Press Release

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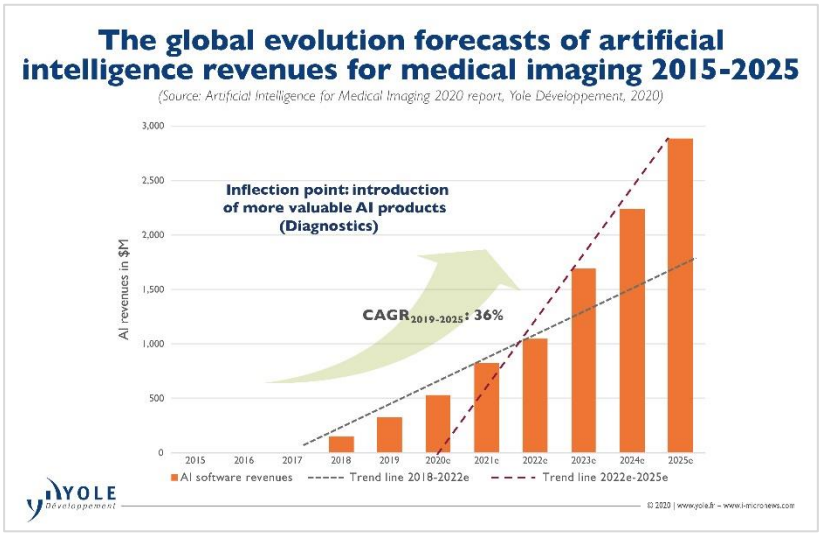
LYON, France

Medical imaging: artificial intelligence changes the rules…[1]

OUTLINES:

- Artificial intelligence algorithms: what are the threats and opportunities within the medical imaging sector?
- AI for medical imaging is a fast growing market: worth than US$2.3 billion in 2025, its value will multiply by 15-fold in 5 years.
- Artificial intelligence dedicated to medical imaging applications is showing an ever-moving ecosystem, with diverse market positions and structures.

"AI[2] has the potential to change all of our diagnostics and treatment procedures to enable more personalized and effective medicine." says **Marjorie Villien, PhD. Technology & Market Analyst, Medical & Industrial Imaging at Yole Développement (Yole).** And **Yohann Tschudi, PhD. Technology & Market Analyst, Computing & Software** adds: *"At Yole, we estimate the total market in 2025 for software generated revenues through the sale of AI tools will reach US$2.9 billion with a 36% CAGR[3] between 2019 and 2025. These revenues can be shared between the main applications including improved image capture, noise reduction, image reconstruction, screening, diagnostic and treatment planning."*



[1] Extracted from : AI for Medical Imaging report, Yole Développement, 2020 - Artificial Intelligence in Medical Diagnostics – Patent landscape analysis, KnowMade, 2019 - AI for Consumer report, Yole Développement, 2019 - AI for Automotive report, Yole Développement, 2019

[2] AI : Artificial Intelligence

[3] CAGR : Compound Annual Growth Rate

Yole Group of Companies including Yole and KnowMade investigates the computing & software domain for a while. Its aim is to develop a deep understanding of the impact of AI on the semiconductor industry, with a special focus on software development. Since the beginning, with dedicated teams, the market research, strategy and IP consulting companies have developed an impressive expertise with both perspectives, software and applications including automotive, consumer and medical. AI, cryptocurrencies, machine learning and block chain are the key words of their researches and are well analyzed in a dedicated collection of reports. A detailed presentation of this collection is available on i-Micronews.com, reports & monitors section.

AI is clearly one of the biggest questioning today. Lots of companies invest a lot of money and develop innovative technologies to answer the market demands and follow the industry evolution. The semiconductor industry is part of this revolution. Today Yole and KnowMade are pleased to announce a special focus on the medical imaging applications with two dedicated reports, respectively AI for Medical Imaging market & technology report and AI in Medical Diagnostics - Patent Landscape.
With its new technology and market report, AI for Medical Imaging, the market research and strategy consulting company, Yole is offering a comprehensive overview of the AI market in the field of medical imaging with the companies involved. This new report proposes a deep analysis at different levels of the supply chain, from device to platform including the development of the related algorithms. Analysts reveal a relevant picture of the ecosystem, technologies used, strategic positioning and the evolution for the coming years. As Yole did in its previous AI reports, AI for Consumer and AI for Automotive, the company points out the software companies' strategy, the different business models and much more…
To complete this technology & market approach, KnowMade describes the patent landscape with the time-evolution of published patents, and countries of patent filings as well as a relevant analysis of the IP strategies of the key players in its new AI in Medical Diagnostics - Patent Landscape report. In addition to the presentation of a detailed ranking of main patent assignees, KnowMade's analysts identified over 90 IP[4] newcomers including startups, described their operations and listed their patents.
Why do we regularly find AI in the medical imaging industry? What are the medical imaging applications? Why is AI key for today's market and its future? Who are the leading players? Who has built and maintained a strong IP portfolio? Is there still any room for new players?... Yole Group analysts offer you today a relevant snapshot of AI for medical imaging.

