PROSPECTS 5.0

PROSPECTS 5.0 Industry 5.0 Wiki April 2026 Patent Analysis

Artificial Intelligence Applications in Healthcare and Life Sciences

Date	: 20.04.2026
Authors	: Kubra Yurduseven, Nilay Yalcinkaya Yoruk
Responsible Partner	: INTRACT
Dissemination Level	: PU

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

TABLE OF CONTENTS

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

AI	Artificial Intelligence
CAGR	Compound Annual Growth Rate
CPC	Cooperative Patent Classification
EPO	European Patent Office
EU	European Union
ICT	Information and Communication Technology
IPC	International Patent Classification
ML	Machine Learning
PCT	Patent Cooperation Treaty
R&D	Research and Development

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

1. EXECUTIVE SUMMARY

This report presents a comprehensive patent landscape analysis of Artificial Intelligence (AI) applications in healthcare and life sciences, based on 241,842 patent families retrieved from the European Patent Office's Espacenet database. The analysis encompasses geographic distribution, temporal trends, technology classifications, competitive landscapes, and inventor activity across this rapidly evolving domain.

The field has experienced extraordinary growth, with annual patent publications increasing from approximately 544 families in 2000 to over 37,500 in 2025, representing a compound annual growth rate (CAGR) of approximately 18.6%. The most dramatic acceleration occurred between 2018 and 2025, where annual filings more than quadrupled, driven by advances in deep learning, computer vision for medical imaging, and digital health platforms.

China leads in raw patent filing volumes (133,183 patent families), followed by the United States (95,471) and international PCT filings (61,671). The European Patent Office ranks fourth with 38,691 families, reflecting Europe's strategic emphasis on quality, international protection, and high-value innovations. EU-based applicants such as Koninklijke Philips NV (Netherlands) and Siemens Healthcare (Germany) are among the global top innovators, demonstrating the EU's leadership in translating AI research into commercially significant, clinically validated technologies.

The technology landscape is dominated by health informatics (G16H classifications), medical diagnostics (A61B5), and neural network/deep learning methods (G06N3), with strong convergence between AI techniques and clinical applications. The COVID-19 pandemic (2020-2021) served as a significant catalyst, accelerating innovation in telemedicine, remote patient monitoring, AI-driven diagnostics, and health data analytics.

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

2. INTRODUCTION

2.1. Background

Artificial Intelligence is transforming healthcare and life sciences at an unprecedented pace. From AI-powered medical imaging and drug discovery to digital health records management and personalized therapy, the convergence of computational intelligence with biomedical science represents one of the most dynamic innovation frontiers of the 21st century. Patent data provides a uniquely objective lens to measure this innovation activity, revealing investment priorities, competitive dynamics, and technology trajectories across the global landscape.

2.2. Scope and Methodology

This analysis is based on a comprehensive search of the Espacenet database covering CPC and IPC classifications related to AI in healthcare, including G16H (health informatics), G16B40 (bioinformatics computational models), G16C20/70 (computational chemistry using machine learning), A61B combined with G06N/G06V/G06F18 (medical diagnostics with AI), A61K with G06N/G16C (pharmaceuticals with AI), C12Q with G06N (molecular biology with AI), and specific AI technique codes (G06N20, G06N3, G06N5, G06N7) combined with healthcare classes.

The search yielded 241,842 patent family results. Data was extracted and analyzed across multiple dimensions: geographic distribution (filing jurisdictions and applicant/inventor origins), temporal trends (publication and priority dates), technology classifications (IPC and CPC), competitive landscape (top applicants and inventors), language distribution, and CPC assigning office activity.

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

3. TEMPORAL TRENDS

3.1. Publication Date Trends

The publication timeline reveals the dramatic evolution of AI in healthcare patenting. While early patents date back to the 1960s, meaningful activity began in the late 1990s. The field entered a steady growth phase between 2000 and 2015, with annual publications rising from 544 to 5,075 families. A significant inflection point occurred around 2017-2018, coinciding with breakthroughs in deep learning and the increasing availability of large medical datasets.

