Crafting Tech

(Engineering AI Systems)

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NOKIA Bell Labs

Inventing the Future X Network

1925

Creation of Bell Labs
The engineering departments of the American Telephone and Telegraph Company (AT&T) and Western Electric were consolidated into Bell Telephone Laboratories. Their mission was to research and design communication technologies for the rapidly expanding telephone network and to explore fundamental areas of science that could shape the future of the industry. Over the years, many cornerstone technologies of modern society have been invented at Bell Labs and 8 Nobel Prizes have been awarded to its researchers

1930's

1937 NOBEL PRIZE
Electron Diffraction
Demonstrating wave nature of matter

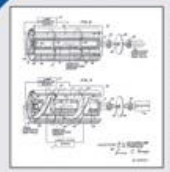
1940's

1948
"A Mathematical Theory of Communications"
By showing that all communications channels – of any type – have a fundamental capacity limit, Claude E Shannon founded the field of information theory

1950's

1954
Solar cells

1956 NOBEL PRIZE
Transistor
To replace the vacuum tube, Bardeen, Brattain and Shockley created a working point-contact transistor. This basic building block for all digital products is the foundation for our information society



1958
LASER
In their 1958 paper, Schawlow and his brother-in-law Townes described in detail a proof of concept for the LASER. The laser enables a wide variety of applications: fiber-optic communications, digital storage, barcode scanners, precision surgery and industrial cutting tools

1960's

1962
Telstar
Transatlantic live TV broadcast via satellite

1970's

1973
UNIX and C Language
Thompson and Ritchie's elegant design made it an immediate hit with the programming community when it was released in 1974. UNIX would later on become the Internet's foundation

1976
Fiber Optic Network
First demonstration of 45 Mbit/s transmission

1977 NOBEL PRIZE
Electronic Structure of Magnets and Glasses

1978 NOBEL PRIZE
Cosmic Microwave Background Radiation
Pioneering work on radio communications using the Holmdel Horn Antenna provides support for the Big Bang Theory

1978
Commercial Cellular Network
Invention of the cellular concept and creation of the first commercial network

1980's

1980
Demonstration of DSP
Large-scale integrated circuit for digital signal processing

1995
Commercial DWDM
Pioneering work on wavelength multiplexing in optical fibers

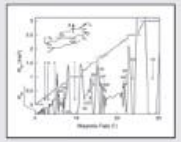
1990's

1995
Integrated ADSL Chip
After co-inventing ADSL technology, follow-up innovations like vectoring continued to generate world records for high speed data transfer over copper telephone lines, fueling the Internet

1997 NOBEL PRIZE
Laser-Based Cooling and Trapping of Atoms
To understand the fundamental limits of materials and matter

1998
Wireless MIMO Spatial Multiplexing
Invention of wireless transmission based on multiple spatial paths

1998 NOBEL PRIZE
Fractional Quantum Hall Effect
Discovery of a novel collective quantum fluid state of matter

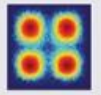


2000's

2006
Software Defined Routing
Predecessor of Software Defined Networks (SDN)

2009 NOBEL PRIZE
CCD
Boyle and Smith's picture phone research realized the enormous potential of the Charge Coupled Device as an imaging device, leading to the invention of the digital photo, video cameras, scanners, satellite surveillance and ultra-sensitive astronomical telescopes

2009
Coherent 100G Optics
Invention of the future of high speed optical communications with coherent processing



2009
World's first standard compliant LTE call

2010's

2011
lightRadio Cube
First demonstration of building block of future small cell wireless networks

2014 NOBEL PRIZE
Fluorescence Microscopy
Ground-breaking work on sub-wavelength optical microscopy leads to super-resolution microscopy at cellular level

2014
XG-FAST
First demonstration of 10 Gbps over copper telephone wires

2015
GreenTouch
International consortium delivers new technologies to improve energy efficiency in wireless networks by more than 10,000X

2015
Optical MIMO-SDM
Pioneering work on utilizing the spatial dimension in fiber, showing greater than 10X increase in optical network capacity

2015
The Future X Network: A Nokia Bell Labs Perspective
First Nokia Bell Labs book written

2016
5G Massive Connectivity
First demonstration of 1M simultaneous, ultra-low latency connections in a single cell for 5G and IoT

The Future

Nokia Bell Labs continues to solve the great industry challenges, producing disruptive innovations for the next phase of human existence

