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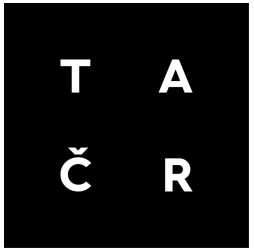


When a Robot Writes a Play: Automatically Generating a Theatre Play Script

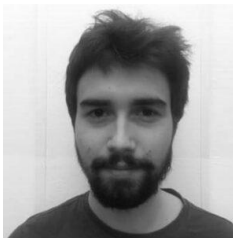
Charles University
Faculty of Mathematics and Physics
Institute of Formal and Applied Linguistics

unless otherwise stated

The team

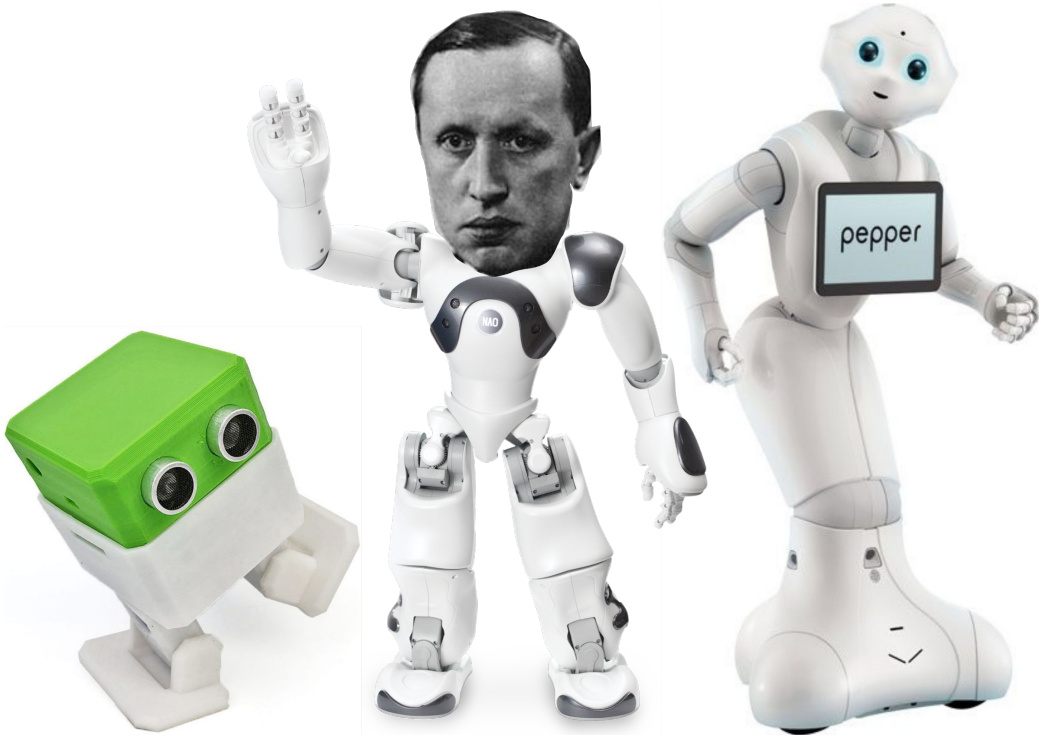
CEEHACKS

DAMU



Motivation

- 25th January 1921
  - R.U.R. by Karel Čapek
  - first theatre play about robots



