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Tematys
Exploration of photonics markets

AI desperately needs photonics

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AI desperately needs photonics

Why photonics can enable the dramatic increase in computing capacity required for AI, while significantly reducing energy consumption

Exploration of photonics markets

Contents

1. Takeaways

Artificial Intelligence (AI) revolutionises numerous industries, from healthcare and finance to telecommunications and autonomous vehicles[1]. As AI models grow larger and more sophisticated, the computational demands for training and inference escalate exponentially. Traditional electronic hardware, including CPUs and GPUs, faces fundamental limitations in speed, energy efficiency, and scalability (see section 2). Photonics—the science and technology of manipulating light—emerges as a compelling alternative. By leveraging the intrinsic properties of photons - such as high speed and parallelism – photonics offers a pathway to accelerate AI computations while drastically reducing energy consumption. Recent advancements in optical devices, integrated photonic circuits, and hybrid systems position photonics as a transformative enabler for the next generation of AI hardware.

Key takeaways of the current report:

- The size of AI models is growing exponentially
- But the number of large AI models also increases exponentially.
- The expected consequences are:
  - a dramatic increase in electricity consumption
  - a dramatic rise in Internet traffic.
- Even following Moore's law, electronics is struggling to provide sufficiently fast, energy-efficient processors.
- Photonics is the only alternative that can provide speed, security, and low latency while using much less energy.
- Photonics is currently the core technology of telecom infrastructure. And new investments will be needed to cope with AI-generated traffic demand.
- New upcoming technologies:
  - Co-packaged optics (photonics) allows for connecting optical fibres directly to the chip, which is already a breakthrough in terms of speed and consumption. Interconnect technologies based on co-packaged optics will become available in 2025.
  - Processors used for AI data centres need to perform massively parallel computing. Some photonic processors, in which photons rather than electrons circulate, are especially well suited for this type of calculation. In the near future, photonic processors will replace current microelectronic processors, making AI more sustainable.
- American and Asian players dominate the data centre equipment market.
- But Europe has maintained its know-how thanks to advanced research, and European start-ups could be part of the game, especially in developing photonic processors.
- But they will only succeed if they can raise enough funds in Europe, since this business is essentially capital-intensive.

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[1] https://www.oecd.org/en/publications/the-impact-of-artificial-intelligence-on-productivity-distribution-and-growth_8d900037-en.html

2. Glossary

- GPU: Graphics Processing Unit;
- TPU: Tensor Processing Unit;
- CPU: Central Processing Unit;
- AI: Artificial Intelligence;
- IEA: International Energy Agency;
- CSP: Communication Service Providers (telecom operators);
- CXL: Compute Express Link;
- CPO: Co-Package Optics;
- FLOP: Floating Point Operations Per Second.

3. Context and the issues at stake

3.1 The surge in AI has led to a sharp increase in demand for advanced computational capabilities.

Artificial Intelligence (AI) revolutionises numerous industries, from healthcare and finance to telecommunications and autonomous vehicles. As AI models grow larger and more sophisticated, the computational demands for training and inference escalate exponentially. Traditional electronic hardware, including CPUs and GPUs, faces fundamental bottlenecks in speed, energy efficiency, and scalability.

Figure 1 shows the computing power required to train the largest AI models. It doubles approximately every six months.

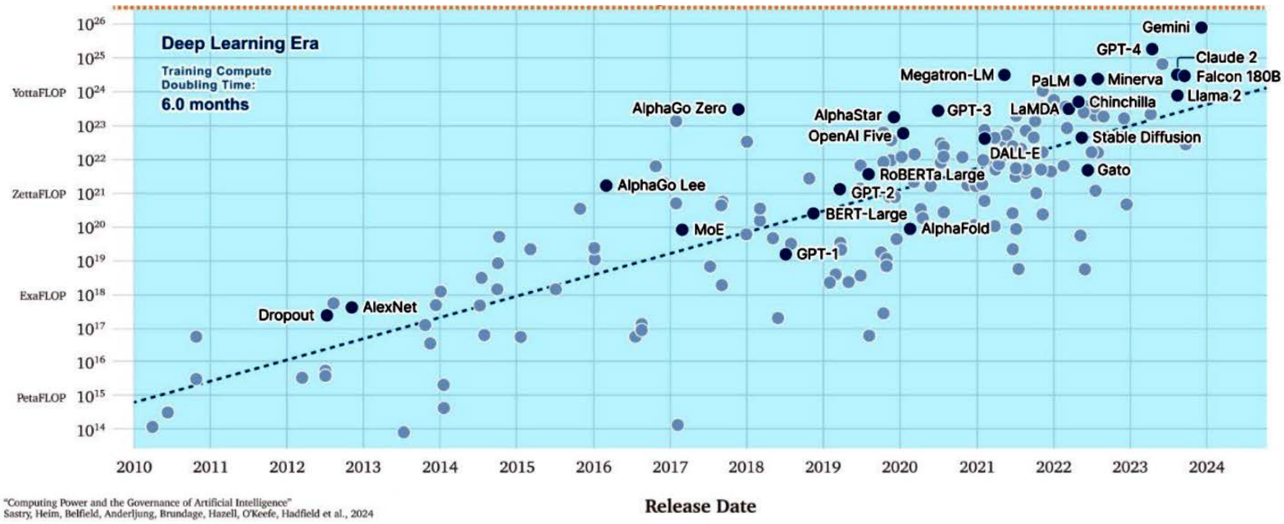


Figure 1: According to Sastry et al., since 2010, the amount of compute used to train the largest AI models has been growing rapidly, with a doubling time of approximately 6 months. This shift signifies that the most general and capable models of today tend to be trained with the most compute.[2]

But the need for computing capacity is increasing further, as models require more computing power and the number of models is exploding with the creation of numerous start-ups worldwide. The blog epoch.ai[3] publishes statistics on AI and estimates that more than 80 new models, each requiring 1024 FLOPs or more, will be launched in 2025. According to their estimate, the annual number of new major models should increase to more than 440 models/y/year in 2030 (Figure 2).

