

Target: Conference Paper Submission (January End)

Phase	Duration	Week	Focus Area	Key Tasks & Goals	Essential Paper Title / Reference
Phase 1: Foundations & Gap	4 Weeks	Wee k 1	SDN-VANET Architecture	Understand core SDVN concepts (RSU, OBU, Control/Data Planes). Deliverable: Architecture Vehicular Diagram.	Yaqoob et al., 2022: "Software-Control/Data Planes). Defined Deliverable: Architecture Vehicular Diagram." Networks: A Survey..."
		Wee k 2	SDN-VANET Security	Summarize unique threats (Sybil, spoofing) and SDN vulnerabilities (Controller DDoS). Deliverable: 1-page Security Note & Draft Intro.	Ali et al., 2023: "Security Challenges and Solutions in SDN-Enabled VANETs..."
		Wee k 3	IDS Landscape in VANET	Systematically survey existing IDS methods (ML/DL) in SDVNs. Deliverable: Comparison Table (Method, Dataset, Metrics, Gaps).	Qureshi et al., 2024: "Intrusion Detection Systems for SDN-based VANETs: A Review..."
		Wee k 4	Final Gap Definition	Analyze how current models fail to capture temporal/mobility dynamics. Choose primary dataset (VeReMi or CICIDS/SUMO). Deliverable: Final	Alharbi et al., 2023: "Machine Learning-Based Security Solutions for

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				Research Gap Statement SDN-(Core Thesis).	VANETs..."
Phase 2: Design & Baselines	4 Weeks	Week k 5	Data Preprocessing I	Download, clean, and normalize the chosen dataset. Start feature engineering (converting flows/packets into sequential data). Deliverable: Working Data Preprocessing Script.	VeReMi: "VeReMi Dataset: A Synthetic and Real-World Dataset..." (or relevant dataset paper)
			Data Preprocessing II	Determine optimal sequence length () for the RNN input. Finalize feature set and train/test splits. Deliverable: Defined Model Inputs and Sequence Generation Logic.	Saini et al., 2024: "Optimizing Sequence Length for Time-Series Analysis..."
		Week k 7	Baseline Implementation	Implement and train baseline models: Random Forest (ML) and a simple CNN/DNN (non-sequential DL). Record initial Accuracy, F1-Score, and Latency. Deliverable: Baseline Results Table.	Kumar et al., 2023: "Comparative Analysis of Random Forest and CNN Baselines..."
		Week k 8	Core RNN Implementation	Implement the core LSTM or GRU model. Train, tune hyperparameters, and	Huang et al., 2023: "Deep Learning Approaches

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				compare results against baselines. Deliverable: Working Core RNN Model Code and updated Results Table.	for Intrusion Detection in SDN-VANETs using Bi-LSTM"
Phase 3: Novelty & Results	4 Weeks	Week 9	RNN Tuning & Latency	Fine-tune the RNN/GRU. Measure and optimize inference latency rigorously—essential for real-time vehicular systems. Deliverable: Optimized RNN Model and Latency Benchmark.	Khan et al., 2024: "Real-Time Optimization of Sequence-to-Sequence Models..."
		Week 10	Attention Mechanism	Implement and integrate the Attention Layer with your best RNN (GRU/LSTM). Train the final model. Deliverable: Working RNN+Attention Model Code.	Al-Qadasi et al., 2023: "Attention-Based Bidirectional LSTM for Advanced Traffic Flow..."
		Week 11	Final Evaluation & Graphs	Run comprehensive tests (Accuracy, F1, Recall, AUC, Latency) for ALL models (ML, CNN, RNN, RNN+Attention). Generate ROC Curve and Confusion Matrix. Deliverable: Complete, Final Set of Tables and Figures.	(Execution Week - No Reading)

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				Write the Methodology and Proposed System sections, detailing the dataset, feature selection, and the mathematics/architecture of the RNN + Attention model. Deliverable: Draft Section: Proposed Method (3-4 pages).	<i>(Writing Week - Focus on Detailing Your Work)</i>	
Phase 4: Writing & Submission	4 Weeks	Week 13	Abstract & Introduction	Write the compelling Abstract and the fully structured Introduction (Motivation, Gap, Contribution, Structure). Deliverable: Polished Abstract and Introduction Sections.	<i>(Writing Week - Focus on Clarity and Impact)</i>	
			Week 14	Related Work & Results	Complete the Related Work (using Week 3-4 notes) and the Experiments & Results sections (inserting Week 11 tables/figures). Deliverable: Draft Sections: Related Work and Experiments/Results.	<i>(Writing Week - Citing All Foundations Papers)</i>
			Week 15	Discussion & Conclusion	Write the Discussion (analyzing trade-offs and novelty) and Conclusion (summarizing findings and defining Future Work, e.g., Edge	<i>(Writing Week - Critical Analysis & Synthesis)</i>

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				<p>Deployment).</p> <p>Deliverable: Full Paper Draft (First Complete Pass).</p>	
				<p>Final proofreading, grammar check, and plagiarism check.</p> <p>Format the entire paper strictly according to the target conference template (e.g., IEEE).</p> <p>Deliverable: FINAL CONFERENCE SUBMISSION </p>	(Final Polish & Formatting)
	Wee k 16	Proofread & Submit			

Actionable Next Steps (Since Week 1 & 2 are done):

1. October (Week 3): Start immediately with the IDS Landscape survey.
2. Document Management: Save this plan and start a parallel document for your paper where you drop the weekly deliverables (diagrams, tables, gap statements). This accelerates the final writing phase.
3. Tool Setup: Ensure your development environment (Python, TensorFlow/PyTorch, necessary libraries) is ready for data handling and the RNN implementation in November.

