AI IN FOCUS
Insights from public and private markets

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Agenda

1. Some AI basics
2. How does ChatGPT work?
3. Why now?
4. Impact of AI on industries
5. AI value creation
Schroders has unique position to see AI from multiple angles

150+ Relationships with Venture Capital, Growth and Buyout funds globally

Founders & CEOs (public & private)

Schroders Platform

VC & PE firms

Customer

4,400+ portfolio companies

Logos shown are the property of their respective entity. Companies shown for illustrative purposes only, not a recommendation to buy or sell.
VC investment in AI companies has surged

Source: Pitchbook, Schroders Capital.
Data through 26 May 2023. There is no guarantee these growth rates will continue.
What is Artificial Intelligence?

**Artificial Intelligence**
Any technique that enables computers to mimic human intelligence.

**Machine Learning**
A subset of AI, that uses complex statistical techniques to enable computers to learn from data.

**Deep Learning**
A subset of machine learning, which significantly enhances the automation of training AI models.

Source: Schroders
Artificial Intelligence timeline

1950
Turing introduces the Turing Test for machine intelligence

1956
McCarthy coins ‘Artificial Intelligence’ at Dartmouth Conference

1957
Rosenblatt develops a neural network for pattern classification

1960
AI Winter – hype exceeds progress, causing disappointment

1960s
Rule-based expert systems are introduced

1980
Second AI Winter begins – interest, funding, and expectations drop

1988
IBM’s Deep Blue beats chess champion Kasparov

1990
Deep learning is developed

1997
IBM’s Deep Blue beats chess champion Kasparov

1997
OpenAI GPT-2 makes significant progress in language understanding

2000
Deep neural network wins ImageNet

2006
Microsoft invests $1bn in OpenAI

2007
NVIDIA unveils CUDA software for accelerated computing

2010
IBM’s Watson wins Jeopardy! against human champions

2011
Chatbots start passing Turing Test

2012
Deep neural network wins ImageNet

2014
AlphaFold predicts protein structures accurately

2015
ChatGPT debuts, reaching 100m users in two months

2016
AlphaGo defeats Go champion

2017
Google introduces Transformer models

2018
OpenAI DALL-E generates images from text

2019
Microsoft invests $1bn in OpenAI

2020
OpenAI launches GPT-3, enhancing natural language processing

2021
DeepMind AlphaFold 2

2022
ChatGPT debuts, reaching 100m users in two months

Source: Schroders. Companies shown for illustrative purposes only and should not be interpreted as a recommendation to buy or sell. Logos are their property of their respective entities.
AI will be more profound for humanity than fire or electricity

Sundar Pichai, Google CEO
The changes from this technological revolution will be bigger than the Industrial Revolution.

Sam Altman, OpenAI
This is the most important technological advance I’ve seen in 40 years

Bill Gates
AI text generation... ChatGPT

Time to reach 100m users

Months to get to 100 million global monthly active users

<table>
<thead>
<tr>
<th>App</th>
<th>Time (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google Translate</td>
<td>78</td>
</tr>
<tr>
<td>Uber</td>
<td>70</td>
</tr>
<tr>
<td>Telegram</td>
<td>61</td>
</tr>
<tr>
<td>Spotify</td>
<td>55</td>
</tr>
<tr>
<td>Pinterest</td>
<td>41</td>
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<tr>
<td>Instagram</td>
<td>30</td>
</tr>
<tr>
<td>TikTok</td>
<td>9</td>
</tr>
<tr>
<td>ChatGPT</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: UBS, 2023. Logos are the property of their respective entities.
How do LLMs such as GPT (behind ChatGPT) work?

The short answer:
Probability is used to determine the next word in the sequence, producing entire sentences that have the highest chance of being right based upon the data that has been fed into the model.