This dramatic explosion of computing demand sets two major challenges:

- Up to now, the processing capacity of hardware, following Moore's law, has grown faster than computing demand, but that is no longer the case. Microelectronics reaches its limits (section 3.2).
- Processing tremendous amounts of data requires substantial energy. Here, too, microelectronics reaches its limit, and there is a critical need for more efficient processors (section 3.3).

[2] "Computing Power and the Governance of Artificial Intelligence", Sastry, Heim, Belfield et al. https://doi.org/10.48550/arXiv.2402.08797, 2024

[3] https://epoch.ai/blog/model-counts-compute-thresholds

In this context, Photonics is already providing solutions to minimise data centre energy consumption (section 4). **But in the future, photonic solutions will be the only option for addressing these two major challenges, which require implementation to be carried out very quickly (sections 5 & 6)**.

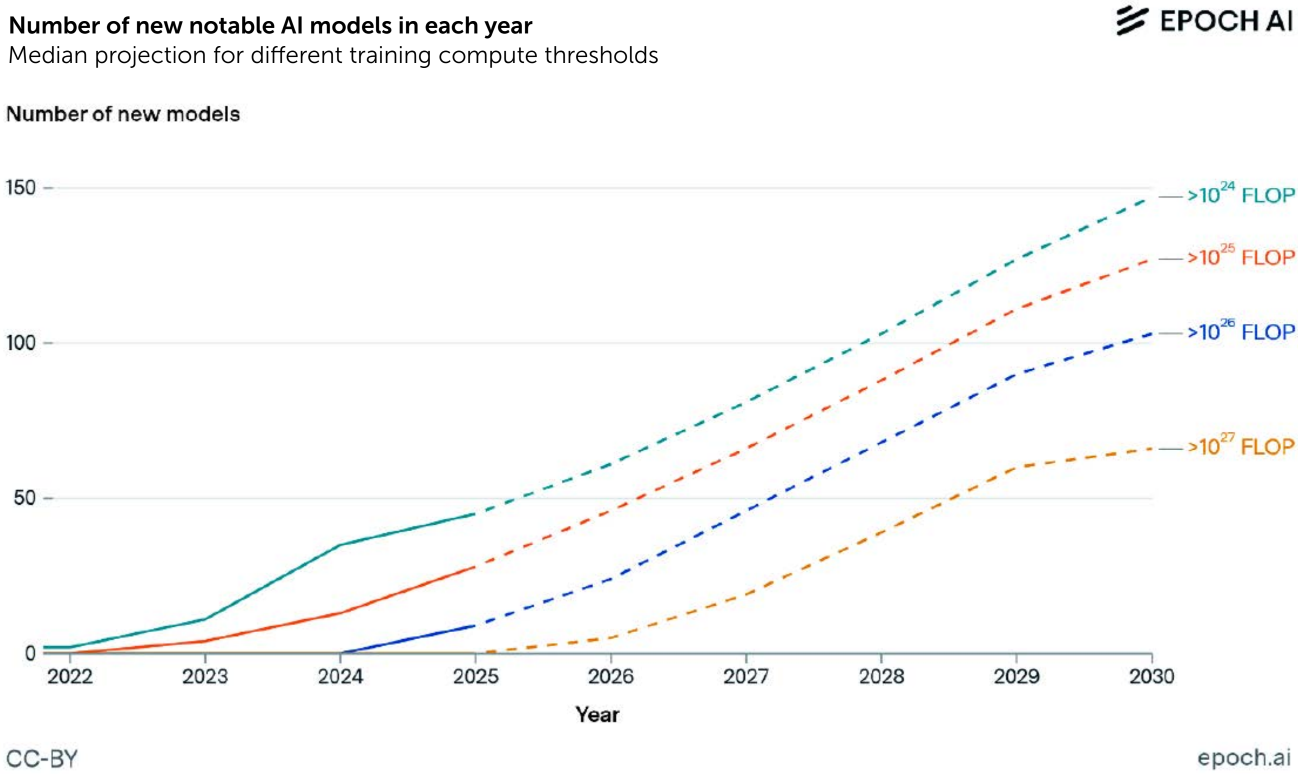
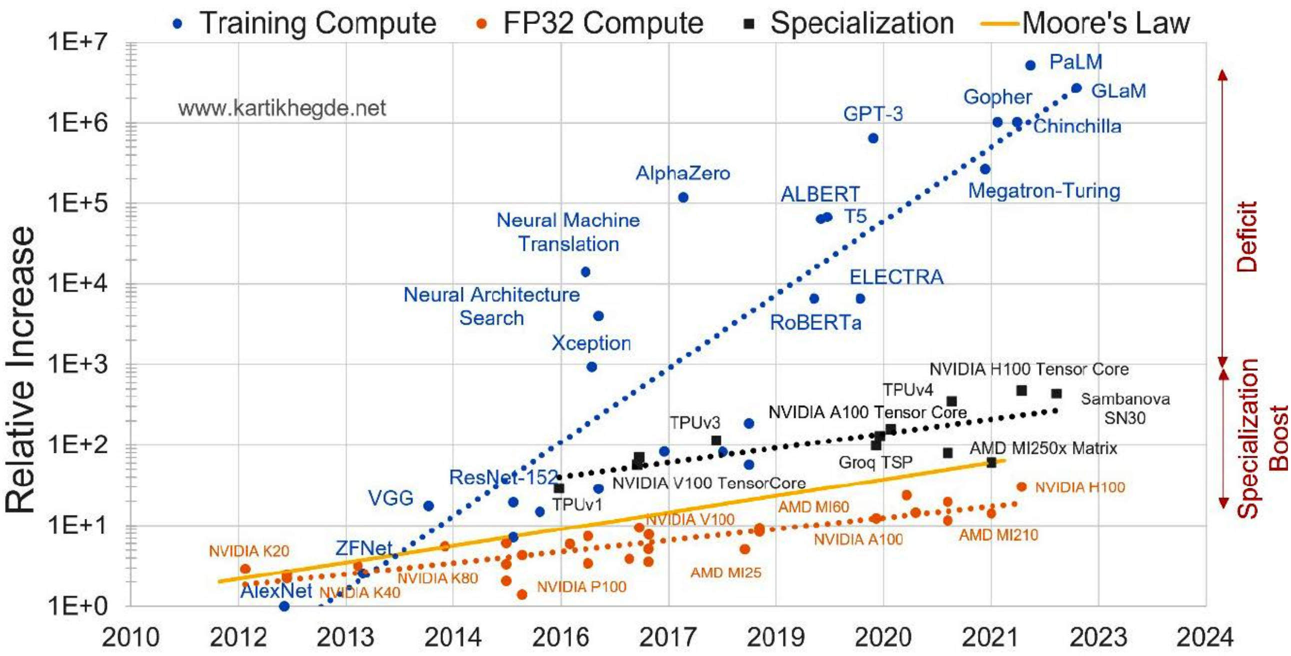


Figure 2: Number of new notable AI models in each year[3]. According to this estimate, the number of new major models per year should increase to more than 440 models/year in 2030.