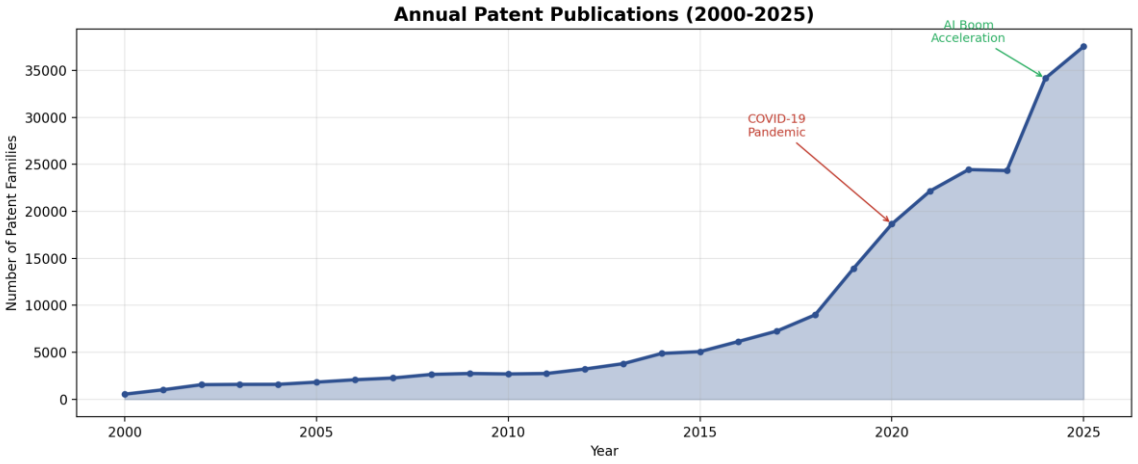

Figure 1 Publication Date Trends

Between 2018 and 2019, annual publications surged from 8,988 to 13,920 families (a 55% year-over-year increase). The growth continued through the COVID-19 pandemic years, with 2020 seeing 18,652 publications and 2021 reaching 22,174. By 2025, annual publications reached 37,538 families, confirming sustained momentum in the field.

3.2. Priority Date Trends

Priority date analysis provides insight into when inventions were actually conceived, offering a leading indicator of innovation activity. The priority date trend largely mirrors the publication trend with a slight time lead, as expected. A notable acceleration begins in 2018 (13,592 priority filings), with continued strong growth through 2024 (30,191). The 2025 figure of 20,022 is incomplete as many applications from this period have not yet been published but already indicates robust activity.

Funded by the European Union
This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

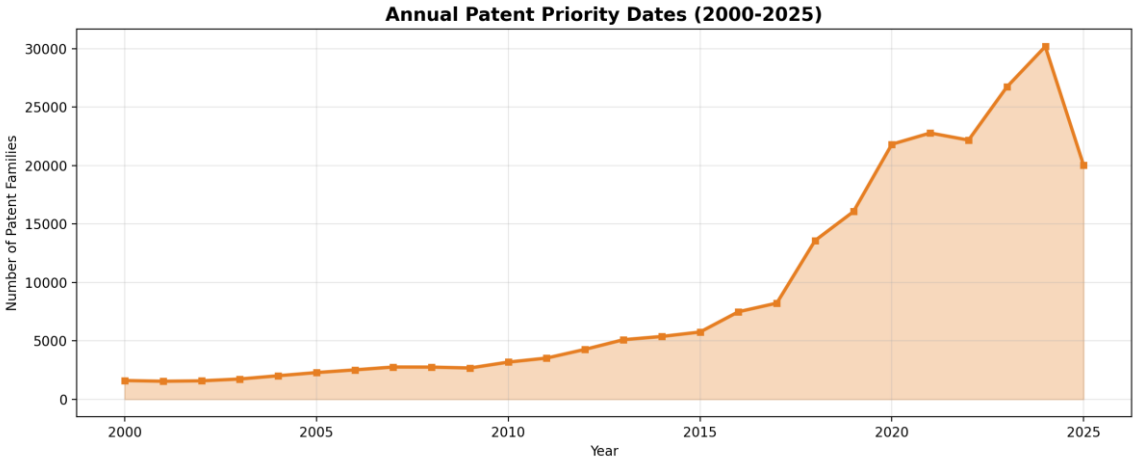

Figure 2 Priority Date Trends

3.3. Impact of COVID-19

The COVID-19 pandemic had a measurable and profound impact on AI healthcare patenting. Between 2019 and 2021, annual publications grew from 13,920 to 22,174 families, representing a 59% increase in just two years. This surge reflects the urgent global demand for AI-powered solutions in pandemic response, including AI-driven CT scan analysis for COVID-19 detection, machine learning models for epidemiological prediction, telemedicine and remote patient monitoring platforms, digital health record systems for pandemic tracking, and drug repurposing and vaccine development algorithms. The acceleration triggered by the pandemic appears to have created a lasting structural shift, with post-pandemic filing levels remaining substantially elevated compared to pre-pandemic trends.

