recommended Resources

- Paper Search: Google Scholar, Scopus, IEEE Xplore, ACM Digital Library, arXiv (for preprints)
- Datasets: Kaggle, UCI ML Repository, Papers With Code, HuggingFace
- Computing: Google Colab (free GPU), Kaggle (30h/week T4 GPU)
- Visualization: Matplotlib, Seaborn, Plotly
- Architecture Diagrams: draw.io, Lucidchart, Figma
- Video Recording: Loom, OBS Studio, Zoom (record to local)
- Code Tools: Jupyter, VS Code, GitHub (for version control)

Frequently Asked Questions

Q1: What if I can't find 10 Q1/Q2 papers on my specific topic?

A: Look for closely related topics or broaden your search slightly. If genuinely stuck after thorough search, document your search process and ask for guidance in Stage 1 submission.

Q2: Can I change my methodology between stages?

A: Yes! That's expected. EDA often reveals better approaches. Just explain why you're changing and how it improves your work.

Q3: What if my results are poor?

A: Be honest about it. Analyze WHY results are poor, what you tried, and what you would do differently. We value analytical thinking over perfect results.

Q4: Do I need to implement everything I proposed in Stage 1?

A: Not necessarily. Research is iterative. If you discover a better approach in Stage 2, adapt. Just explain the change.

Q5: Can I use pre-trained models (BERT, YOLOv8, etc.)?

A: Yes, but show what you added beyond just loading the model. Fine-tuning, custom layers, novel architecture, etc.

Q6: What if feedback is delayed beyond 24 hours?

A: Your deadline extends by the delay duration. For example, if we give feedback 36 hours late, you get 36 extra hours for next stage.

Q7: What if I have questions during implementation?

A: Ask via WhatsApp, but show what you've tried first. "I tried X and Y, got this error, here's my debugging attempt" gets faster help than "How do I do X?"

MEGAMINDS IT SERVICES

Contact Information

For queries, clarifications, or feedback follow-ups:

WhatsApp: [Number from which you received this assignment]
Technical Lead: Kushagra Jaiswal
Organization: Megaminds IT Services

Response Time: Within 24 hours for stage feedback. For urgent queries during implementation, we aim for same-day response.

Important Reminder: Your specific research title and research questions will be provided separately. Review them carefully before starting Stage 1.

This is a progressive learning experience. We want to see how you think, adapt, and improve.

Good luck with your research!