<Title>

PhD Thesis Synopsis

National University of Sciences and Technology
School of Electrical Engineering and Computer Science

Candidate: [Full Name]
Program: [PhD Program]
Research Area: [Area]
Supervisor: [Name]
Date: [Month Year]

Table of Contents

Synopsis flow from context to contribution

Abstract: Proposal Snapshot

The abstract must make the full proposal understandable in one reading: problem, gap, solution direction, validation logic, and expected contribution.

What it must state

- Exact research problem and why it matters in Computer Science
- Identified gap in existing work
- Main research artifact: algorithm, framework, system, benchmark, dataset, or theory

Validation logic

- Name the evaluation setting rather than implying it
- Connect proposed solution to measurable evidence
- Keep claims precise, technical, and evidence-oriented

Writing discipline

- Recommended length: 250–350 words
- Use two compact paragraphs: context, then gap/solution/evaluation/contribution
- Avoid broad technology claims and vague improvement statements

CH 1

Introduction and Background

Crux This chapter positions the study: it narrows from the broad CS domain to the exact technical problem, explains why the problem matters, and defines the feasible scope.

Research context

- Start with the broader domain and quickly narrow to the technical subproblem
- Clarify where the work sits within Computer Science
- Use precise technical framing instead of trend-driven language

Motivation

- Show why the problem is PhD-level: unresolved, technically difficult, and practically relevant
- Connect significance to robustness, efficiency, privacy, fairness, safety, reliability, or deployment constraints
- Avoid popularity-based justification

Scope and roadmap

- Specify the subdomain, assumptions, boundaries, and exclusions
- Keep scope ambitious but feasible for a doctoral timeline
- Close with a roadmap showing how the chapters build toward the contribution

CH 2

Domain Related Concepts

Crux This chapter gives the reader the operational vocabulary needed to understand the problem, proposed solution, and evaluation criteria without becoming a textbook review.

Core concepts

- Define essential technical terms, representations, data modalities, architectures, systems, or interaction settings
- Use operational definitions that will recur in later chapters
- Support standard definitions with citations where needed

Task formulation

- State the task view, inputs, outputs, assumptions, and constraints
- Use compact notation only when it improves clarity
- Make the problem conditions explicit before evaluating solutions

Evaluation dimensions

- Identify dimensions that determine success: accuracy, robustness, efficiency, usability, fairness, safety, scalability, interpretability
- Explain why each dimension matters in the domain
- Prepare the reader for later methodology and metric choices

CH 3

Problem Analysis, Existing Approaches, and Research Gap

Crux This chapter builds the central argument: here is the specific unresolved problem, how the field has tried to solve it, why those attempts remain insufficient, and the exact gap this PhD will address.

Problem statement

- State the precise technical difficulty, not just a broad topic
- Describe where and under what conditions the problem appears
- Make the problem testable and linked to measurable evidence

Existing approaches

- Organize prior work by approach families rather than paper-by-paper chronology
- Explain each family's assumptions, mechanism, strengths, and operating conditions
- Use a comparative synthesis table to show methods, settings, data, metrics, and limitations

Gap and positioning

- Tie limitations to evidence: assumptions, benchmarks, robustness, efficiency, reproducibility, interpretability, or deployment fit
- State the gap narrowly and defensibly
- Explain how the proposed work directly addresses the missing capability or unresolved trade-off

CH 4

Research Objectives and Questions

Crux This chapter converts the gap into an assessable research agenda: one overarching aim, a focused set of objectives, answerable research questions, and clear evidence paths.

Aim and objectives

- State one overarching aim that links problem, intervention, and contribution
- Use 3–5 objectives focused on research outcomes
- Prefer verbs such as design, evaluate, compare, quantify, validate, formulate, and analyze

Research questions

- Use 2–4 questions that are precise and answerable within the doctoral study
- Questions should address effectiveness, mechanisms/trade-offs, and robustness/generalizability where relevant
- Avoid broad, opinion-based, or trivial questions

Alignment logic

- Identify academic audience, technical users, and beneficiaries realistically
- Use an alignment table: Objective → Research Question → Evidence Required
- Ensure every objective and question has a measurable evidentiary path

CH 5

Research Methodology

Crux This chapter is the technical backbone of the synopsis: it explains how the research will be designed, implemented, compared, evaluated, reproduced, and risk-managed.