The longer answer:
A four step process of pre-training, fine-tuning, ranking and more fine-tuning:

**Step 1: Pre-training**
A large data set is input into an unsupervised (no human intervention) model that learns the patterns or structures within the data.
E.g. ‘A cat sat on the...’ is often followed by ‘mat’

**Step 2: Fine-tuning**
A small set of prompts is selected and human labellers are asked to write down the expected responses.
Slow and more expensive, resulting in a smaller dataset of ~15k data points with more limited use.

**Step 3: Ranking**
The model is prompted and multiple outputs are provided. The labellers then rank these outputs from best to worst.
This ranked dataset is ~10x the dataset from the previous step.
This step mimics human preference.

**Step 4: Fine-tuning...again**
Using the model in Step 2, random prompts are generated and a response is provided.
These responses are then evaluated on the ranking from Step 3, and a reward is given for correct answers.
This reward trains the model to optimise responses from the ranking exercise.

Source: Schroders, OpenAI
Why now for AI?

New(ish) model architecture
Enhanced computing power
Increased data availability and usability
Techniques for deployment at the edge

Source: Schroders Capital. The views shared are those of Schroders Capital and are subject to change.
Impact of Generative AI on industries

**Sector-Agnostic Impact to Enterprises**
- Enterprise search (internal ‘ChatGPT’ for enterprises)
- Research and first draft content creation
- Summarization and transcribing of meetings
- Superior knowledge management
- Improved productivity across functions thus increasing ROI
- Personalized customer experience

**Sector Specific Impact to Enterprises**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare</td>
<td>- Drug discovery and development</td>
</tr>
<tr>
<td></td>
<td>- Mental health chatbots</td>
</tr>
<tr>
<td>Media</td>
<td>- Cheaper and faster content creation</td>
</tr>
<tr>
<td></td>
<td>- Personalized and user generated content</td>
</tr>
<tr>
<td>Financial</td>
<td>- Improved compliance and risk management</td>
</tr>
<tr>
<td>Services</td>
<td>- Reduced need for customer facing personnel</td>
</tr>
<tr>
<td>Software</td>
<td>- Intelligent applications</td>
</tr>
<tr>
<td></td>
<td>- No code application development</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>- Increased demand for semis e.g. GPUs/CPUs</td>
</tr>
</tbody>
</table>

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Impact of Generative AI on industries

**Enterprise Software/SaaS**

**Near Term**
- Research and first draft content creation
- Enterprise search
- Cyber security threat detection

**Long Term**
- Intelligent applications
- No-code application development
- Virtual humans for customer care
- Predictive cyber security

**Healthcare**

**Near Term**
- Clinical documentation summarization
- Drug development (protein folding)
- Mental health via chatbots

**Long Term**
- Drug discovery (molecule development)
- Personalized healthcare and medicine
- Predictive patient data
- Automation of triaging (resource mgmt.)

**Financial Services**

**Near Term**
- Personalize consumer experience
- Improved compliance
- Targeted customer acquisition

**Long Term**
- Enhanced risk management
- Reduced need for human capital customer service agents, loan officers
- Dynamic forecasting and reporting

**Media and Consumer Internet**

**Near Term**
- Contextual search (shift to ChatGPT)
- Reduced resources for content creation
- Lower entry barriers for new platforms

**Long Term**
- Personalized and user generated content and asset creation
- Reduce cost for large scale creations
- Real-time and interactive content

**Sustainability (Agtech, ClimateTech)**

**Near Term**
- Democratize crop disease diagnosis
- Yield prediction
- Custom insights from carbon accounting

**Long Term**
- Digital transformation of rural belts
- Agri demand and consumption prediction
- Optimize mobility for reduced carbon footprint

**eCommerce, Supply Chain and Infrastructure**

**Near Term**
- Personalized shopping assistants
- Improved queries and order tracking
- Productivity boost for freight forwarders

**Long Term**
- Deeper individualization
- Improved loss prevention
- Real-time inventory management
- Rapid prototyping of large infra projects

Source: Schroders Capital. The forward looking views shared are based on assumptions within the bounds of what we currently know. There is no guarantee these views will materialize.
What does AI think of itself?