3.2 Microelectronics reaches its limits.

Although AI has only recently captured mainstream attention, the underlying research has been developing for decades. It is the combination of large-scale data centres and new algorithms that has enabled today's breakthrough performance. During this time, the compute capacity required by AI models grew exponentially. But for a long time, it was small enough to go unnoticed, except by experts, and compensated for by the installation of numerous data centres. It is not the case anymore.

AI algorithms are based on massive parallel computing. That is why engineers first took advantage of the Graphics Processing Unit (GPU), initially designed for 3D image and video processing, which also requires massive parallel, real-time computing. This is how NVIDIA, one of the GPU leaders, came into the AI business. But Figure 3 shows that GPU computing capacity increased slightly slower than Moore's law, while the compute requirements of AI models were skyrocketing.



Data collected by Kartik Hedge (kvhedge2@illinos.edu). Training FLOPS for transformers is based on Narayanan et al. "Efficient large-scale language model training on gpu clusters using megatron-lm". In SC'22, for others it is calculated as FLOPS/forward pass* #dataset * #epochs * 3.

Figure 3: The orange dots show the processing capacity of Graphic Processing Units (GPUs) vs their year of release. Their computing capacity increased slightly slower than Moore's law (yellow line). Meanwhile, the compute requirement of AI models was skyrocketing (blue dots). Since 2016, Tensor Processing Units (TPUs) have been developed (indicated by grey dots). They were fully optimised for the type of calculation used for training and operating AI. But if they are a significant step in terms of efficiency, their compute capacity has also grown with Moore's law, which is not enough to keep pace with the tremendous pace of AI computing.
Source: Data processed by K. Hegde[4] based on data from Narayan et al.[5]

To address the growing capacity gap, Tensor Processing Units (TPUs) were developed and released in 2016. Compared to GPUs, they are processors even more optimised for the type of calculation used for training and operating AI. It was a significant step in terms of efficiency (Figure 3), but their compute capacity has also grown with Moore's law.

In other words, current hardware processors can't cope with this dramatic new demand. Currently, it is only compensated for by the installation of more and more data centres. But more data centres mean more energy.

3.3 More data centres mean much more energy

Concern about the energy consumption of data centres predated the surge in AI. It's enough to imagine a huge room full of several hundred thousand servers, each one heating like a personal computer. But what counts is the compute needed to perform a task, and estimates say it costs about 30 times as much energy to generate text as to extract it from a source simply.[6] In another example, in a presentation in May 2025, Michael Förtsch, CEO of Q.ANT GmbH, said that generating an image by AI required the same amount of energy as fully charging a smartphone battery[7].

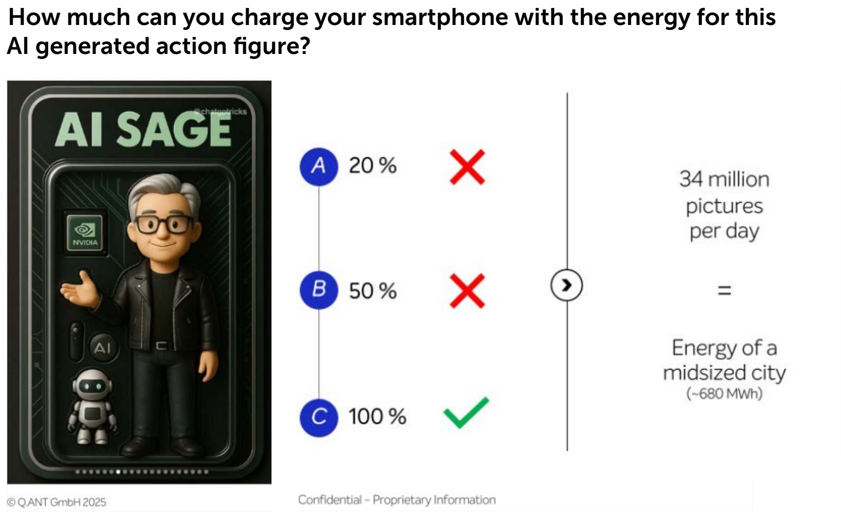
[4] Accelerating Deep Learning in the Post-Moore's Law World", Kartik Hegde, Kartik's Musings blog, https://kartikhegde.substack.com/p/accelerating-deep-learning-in-the

[5] "Efficient Large-Scale Language Model Training on GPU Clusters Using Megatron-LM", Narayanan et al., Aug. 2021, https://doi.org/10.48550/arXiv.2104.04473

[6] https://www.scientificamerican.com/article/what-do-googles-ai-answers-cost-the-environment/

[7] Presentation by Q.ANT at the Photonics Partnership Annual Meeting 2025 www.photonics21.org/news/2025/2025-05-22-report-annual-meeting-2025.php, courtesy of Q.ANT