Study design and data

- Name the design: experimental, simulation-based, proof-oriented, design science, systems evaluation, mixed-methods, or human-subjects
- Define study setting, benchmark/deployment context, and scope
- Specify datasets, corpora, repositories, logs, simulations, participants, sampling, and labeling quality control

Proposed method

- State the algorithmic or system novelty precisely
- Show high-level workflow/pipeline and major components
- Describe training, optimization, implementation details, and feasibility constraints

Evaluation and rigor

- Compare against strong current and conventional baselines
- Define benchmark protocol, splits, ablations, sensitivity analysis, robustness checks, and statistical validation
- Specify metrics, reproducibility practices, compute environment, ethics, privacy/security risks, and validity-threat mitigation

CH 6

Expected Results and Significance

Crux This chapter states what the research is expected to produce and why those outputs matter scientifically and, where relevant, practically.

Technical outcomes

- Name the expected artifact: algorithm, framework, benchmark, system, dataset, tool, or theoretical result
- Indicate what capability the artifact will provide
- Keep expectations aligned with objectives and methodology

Empirical/theoretical findings

- State likely patterns, comparisons, or insights cautiously
- Relate expected findings to hypotheses and research questions
- Avoid claiming results before evidence is generated

Significance

- Explain why the field should care if the study succeeds
- Link significance to the identified problem and contribution
- Avoid exaggerated claims; emphasize validated improvements, clarified trade-offs, or stronger evidence

CH 7

Original Contribution to Knowledge

Crux This chapter identifies the originality of the PhD in knowledge terms: the primary advance, supporting contributions, contribution types, and dissemination plan.

Primary contribution

- State the single most important original contribution
- Phrase it as an advance in knowledge, not as a task
- Make clear what the field will know or be able to do differently

Secondary contributions

- Rank supporting contributions clearly
- Include methodological, theoretical, empirical, systems, benchmark, dataset, or evidence contributions as appropriate
- Use a contribution-type table to distinguish forms of originality

Dissemination

- Identify plausible conference and journal targets aligned with the topic
- Plan artifact outputs such as code, benchmark, dataset card, model card, or replication package
- Show how the work can be evaluated and reused by the community

Work Plan and Timeline

Crux This chapter demonstrates feasibility by translating the research design into phases, deliverables, milestones, timeline, and contingency options.

Work packages

- Break the PhD into manageable phases from formulation to validation and thesis completion
- Define major tasks and deliverables for each phase
- Keep the plan realistic for the doctoral timeline

Milestones and Gantt logic

- Use measurable checkpoints: problem formulation, benchmark selection, baselines, pilot evaluation, method validation, submissions, thesis writing
- Show sequencing across Year 1, Year 2, and Year 3
- Make dependencies visible: data → baselines → method → experiments → publication → thesis

Contingency planning

- Identify backup datasets, alternative benchmarks, or fallback evaluation plans
- Show that the project remains viable under data, compute, or access constraints
- Treat contingency as research discipline, not pessimism

CH 9

Limitations and Delimitations

Crux This chapter strengthens credibility by clearly separating intentional study boundaries from unavoidable constraints, then explaining how major risks will be mitigated.

Delimitations

- State what the study intentionally will not cover
- Explain why those boundaries are appropriate
- Use delimitations to keep the project focused and feasible

Limitations

- Identify constraints affecting execution, generalization, inference, data access, benchmark realism, or compute budget
- Discuss limitations honestly and specifically
- Avoid generic statements such as “time and data limitations” without explanation

Mitigation measures

- Use stress testing, sensitivity analysis, error categorization, alternative datasets, or robustness checks
- Match mitigation to the actual limitation
- Show awareness of internal, external, construct, and statistical validity concerns where relevant

CH 10

Conclusion

Crux The conclusion closes the synopsis as a single integrated argument: problem, gap, proposed direction, expected contribution, and feasibility.

Synthesis

- Restate the central problem and why it matters
- Summarize the gap that remains after prior work
- Show how the proposed research direction follows logically from the gap

Contribution focus

- Re-emphasize the expected original contribution to knowledge
- Connect contribution to objectives, questions, and methodology
- Keep the closing confident but evidence-oriented

Feasibility signal

- End with a concise statement that the work is appropriately scoped
- Highlight that evaluation, timeline, and risk mitigation are coherent
- Avoid adding new claims, methods, or literature in the conclusion