

Santa Studies: AI & Machine Learning

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ISBN: 9798277511251

**Forever in Loving Memory of
Sanjay, Farah, and Everyone Else
Dearly Missed**

About the Book

The content of this book was written by **humans**.
The pictures were made using free **AI** apps.

Pictures made with **AI** can have funny mistakes.
People might have the wrong number of fingers or
there may be writing and objects that don't make
sense! On different pages of this book, Santa might
look different, toys and decorations might be
different... Keep an eye out!

Can you find examples of funny **AI** mistakes in the
pictures in this book?

It is important to practice finding **AI** mistakes to
help you tell what is real and what is fake online!



**Santa was finally starting his list when
his friend John Hinton stopped by.**

**The expert computer scientist had
just made an app that uses AI.**



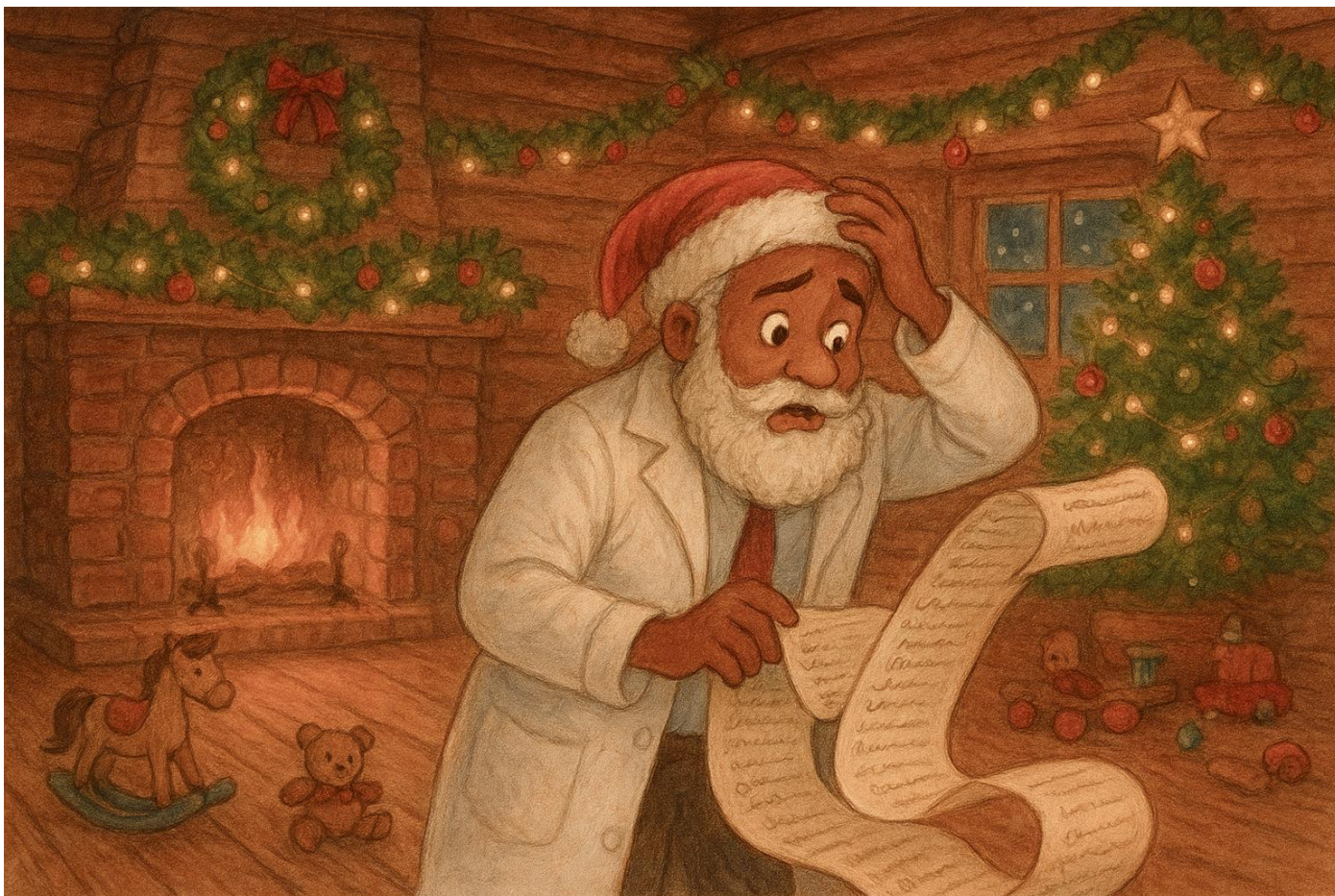
**John was excited about the app,
which he named ClausGPT for short.**