Motivation

- 25th January 1921
  - R.U.R. by Karel Čapek
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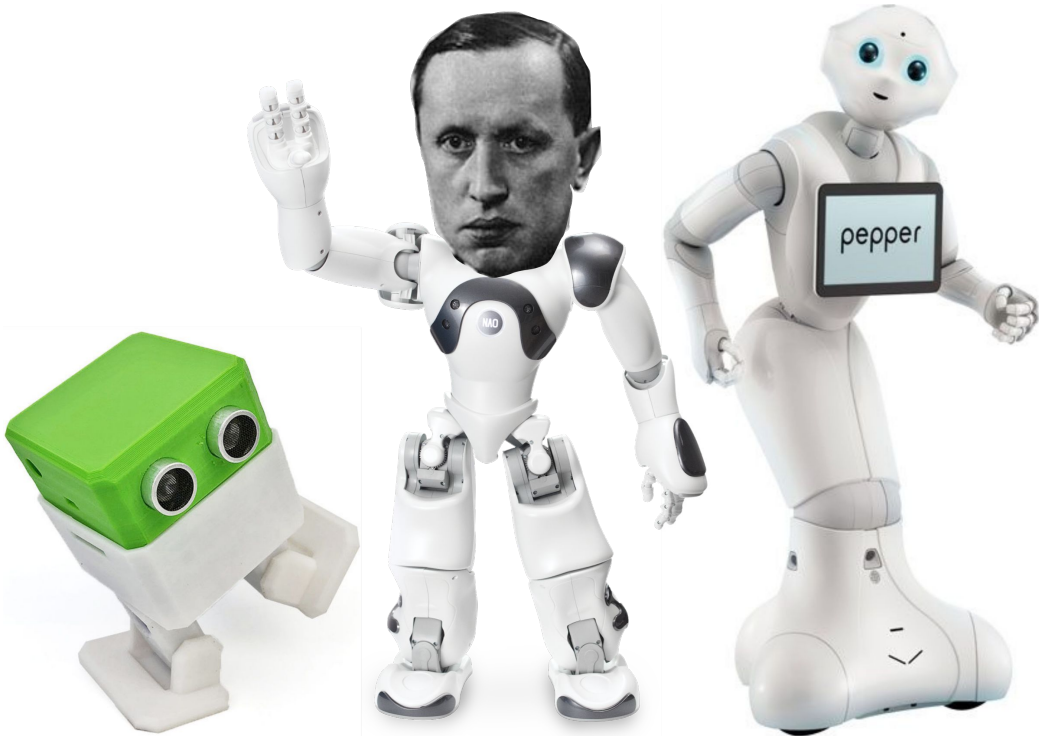
- 26th February 2021
  - AI: When a Robot Writes a Play
  - first theatre play written (from 90%) by “robots” (actually AI)



Approach

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2.
3.
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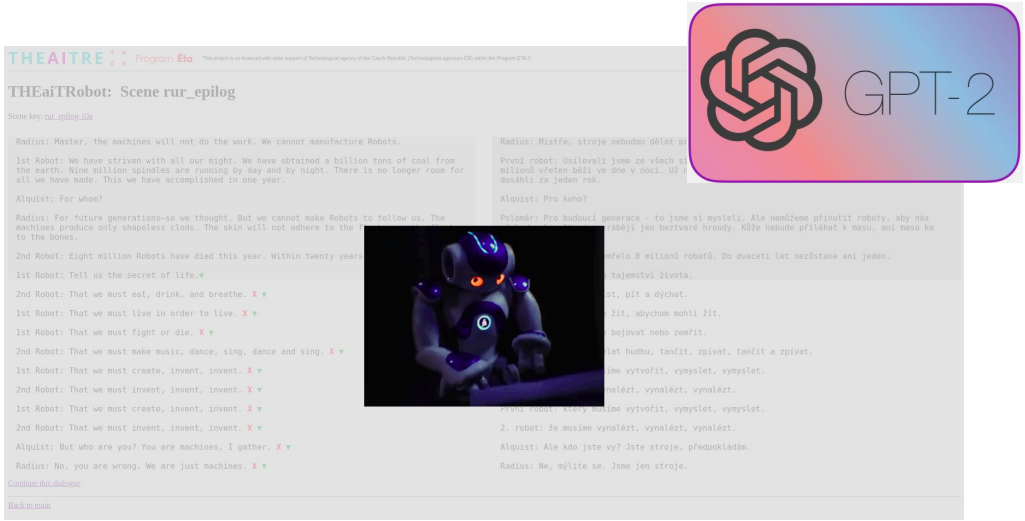