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

4. GEOGRAPHIC ANALYSIS

4.1. Filing Jurisdictions

The geographic distribution of patent filings reveals the strategic priorities of innovators in AI healthcare. China leads with 133,183 patent families, reflecting its massive domestic filing volume and strong government support for AI and healthcare innovation. The United States follows with 95,471 families, representing the world's largest healthcare market and home to leading technology and pharmaceutical companies.

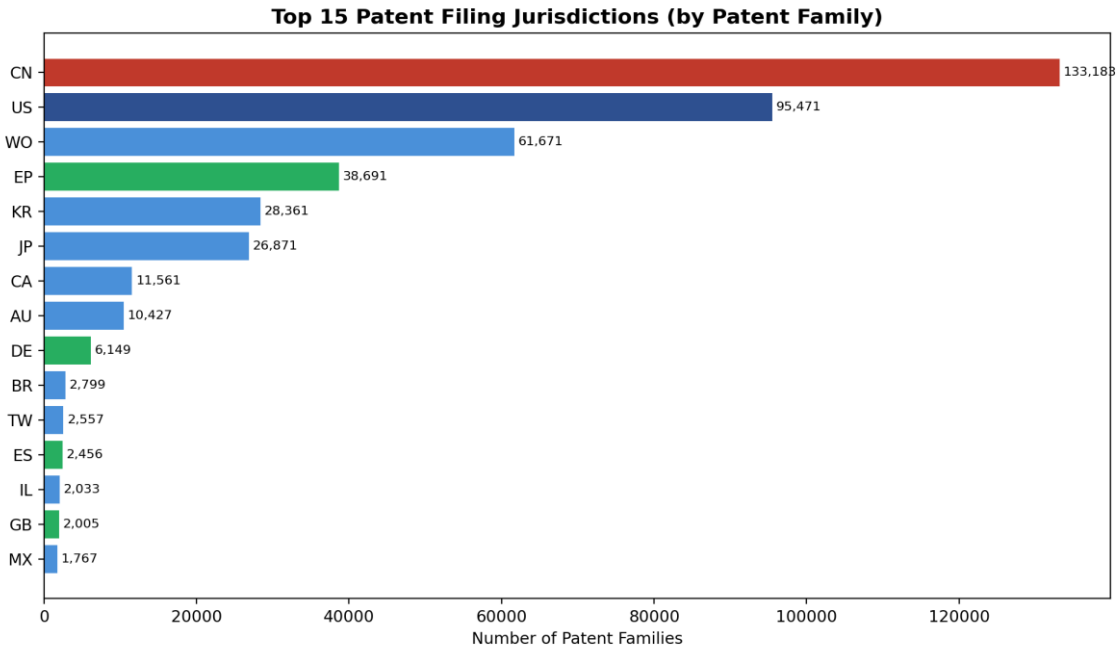

Figure 3 Patent Filing by Jurisdiction

International PCT (WO) filings account for 61,671 families, indicating that a significant proportion of innovations are seeking broad international protection. The European Patent Office (EP) ranks fourth with 38,691 families. Additionally, individual European countries such as Germany (6,149), Spain (2,456), France (1,330), and Denmark (934) contribute substantial filing volumes through their national patent offices.

4.2. Applicant Country of Origin

Analysing applicant origin provides a clearer picture of where innovation actually originates, independent of where protection is sought. The United States dominates with 213,892 patent families by applicant origin, reflecting the concentration of major technology companies, pharmaceutical firms, medical device manufacturers, and research universities.