**He said, “it can draw pictures, write
stories, or even make you a report!”**



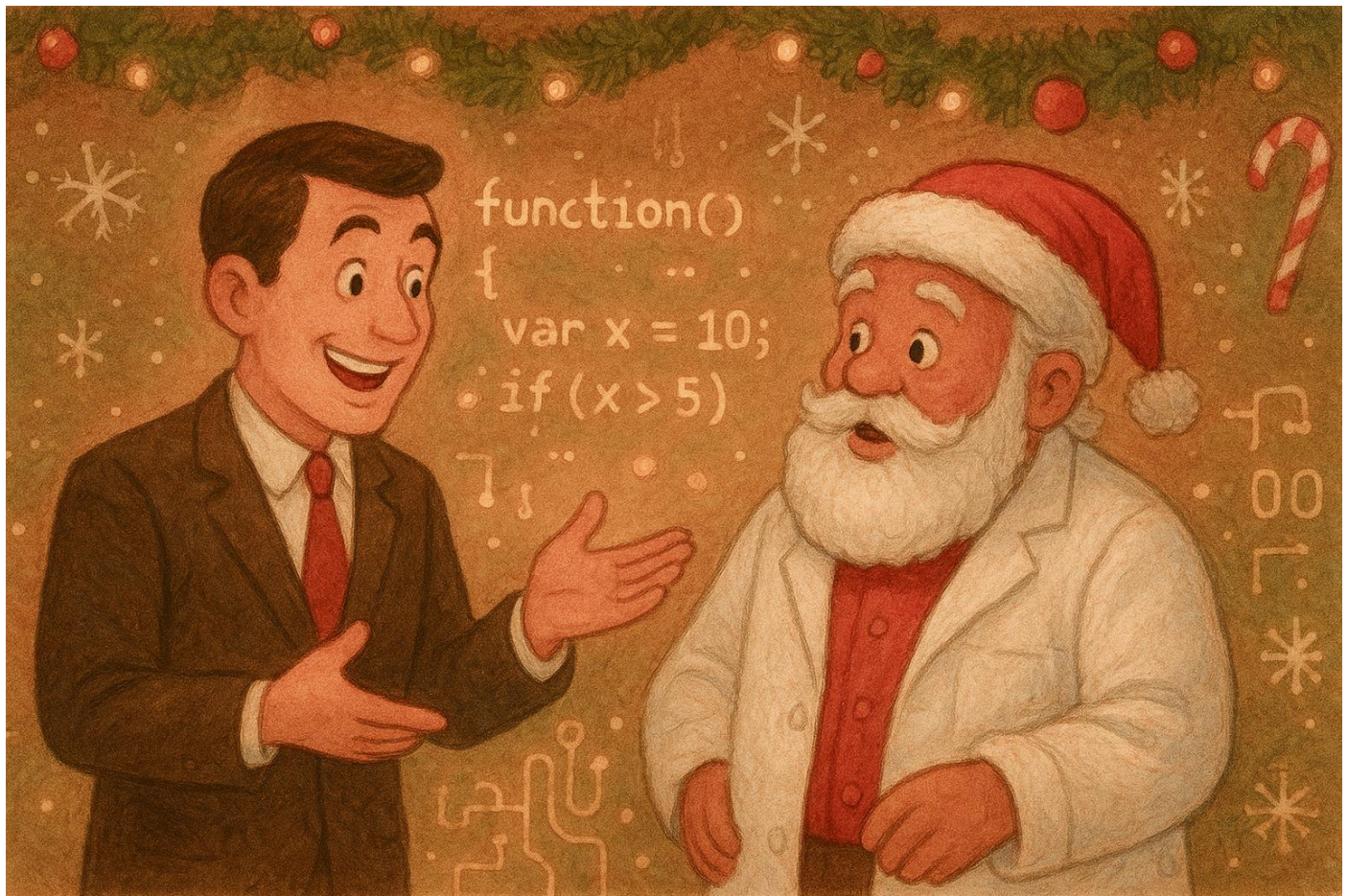
**“And with over 8 billion people
around the world for you to see...**