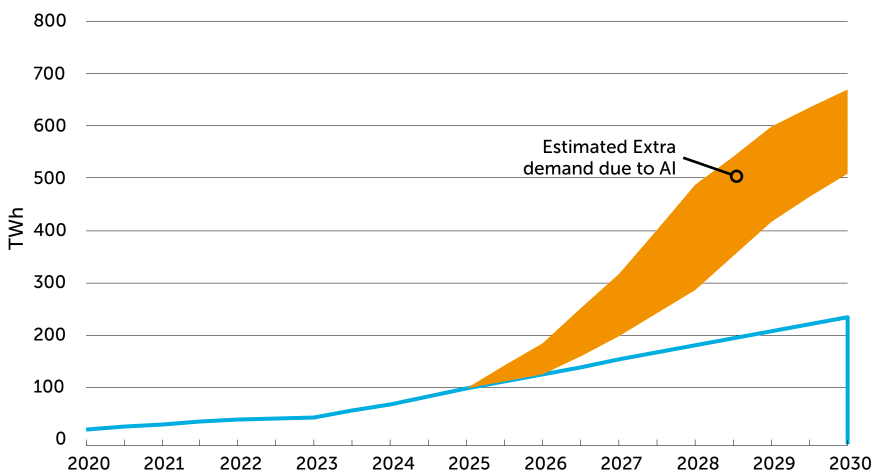
Figure 4: Generating an image by AI required the same amount of energy as fully charging a smartphone battery[7]



According to the International Energy Agency[8], data centre electricity consumption is estimated at around 415 terawatt-hours (TWh), or about 1.5% of global electricity consumption in 2024. It has grown at 12% per year over the last five years. In the study on "Energy and AI", IEA analysts have set projections of energy consumption for 2035 spanning 700 TWh to 1,720 TWh across the four elaborated growth scenarios. On the other hand, it is most probable that data centre energy consumption will more than double from 2024 to 2030.

The same study[8] showed that this dramatic increase is mainly due to the explosion of AI (Figure 5). And between now and 2030, renewables could meet nearly half of the rise in global data centre electricity demand, and around 40% of the renewable mix would be solar (i.e., photovoltaic) energy.

Figure 5: Estimated extra electricity demand in data centres due to AI, 2020-2030. The blue curve is a forecast elaborated before the surge of Large LLM models. The orange area is a combination of various more recent forecasts (2024, from Deloitte, Gartner, Goldman Sachs, Schneider Electric, SemiAnalysis, and Shehabi, et al.) taking into account the demand coming from these models.
Sources: IEA[8] processed by TEMATYS.



[8] "Energy and AI", World Energy Outlook Special Report, IEA, April 2025.

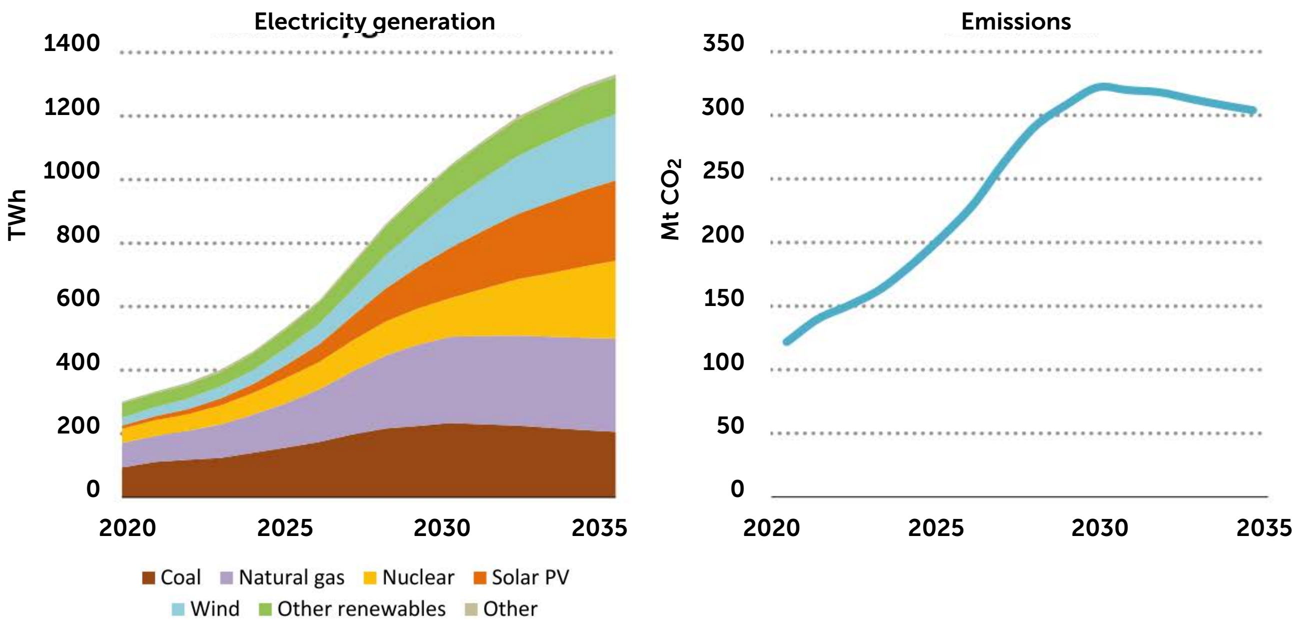


Figure 6: Global electricity generation for data centres and the associated CO_2 emissions in the Base Case, 2020-2035, i.e. the most probable scenario according to IEA[8]. Between now and 2030, renewables will meet nearly half of the increase in global data centre electricity demand, and around 40% of the renewable mix will be solar (i.e., photovoltaic) energy.

3.4 The photonics alternative as the only option

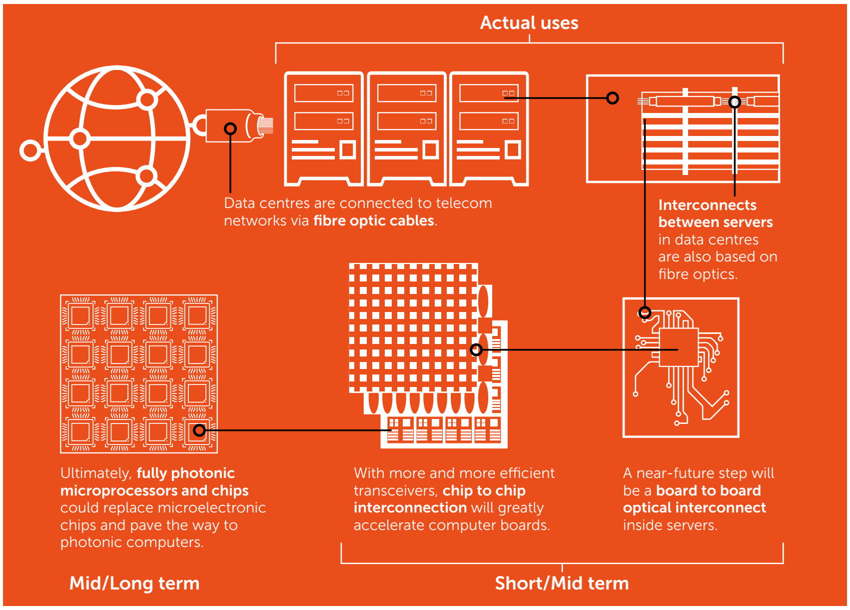
Given the scale of the challenges, it is critical to provide realistic solutions. Photonics—the science and technology of manipulating light—emerges as a compelling alternative. By leveraging the intrinsic properties of photons — such as high speed and parallelism — photonics offers a pathway to accelerate AI computations while drastically reducing energy consumption.

