

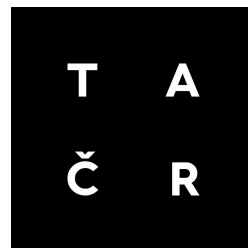
Rudolf Rosa, Tomáš Musil, Ondřej Dušek, Dominik Jurko, Patrícia Schmidtová,
David Mareček, Ondřej Bojar, Tom Kocmi, Daniel Hrbek, David Košťák, Martina Kinská,
Marie Nováková, Josef Doležal, Klára Vosecká, Tomáš Studeník and Petr Žabka



CEEHACKS



THEAiTRE



THEAiTRE 1.0: Interactive generation of theatre play scripts



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



unless otherwise stated

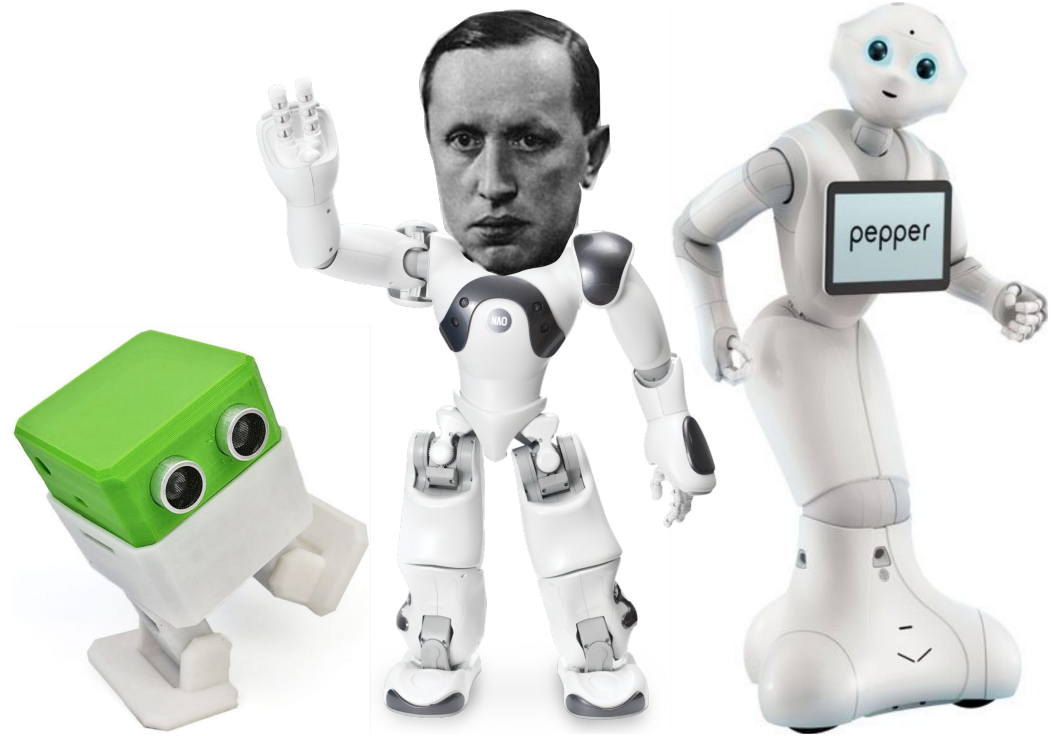
Motivation

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



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



Approach

1. Hacking GPT-2
- 2.
- 3.
- 4.



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THEaiTRE Program Eta This project is co-financed with state support of Technological agency of the Czech Republic, Technological agency CZI, within the Program CTR 2.

THEaiTRobot: Scene rur_epilog

Scene key: [act_rapine00a](#)

Radius: Master, the machines will not do the work. We cannot manufacture Robots.

1st Robot: We have striven with all our might. We have obtained a billion tons of coal from the earth. Nine million spiders are running by day and by night. There is no longer room for all we have made. This we have accomplished in one year.

Alquist: For whom?

Radius: For future generations-so we thought. But we cannot make Robots to follow us. The machines produce only shapeless clods. The skin will not adhere to the bones.

2nd Robot: Eight million Robots have died this year. Within twenty years-

1st Robot: Tell us the secret of life. ✖

2nd Robot: That we must eat, drink, and breathe. ✖

1st Robot: That we must live in order to live. ✖

1st Robot: That we must fight or die. ✖

2nd Robot: That we must make music, dance, sing, dance and sing. ✖

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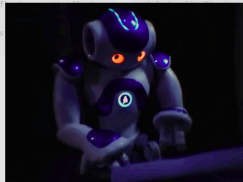
2nd Robot: That we must invent, invent, invent. ✖

Alquist: But who are you? You are machines, I gather. ✖

Radius: No, you are wrong. We are just machines. ✖

[Continue this dialogue](#)

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Radius: Mistrě, stroje nebudou dělat pr

První robot: Usilovali jsme ze všech síl získat více světla ve dne i noci. Už jsme dosáhli za jeden rok.

