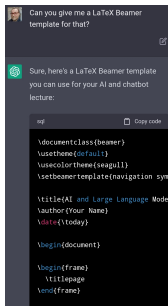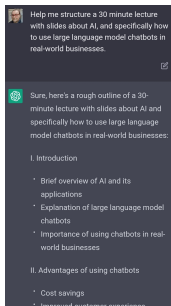# AI and Large Language Model Chatbots for Real-World Businesses

Tero Keski-Valkama

May 7, 2023

Introduction: Tero Keski-Valkama

- ▶ Tero Keski-Valkama is an AI practitioner with over 20 years of experience spanning four countries, currently living in Spain.
- ▶ Worked with machine vision, complex control, SLAM, sensor fusion, semantic web, perceptrons, genetic algorithms, simulated annealing, SVMs, gradient boosting, deep learning, deep reinforcement learning, GANs, CNNs, Transformers, **LLMs**, **AGI**, embodiment, meta-learning, ...
- ▶ Robotics, pre-LLM chatbots, **LLM chatbots**, facial emotion recognition, automatic mapping, logistics, supply chain, ...
- ▶ He has authored over 20 patents in the topic among countless other publications.
- ▶ Authored the first correct open source Google WaveNet implementation, the first communist AI, cofounded the second largest recurring AI event in Finland (AI Morning), ...

Why Is This a Big Deal?

Chatbots is a misnomer – They don't just chat. They can control other machines, adapt/learn, and most importantly, they integrate together societies of people and machines. They are already as intelligent as humans in many important topics, and very soon surpass humans in every cognitive task.

The **Technological Singularity** has started, and along it the societies are now waking up to a sudden and extreme appetite for data, knowledge, network connectivity and chips.

> *"The fabric tunnel that stretched out behind it was a* **'camera tunnel...'** *The shredded fragments of books and magazines flew down the tunnel like leaves in a tornado, twisting and tumbling. The inside of the fabric was stiched with thousands of tiny cameras. The shreds were being photographed again and again, from every angle and orientation, till finally the torn leaves dropped into a bin just in front of Robert."*
> *- Vernor Vinge, Rainbows End*

Inside Chatbots
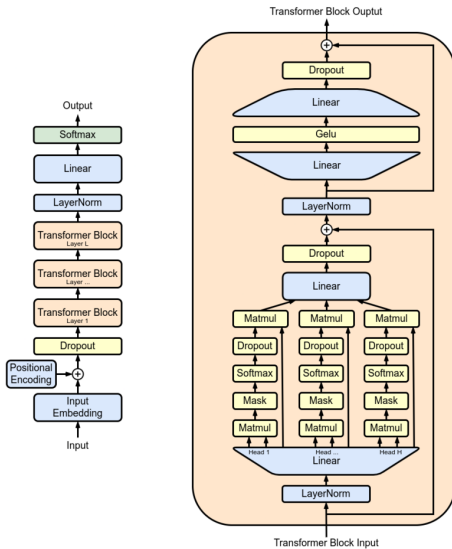
Inside Chatbots

So, Large Language Model (LLM) chatbots are based on a **Transformer** (or an RNN) architecture which is trained **autoregressively** on text (plus tricks like RLHF). They only predict the next token (part-of-word) given what text comes before.

So why are they so smart?
Turns out this task is **"AGI complete"**.
It is not possible to predict in general what words come next without understanding how people think and how the world works. That is indeed what these models have learned inside their basic structure.
How can we use their learned knowledge? Just train them to **emulate an assistant persona** which answers questions and performs tasks given to them. That is indeed what LLM chatbots are.

Using Chatbots in Business

Chatbots know all of **Wikipedia** by heart but they don't know about **your business**. Whatever task you put them to perform, they need to know what you want.

- ▶ **"NEVER give money back for complaints!"**

You need to be able to explain the task to the chatbot clearly and concisely. They are very smart, but they are not great at handling large amounts of text!

You can play around and test whether they are able to do what you want them to do in OpenAI ChatGPT frontend or with Playground. When deploying you just use the API they offer with e.g. Python or Java language. The ChatGPT API costs a bit, but they tend to give some free credits for experimentation.

Tips and Tricks

You would typically integrate a chatbot to perform a task by making a small **Python** code which calls the **chatbot API** when something happens, give it some amount of **carefully designed context**, and utilize its responses to **make decisions** or **generate answers**.

To limit the amount of context you give to the chatbot for every task you make it to do you can **decompose** the knowledge **hierarchically**. In effect you ask the chatbot whether the context it got relates to some topic, and depending on its answer, you clear the session and start from scratch, now performing a **subtask**. You do this for all separate subtasks and then collect together the answers in some way.

Alternatively you can make your **knowledge base** searchable by the chatbot so that it can ask specific information it needs from it only when it needs it.

Future - People

AIs will not match, they will **exceed all meaningful human cognitive capabilities** during this year. The progress is still **superexponential**.
What skills are important in the immediate future?

- ▶ **Clarity of thought**, **understanding** what is possible, and skill to **write** your knowledge, ideas and wants **clearly** to machines.
- ▶ **Empathy** and capability to understand the points of view of others, specifically of chatbots but also of other people. What don't they understand, and how to explain it to them better?
- ▶ **Connect** with people you **trust**. It is fast becoming impossible to tell the difference between a real person and a bot just over the net, even over video calls.

Future - Businesses 1/2

What about businesses?

- ▶ Be prepared to serve AIs; they can be your users through natural language APIs, or your customers deriving value from your assets.

- ▶ Chatbots form a new **service provisioning channel** along with web and mobile apps. Chatbots will serve their users by calling your service on their behalf.

- ▶ To do all that, the chatbots need to understand what your business is about and how it can help them. Just like with Web Services (WS-*) required businesses to describe their APIs in XML, chatbots now require businesses to introduce themselves to them and serve chatbots, whether internal or external.

Future - Businesses 2/2

The most important question isn't whether your business or employees are automated or not, or where to gain efficiencies.
It is whether **your business** will still have value in **a world full of AGI** next year.
Does it?
Does your business serve chatbots with knowledge assets and affordance interfaces?

▶ **Knowledge assets** are any type of information and knowledge, especially real-time or under constant updates, which keep being valuable for AIs of practically unlimited intelligence. The AI **hunger for knowledge** will be immeasurable.

▶ **Affordance interfaces** are any type of APIs chatbots can use to effect changes in the real world. Ordering items, mobile robotics, tasking people or machines, all things which happen over the boundaries of information networks and the physical world. **Hands and legs** of AIs.