Today, data centres communicate by fibre optics and servers inside data centres are also connected with photonic cables (**Section 4 'Today, optical cables and telecom components'**). But for tomorrow, fibre optic should be directly connected to the chip in order to reduce latency, increase bit rates and reduce energy consumption (**Section 5 'Tomorrow, Chip To Chip Interconnect'**). And in the future, the TPU processor itself might become fully photonic. For physical reasons, it is not possible to make tiny nanometer-scale transistors with photonic circuits, as in microelectronics. But the architecture of photonic processors is completely different from that of electronic processors. And with many fewer components on the chip, photonic processors can be much faster and much more efficient, needing far less energy (**Section 6 'Short future, photonic processing units or optical computing'**).

4. Today: Optical cables and telecom components

Figure 7 below gives an overview of current and future applications of Photonics technologies in data centres.

Figure 7: Overview of current and future applications of Photonics technologies in data centres. Source: TEMATYS/Photonics21, 2023



Connection to telecom networks

It is so common and obvious that it is easy to forget that today's massive flows of data on the Internet could not exist without fibre optics and photonic devices, which are the core of telecom infrastructure. Data centres are connected to networks to enable remote use of computing resources. Photonic-based telecom equipment is critical in the high-demand context of high-performance computing.

In fact, the surge in AI has put communication service providers (CSPs) under pressure. According to Nokia's forecasts[9], AI traffic will have a significant impact on global network demand, with projections reaching 1,088 EB per month by 2033 at a compound annual growth rate (CAGR) of 24%. In this projection, considered conservative, 33% of traffic would come from AI training and queries. Consequently, CSPs and hyperscale data centre operators will need to make substantial investments in network infrastructure to meet this rapidly growing demand.

Rack-to-rack interconnect

Compared to copper wires, fibre optics is so efficient that even for distances shorter than a meter, it is faster to transform the electronic signal that comes out of a server into light, insert it into a fibre, transfer it through an optical cable, and convert it again into an electric signal to be processed by the receiving node processor. That is why the hundreds of thousands of data centre servers, or nodes, are connected by optical cables.

[9] "Global network traffic report, understanding the growing impact of advancing technologies on future networks", NOKIA, 2024.

An optical cable has one transceiver at each end, which converts electronic signals to light and vice versa, and a fibre-optic cable in between. Transceivers are made of advanced photonic components, including a laser, a photodetector and a modulator.

Figure 8: The hundreds of thousands of data centre servers, or nodes, are connected by optical cables. Credit:kynny/Istock

Memory and storage acceleration

Highly massive parallel computing requires intensive data access and storage operations. Photonics enhances memory and storage by leveraging standard interconnect protocols, such as Compute Express Link (CXL), over optical links. This can significantly accelerate communication between processors and memory/storage subsystems, optimising board architecture, reducing latency, and improving overall system throughput.[10,11] CXL offers particular benefits for large-scale simulation, big data analytics, and machine learning applications, where rapid data access and processing are critical.

10 "An Introduction to the Compute Express Link (CXL) Interconnect", Debendra Das Sharma, Robert Blankenship, Daniel Berger, ACM Computing Surveys, Volume 56, Issue 11, Pages 1 – 37, July 2024, https://doi.org/10.1145/3669900

11 https://www.servermall.com/blog/compute-express-link-cxl-3-0-all-you-need-to-know

5. Tomorrow: Chip to chip interconnect, co-package optics

Despite their huge capacity, the interconnect architecture of current data centres, made of optical cables, will not be able to cope with the increasing demand for higher speed, greater density, lower heat generation, and greater energy efficiency. The Co-Package Optics (CPO) technology platform aims to overcome these challenges by **bringing optics directly into the chipset, i.e., bringing data to the point where it is centrally processed**. This concept is called "optical interconnect".

Semiconductor manufacturers are currently investing heavily to industrialise co-packaged optics and achieve optical interconnects. Several associations[12,13] bring together major manufacturers and users to standardise these technologies and prepare for massive deployment in future data centres.

Figure 9: Interconnect concept released by ICON PHOTONICS. Courtesy of ICON PHOTONICS.

European companies develop components and technologies for optical interconnect. Figure 9 shows the technology developed by the French company ICON PHOTONICS. SCINTIL Photonics develops advanced lasers to miniaturise connections and increase fibre data throughput by a factor of 10. But despite advanced research in Europe, the interconnect market is dominated by American and Asian companies (section 7.2.1).

On March 18, 2025, NVIDIA announced the release of its concept for Co-Packaged Optics Networking Switches, co-developed with TSMC, Coherent, Corning Incorporated, Foxconn, Lumentum, and SENKO[14]. These switches are key building blocks for AI data centres (see section 6). They claim that such silicon photonic technology integrates *"optics innovations with 4x fewer lasers to deliver 3.5x more power efficiency, 63x greater signal integrity, 10x better network resiliency at scale, and 1.3x faster deployment compared with traditional methods"*[14].

12 UCIE EXPRESS https://www.uciexpress.org/board-representatives
13 ADVANCED PHOTONICS COALITION https://www.advanced-photonics.org/
14 https://nvidianews.nvidia.com/news/nvidia-spectrum-x-co-packaged-optics-networking-switches-ai-factories

Companies like AYAR LABS, JABIL, GLOBAL FOUNDRY, and IBM are also developing their own mass-manufacturing interconnect processes[13]. AMD acquired the start-up ENOSEMI in May 2025[15]. From now on, photonic interconnect will progressively become the standard for connecting ultrafast switches and, later, processors in data centre facilities. Currently, photonics and microelectronics are integrated with displays, cameras, and sensors, supported by microelectronic processors, to make devices like smartphones. Tomorrow, these two technologies will be fully merged to accelerate further IT systems while reducing their energy consumption.