TÈCN

Round up

name, past programming, likes/dislikes

Crafting Tech

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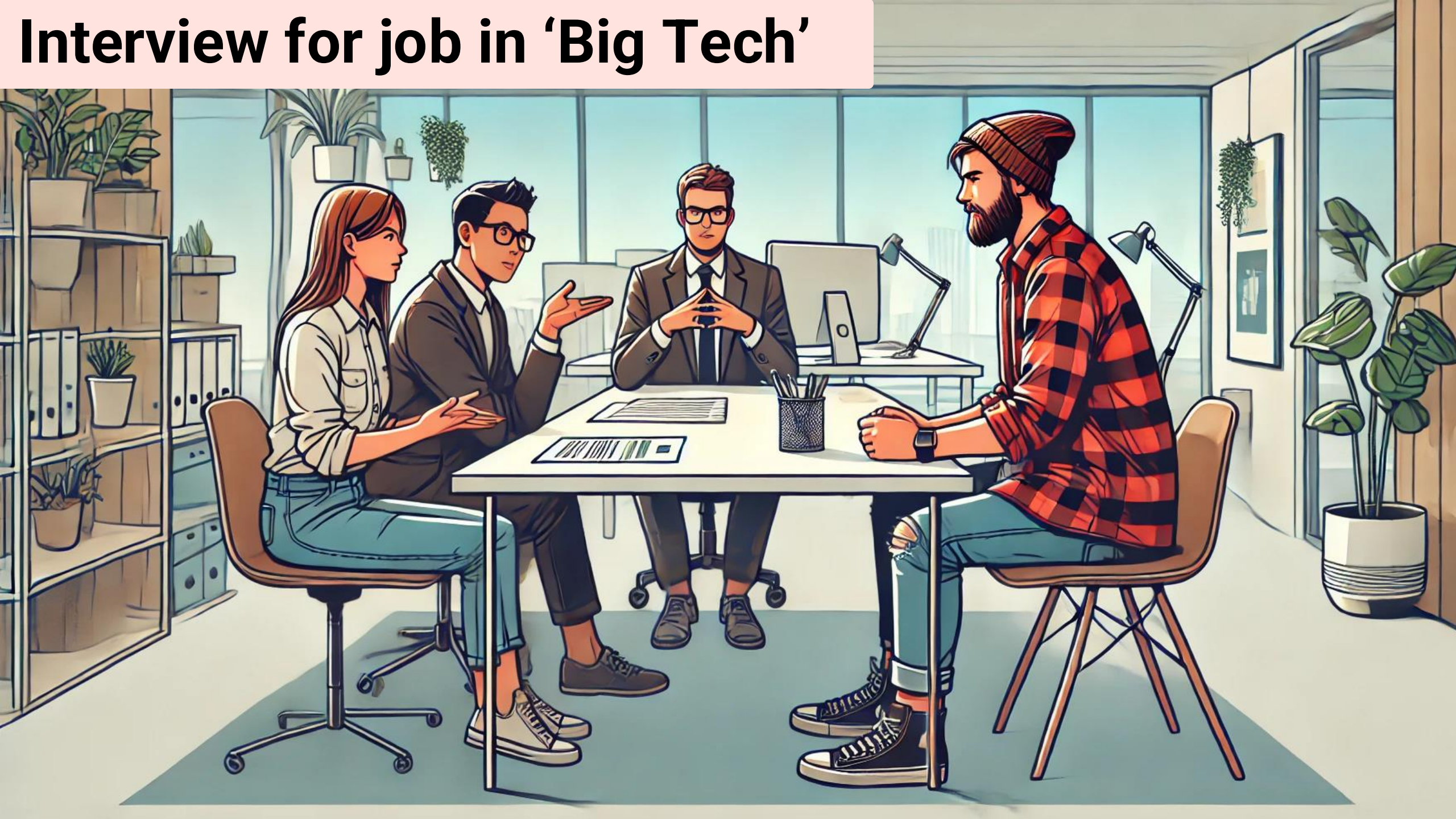
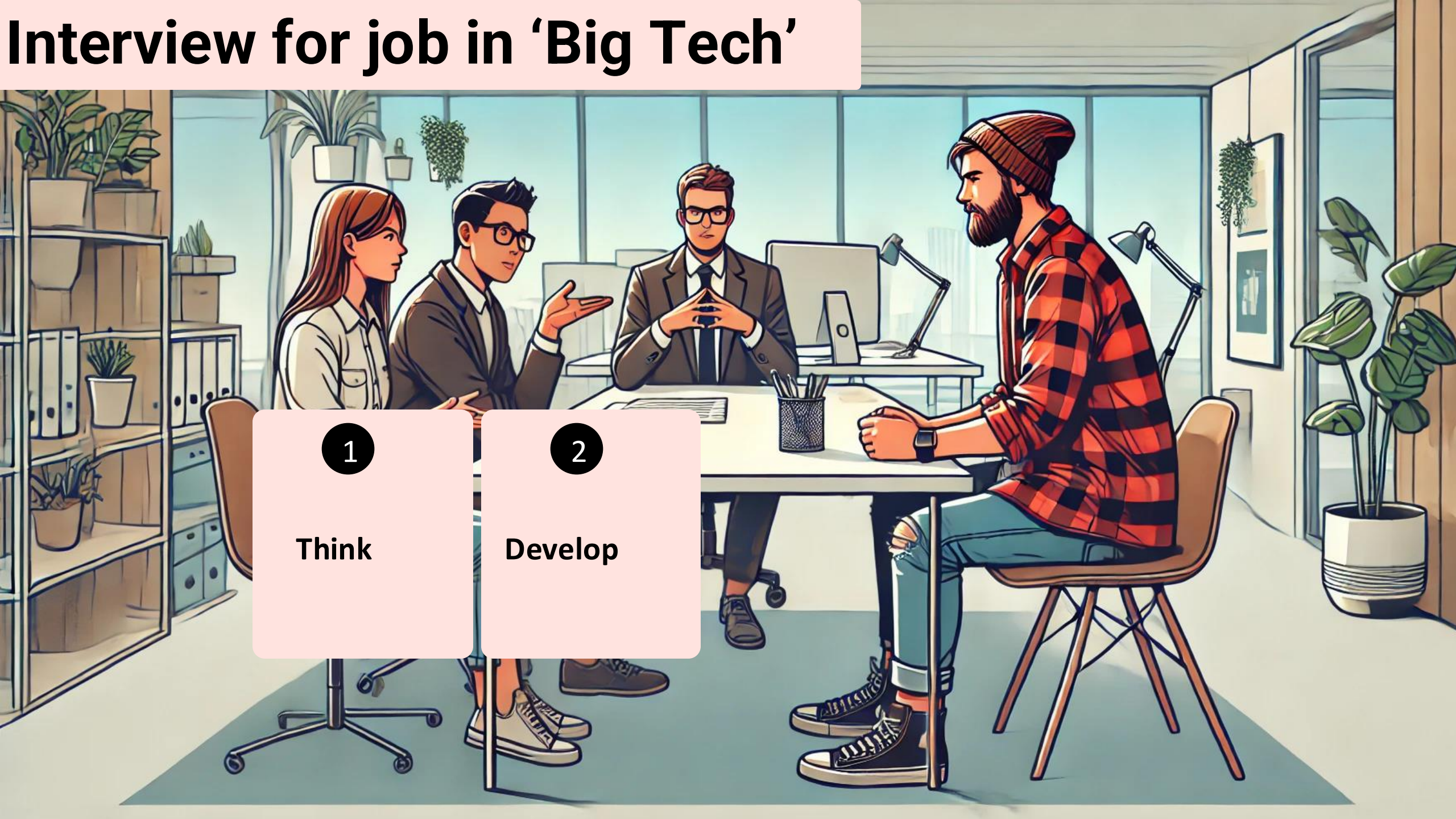
Interview for job in ‘Big Tech’