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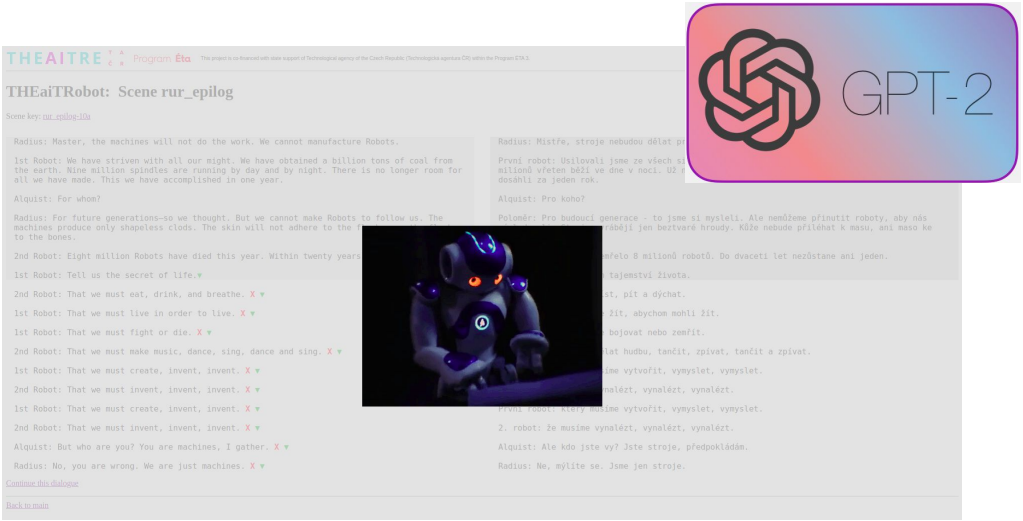

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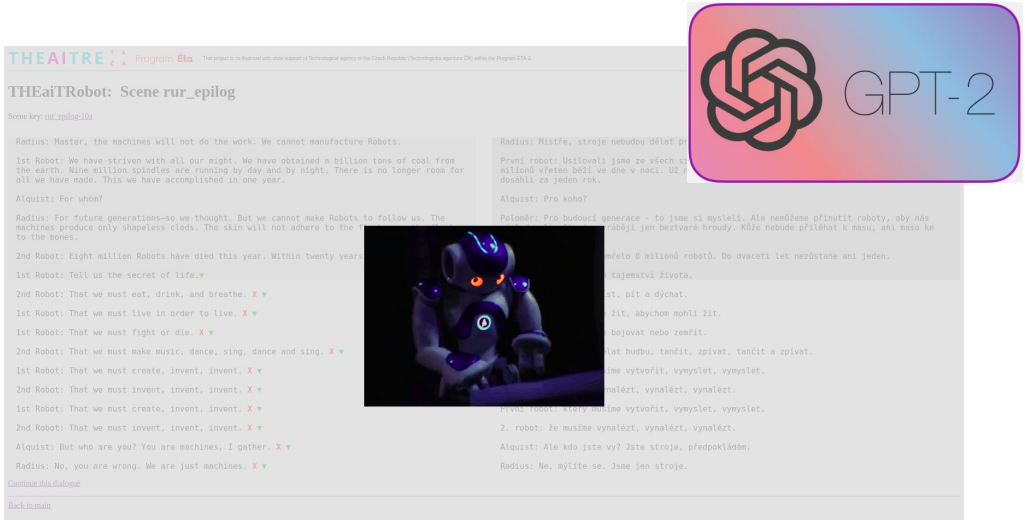
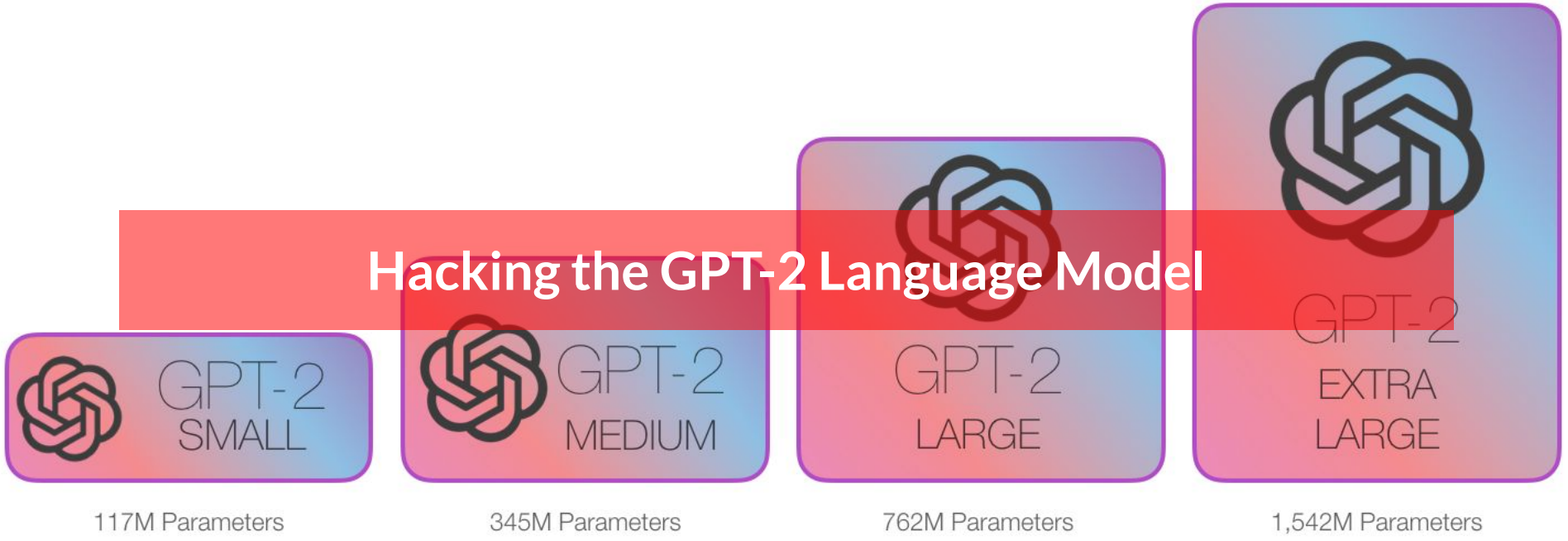