But even with these new co-packaged concepts, each technology still plays the same role as before: microelectronics computes, and photonics enables in- and out-of-band interfaces.

[15] https://www.amd.com/en/blogs/2025/amd-acquires-enosemi-to-accelerate-co-packaged-optics-innovation.html

6. Near future: Photonic processing units or optical computing

Co-packaged optics are an important step for next-generation AI data centres. However, both the number of data centres and the scale of AI models are expected to grow rapidly, far outpacing these efficiency gains. NVIDIA's claimed "3.5× greater power efficiency"[14] is valuable, but not enough to counter the steep rise in energy use. Photonic processing will be needed to go further.

For some years, laboratories and companies have been developing fully photonic processors, i.e., processors that do not use electrons but instead use photons[16]. Photonic processing requires far less energy, and photons travel much faster than electrons. For physical reasons, it is not possible to make nanometer-sized photonic transistors. But photonics processors operate very differently and do not require such tiny structures. They are perfectly suited for parallel processing, such as image recognition, switches (Figure 10, Figure 11), and TPU[17].

Currently, GPUs are the only mature technology for advanced AI data centres, but Photonic process units are seen as the next solution, offering both energy efficiency and computational speed. This step is still under research, and many laboratories and companies are working hard to achieve this goal (see sections 7.2 and 7.3).

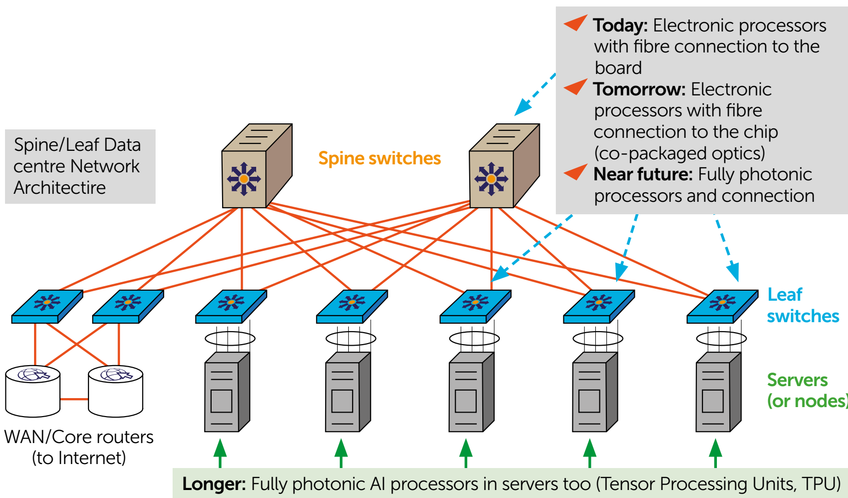


Figure 10: Architecture of a typical AI-dedicated data centre. Servers (or nodes) are connected to two layers of switches, which allow processors in servers to work together for massive parallel computing. Latest switches are made with electronic processors interconnected with co-packaged optics (CPO section 5). But soon, even the switch processor will be fully photonic. In the longer term, the AI processor on servers (TPU) should be fully photonic as well. Source: TEMATYS

For now, the next step toward fully photonic data centres is the development of a fully photonic switch. Figure 10 shows a typical architecture of a data centre. Servers (or nodes) are connected to two layers of switches, which allow processors in servers to work together for massive parallel computing. These switches are critical for speeding up communication between servers and simplifying data centre architecture. Companies like IPRONICS in Spain (Figure 11) or LIGHTMATTERS in the US are developing such a solution.

[16] Ambs, Pierre, "Optical Computing: A 60-Year Adventure, Advances in Optical Technologies", 2010, 372652, 15 pages, 2010. https://doi.org/10.1155/2010/372652
[17] Ananya Palivela, "Photonic Computing Takes a Step Toward Fruition" https://physics.aps.org/articles/v18/84

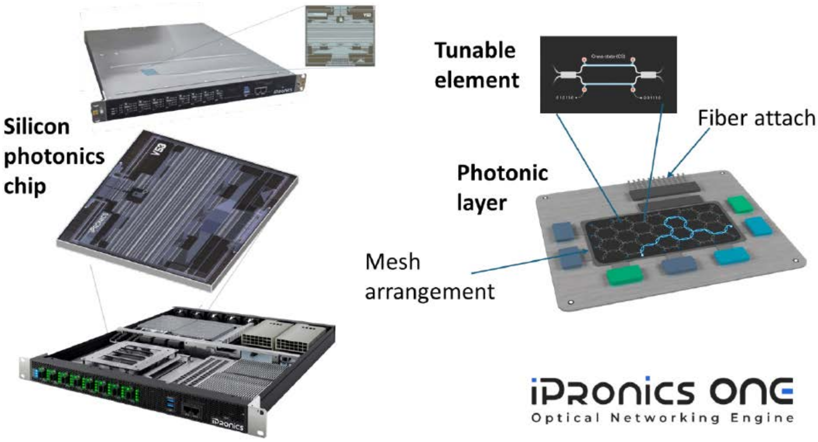


Figure 11: Example of a fully photonic switch for a data centre. Courtesy of IPRONICS.

Achieving a fully photonic processor is the next major milestone. A significant step occurred in December 2024, when MIT researchers demonstrated an integrated photonic chip that performed deep neural network computations entirely in the optical domain.[18,19] Deep neural networks are the building blocks of AI processors, which means that fully photonic data centres are no longer a dream but an expected, more sustainable future.

18 "Photonic processor could enable ultrafast AI computations with extreme energy efficiency", https://news.mit.edu/2024/photonic-processor-could-enable-ultrafast-ai-computations-1202

19 Bandyopadhyay, S., Sludds, A., Krastanov, S. et al. Single-chip photonic deep neural network with forward-only training. Nat. Photon. 18, 1335–1343 (2024). https://doi.org/10.1038/s41566-024-01567-z

7. Stakeholders and market

7.1 Value chain

Figure 10 shows a simplified view of a data centre architecture. The core equipment consists of servers, switches, and numerous optical cables to connect each device. Another critical piece of equipment is the telecom connection, given the high traffic generated by data centres (section 4).

