NatureNLP Project Summary: Versions v3 to v6

This document outlines the evolution of the NatureNLP project from version 3 to version 6, highlighting major improvements, evaluation metrics, and our trajectory towards version 7. It serves as a professional report to showcase project progress to professors, collaborators, or potential investors.

# 📊 Evaluation Summary: v3 – v6 vs. Baselines

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | BLEU ↑ | Perplexity ↓ | Loss ↓ | Tokens/sec ↑ |
| NatureNLP v3 | 0.12 | 45.2 | 4.95 | 45 |
| NatureNLP v4 | 0.16 | 35.3 | 4.32 | 73 |
| NatureNLP v5 | 0.21 | 30.4 | 4.01 | 125 |
| NatureNLP v6 | 0.24 | 27.6 | 3.81 | 138 |
| GPT-2 | 0.17 | 32.0 | 3.8 | 110 |
| GPT-Neo-125M | 0.21 | 28.5 | 3.5 | 220 |
| Grok-1 | 0.26 | 25.2 | 3.1 | 310 |

# 🚀 Version Evolution and Key Improvements

## 🧠 Version 3

- Initial baseline with basic fine-tuning.  
- Low BLEU, high perplexity, slow inference speed.

## 🔧 Version 4

- Added dataset preprocessing improvements.  
- Introduced padding/token optimizations.  
- Gained 62% speedup over v3.

## 🔥 Version 5

- Applied dynamic batching + improved loss function.  
- Revived 'dead neurons' via selective reactivation.  
- First comparison against GPT-2 and Grok-1.  
- Strong BLEU gains and notable speed increase.

## ⚡ Version 6

- Introduced multi-task learning (IMDB, GSM8K, GitHub Code).  
- Modular fine-tuning pipeline with lightweight fallback.  
- Clean tokenization and lower perplexity across board.

# 🧬 Upcoming in Version 7

- Rewrite tokenizer + data loader to fully adopt Sunflower Hive Structure.  
- Add sparse attention & oscillatory layers.  
- Compare with newer models (Mixtral, DeepSeek, Yi-34B).  
- Target BLEU > 0.3, loss < 3.5, tokens/sec > 200.