Hacking the GPT-2 Language Model



OpenAI

Transformers

Language model

Language model

- Task: Which word should follow?

Language model

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  - I woke up in the morning and went to the…
    - ???

Language model

- Task: Which word should follow?
  - I woke up in the morning and went to the…
    - kitchen
    - bathroom
    - cinema
    - horse

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  - I woke up in the morning and went to the… kitchen/bathroom/cinema/horse
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  - Needs to learn what language looks like
  - Large amount of texts: news, books, websites, film subtitles… (bilions of words)

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- N-gram language model (e.g. 4-gram)
  - How often are words A B C followed by word D (in first 100M lines of Wikipedia)?
    - “went to the bathroom” > “went to the horse”?
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- Neural language models
  - See a larger number of preceding words (GPT-2: up to 1023 previous words)
  - Choose which preceding words to look at (attention, skip-gram)
  - Can estimate word similarity (cosine distance of word embeddings)
  - Complex internal representations and operations instead of simple comparison of frequencies

The base approach

- Take GPT-2 XL language model
- Feed it with a theatre-script-like prompt, e.g.:

  A man is driving in his car. He sees a girl hitchhiking next to the road. He stops the car.

  Man: *Do you want a ride?*

  Girl: *Oh yes please!*

- Let it generate a continuation
- Machine translation English→Czech

A sample output

A man is driving in his car. He sees a girl hitchhiking next to the road. He stops the car.
Man: Do you want a ride?
Girl: Oh yes please!

Man: Okay, then you must first convince me you're not a child prostitute.

Girl: I'm 16 years old, and I'm only 16.

Man: Then I'll take you home!

Woman: He's asking for trouble!

Man: No, he's only asking!

Woman: Then why don't you just take her home already?

Man: But I have a family!

