## **Final Report Structure: Transformer on Stationary Wavelet Transform**

YCK: Ignore the word count. It is all right that the chapters will not be of equal length as we expect Chp 5 to be the longest.

**1. Front Matter (Not Included in Word Count)**

* **Title Page:** Include project title, your name, institution, date.
* **Acknowledgements**
* **Abstract:** Briefly summarize the entire report: objectives, methodology, key findings, and conclusions.
* **Table of Contents:** List all sections and subsections with corresponding page numbers.
* **List of Figures & Tables (Optional):** If extensive visuals are used, include a separate list.

**2. Chapter 1 Introduction**

* **Background:**
  + Value of forecasting
  + Methods used:
    - Statistical methods
      * ARIMA
    - Machine Learning methods
      * Gradient boosting models
      * RNN
  + Introduce the concept of transformers and their role in time series modelling.
* **Motivation:** Explain the limitations of standard transformers and why stationary wavelet transform (SWT) is considered.
* **Problem Statement:** Clearly define the specific problem your research aims to solve.
* **Objectives:** List the key objectives you aimed to achieve with the transformer-SWT approach.
* **Project Schedule**
* **Organisation of Report**

**3. Chapter 2**

**4. Chapter 3 Methodology**

* **Data Description:** Explain the dataset used for training and evaluation. Include details on data size, format, and any pre-processing steps.
* **Transformer Architecture:** Describe the baseline transformer architecture you used. Explain its core components (encoder, decoder, attention mechanism).
* **Stationary Wavelet Transform Integration:** Explain how you integrated SWT into the transformer architecture. Discuss the specific modifications made and the rationale behind them. (Referencing material)
* **Training Details:** Describe the training process, including hyperparameter tuning, optimization algorithms, and loss functions used.
* **Evaluation Metrics:** Define the metrics used to evaluate the performance of your model. Explain how these metrics align with your research objectives.

**5. Chapter 4 Results and Discussion**

* **Experimental Setup:** Briefly describe the hardware and software environment used for training and evaluation.
* **Baseline Performance:** Report the performance of the baseline transformer model on the chosen metrics.
* **Transformer-SWT Performance:** Present the results of your proposed model using the defined metrics. Include visualizations (figures, tables) to compare performance with the baseline.
* **Ablation Study (Optional):** If applicable, discuss the impact of specific components or modifications within your model through ablation studies.
* **Interpretation of Results:** Analyze and explain the observed performance of your model. Discuss how SWT integration contributes to the findings.
* **Comparison with Existing Work:** Compare your results with relevant existing research on transformer architectures for NLP tasks.
  + Comparison with TSRNN, TRFBB, TRFBF (reference these papers)
  + Comparison with self-done statistical models
* **Limitations and Future Work:** Discuss limitations of your approach and identify areas for future research and improvement.
  + Limitations: Boundary problem in sliding window algorithm by the referenced material
* **Address Limitations**
  + Use SWT values from lookback to predict SWT values for next x time steps together
  + Use SWT values and predict SWT values 1 time step at a time
  + Use SWT values and predict Actual values for next x time steps together
  + Use SWT values as features (multi-variate data) with Actual values to predict Actual values for next x time steps together
* **Further implementations:**
  + Addressing SWT and DWT limitations, using MODWT. MODWT transformer in DARTs library
    - fit(), predict()
    - historical\_forecasts()

**6. Chapter 6 Conclusion**

* **Summary of Findings:** Briefly restate the key objectives and summarize the main research contributions.
* **Overall Impact:** Highlight the overall impact of your research on the field of NLP and transformer architectures.
* **Concluding Remarks:** Briefly discuss the broader implications of your work and potential future applications.

**References (Not Included in Word Count)**

* List all sources cited in your report using a consistent referencing style (APA, MLA, etc.).

**Appendix (Optional - Not Included in Word Count)**

* Include any additional information that is too lengthy for the main report but supports your research. This could be code snippets, detailed data analysis results, or supplementary figures.