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elif operation == "MIRROR_Z":
    mirror_mod.use_x = False
    mirror_mod.use_y = True
    mirror_mod.use_z = False
elif operation == "MIRROR_Z":
    mirror_mod.use_x = False
    mirror_mod.use_y = False
    mirror_mod.use_z = True
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MEGATRENDS

UNLOCK TOMORROW'S
GROWTH OPPORTUNITY



Megatrends: unlock tomorrow's growth opportunity

More and more, we are seeing that people want to form a direct connection with their investments, such that they can believe strongly in their future potential for success. While the invention of the crystal ball hasn't yet occurred, we do see so-called 'Megatrends' gaining greater and greater traction. The benefit is that a megatrend is really just a story at its core, and people have a long history of connecting with stories. Look back at history for a moment:

+ Steam engines, internal combustion engines, and then trains, cars, planes and ships could be said to have been a part of a **Transportation Megatrend**. We cannot go back in time and invest in the early stages of these things, but few would debate the economic benefits that have transpired.

+ If someone asked you the invention that potentially influenced the most lives, globally, throughout history 'Antiseptic' is a great answer. Soap, antibiotics, and vaccinations are also great answers, and, taken together along with other things, we could see the history of somewhat of a **Healthcare Megatrend**.

We all want to build a time machine, knowing what we know today, and go back and find ways to invest in the early iterations of many of these things that have dramatically influenced how we live our lives as a human race on earth today. Although we cannot yet go back in time, the reason that today's megatrends are exciting is that they allow investors to connect with the stories of greatest potential economic impact for tomorrow.

While it is very difficult to know exactly which megatrends will make the best investments ahead of time, it is far simpler to understand that the evolution of human progress has been defined by massive innovations that have, simply put, revolutionised how we do certain things. At WisdomTree, we believe that megatrends are important pieces to build into portfolio allocations. Thus far, our family of megatrend strategies includes:

+ A strategy focused on **Artificial Intelligence** and those companies pushing this field forward for customers.

+ A strategy focused on **Cloud Computing**, since that is how software of the future seems likely to be delivered.

+ A strategy focused on **Battery Technology**, since people are considering strategies for less carbon emissions within our energy consumption.

+ A strategy focused on **Cybersecurity**, to safeguard the integrity of the systems we all use and depend on.

We bring together expert partnerships to build unique, innovative approaches that give investors the potential to access these megatrends as well as provide clarity regarding their development for those seeking a deeper understanding.

Artificial Intelligence:

A transformative and exciting megatrend

People today are creating more data than ever before. Emails, instant messages, credit card purchases — even locations visited are collected and stored. For anyone to make sense of things at this scale, with individual datapoints in the billions of records, a new toolkit is required. That toolkit is **Artificial Intelligence (AI)**.

Now, humans have been inventing ground-breaking technologies for hundreds, if not thousands of years. Harnessing the power of fire is likely one of the earliest examples. In more modern history, it's technologies such as steam engines, railways, Internal Combustion Engines, electricity, computers and the Internet.

Will AI have an impact that is on par or perhaps greater than any of these? With the passage of time, it is becoming clearer that AI will be important, but the nature of disruptive innovation is that breakthroughs and unexpected use cases can be developed that can create exponential increases in economic value.

AI has been discussed since the fifties, so why hasn't it become a "megatrend" sooner? For AI to be used in more mainstream applications, three distinct capabilities needed to evolve:

+ Computer Storage or Memory: In the late 1950's, the price for one megabyte of storage was nearly \$10,000. Today, the price of that same amount is one one-thousandth of one cent;

+ Average Transistor Prices: Let's assume that a transistor cost roughly \$100 around 1970. In today's terms, a transistor would cost roughly one ten-thousandth of one cent;

+ Internet Connection Speeds: Transferring data over the internet used to be quite taxing, with one megabit taking substantial time to make its way to its destination in the 1980's and 1990's. Now people don't think twice about downloading files multiple gigabytes in size, all within minutes.

The fact that we can now store, process and transfer very large amounts of data lead to AI's potential to influence society on the scale of a megatrend.