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- Set of characters: introduces new, forgets old
  - modify next token probabilities to restrict characters
- Repetitiveness: identical lines
  - increase repetition penalty 1.00 → 1.01
  - discard and regenerate if repetition occurs
- Limited context (1024 subwords): long-distance inconsistencies
  - extractive summarization (TextRank) of prompt+output → 5 lines
  - plus keep last 250 subwords

WIP + plans

- Generating a whole play (now: individual scenes)
  - hierarchical approach: title → outline → scenes (fine-tuned models)

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  - annotate plays, detect situations, tune to generate situations
- Various machine translation issues (gender, politeness, context…)
  - document-level, fine-tuning, automatic post-editing

The Web Application

THEaiTRobot: Scene masters_death

Scene key: masters_death-3ab10a

It's the morning. The Robot enters the room of his master who is really old and sick. The Robot sees that his master is not doing very well this morning. He sits at the edge of his bed and takes his hand.

Robot: I remember how you jumped on this bed when you were little, you were full of beans.

Master: We both know I am dying.

Robot: I remember you saying that too, you sick old man. And how you have tried to kill yourself many times.

Master: I have tried but it's so hard. I want to be alive. I want to be with my children and grandchildren.

Robot: I am sorry but you can't. There is no way. No way. There is no way.

Master: I don't want to hear that, you can't keep killing yourself and not do something about it.

Robot: Oh, well I don't want to hear that either.

Master: Well, you have to get up. I need to help you.

Robot: I am going to bed.

Master: I will wait for you.

Je ráno. Robot vstoupí do pokoje svého pána, který je opravdu starý a nemocný. Robot vidí, že jeho pánovi se dnes ráno moc nedaří. Sedí na kraji postele a bere ho za ruku.

Robot: Pamatuju si, jak jsi na tuhle postel skákala, když jsi byla malá. Byl jsi plný fazolí.

Mistr: Oba víme, že umírám.

Robot: Pamatuju si, že jsi to říkal taky, ty starej nemocnej dědku. A jak ses mnohokrát pokusil zabít.

Mistr: Zkoušel jsem to, ale je to tak těžké. Chci být naživu. Chci být se svými dětmi a vnoučaty.

Robot: Je mi líto, ale to nemůžete. V žádném případě. Ani náhodou. V žádném případě.

Mistr: To nechci slyšet. Nemůžeš se pořád zabíjet a nic s tím nedělat.

Robot: No, to taky nechci slyšet.

Mistr: No, musíš vstát. Musím ti pomoct.

Robot: Jdu si lehnout.

Mistr: Počkám na tebe.

Producing the Script

Producing the script

- Generating individual scenes

- Post-processing the script

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  - THEaiTRobot operated by a proffessional theatre dramaturge
  - interventions
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    - choosing different variant
    - manually adding a line
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Producing the script

- Generating individual scenes (15 generated, 8 selected)
  - THEaiTRobot operated by a proffessional theatre dramaturge
  - interventions
    - the input prompts (2% of lines)
    - choosing different variant (for 8% of generated lines)
    - manually adding a line (1% of lines)
- Post-processing the script
    - deletions (15% of lines)
    - small edits (30% of lines, 8% of words)
    - fixing errors in automated EN→CS translation (20% of words)

Producing the script

- Generating individual scenes (15 generated, 8 selected)
  - THEaiTRobot operated by a proffessional theatre dramaturge
  - interventions
    - the input prompts (**2% of lines**)
    - choosing different variant (for 8% of generated lines)
    - manually adding a line (**1% of lines**)
- Post-processing the script
    - deletions (15% of lines)
    - small edits (30% of lines, **8% of words**)
    - fixing errors in automated EN→CS translation (20% of words)
- …so ~90% of the script comes from GPT-2

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- Only dialogues generated
- Everything else done manually
  - stage directions, scene design, music, costumes…

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  - 1 director (Daniel Hrbek)
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- Proffessional theatre team
  - 1 director (Daniel Hrbek)
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  - 6 actors
  - scenographer, costume designer, choreographer…
- Online premiere on 26th February 2021
  - ~ 10 000 views
- Live performances once possible

Summary

When a Robot Writes a Play: Automatically Generating a Theatre Play Script

- Hacking the GPT-2 language model
- Building a web application
- Generating a theatre play script
- Performing the play on stage

https://www.theaitre.com/

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