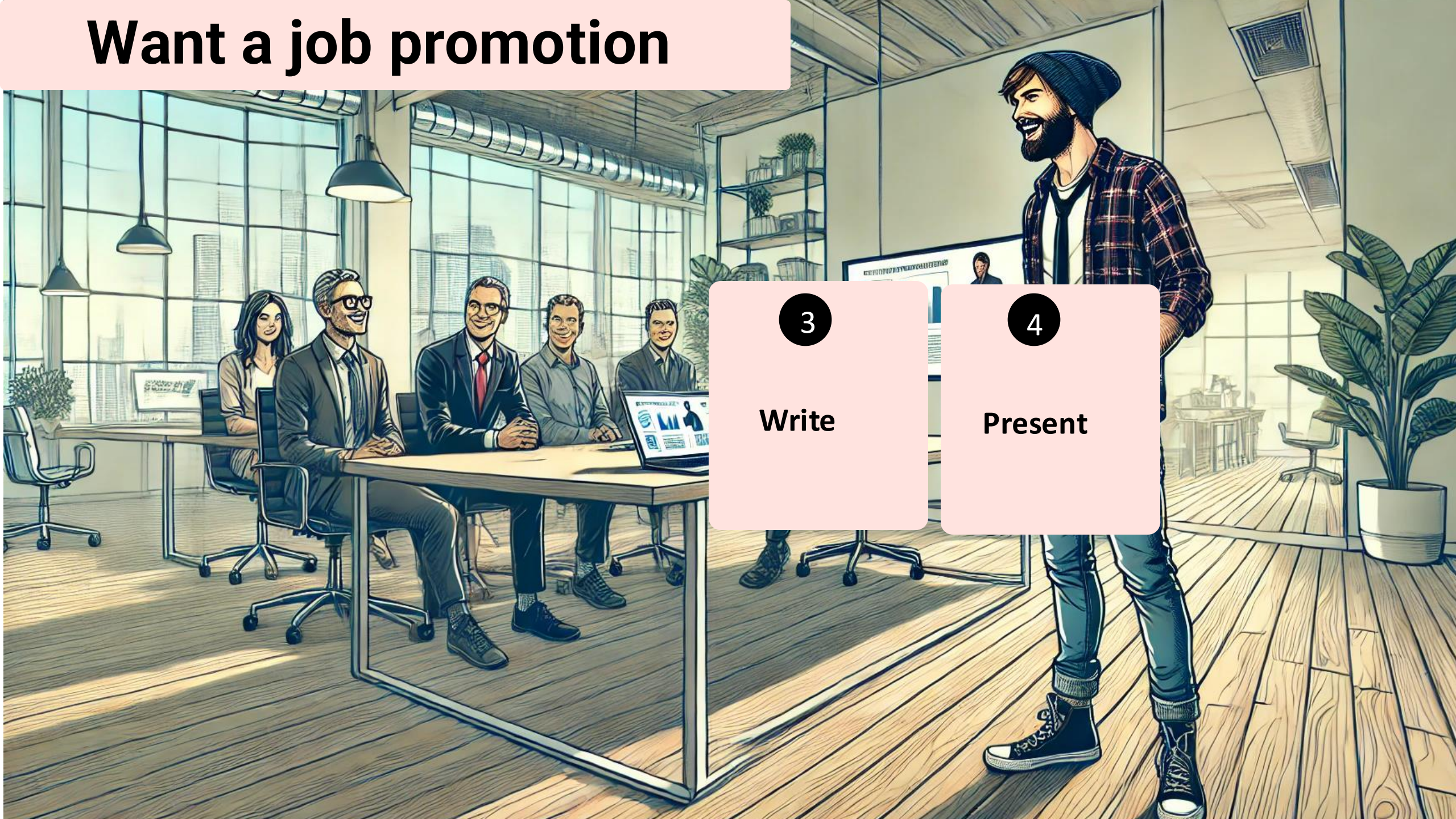
Interview for job in ‘Big Tech’