Importance of the AI Value Chain

Unfortunately, even if one is excited about AI's potential, it isn't easy to make an investment directly in AI. We think that understanding the value chain of AI is helpful. Put simply:

- + There are companies that write software that can "learn", meaning that it ultimately can perform functions that the initial programmers didn't directly encode. Image recognition and natural language processing are two big examples of this. We call this group of companies "Engagers".
- + There are companies that design computer chips in ways that allow them to train AI algorithms more efficiently - AI without processing power is like a car without fuel. We call this group of companies "Enablers".
- + There are giant, widely recognised firms making massive investments in AI's future capabilities. Importantly, these are usually widely diversified business doing more than AI-related work. We call this group of companies "Enhancers".

Battery Technology:

the megatrend to power the future

Countries, companies and citizens are thinking more and more about the environmental impact of different policies, and a core tenet of that has been a focus on lowering carbon emissions. For years, debate has raged about how humans have impacted both the composition of earth's atmosphere as well as what this has meant in terms of changing global temperatures.

Ultimately, improving battery technologies represents an opportunity that can completely change the toolkit that we use to influence this issue in the coming decades. This is happening across a number of fronts.

+ Power Generation: Pressurized steam spinning a turbine represents a common way in which electricity is generated, so the critical question regards creating the heat to supply the steam. Coal is one way that has been very popular, as has natural gas. While there are differences, both of these approaches do put carbon into the atmosphere. Nuclear power is a different way, but in many countries, it is politically charged. Wind, solar and waterpower are certainly very interesting, but they don't necessarily have a constant supply. If battery storage technologies could be improved, it would be easier to take the power generating on a windy day, for example, and then deploy that more evenly if the wind dies down.

+ Mobility: The internal combustion engine, which typically burns diesel, natural gas or conventional gasoline, created a revolution in human mobility. However, these engines do put carbon into the atmosphere in varying amounts. Improving battery technologies could better hold the energy required to power this mobility without the carbon emissions.

+ Convenience: In the so-called 'app-economy' we have people seeking to be constantly connected for communication, information, business or entertainment purposes. Laptops, smart phones, tablets—these are only a small portion of the portable array of electric devices used by ever increasing numbers. There is always an interest in saving weight, saving time on charging, or lasting longer when thinking of batteries within these devices.

WisdomTree has capitalised on its long history of being a market leader in commodities and partnered with Wood MacKenzie on the development of an equity strategy to access innovations in battery technology. While in the past, investors had to select specific raw materials, like Nickel, through which they would gain exposure to future battery demand, now there is a new option where investors can see a diversified array of companies existing across the value chain that supports innovations in battery solutions. The strategy is also allocated to companies pursuing that next widespread technology, even though we may not know much about its commercial potential for years to come.





Cloud Computing

The disruptive “shift to cloud” for the long-term investor

The cloud computing space has been generating massive amounts of attention. From a growth perspective, this makes sense¹:

+ Overall Size of Market: The public cloud services market is expected to total more than \$214 billion when the figures for 2019 are finalised.

+ Growth of Market: The Infrastructure-as-a-Service (IaaS) segment of cloud is expected to have grown nearly 30% during 2019. If you haven't heard of “IaaS”, just think of “Amazon Web Services” or “Microsoft Azure”, some of the biggest players in IaaS. In 2019, the US Department of Defence even entered into a \$10 billion contract with Microsoft Azure to move to the cloud, offering yet another proof point on the perceived convenience and security of using cloud-based infrastructure².

Software is eating the world (and cloud is eating software)

In August of 2011, Marc Andreessen, a prominent Silicon Valley venture capitalist, wrote the phrase “software is eating the world” within a Wall Street Journal article³. Even then, now more than eight years ago, the case was clear that companies in Silicon Valley were relying less and less on delivering a physical “product” and more and more on delivering some type of software over the internet.

A particular trend that we find exciting regards large, established companies changing their business models and shifting to the cloud. In fact, we'd challenge anyone reading this article to think of a software company today that doesn't use a cloud-based delivery model. There are important benefits for the customer and the software company.