AI is based on the training of algorithms. Deep learning is a type of AI technology based on artificial neural networks which can detect more precise details in the data. This technology has initially been implemented for recognition models and is specialized for the study of images.
"Radiology is mutating with the adoption of deep learning models for the recognition of lesions in the body, to prioritize cases for the direct treatment of patients at risk, to predict the evolution of pathologies", asserts Marjorie Villien from Yole. *"Furthermore, AI affects all the imaging modalities in particular MRI[5], CT[6] scanning, X-rays and Ultrasound imaging. These are the ones at the center of Yole's study."*

[4] IP: Intellectual Property
[5] MRI : Magnetic Resonance Imaging
[6] CT : Computed Tomography

Not every type of modality requires the same algorithm. In fact, modalities can be organized into two types of procedures: quality procedures, which include MRI and CT scans, and fast imaging procedures, which include ultrasound and X-rays.

"The professionals' needs depend highly on the imaging modality used", adds Marjorie.

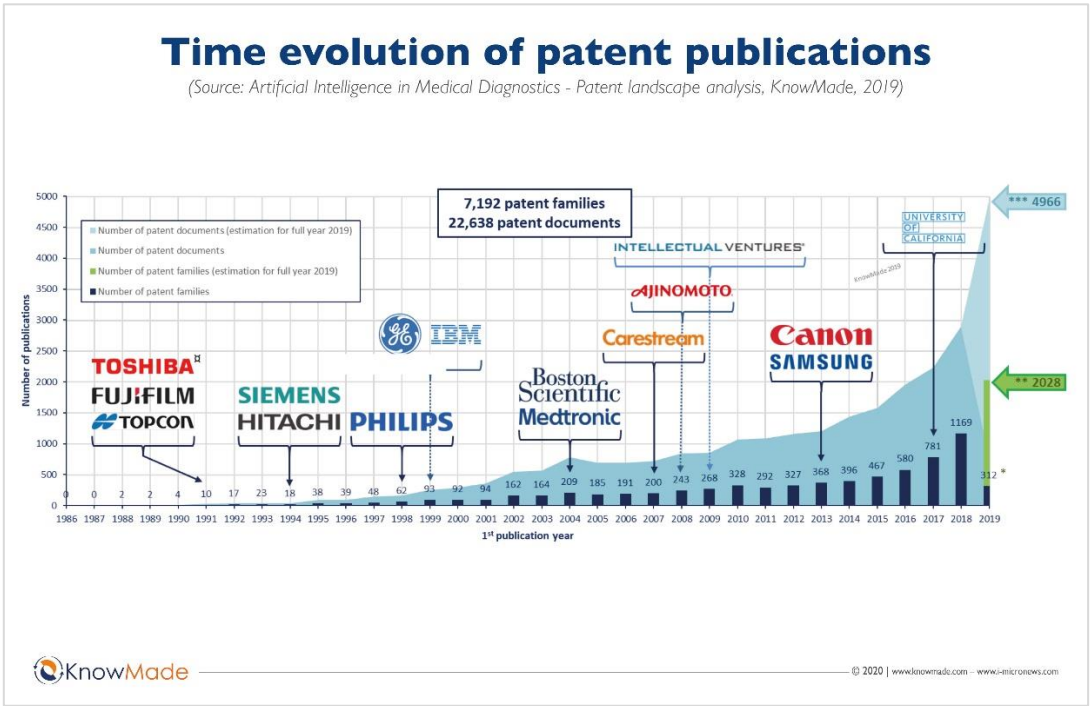
On the one hand, MRI and CT scans are intensive procedures able to acquire high quality images. With the addition of annotations on the images, the model can reach very high accuracy to classify pathologies or to segment objects. Furthermore, the execution speed of the model does not need to be very fast, as the imaging procedure is usually long. On the other hand, models trained on ultrasound images are in need of very fast execution to be able to process real-time images. Those models are then used to detect abnormalities faster and prioritize cases, implying an important productivity gain.

The application of the models empowered by AI can be classified as within 3 parts: the screening models, in charge of the detection of abnormalities, the diagnostic models which is, from its side, in charge of the evaluation of the disease and the treatment planning models. These latest ones are able to predict the most pertinent treatment according to the pathology and the physical condition of the patient. The value generated by the use of such models in hospitals depends on their applications.

According to Yole's AI reports, more than US$2.05 billion has been invested since 2010 by companies working on the development of artificial intelligence for medical imaging.

Companies such as Heartflow received US$476 million investment in the past 10 years. The main expected players in this market are the medical diagnostic systems manufacturers, General Electric, Philips and Siemens, but also AI-guru companies like IBM or Microsoft.

"Beside these big companies, the number of IP newcomers is important and growing", asserts **Brice Sagot, CTO and co-founder at KnowMade**. And he adds: *"Unlike the development of new medical devices, AI software development costs are moderate. As a result, the number of IP newcomers developing innovative software is likely to continue to rise sharply in coming years."*



Thereby, with emergence of many new companies like Aidence, Bay Labs and doc.ai, and given the many advantages and new applications of AI for medical diagnostics, it is crucial to understand the IP position and strategy of these different players. This analysis helps detect business risks and opportunities, anticipate emerging applications, and enables strategic decisions to strengthen one's market position.