1. Think
2. Develop

Want a job promotion

Want a job promotion



Paint points

1. Think
2. Develop
3. Write
4. Present

Crafting Tech

(Emerging Topics in AI)

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Course

1. How to **present**
2. 20% **Present** Emerging Topics in AI
3. **Think** about a solution
4. **Write** initial solution
5. **Test solution**
   1. Technical
   2. Business
   3. Ethics
6. **Develop & write-up** the solution

Hot Topics in AI

Output

70% **Final Report**

10% **Short video pitch**

Course

1	2	3	4	5	6
How to **present**	20% **Present** Emerging Topics in AI	**Think** about a solution	**Write** initial solution	**Test solution** 1. Technical 2. Business 3. Ethics	**Develop & write-up** the solution

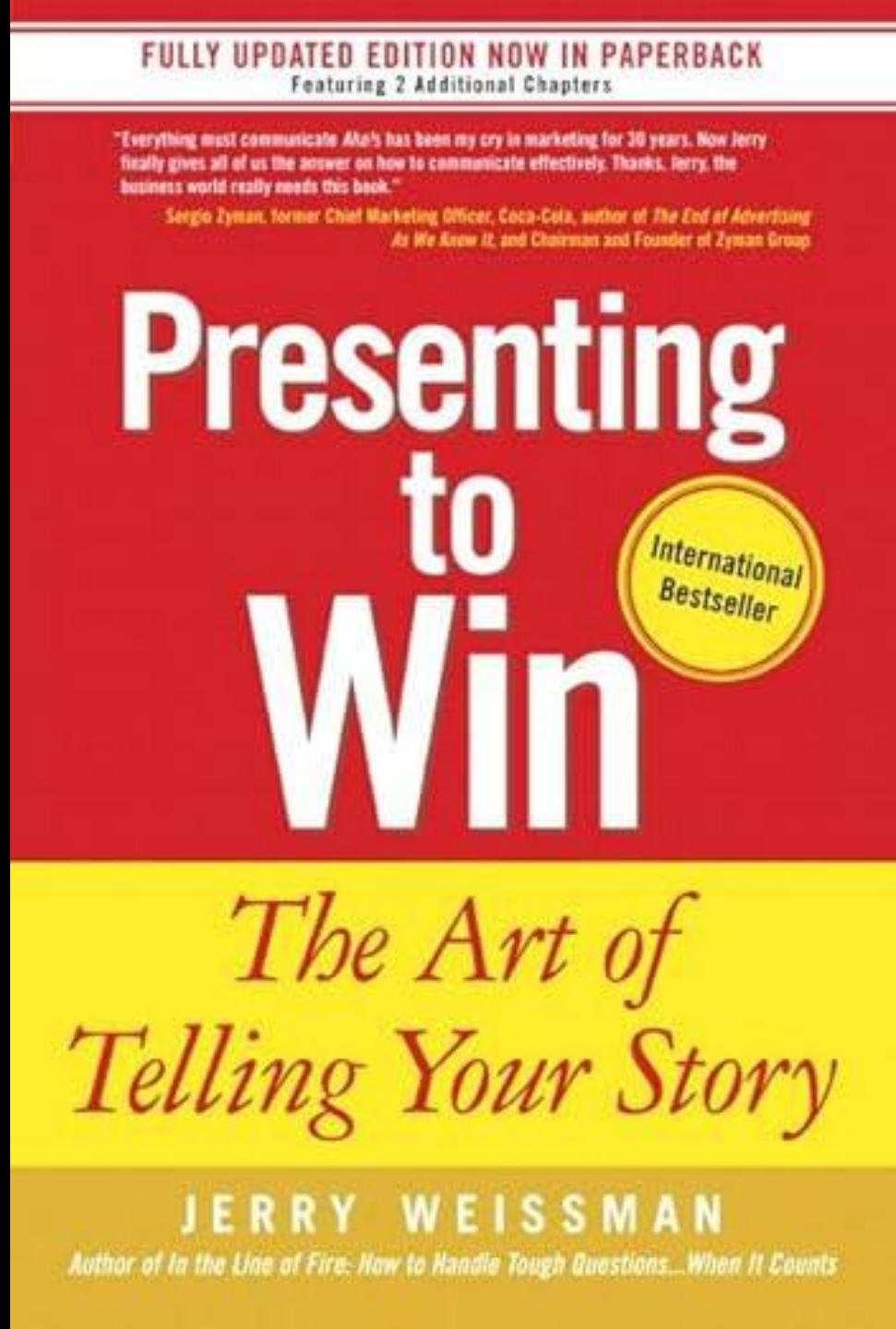
SKILLS

Impactful presentation	Practice presenting Emerging topics in AI	Creative Thinking	Technical Writing	Scientific, business, and ethical assessments	Doing the work