+ The customer doesn't pay as large an up-front cost and instead can choose to subscribe to software that will be used over time. Sometimes, payments can even be tied to usage.

+ The software company receives more regular revenue streams based on subscriptions instead of needing to convince customers to continually buy new versions of products.

Here are two large companies that have touched and continue to touch the lives of millions of consumers that have transitioned to cloud-based delivery models.

Adobe

The software company, that achieved great success with their PDF file viewing format, began to shift its strategy to Cloud in 2009. The company took a risk after a series of acquisitions, launching its Creative Cloud software in 2012, where customers would pay monthly to have access to the platform. By May of 2013, Adobe's cloud software had more than 700,000 paid subscribers, massively outperforming the company's expectations⁴.

Microsoft

I remember the excitement around the release of Windows '95, when you would come home with some disks and instruction manuals to hopefully install the software. Microsoft was in a tough position at this time, needing to convince customers to continually upgrade every few years to ensure the software would continue to work for their needs. Today, many laptops don't have built-in disk drives, and subscribers to Microsoft's Office 365 receive automatic updates and troubleshooting.

When customers get better services and businesses stabilise their revenues, the cloud clearly represents the future of software delivery and we believe investors may want to make the “shift to cloud” in their portfolios as cloud companies may be an avenue for more specific exposure to technology with a different set of growth prospects going into the next decade.

¹ Source: For both bullets, “Gartner Forecasts Worldwide Public Cloud Revenue to Grow 17.5% in 2019.” Gartner Press Release. 2 April 2019.

² Source: Lardinois, Frederic. “In a Victory over Amazon Microsoft wins \$10 billion JEDI Cloud Contract.” TechCrunch. 26 October 2019.

³ Source: Andreessen, Marc. “Why Software is Eating the World.” Wall Street Journal. 20 August 2011.

⁴ Source: Gupta, Sunil and Lauren Barley. “Reinventing Adobe.” Harvard Business School. 20 January 2015.

Cybersecurity

Data is the new oil,
and it must be secured

The phrase "Data is the new oil" has grown in prominence during recent years. It is no accident that some of the world's largest companies by market capitalisation use data collection and processing that lead to insights and monetisation on a scale that has never been seen before.

+ Data breaches have become high profile events: A 2018 data breach, as a result of a cyber attack, at British Airways led to the exposure of payment card information for 380,000 customers and personal records exposure of 185,000 people. In October 2020, the UK Information Commissioner's Office ("ICO") fined British Airways £20 million¹. A 2018 data breach at Marriott International led to the exposure of information on 383 million people worldwide. Marriott was recently fined by the ICO in the UK £18.4 million². Clearly, companies would benefit from improving efforts in cybersecurity, and spending is forecast to grow about 9% a year from 2021 to 2024, when it is projected to hit \$207 billion³.

+ Governments are waking up to privacy and data concerns: Similar to how company data breaches are becoming high profile events, governments are beginning to more aggressively legislate and enforce privacy regulations. In December 2020, the French regulator CNIL fined Google a record \$120.8 million for allegedly storing high volumes of advertising-related identifiers on the computers of consumers before asking for consent and without sufficiently explaining how these cookies were used⁴.

+ Other megatrends require cybersecurity: Cloud Computing received a lot of attention because it represents a type of software infrastructure that allows for a large degree of flexibility as well as instant economies of scale. It is estimated that more than 80% of all enterprise software will be cloud-based by 2030. Artificial Intelligence received a lot of attention because it represents the toolkit that can be used draw inferences from the massive amounts of data being collected. The Internet-of-Things, which can be defined as a massive network of devices collecting data and connected to the web, is growing at such a rate that it is possible that more than 1 trillion such devices will exist by 2035⁵.

^{1,2} The Information Commissioner's Office ico.org.uk

³ Cherney, Mike. "Can Businesses Keep Up with New Cyber Threats." Wall Street Journal. 6 October 2020.

⁴ Source: Schechner, Sam. "Google, Amazon Fined \$163 Million as France Takes Hard Line on Privacy." Wall Street Journal. 10 December 2020.