In addition, the analysis of the time evolution of patent publications points out the development of medical diagnostic systems with built-in computer-assisted detection features. According to KnowMade's AI report, this trend is not new. *"The first patents related to this topic were published in the 1980s"*, explains **Olivier Thomas, Patent & Technology Analyst at KnowMade**. "*In the 1990s Japanese medical imaging system manufacturers like Toshiba, Fujifilm, Topcon, Fujitsu and Hitachi started to investigate this topic soon followed by European companies like Siemens and Philips and then by American companies like IBM, Medtronic and General Electric…"*

AI for medical imaging is presenting an ever-moving ecosystem with diverse market positions and structures. It is made up of a myriad of start-ups, such as various spin-offs from universities. Yole Group of Companies invite you to discover its AI analyses all year long on i-Micronews.com.

All year long, Yole's experts realize numerous presentations to present their results all around the world. This year, Yole's experts will be at Embedded World as well as Brain-Inspired Computing Congress with a presentation. Make sure to meet our analysts and discover today our program on I-Micronews. Stay tuned!

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About the reports

Artificial Intelligence for Medical Imaging 2020

With the emergence of AI in Imaging, the medical industry and the radiology profession have begun to dramatically change. - Performed by Yole Développement

Companies cited

4quant, 16bit, Advantis, ai analysis inc, Aidence, Aidoc, Amazon, Aquila medical innovation, Arterys, Ascension, Avalon AI, Azmed, Balzano, Behold.ai, Blackford analysis, Brainminer, BrainScan, Butterfly network, Canon, Caption health, Carestream, Cercare medical, Circle cardiovascular imaging, Contextflow, Corindus Vascular robotics, Curacloud, Curemetrix, Deepcare, DeepMind, Deepnoid, Deepradiology, Deepwise, Densitas, Deski, Dia imaging analysis, Dr CADx, eko.ai and many more...

Artificial Intelligence in Medical Diagnostics – Patent landscape analysis

Artificial intelligence is revolutionizing the healthcare industry. What are the most-targeted medical applications, and which companies are going for them? - Performed by KnowMade

Related reports

- Artificial Intelligence Computing for Automotive
- Artificial Intelligence Computing for Consumer
- Image Signal Processor and Vision Processor Market and Technology Trends

Authors

As a Technology & Market Analyst, Medical & Industrial Imaging, **Marjorie Villien**, PhD., is member of the Photonics & Sensing activities group at Yole Développement (Yole).
Marjorie contributes regularly to the development of imaging projects with a dedicated collection of market & technology reports as well as custom consulting services in the medical and industrial fields. She regularly meets with leading imaging companies to identify and understand technology issues, analyze market evolution and ensure the smart combination of technical innovation and industrial application.
Marjorie Villien graduated from Grenoble INP (France) and holds a PhD. in physics & medical imaging.

As a Technology & Market Analyst, **Yohann Tschudi**, PhD is a member of the Semiconductor & Software division at Yole Développement (Yole). Yohann is daily working with Yole's analysts to identify, understand and analyze the role of the software parts within any semiconductor products, from the machine code to the highest level of algorithms. Market segments especially analyzed by Yohann include big data analysis algorithms, deep/machine learning, genetic algorithms, all coming from Artificial Intelligence (IA) technologies.
Yohann has a PhD in High Energy Physics and a master degree in Physical Sciences from Claude Bernard University (Lyon, France).

As a Technology & Market Analyst, Artificial Intelligence (AI) & Imaging Technologies, **Loic Michoud** is involved in the development of technology & market reports at Yole Développement (Yole), within the Photonics & Sensing team. Loic studies and investigates innovative AI technologies for imaging applications and related markets. Software and image processing are part of his technical background.
Loic Michoud is currently completing a bachelor degree at CPE Lyon (France). In parallel, he is studying a dedicated program focused on innovation management at EM Lyon Business School (France).

Olivier Thomas works at KnowMade in the field of Biotechnology and Life Sciences. He holds a MSc in Molecular and Cellular Biology from the UPMC in Paris, France. He also holds the Industrial Property International Studies Diploma in Patents and Trademarks from the CEIPI in Strasbourg, France.

Brice Sagot, PhD., CTO and co-founder of KnowMade, Brice leads the Biotechnology and Life Sciences department. He holds a PhD in Molecular Biology from the University of Nice Sophia Antipolis, France

About KnowMade

KnowMade is a technology intelligence and IP strategy consulting company specialized in analysis of patents and scientific information. The company helps innovative companies and R&D organizations to understand their competitive landscape, follow technology trends, and find out opportunities and threats in terms of technology and patents… More

About Yole Développement

Founded in 1998, Yole Développement (Yole) has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, & technology trends to grow their business… More

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