METHODOLOGY

SO3 – Analysis of Semantic Fidelity and Cultural Adequacy in Itaukei Translations Produced by Machine Translation Models

This study adopts a comparative evaluation approach to analyse semantic fidelity and cultural adequacy in iTaukei translations produced by Large Language Models (LLMs) and Neural Machine Translation (NMT) systems. The methodology combines automatic semantic similarity measures with structured qualitative assessment, enabling a balanced analysis of meaning preservation and cultural appropriateness.

1. Data Selection

Utilization of the dataset created via SO2

2. Operationalisation of Semantic Fidelity

Assessed using:

- **Automatic semantic similarity measures** that compare machine translations with reference translations
- **Targeted consistency checks** for meaning-sensitive elements such as negation, numerals, and named entities

These measures provide an objective baseline for comparing semantic preservation across systems and translation directions.

3. Operationalisation of Cultural Adequacy

To evaluate this, the analysis focuses on:

- Sentences containing idioms, proverbs, and metaphorical language
- Culturally significant lexical items such as kinship terms, honorifics, and indigenous concepts

Translations are assessed against the reference translations using a **structured scoring rubric** that captures:

- Idiom handling
- Cultural appropriateness
- Pragmatic suitability (e.g., tone and register)

4. Evaluation Procedure

For each translation output, semantic fidelity and cultural adequacy are assessed independently to avoid conflating meaning preservation with stylistic or cultural appropriateness. Comparisons are conducted without reference to the generating system to minimise bias.

Where automatic measures indicate potential meaning loss or cultural distortion, translations are examined in greater detail to determine the nature and extent of the issue.

5. Validation and Reliability

To ensure the robustness of the analysis, a subset of translations is independently reviewed by evaluators with proficiency in both iTaukei and English. Inter-annotator agreement is calculated to assess consistency in judgments, and disagreements are resolved through discussion or adjudication.

6. Analysis

Results are analysed comparatively across:

- Translation systems (LLMs vs NMTs)
- Translation directions
- Domains and sentence types

This analysis identifies systematic patterns in semantic degradation and cultural misrepresentation, particularly in idiomatic and culturally dense text.

7. Outcome

The methodology yields a structured assessment of how well current machine translation systems preserve meaning and cultural nuance in iTaukei. The findings provide empirical evidence of semantic and cultural gaps in existing models and inform subsequent harmonisation strategies and recommendations for improving translation quality in low-resource and indigenous language contexts.