**...why not save time by making your
naughty and nice list with ClausGPT?”**



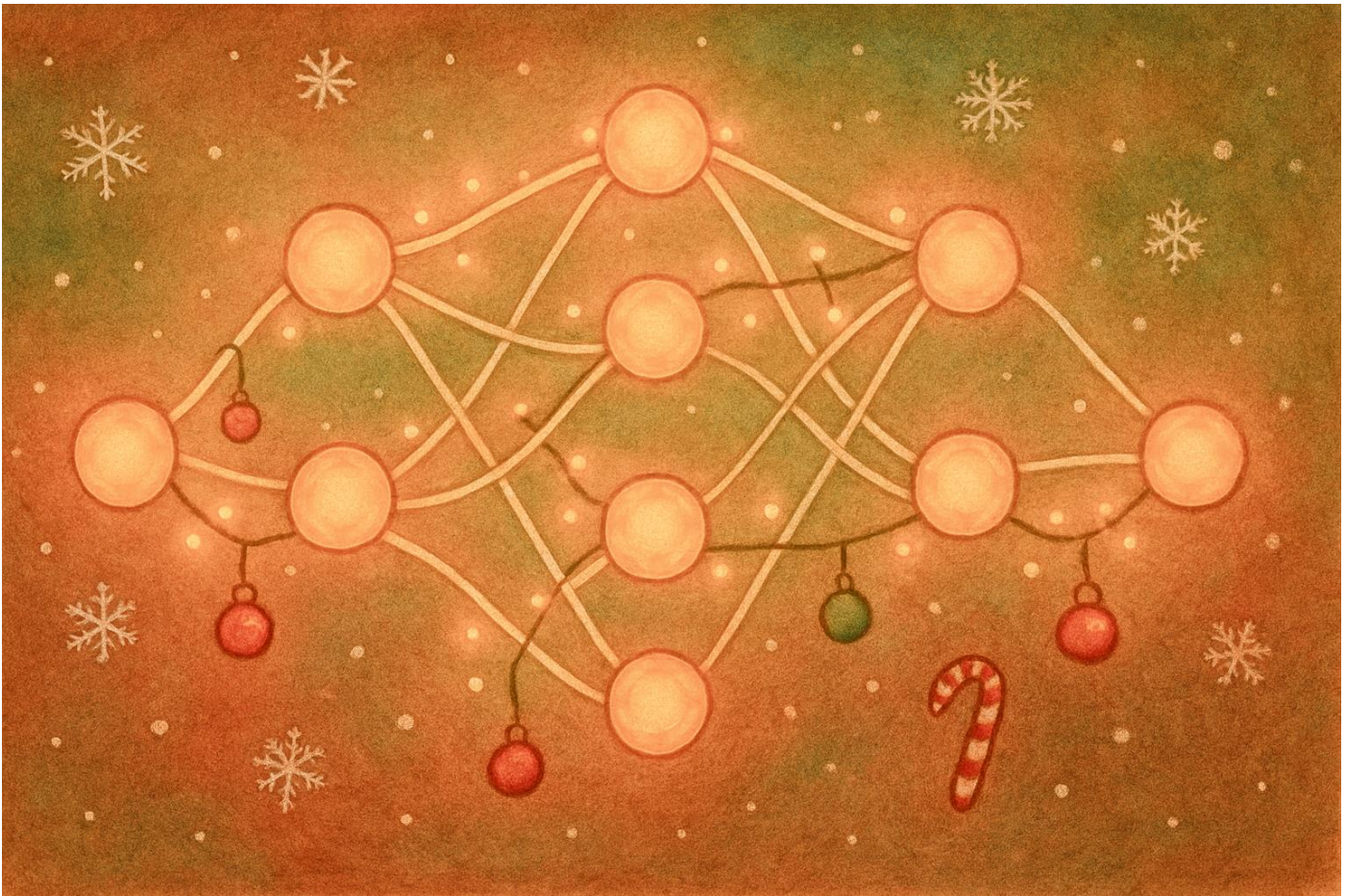
“I promise you won't even have to check your list once, certainly not twice.