No company can develop servers or switches on its own. This is true for R&D, as well as for the industrialisation and commercialisation phases. That is why NVIDIA highlighted its consortium in its product release announcement[14]. The company needed to gather a wide range of know-how and industrial resources to develop the co-packaged switches. But to push this disruptive product and the new architecture it implies, the company needed to show that it is backed by trustworthy partners (section 5). This example is a perfect illustration of the vital importance of any company or start-up that wants to grow its business in this market being part of an ecosystem that covers the entire value chain. In other words, the search for sovereignty in AI hardware implies covering the whole value chain.

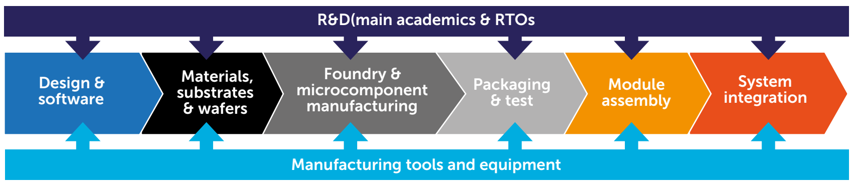


Figure 12: Value chain for the development of advanced microelectronic or photonic equipment. To survive and grow, each player must be part of an ecosystem of partners and demonstrate its ability to scale up production. This statement is true for every industry, but it is especially critical here. Source: TEMATYS

A detailed description of the ecosystem is beyond the scope of this report. The next section lists the providers of the core photonic equipment and technologies for data centres, i.e., Interconnect through Co-packaged optics, photonic switches, and optical computers.

7.2 Landscape

7.2.1 Interconnect and co-packaged optics

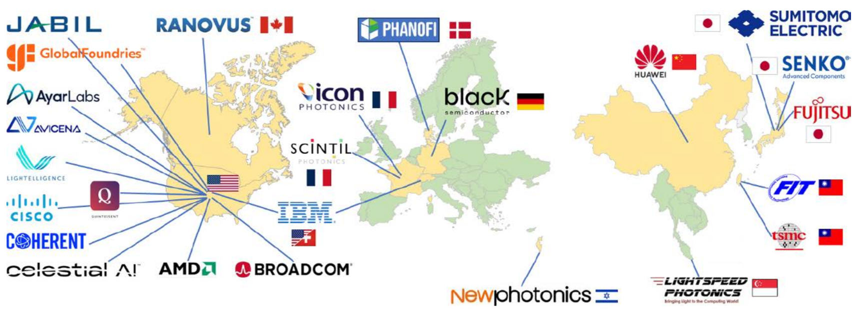


Figure 13: Landscape of main companies which develop co-packaged optics and interconnect technologies for data centres. IBM is an American company, but to our knowledge, the team working on optical interconnects is based in Switzerland. Source: TEMATYS

The real breakthrough for datacom is connecting fibre to processor chips to secure and speed up data transfer. This interconnect technology is critical for datacom, but it will also be useful for telecom applications, including data centre connections and 6G. It will also be useful for many other applications that require high-speed data transfer and processing, such as video, radar, and sensor fusion (automotive, defence).

7.2.2 Switches

Figure 14: Landscape of companies that develop or provide photonic-based switches. There are two types. Some use a microelectronic chip (ASIC) connected through co-packaged optics. For some others, the chip is also photonic (circled in orange). Source: TEMATYS

Currently, most switches are microelectronic devices connected with optical cables (section 4). But thanks to co-packaged optics, some companies have developed switches in which the fibre connects directly to the microelectronic chip (ASIC). And fully photonic switches, where the chip is also a photonic integrated circuit, are upcoming[20].

7.2.3 Optical processors

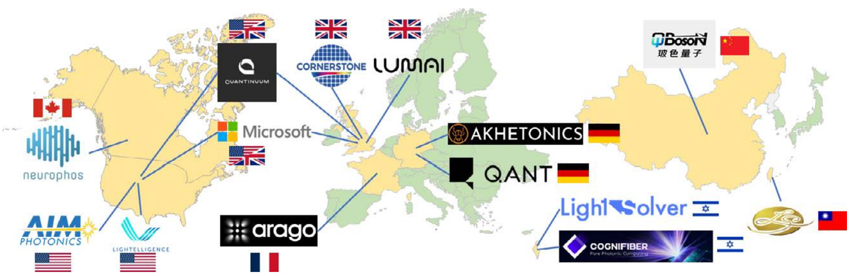


Figure 15: Optical computing companies around the world. Not all listed companies claim to develop optical processors for AI. Still, most optical (photonic) processors are designed as neural networks or matrix manipulation devices, which serve as the building blocks of AI computing. Microsoft and Quantinuum are American companies, but to our knowledge, their respective teams working on optical computing chips are based in the UK. Companies which develop quantum computers based on photonic qubits are not listed. Source: TEMATYS

It was previously mentioned that the ultimate goal is to develop photonic AI chips (section 6). Photonic processors are under development worldwide (Figure 15). Not all listed companies claim to create optical processors for AI, but most optical (photonic) processors are designed as neural networks or matrix manipulation devices, which are the building blocks for AI computing. In other words, the desperate need for more performant and sustainable AI compute power is clearly a market opportunity for the future.[21]

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[20] https://www.lumentum.com/en/media-room/news-releases/lumentum-optical-circuit-switch-improve-next-generation-ai-data-center

[21] Along with those optical computing players, some companies develop also quantum computers based on photonic qubit like Quandela (FR), ORCA (UK), QuiX Quantum (NL), PsiQuantum (US), or Xanadu (CA). It is still hypothetical but some think of using quantum computer for boosting AI. But this can be envisaged only when quantum computers have proved their efficiency. Source: https://www.scientificamerican.com/article/quantum-computers-can-run-powerful-ai-that-works-like-the-brain/