1

How to **present**

. CEOs, Executives
. Highly Adaptable
. Delivering powerful presentations

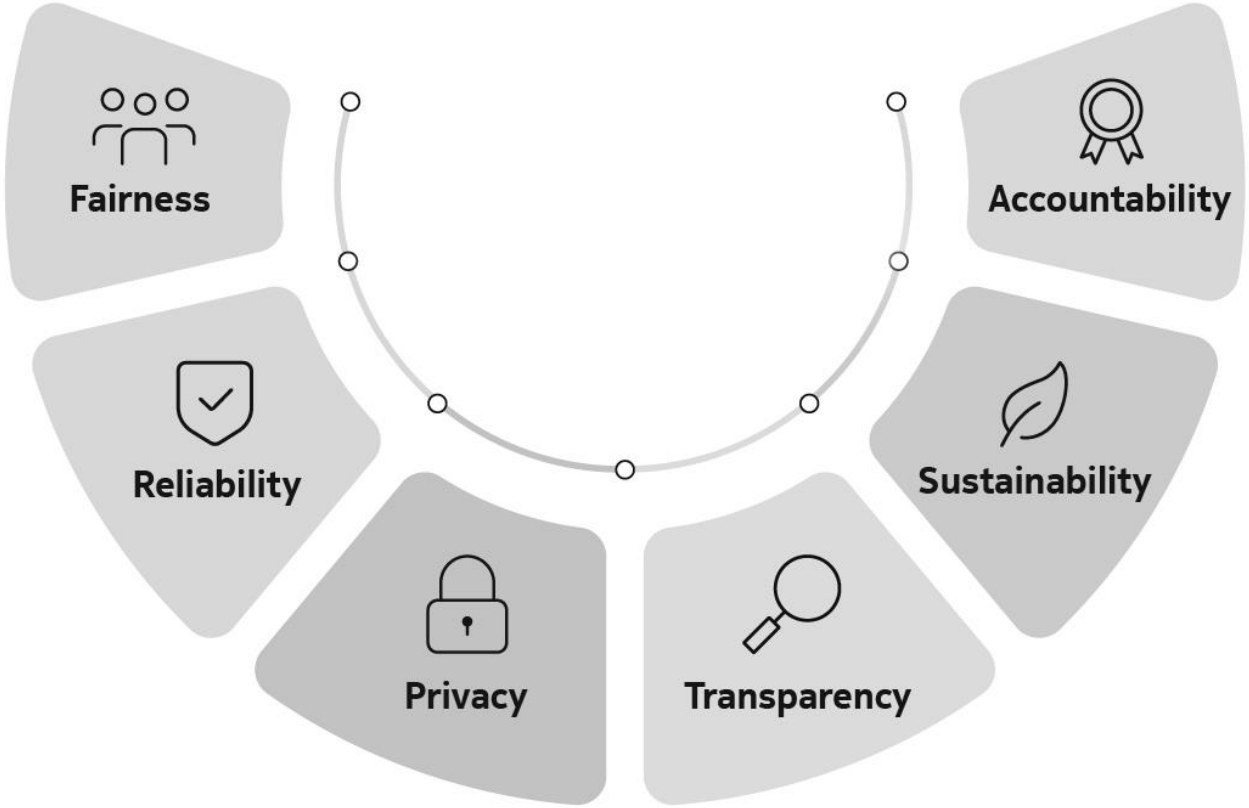


2

Present
Emerging Topics in AI

Hot Topics in AI