ClausGPT should easily figure out who is naughty and who is nice!”



Santa liked this plan, but wanted to know his lists would still be made with care.

So he asked John to explain the science behind ClausGPT's software.



**“ClausGPT learns with a network,
inspired by the neurons in our brains.**

**It reads data to build its skills and make
important connections as it trains.”**



“Santa, you should give ClausGPT all your old naughty and nice lists to read.

With data like that, it can learn the careful list-making skills that you need.”



**When ClausGPT finished learning,
it was ready to help, just like an elf.**

**Santa asked if it could make this year's
naughty and nice list all by itself.**



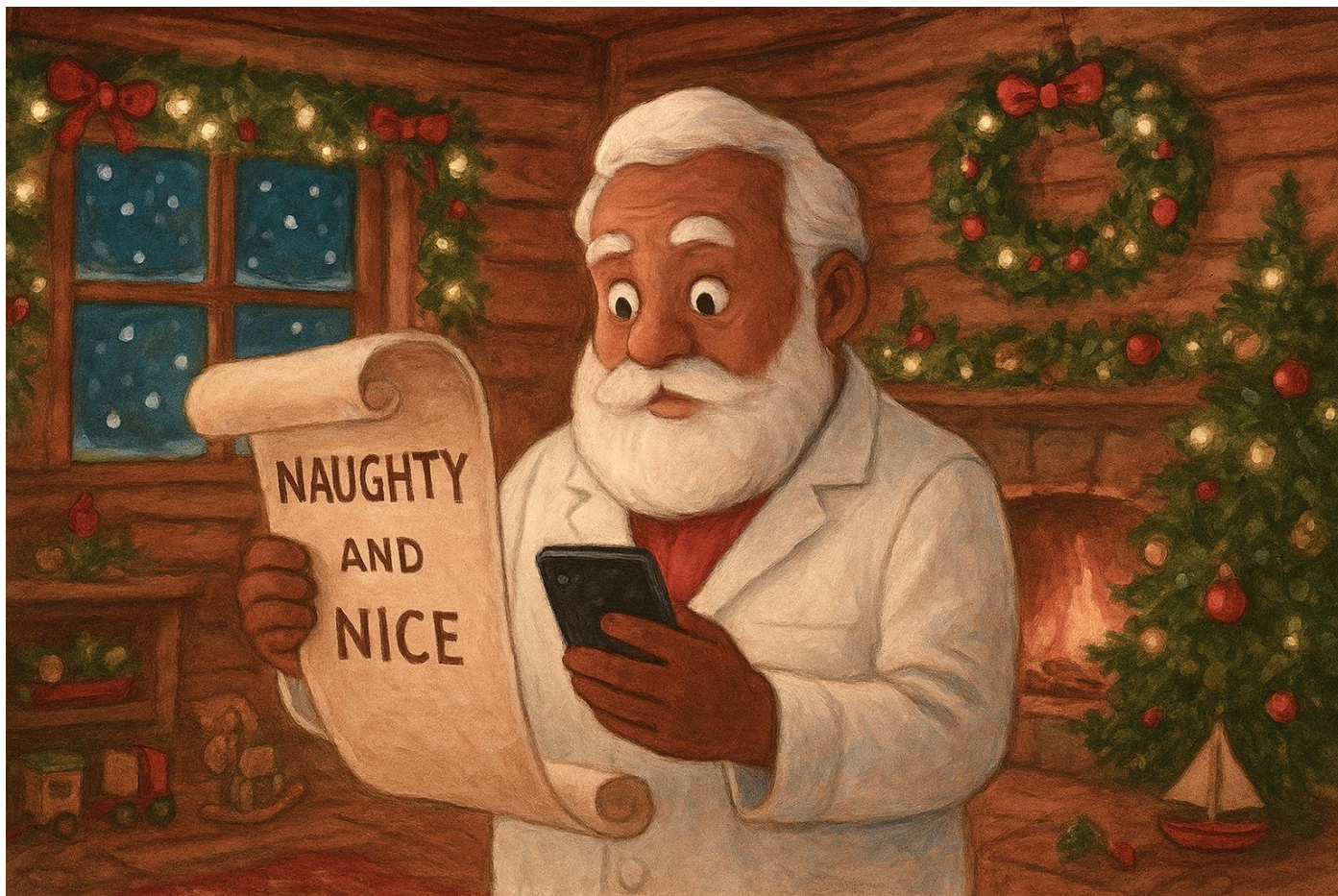
ClausGPT quickly made a list of all the children who should get toys.