Artificial Intelligence (AI) has the potential to transform the field of education in many ways, including how teachers interact with students and how they manage their workload. While there is no doubt that AI will have an impact on the teaching profession, it is important to note that it is unlikely to completely replace teachers. Instead, AI will likely be used to support and enhance the work of teachers in a number of ways, such as:

- **Personalized Learning**: AI can be used to create personalized learning experiences for students, based on their individual needs and learning styles. This can help teachers to better meet the needs of each student in their classroom.

- **Grading and Assessment**: AI can be used to grade assignments and assessments, freeing up teachers’ time to focus on other aspects of their job, such as lesson planning and student engagement.

- **Administrative Tasks**: AI can be used to automate administrative tasks, such as attendance tracking and grading, allowing teachers to focus on teaching and interacting with their students.

- **Curriculum Development**: AI can be used to develop and refine curriculum materials, ensuring that they are up-to-date and aligned with the latest educational standards.

Overall, while AI will likely have an impact on the teaching profession, it is unlikely to completely replace teachers. Instead, it will be used to support and enhance their work, allowing them to focus on the aspects of their job that require human interaction and expertise.

Source: OpenAI, Schroders Capital. The forward looking views shared are based on assumptions within the bounds of what we currently know. There is no guarantee these views will materialize.
Key takeaways and next steps

- AI is not a fad and is here to stay

- AI use is accelerating, driven by: 1) new models, 2) better computing, 3) more data, 4) deployment at the edge

- AI is impacting all industries

- Value creation will occur across the AI tech stack – although still too early to tell and hard to come to a consensus...

- Please join us for future AI webinar sessions in the coming weeks / months with deeper dive on specific topics

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## Risk considerations

<table>
<thead>
<tr>
<th>Risk Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital loss risk</td>
<td>The value of investments and the income from them may go down as well as up and investors may not get back the amounts originally invested.</td>
</tr>
<tr>
<td>Market risk</td>
<td>Market risk is the risk of investment losses due to negative effects of the capital markets on the overall performance of the fund.</td>
</tr>
<tr>
<td>Credit risk</td>
<td>The fund will have an investor commitment/draw-down funding model which exposes the investment vehicle to the credit risk of its investors. If an investor fails to comply with a drawdown notice, the investment vehicle may be unable to pay its obligations when due.</td>
</tr>
<tr>
<td>Liquidity risk</td>
<td>Given the illiquid nature of private equity investments, investing in private equity are subject to asset liquidity risk. This liquidity risk is a result of the likelihood that a loss from current net asset value would be realised if an asset in the fund needed to be sold quickly in the secondary market to meet the obligations of the fund.</td>
</tr>
<tr>
<td>Currency risk</td>
<td>Investments in companies or instruments which are denominated in currencies other than the fund’s respective currency expose the fund to the risk of losses in case foreign currencies depreciate.</td>
</tr>
<tr>
<td>Counterparty risk</td>
<td>The target investments may utilise derivative instruments for currency hedging purposes, which expose the fund to the risk of a counterparty defaulting.</td>
</tr>
<tr>
<td>Operational risk</td>
<td>Operational risks are risks of loss resulting from inadequate or failed internal processes, people and systems, or from external events conducted by Schroders Capital and the managers the fund will invest alongside.</td>
</tr>
</tbody>
</table>

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Important Information (1/2)

Performance

Net IRR – The net annualized internal rates of return are calculated based on an effective compounded rate of return achieving Limited Partner daily cash flows and quarterly capital values, presented net of all management and performance fees and other fund expenses. Fund IRRs are calculated from the first capital call in that fund through the date shown.

Gross IRR – Represents the annualized internal rates of return calculated using daily cash flows from the funds managed by Schroders Capital to and from the various partnerships in which the Schroders Capital funds invested during the period specified, after the fees, expenses, and carried interest of the underlying partnership investments, but before the fees, expenses, and carried interest charged the Schroders Capital funds.