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

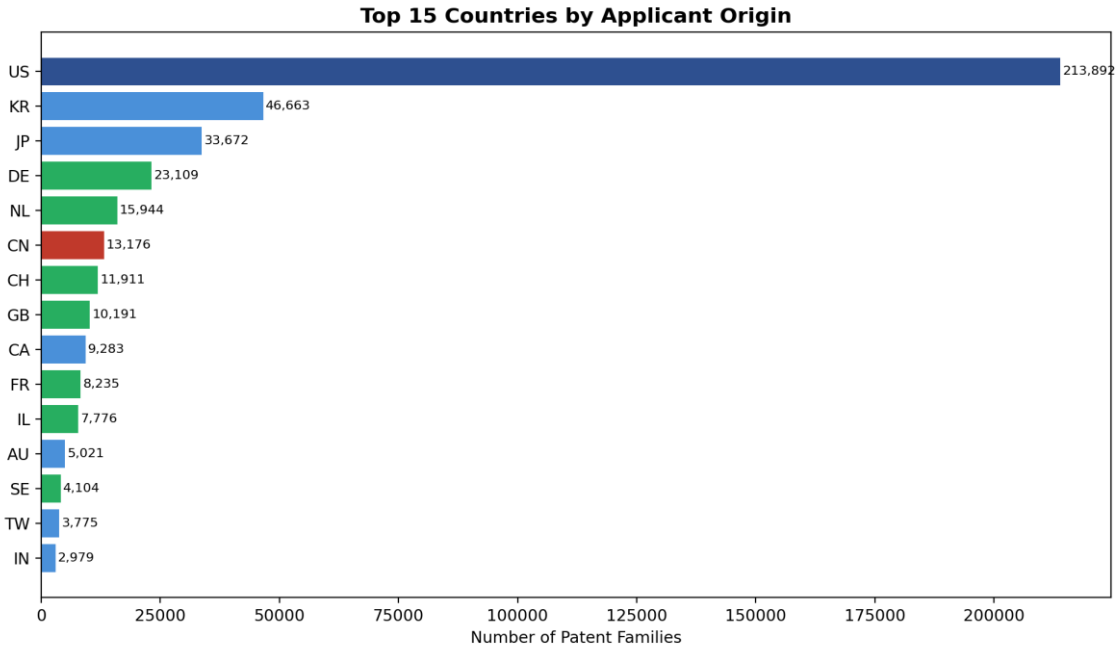

Figure 4 Applicant Country Analysis

Table 1 Applicant Country of Origin

Rank	Country	Patent Families	Key Strengths
1	United States	213,892	Tech companies, pharma, medtech
2	South Korea	46,663	Electronics, medical devices, AI
3	Japan	33,672	Medical imaging, diagnostics, robotics
4	Germany	23,109	Medical devices, industrial healthcare
5	Netherlands	15,944	Health informatics, imaging (Philips)
6	China	13,176	AI platforms, university research
7	Canada	9,283	AI research, university spin-offs
8	France	8,235	Pharma, medical devices, AI research
9	Australia	5,021	AI research, medical imaging, biotech
10	Sweden	4,104	Medtech, life sciences, digital health

4.3. Europe's Strategic Position

Europe occupies a strategically significant and distinctive position in the AI healthcare patent landscape. While China leads in sheer filing volume, Europe's strength lies in the quality, international reach, and clinical relevance of its innovations. The EPO is the fourth-largest filing jurisdiction globally with 38,691 patent families, and European applicants collectively account for a substantial share of high-value international filings.

Funded by the European Union
This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