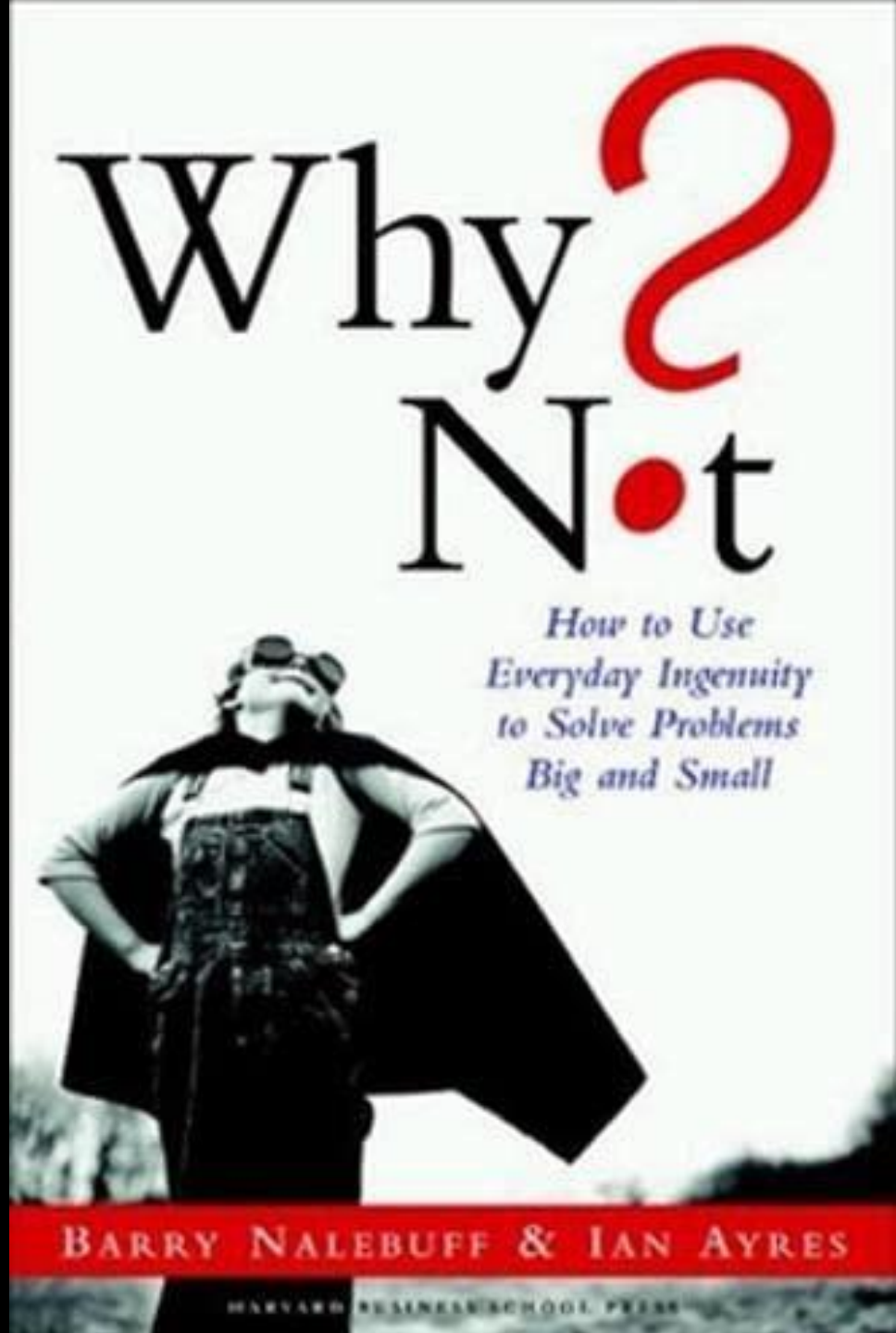
Six Responsible AI Pillars



3

Think about a solution

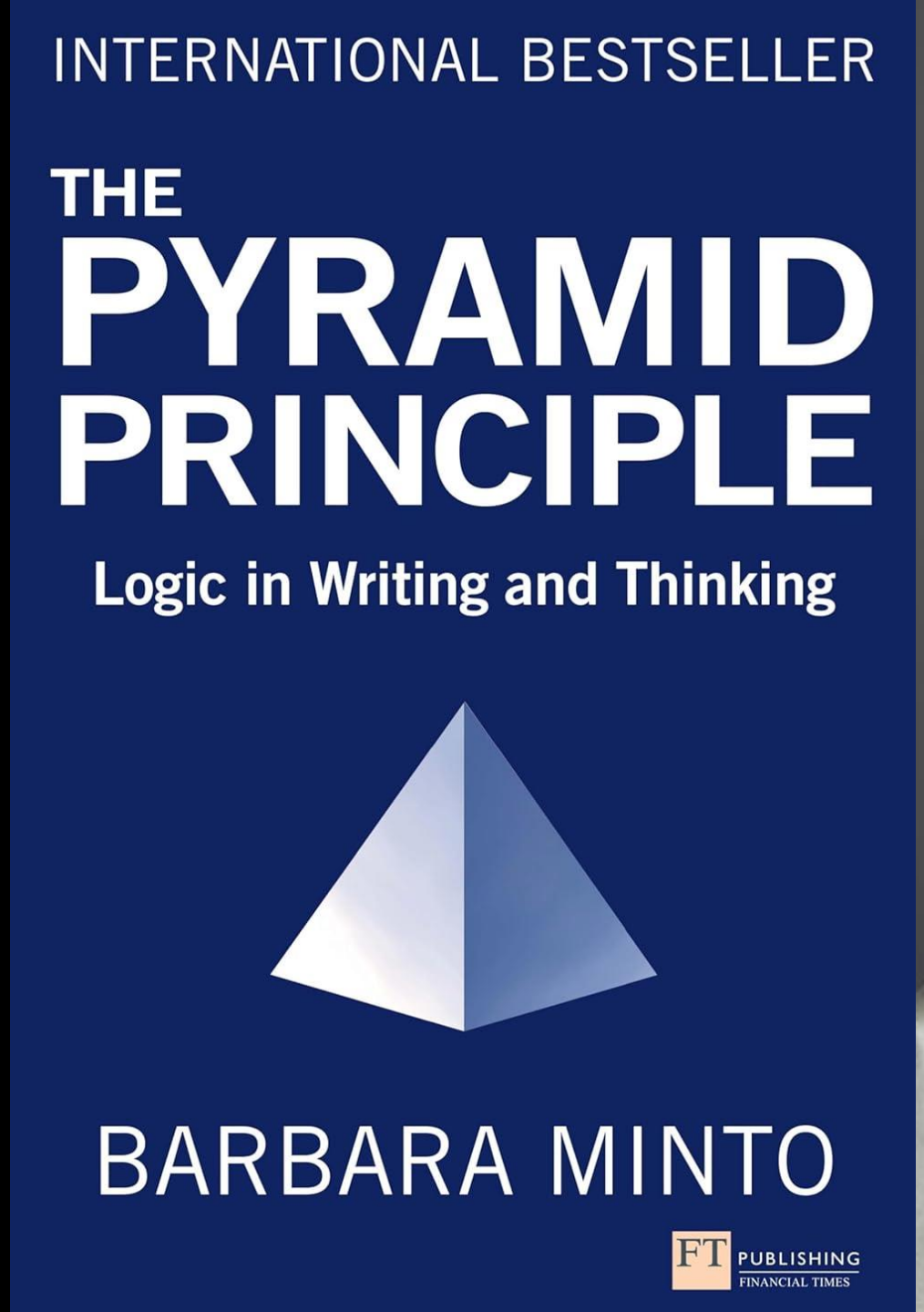
. By two Yale professors
. Roadmap to think about problems