Alquist: Pro koho?

Radius: Pro budoucí generace - to jsme si mysleli. Ale nemůžeme přinutit roboty, aby nás poslouchali. Jsou jen bezvládné hromady. Když nebude přiléhat k masu, ani maso ke kostem.

2nd Robot: Osm milionů robotů. Do dvaceti let nezůstane ani jeden.

1st Robot: Tajemství života.

2nd Robot: Žít, pít a dýchat.

1st Robot: Žít, abychom mohli žít.

2nd Robot: Bojovat nebo zemřít.

1st Robot: Hát hudbu, tančit, zpívat, tančit a zpívat.

2nd Robot: Inven vyvíjet, vymyslet, vymyslet.

1st Robot: Vynalézt, vynalézt, vynalézt.

První robot: Který musíme vytvořit, vymyslet, vymyslet.

2. robot: že musíme vynalézt, vynalézt, vynalézt.

Alquist: Ale kdo jste vy? Jste stroje, předpokládám.

Radius: Ne, mylíte se. Jsem jen stroje.

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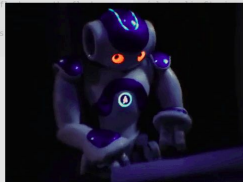
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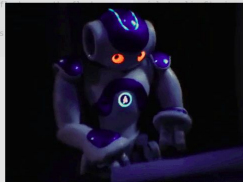
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GPT-2



Hacking GPT-2



GPT-2
SMALL

117M Parameters



GPT-2
MEDIUM

345M Parameters



GPT-2
LARGE

762M Parameters



GPT-2
EXTRA
LARGE

1,542M Parameters



OpenAI



Transformers

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

Resolved issues

- Set of characters: introduces new, forgets old
 - modify next token probabilities to restrict characters

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 - extractive summarization (TextRank) of prompt+output \rightarrow 5 lines
 - plus keep last 250 subwords

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- Limited context (1024 subwords): long-distance inconsistencies
 - extractive summarization (TextRank) of prompt+output \rightarrow 5 lines
 - plus keep last 250 subwords
- Minor machine translation issues

Unresolved issues + plans

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

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 - document-level, fine-tuning, automatic post-editing
- Aboutness
- Visual information
- Subtext
- ...



The Web Application



THEaiTRobot: Scene masters_death

Scene key: [masters_death-Jab10a](#)

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. X *

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

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

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

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

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

Robot: I am going to bed. X *

Master: I will wait for you. X *

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

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

Mistr: Oba víme, že umírám.

Robot: Pamatuju si, že jsi to říkal taky, ty starý nemocný 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 nemůžeš. V žádném případě. Ani náhodou. V žádném případě.

Mistr: To nechci slyšet. Nemůžu se pořád zehýbat a nic s tím dělat.

Robot: No, to taky nechci slyšet.

Mistr: No, musíš vstát. Musím ti pomoci.

Robot: Jdu si lehnout.

Mistr: Počkám na tebe.

Al.
KDYZ ROBOT PISE
HRU

Producing the Script



Producing the script

- Generating individual scenes
- Post-processing the script

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- Generating individual scenes
 - THEaiTRobot operated by a professional theatre dramaturge
 - interventions
 - the input prompts
 - choosing different variant
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 - fixing errors in automated EN→CS translation

Producing the script

- Generating individual scenes (15 generated, 8 selected)
 - THEaiTRobot operated by a professional 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)

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 - manually adding a line (**1% of lines**)
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 - 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

A photograph of a theater stage. A large blue curtain hangs across the stage. Above the curtain, two small rectangular windows are visible. A red banner with the text "Staging the Play" is superimposed over the center of the image. In the foreground, a person is seated at a table, facing the stage. The audience seating area is visible, with several people seated in the front rows, some wearing masks. The stage floor is dark, and there are some equipment items like a laptop and a bag on the floor.

Staging the Play

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

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- Professional theatre team
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- Online premiere on 26th February 2021
 - ~ 10 000 views
- Live performances once possible

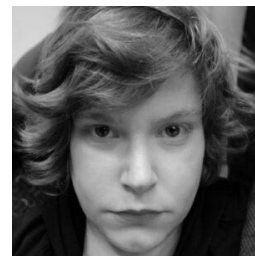
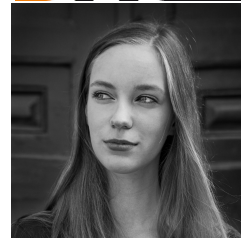
DIRECTOR DANIEL HRBEK

**AI: WHEN A ROBOT
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The Team

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<https://www.theaitre.com/>