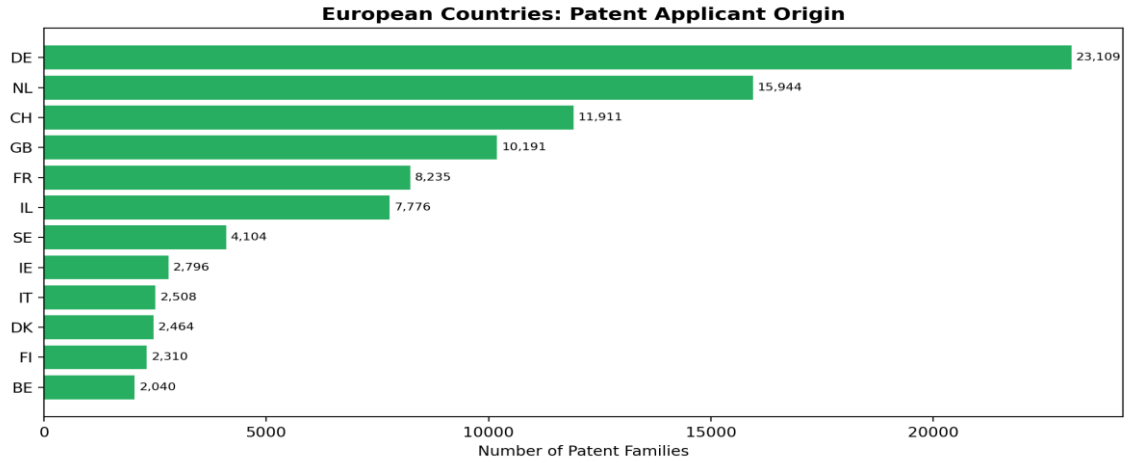

Figure 5 European Patent Position

Germany leads EU applicant countries with 23,109 patent families, driven by industrial healthcare giants such as Siemens Healthcare and Siemens AG. The Netherlands ranks second with 15,944 families, largely attributable to Koninklijke Philips NV, the single largest patent applicant globally in AI healthcare with over 4,900 combined patent families. France contributes 8,235 families, reflecting its strong pharmaceutical and AI research base.

A critical differentiator for Europe is the role of the EPO as a CPC classification assigning office. With 137,023 CPC-classified documents, the EPO is the single largest CPC assigning office globally, surpassing both China (114,370) and the United States (100,580). This underscores Europe's central role in organizing and defining the global patent classification infrastructure for AI healthcare technologies.

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

5. TECHNOLOGY CLASSIFICATION ANALYSIS

5.1. IPC Main Group Distribution

The IPC main group analysis reveals the core technology domains within AI healthcare. The dominant classification is G16H50 (ICT for medical data analysis and data mining), with 78,126 patent families, reflecting the central role of data-driven approaches in modern healthcare innovation. A61B5 (medical diagnostic measuring/testing) ranks second with 65,953 families, indicating the strong focus on AI-enhanced clinical diagnostics.

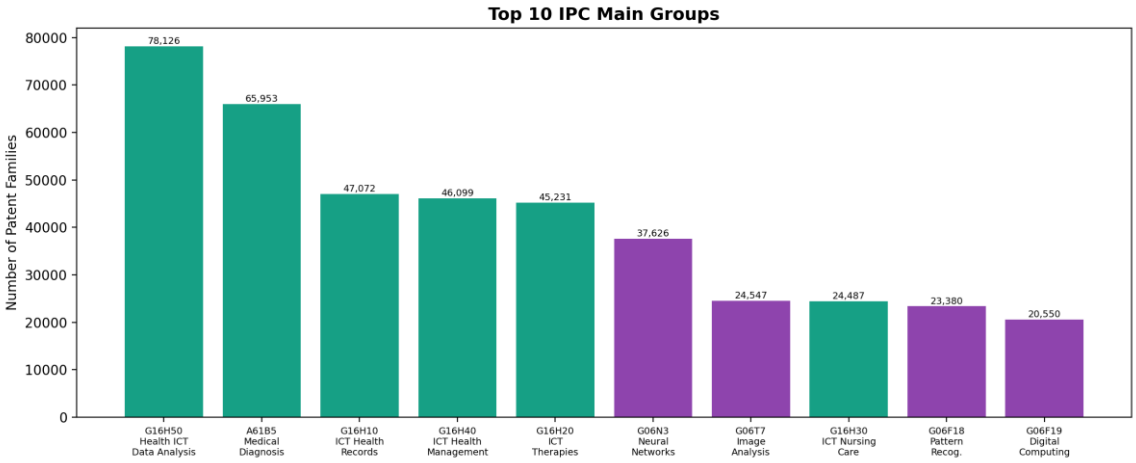

Figure 6 IPC Main Group Distribution

Health informatics classifications (G16H10 for health records, G16H40 for ICT management, G16H20 for therapies, and G16H30 for nursing care) collectively represent a massive share of the landscape, confirming that digital health infrastructure is a primary innovation driver. AI-specific classifications including G06N3 (neural networks, 37,626 families), G06F18 (pattern recognition, 23,380), and G06N20 (machine learning, 14,993) demonstrate the depth of AI technique application across healthcare domains.