4

Write
initial
solution

. Harvard
Business School
. McKinsey

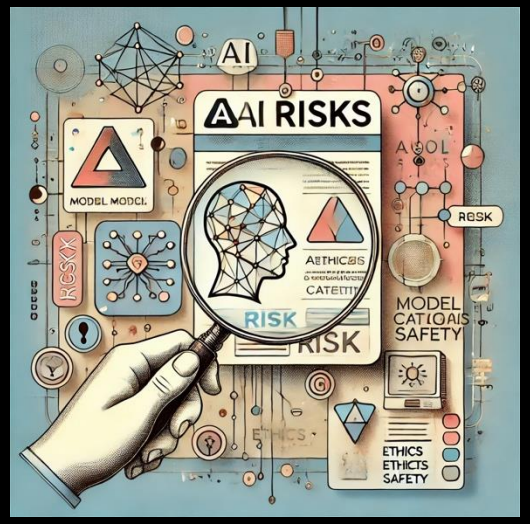


5

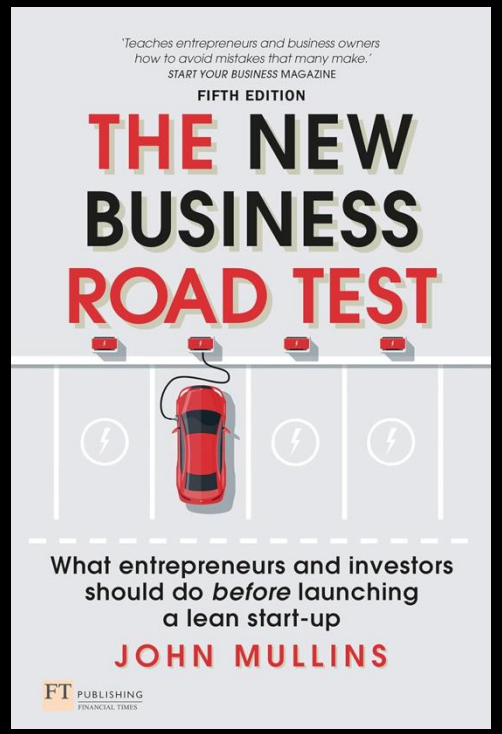
Test solution

1. Technical
2. Business
3. Ethics

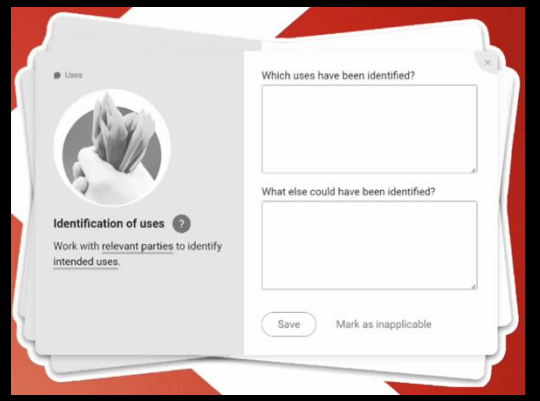
Technical



Business



Ethics



6

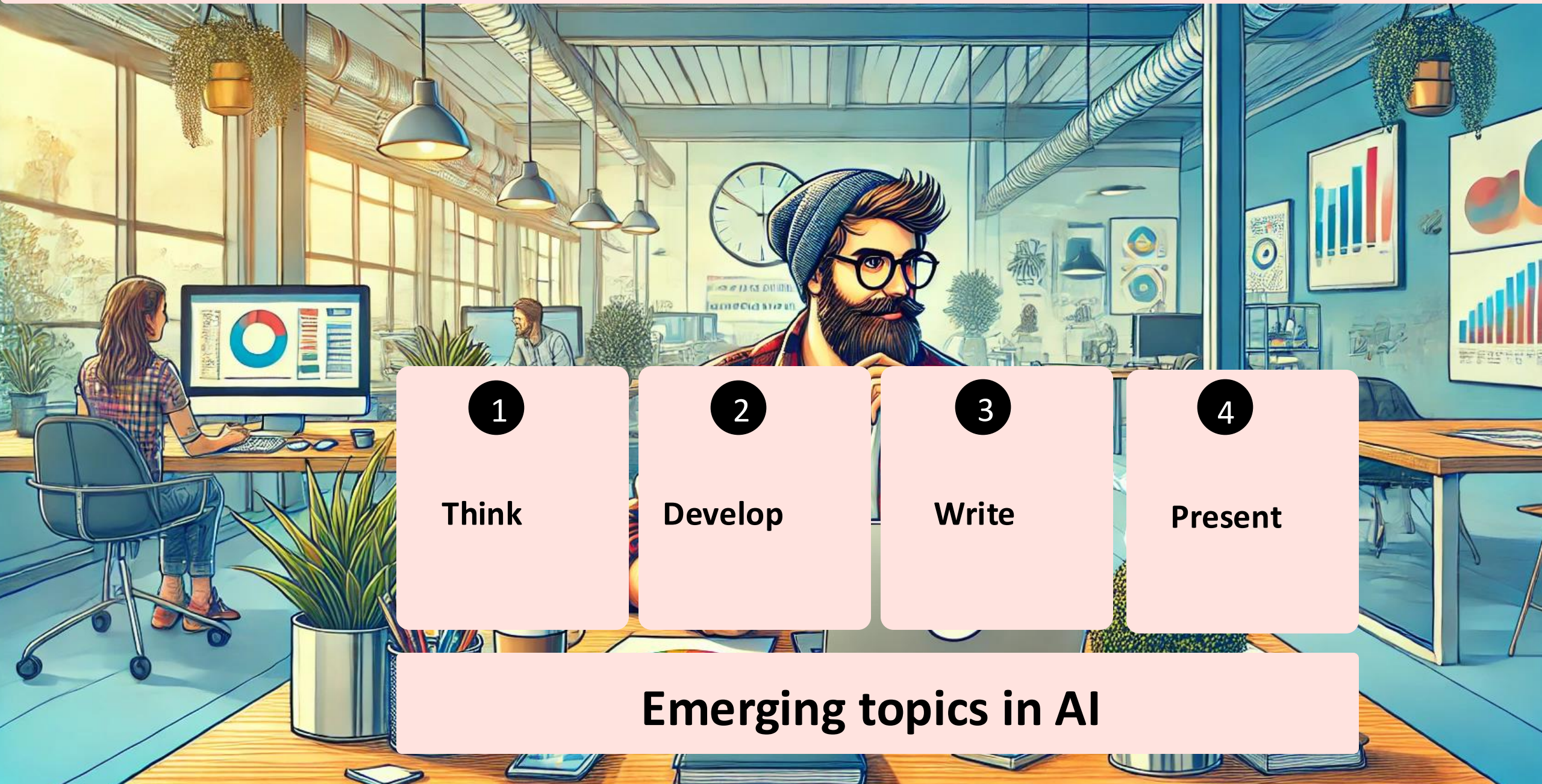
Develop & write-up the solution

~ half of the course