Month 1: Understanding the Field (October)

Goal:

Build solid conceptual base and identify your research gap.

◆ Week 1:

- **Read 2 short survey papers:**

1. **Hafeez et al., 2023 – SDN-VANET Architecture (IEEE Access)**
2. **Nguyen et al., 2022 – SDN for Vehicular Networks (IEEE Surveys & Tutorials)**

- **Make quick notes:**

- **SDN architecture for VANETs**
 - **Planes (Data, Control, App)**
 - **Why SDN helps VANET (central control, dynamic routing)**

- **Deliverable:**

- **One diagram: SDN-VANET architecture**
 - **One paragraph: “Why SDN for VANET?”**

◆ Week 2:

- **Read 2 IDS-related surveys:**

1. **Qureshi et al., 2024 – IDS in SDN-VANETs**
2. **Alharbi et al., 2023 – ML/DL Security for VANETs**

- **Make a table:**

| Paper | Dataset | Method | Metrics | Limitations |

- **Identify missing elements like:**

- **No temporal modeling**
 - **Lack of real-time testing**
 - **No integration with SDN controller**

- Deliverable: Research gap statement (4–5 lines)
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Month 2: Problem Formulation & Design (November)

Goal:

Finalize your problem, dataset, and architecture.

◆ Week 3:

- Write clear problem statement:

“Existing IDS models in SDN-VANETs fail to capture temporal flow patterns. We propose an attention-based RNN for real-time anomaly detection.”

- Choose datasets:

- VeReMi (vehicular misbehavior) — preferred
 - Or CICIDS2017 (for hybrid VANET traffic)

- Sketch your architecture:

- Input: flow or mobility features
 - Layers: LSTM / GRU + Attention
 - Output: normal vs attack

- Deliverable: block diagram + short explanation.

◆ Week 4:

- Review 2–3 similar models:

- Huang et al., 2023 – Deep IDS for VANETs
 - Saini et al., 2024 – LSTM-based IDS for VANETs

- Identify parameters they used (hidden units, sequence length, etc.)

- Deliverable: design your RNN model configuration.
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Month 3: Implementation & Experiments (December)

Goal:

Train baseline models and your proposed RNN model.

◆ Week 5–6:

- Prepare dataset (normalize, encode, split train/test).
 - Implement baseline models:
 - Random Forest, SVM, CNN
 - Evaluate on metrics: Accuracy, F1, Recall, AUC.
 - Deliverable: Table of baseline results.
- ◆ Week 7:
- Implement RNN (LSTM or GRU) model.
 - Train & compare results.
 - Add attention layer for feature focus.
 - Deliverable: improved results + confusion matrix.
- ◆ Week 8:
- Compare all models (ML, CNN, RNN, RNN+Attention).
 - Perform lightweight ablation study (showing attention's impact).
 - Deliverable: Final performance table + graphs.
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Month 4: Paper Writing & Submission (January)

Goal:

Finalize and format your paper for conference submission.

- ◆ Week 9:
- Write Abstract, Introduction, and Related Work using survey summaries.
 - Insert diagrams (architecture, workflow).
- ◆ Week 10:
- Write Methodology + Experiments section:
 - Dataset description
 - Model design
 - Evaluation metrics
- ◆ Week 11:

- **Write Results, Discussion, and Conclusion:**
 - **Highlight improvement**
 - **Discuss latency & scalability**
 - **Add “Future Work” (e.g., real-time deployment in SDN controller).**

◆ **Week 12:**

- **Proofread + format (IEEE double-column template).**
- **Check plagiarism (<10%) via Grammarly/Turnitin.**
- **Submit to target conference.**

☒ **Target Output (by January End)**

- Working model (RNN-based IDS)**
 - Result comparison with baseline**
 - 6–8 page formatted conference paper (IEEE/Springer format)**
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⌚ **Recommended Paper Sources**

- **IEEE Xplore – main source for SDN-VANET papers**
 - **Elsevier Computers & Security**
 - **Springer Neural Computing & Applications**
 - **arXiv.org (for open-access preprints)**
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📅 **Summary Timeline (Condensed)**

Month	Focus	Outcome
Oct	Learn SDN-VANET + IDS landscape	Research gap + background
Nov	Design architecture + select dataset	Defined problem + model design
Dec	Implement models + experiments	Results + graphs
Jan	Write & submit paper	Final conference paper