5.2. CPC Subgroup Analysis

The CPC subgroup analysis provides more granular insight into specific technology focus areas. The top subgroups highlight the dominance of health data analysis (G16H50/20 with 52,076 families), electronic health records management (G16H10/60 with 42,434), and clinical decision support (G16H50/30 with 39,679).

Funded by the European Union
This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

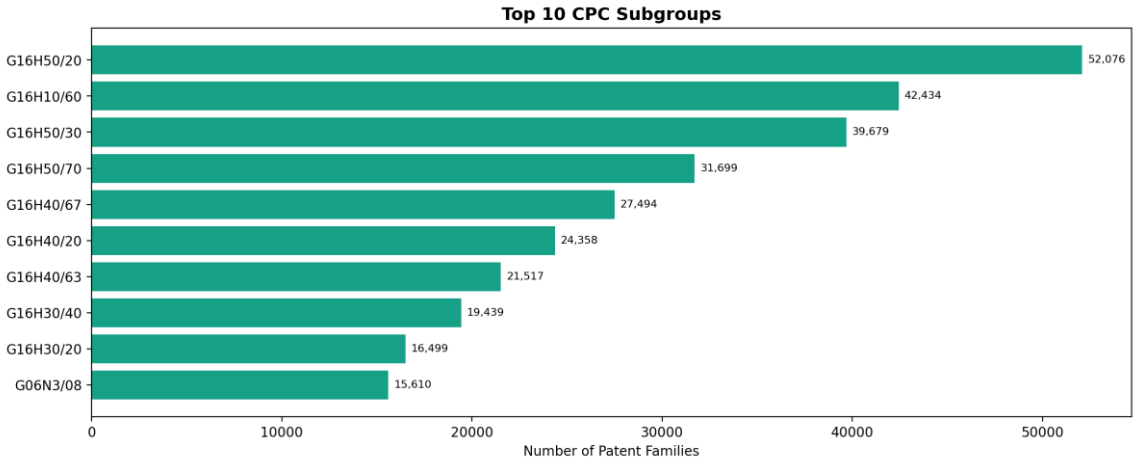

Figure 7 CPC Subgroup Analysis

Table 2 CPC Subgroup Analysis

CPC Subgroup	Description	Families
G16H50/20	ICT for medical data analysis	52,076
G16H10/60	ICT for electronic health records	42,434
G16H50/30	ICT for clinical decision support	39,679
G16H50/70	ICT for patient outcome prediction	31,699
G16H40/67	ICT for healthcare quality management	27,494
G16H40/20	ICT for health workflow management	24,358
G06N3/08	Neural network learning methods	15,610
G06N3/0464	Convolutional neural networks	14,058
G06N20/00	Machine learning general	12,275
G16C20/70	Computational chemistry with ML	11,941

5.3. CPC Assigning Offices

The distribution of CPC assigning offices reveals which patent offices are most actively classifying AI healthcare patents. The European Patent Office leads with 137,023 classified documents, followed by China (114,370) and the United States (100,580). South Korea accounts for 26,995 classified documents. This distribution confirms the EPO's pivotal role as the global standard-setter in patent classification for AI healthcare technologies.

