Masterprojekt: Effiziente Methoden des Maschinellen Lernens

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Not so large Language Model

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Project overview

Dataset: TinyStories

- > 2M stories - several sentences each

- Easy language
- Diverse vocabulary
- Diverse style

- Synthetically generated (GPT3.5/4)

Reference paper

Eldan, R., & Li, Y. (2023). Tinystories: How small can language models be and still speak coherent english?. *arXiv preprint arXiv:2305.07759*.

- At what scale & complexity does semantic and logical understanding emerge?
- Constrain dataset to essential elements of natural language

- Consistency and grammar “easier” for SLM than creativity
- Embedding dimension for fact learning
- Number of layers for context

→ SLM **do not** only memorize

→ SLM behave similarly to LLM under changing parameters

Transformer Model

- No recurrency - faster training
- … popular

- Torch python library

- TinyStories Paper → possible with < 10 million parameters (embedding dimension 256), only one transformer block
- 1 million parameters for our model? → reasonable training time

2nd Model

- RNN
- Popular for LM
- Slower training
- Less vanishing gradient problem at smaller scale

Model Evaluation

- Accuracy vs Creativity
  - Cosine Distance to closest training examples (creativity, novelty)
- Perplexity
- GLUE (in part), CoLa(grammar), HellaSwag
- Human evaluation
- Use GPT4 to grade generated stories
  - Multidimensional score, output not restricted to be very structured

Efficiency

- Tokenizer
- Model architecture
  - Number of parameters
  - layers
- Dataset
  - Fix/delete bad character encodings
  - Filter out incomplete stories
  - Restrict vocabulary

Goals of the week

GOAL 1

- This presentation ☺

GOAL 2

- GUI Integration
  - Load and select model
  - Initialize model training
  - Display training time / progress

GOAL 3

- Training schedule
  - Train model successfully

Our goals

- Data Efficiency
- Valid syntax and semantics
  - Valid grammar and spelling

Maybe…(?):

- Logical reasoning
- Creativity

→ Goals of the week

GOAL 1

- Add positional encoding

GOAL 2

- Format output of the model (e.g., spaces between tokens, capitalization)

GOAL 3

- Enter a prompt in the GUI. The model should automatically end the story (train with <EOS> tokens)

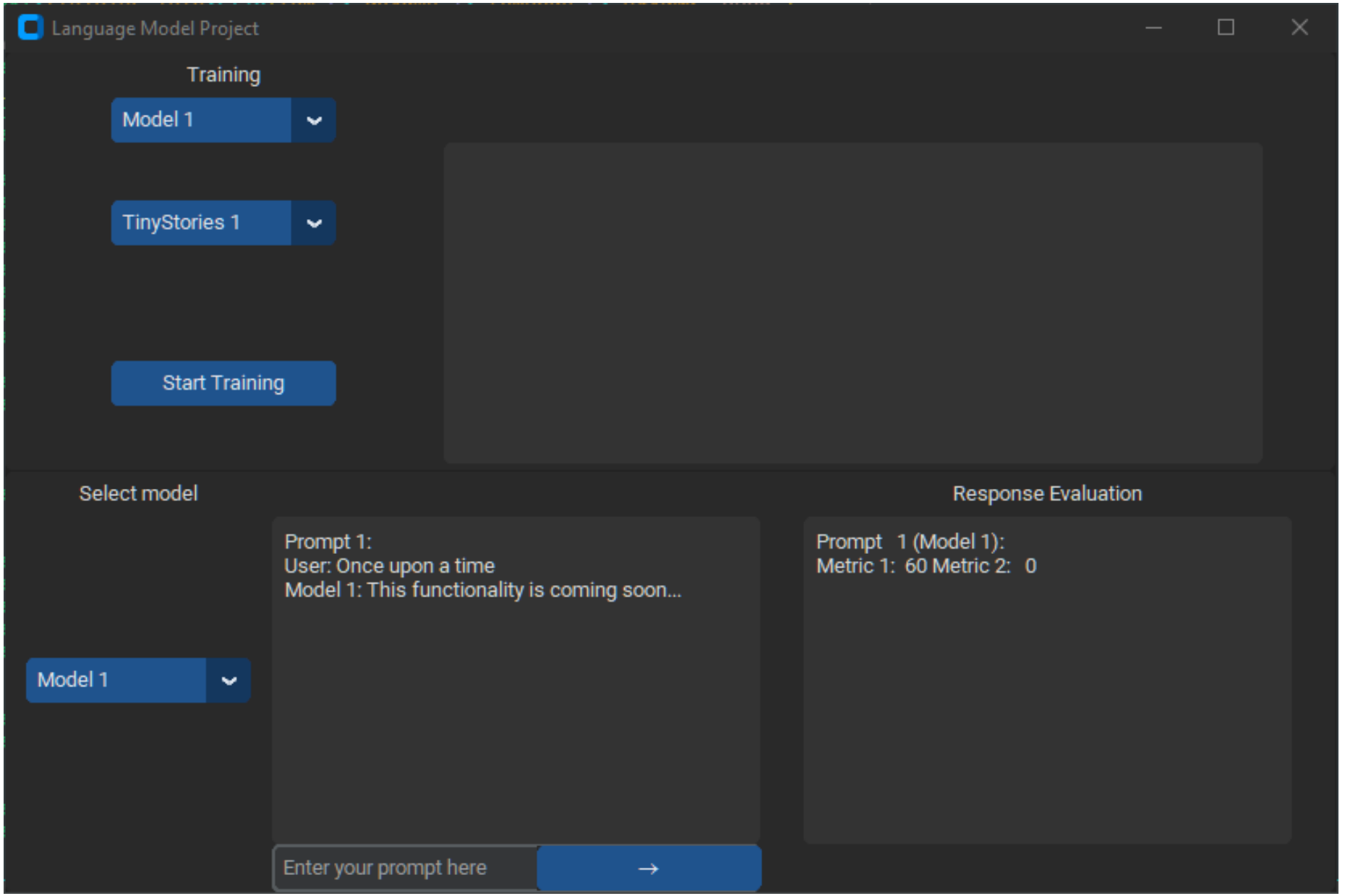
Proof of concept

“once… upon a loud noise coming from the man gave it was perfect way to the front of him . the end .i ' m tired . one more time there was a feeling better than john was a girl named benny . a dog barked soon his owner went to catch the yard .”

“once… lucy got high like something that day about questions . she stepped closer to her . anna and did owl ' ll hide under the piece while , here to stand take them in a piece , said he admired”

“today… can we own herself we read fell water would <unk> to use anything would <unk> for special seemed cars can hurt lit the dad picked it up and came seemed to have feels through decided to stay at <unk> blocks”

GUI


Language Model Project
Training
Model 1
TinyStories 1
Start Training
Select model
Model 1
Prompt 1:
User: Once upon a time
Model 1: This functionality is coming soon...
Enter your prompt here
→
Response Evaluation
Prompt 1 (Model 1):
Metric 1: 60 Metric 2: 0