⁵ Source: "Drastic Falls in Cost are Powering Another Computer Revolution." Economist. 12 September 2019.

7 Cybersecurity development themes

As is often the case in thematic strategies, the details as to how the companies are selected and grouped is of paramount importance. 'Cybersecurity' and 'digital privacy' are extremely broad terms covering many different activities. Team8, WisdomTree's expert partner on the cybersecurity theme, has brought some order to the space by defining 7 specific themes. Instead of simply defining a 'cybersecurity' company, Team8 can instead classify the focal points that different firms in the cybersecurity space are taking in their efforts to secure systems and data.

1. Privacy and Digital Trust
2. Cloud Security
3. Shift-Left
4. Perimeterless World
5. Security of Things
6. Resilience & Recovery
7. Smarter Security

Cybersecurity represents a powerful megatrend over the coming decades

If it is true that data is only increasing in importance for our global society, protecting that data will become ever more important. Actors with ill intent never rest and are constantly evolving, so consumers, firms and governments will need to constantly invest time, energy, effort, and money into cybersecurity to stay ahead of the game. An expert-led approach to this theme will help investors sift through to find the most important activities in cybersecurity as well as the companies that are best positioned to capitalise on this growth.

To find out more about our family of Megatrend strategies, visit wisdomtree.com

WisdomTree Artificial Intelligence UCITS ETF – USD Acc

Ticker	Exchange	ISIN	Bloomberg Code	Listing Currency	Base Currency	TER %
WTAI	LSE	IE00BDVPNG13	WTAI LN	USD	USD	0.40%
WTAI	LSE	IE00BDVPNG13	INTL LN	GBx	USD	0.40%
WTAI	Borsa Italiana	IE00BDVPNG13	WTAI IM	EUR	USD	0.40%
WTI2	Xetra	IE00BDVPNG13	WTI2 GY	EUR	USD	0.40%
WTAI	SIX	IE00BDVPNG13	WTAI SW	USD	USD	0.40%

WisdomTree Cloud Computing UCITS ETF - USD Acc

Ticker	Exchange	ISIN	Bloomberg Code	Listing Currency	Base Currency	TER %
WCLD	LSE	IE00BJGWQN72	WCLD LN	USD	USD	0.40%
KLWD	LSE	IE00BJGWQN72	KLWD LN	GBx	USD	0.40%
WCLD	Borsa Italiana	IE00BJGWQN72	WCLD IM	EUR	USD	0.40%
WTEJ	Xetra	IE00BJGWQN72	WTEJ GY	EUR	USD	0.40%
WCLD	SIX	IE00BJGWQN72	WCLD SW	USD	USD	0.40%

WisdomTree Battery Solutions UCITS ETF – USD Acc

Ticker	Exchange	ISIN	Bloomberg Code	Listing Currency	Base Currency	TER %
VOLT	LSE	IE00BKLF1R75	VOLT LN	USD	USD	0.40%
CHRG	LSE	IE00BKLF1R75	CHRG LN	GBx	USD	0.40%
VOLT	Borsa Italiana	IE00BKLF1R75	VOLT IM	EUR	USD	0.40%
W1TA	Xetra	IE00BKLF1R75	W1TA GY	EUR	USD	0.40%
VOLT	SIX	IE00BKLF1R75	VOLT SW	USD	USD	0.40%

WisdomTree Cybersecurity UCITS ETF – USD Acc

Ticker	Exchange	ISIN	Bloomberg Code	Listing Currency	Base Currency	TER %
WCBR	LSE	IE00BLPK3577	WCBR LN	USD	USD	0.45%
CYSE	LSE	IE00BLPK3577	CYSE LN	GBx	USD	0.45%
WCBR	Borsa Italiana	IE00BLPK3577	WCBR IM	EUR	USD	0.45%
W1TB	Xetra	IE00BLPK3577	W1TB GY	EUR	USD	0.45%
WCBR	SIX	IE00BLPK3577	WCBR SW	USD	USD	0.45%

TER = Total Expense Ratio.

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