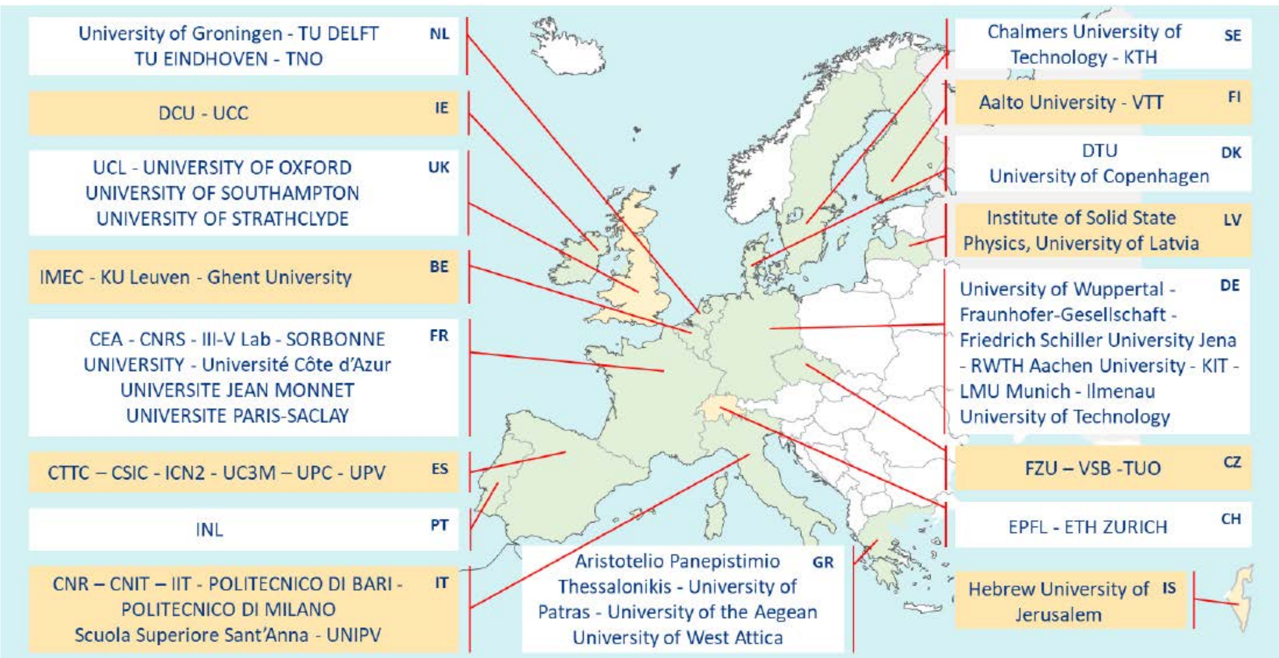
7.3 Europe’s strengths and weaknesses

For the telecom market, rapidly growing AI-related traffic (section 4) will drive increased demand for photonic equipment, alongside other supporting technologies. Wireless technologies will be impacted, as many AI users will communicate through their smartphones, and more and more IoT wireless systems will use AI. European telecom manufacturers, such as NOKIA, ERICSSON, and others, should benefit from this opportunity.

According to YOLE GROUP[22], the market for optical processors (at the chip level) is expected to grow from $50M in 2027 to $3B in 2034. According to different reports, the optical interconnect market, including transceivers for optical cables, is around $14B-$17B in 2025 and is expected to grow at a CAGR of 13% over the next 5 years.[23,24] Can Europe catch a fair share of that value?

The transceiver market (section 4) is representative of Europe. Although early transceivers were developed in Europe, funding was largely driven by American companies willing to invest over long timelines. Consequently, the market today is dominated by US and Asian players.

Figure 16: European universities and research organisations (including the UK and Switzerland) which have been recently or are currently involved in European collaborative projects dealing with photonic technologies which serve the datacom market. This list is representative but not exhaustive. It demonstrates that if sufficiently supported, European research has the knowledge and know-how for effective sovereignty. Source: TEMATYS



[22] Optical Computing 2024”, Yole Group Product Brochure
[23] https://www.fortunebusinessinsights.com/optical-interconnect-market-110836
[24] https://www.skyquestt.com/report/optical-interconnect-market

Regarding co-packaged optics and optical processors, knowledge exists in Europe, as illustrated by the creation of start-ups such as IPRONICS, Q.ANT, AKHETONICS, ARAGO, etc. LIGHTSOLVER, an Israeli company, also benefited from support from the European Framework Programme. Figure 16 shows European universities and research organisations (including the UK and Switzerland) that have been recently involved in, or are currently engaged in, European collaborative projects on photonic technologies serving the datacom market. This list is representative but not exhaustive. It demonstrates that if sufficiently supported, European research has the knowledge and know-how for effective sovereignty.

But the challenge is to compete with major players like NVIDIA, COHERENT, LUMENTUM, or to be recognised as a valuable partner to be integrated into their ecosystems. What is at stake is supporting European start-ups to become significant market players and produce locally. Several challenges lie ahead: attract public and private investors, build manufacturing facilities, train enough operators, technicians, and engineers to run them, and maintain strong research. In other words, it's a full ecosystem that needs to be reinforced or rebuilt in Europe.

8. Annex: Photonics for AI in European projects

A search of European projects related to the topic “Photonics for AI” has been conducted. The following selection criteria were set:

- Programmes to be searched: CHIPS JU/SNS JU/HORIZON EUROPE
- The project focused on fundamental research in photonics, integrated circuits and co-packaged optics, which was not selected. Photonic technologies for AI will benefit from such research, but these projects are not specific enough.
- Since there are few projects specifically dedicated to the development of tensor processing units (TPUs), all projects dealing with “optical computing” were selected, as they can develop bricks for future optical (photonic) processors.
- Data centres need to be connected, and some projects aim to improve their telecom connections. Projects focused on connecting data centres were selected, but not those focused on the telecom network itself or 6G.

Category	nb	EC contribution (€)
Interconnect/co-packaged optics	4	21 481 581.00
Datacom technologies	4	7 673 582.75
Datacentre telecom access	4	14 864 994.05
Optical processor	14	26 588 697.06
PIC fundamentals	10	49 304 364.62
Switches	6	25 500 906.67
Total	**42**	**145 414 126.15**

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