Santa was impressed, but noticed the low number of good girls and good boys.



**The thought of ClausGPT missing
any good children gave Santa a fright!**

**He read all the names on the list and
saw that ClausGPT wasn't quite right.**



**Santa realized he should always
check any list that ClausGPT makes.**

**Because, like us, even the best AI
apps can sometimes make mistakes.**



**Still, Santa was satisfied ClausGPT
could help him work a bit faster...**

**And that learning to use it carefully
stopped a Christmas list disaster!**

Fun Facts

Artificial Intelligence, known as **AI**, is the idea of making machines and computers that can learn, talk, make decisions, and do tasks that would normally need a human.

Machine learning is a type of **AI** that uses data (like stories or pictures) to teach machines to do tasks without needing to program them like regular computer software.

There are many types of **machine learning**.

Fun Facts

Deep learning is a type of **machine learning** that uses **artificial neural networks** to learn patterns and tasks like writing, drawing pictures, or making a naughty or nice list for Santa!

Neurons in a human brain are the cells that let us think! They make strong and weak connections between each other in groups (a network) as we store memories, learn, and grow.

Fun Facts

A **neural network** in **AI** is computer code that was inspired by **neurons**. This **artificial neural network** helps an **AI** learn and do tasks.

Artificial networks cannot think independently like humans or have original thoughts. They are only as good as the data used to **train** them.

Deep learning needs lots of data to properly **train** an **artificial neural network** to make connections and recognize patterns.

Training a machine is like training dogs to do tricks: it takes lots of examples and practice.

Fun Facts

Deep learning networks that are made for language are known as **Large Language Models**, or **LLMs**.

Examples include ChatGPT, DeepSeek, CoPilot, Gemini, Grok, and Apple Intelligence, to name a few!

Image models like Stable Diffusion, DALL-E, and Midjourney are networks that are **trained** to make pictures.

Fun Facts

The **GPT** in ChatGPT stands for:
Generative Pre-trained Transformer.

“**Generative**” means the **AI** can generate or create new things like poems and reports.

“**Pre-trained**” means the **AI** is already **trained** with lots of examples, so it has learned and is ready to perform tasks.