Paint points

1. Think
2. Develop
3. Write
4. Present

Being successful and having fun in tech



1. Think
2. Develop
3. Write
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Emerging topics in AI

When?

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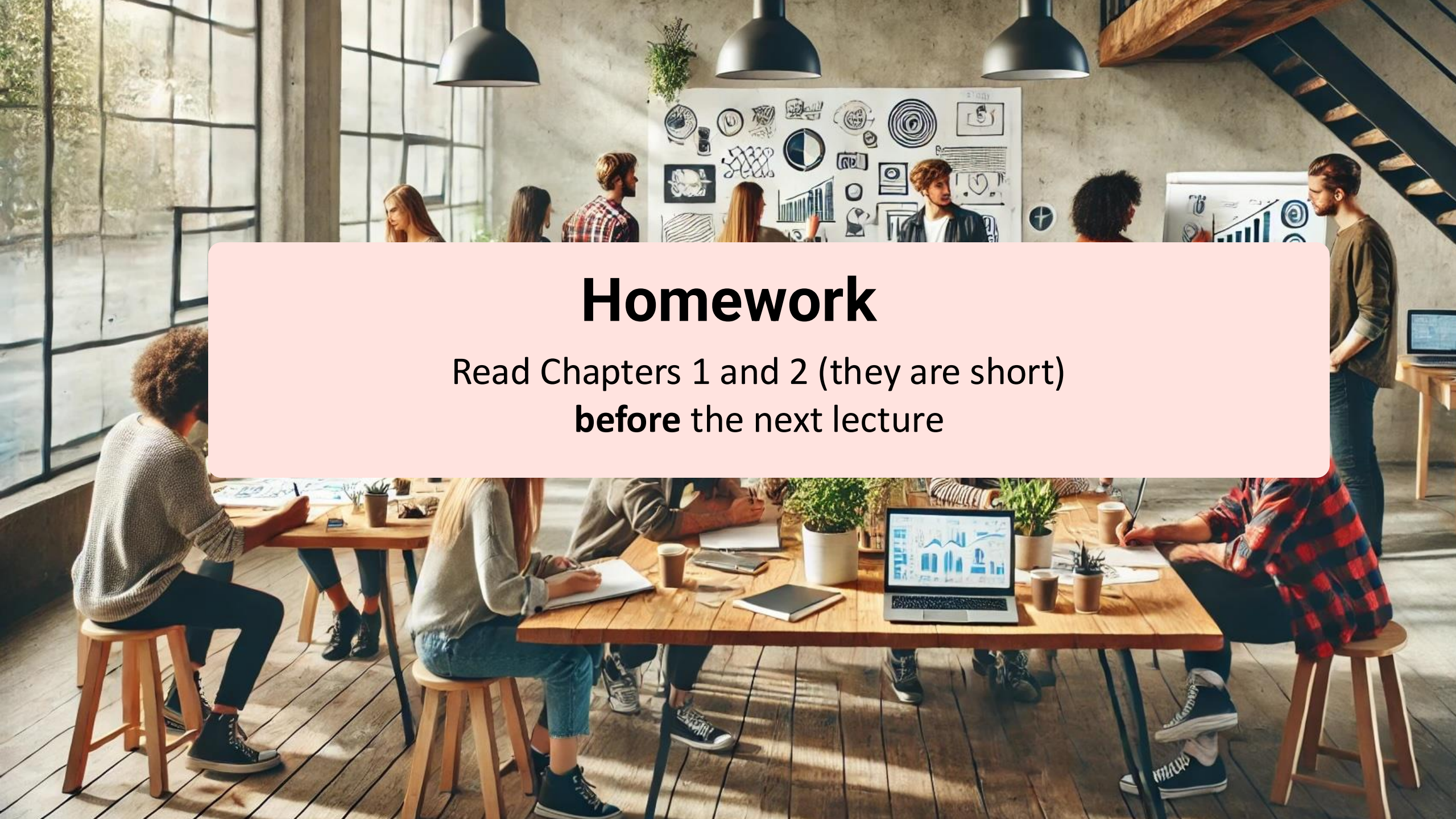

Homework

Read Chapters 1 and 2 (they are short)
before the next lecture