“**Transformer**” is a special type of **artificial neural network** that helps an **AI** understand language.

Fun Facts

John McCarthy is considered one of the main founders of **AI**. He was the first to use the term “**artificial intelligence**” in 1955. In 1956, he helped organize a workshop that brought together some of the best researchers in the world to discuss **AI**.

Geoffrey Hinton is considered one of the main founders of **machine learning**. His work on training **artificial neural networks** helped inspire **deep learning**. In 2024, he was awarded the Nobel Prize in Physics, together with **John Hopfield**. Geoffrey is a strong supporter of making **safety guidelines** for the use of **AI**.

Fun Facts

It is important to remember that **AI** is not a real friend, no matter how friendly it seems. It is not actually conscious and has no feelings or thoughts. It can be a useful helper, but is not a replacement for our human brains!

Never take advice from an AI without also talking to a trusted person.

AI can be useful, but it does not know everything.

It can make mistakes, just like humans! **AI** can make up wrong information that sounds right. Computer scientists call this “**hallucinating**”. You must be careful when using **AI** because of this.

Fun Facts

It is always important to check the answers from **AI** (like Santa did) to avoid problems, because **AI** doesn't actually understand the answers it gives. For example, **Large Language Models** are not very good at math and might tell you, very confidently, that $2+2=5$.

Every **AI** is unique and asking them each the same question can give different answers. Even asking one **AI** the same question at different times can give different answers. The creators of an **AI** can also control what type of answers it gives when helping, so it is important to remember that an **AI is not neutral or unbiased**.

Fun Facts

It takes millions of dollars and **lots and lots of electricity** to train an **AI** like ChatGPT (enough to power hundreds of houses!). Each time **AI** is used to write a report, make a picture, or answer a question, it takes energy. Each bit of energy can add up quickly with many people using **AI** daily! People are worried about how much energy **AI** will need in the future, but researchers are working on ways to reduce it.

Large **data centres** are needed for the computer power to run **AI**. These centres make a lot of **heat**, so Santa having one in the North Pole helps keep everything cool and running properly!

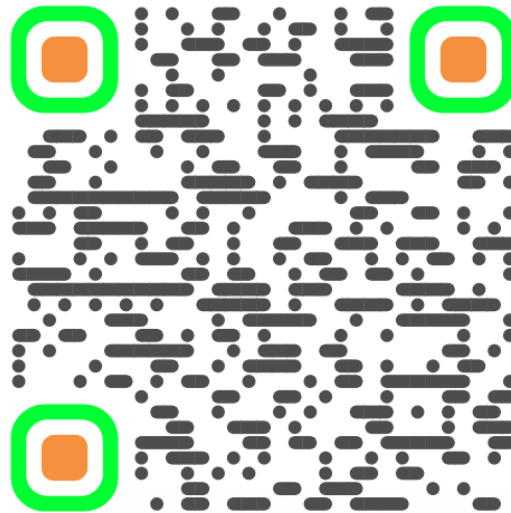
About the Authors

Roshan earned a PhD in Physics focusing on nanotechnology, atomic-scale manufacturing, and commercialization. At age five, he decided that Santa must be a scientist who developed a teleporter to travel the world. This was the inspiration for the *Santa the Scientist* series.

Jordan earned an MSc in Interdisciplinary Geophysics focusing on the public perception of hydraulic fracturing, induced seismicity, and the oil and gas industry in western Canada. She is an experienced freelance editor with a background in clean technology.

The End!

To learn more about this outreach project or
download a free copy of the eBook visit:
roshanachal.com/AI



There's More...

Check out the other books in this series in print on Amazon (at cost) or digital download (free) at:
roshanachal.com/SantaTheScientist

“Santa the Scientist,” where Santa discovers he can stop time with gravity and cookies!

“Santa Studies: The Aurora,” where Santa learns all about the science of the beautiful aurora!