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

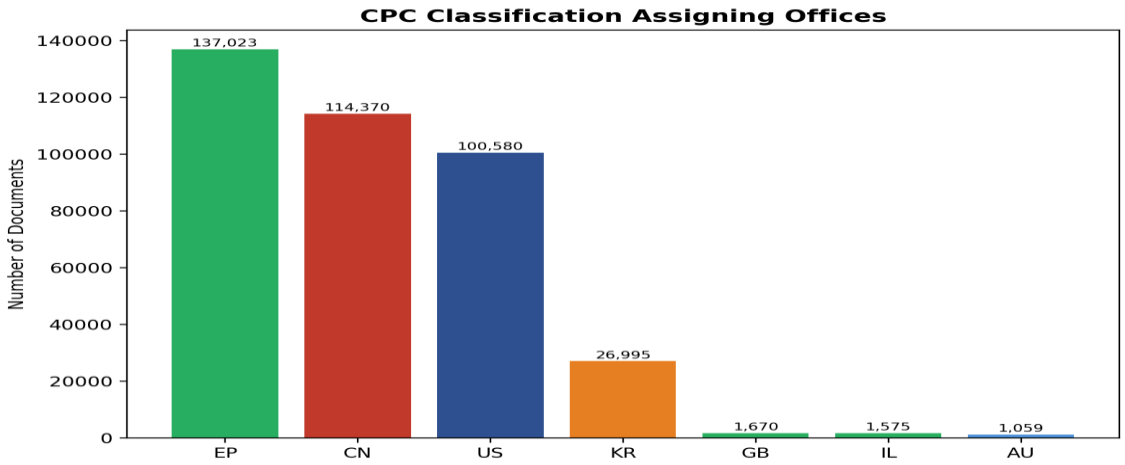

Figure 8 CPC Assigning Offices

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

6. COMPETITIVE LANDSCAPE

6.1. Top Patent Applicants

The competitive landscape is led by major multinational corporations with deep expertise in medical technology, health informatics, and AI. Koninklijke Philips NV is the global leader with 3,297 patent families under its primary entity name, with additional filings under related entities, bringing the combined Philips portfolio to approximately 4,917 families. This dominant position reflects Philips' strategic focus on AI-driven health technology, medical imaging, and patient monitoring systems.

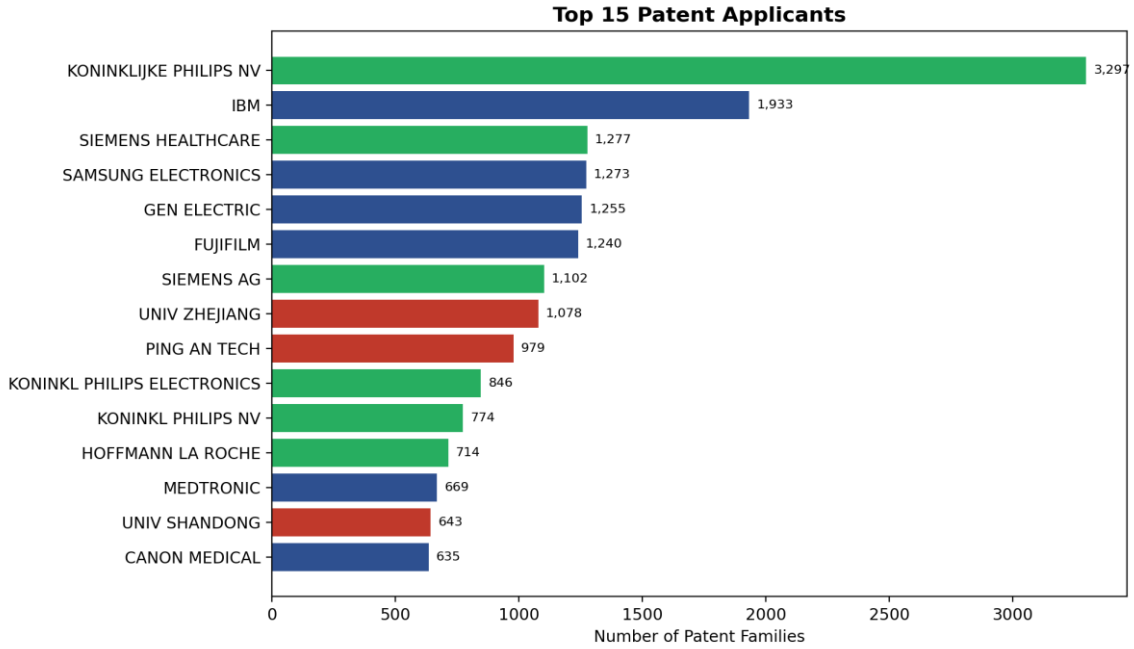

Figure 9 Top Patent Applicants

IBM ranks second with 1,933 families, leveraging its Watson Health and AI research capabilities. Siemens Healthcare GmbH (1,277), together with Siemens AG (1,102) and Siemens Healthineers AG (553), brings the combined Siemens portfolio to approximately 2,932 families, making it the second-largest European innovator. Samsung Electronics (1,273) and General Electric (1,255) represent strong competition from Asian and American conglomerates respectively.

6.2. Top Inventors

The inventor landscape shows a distinctive pattern, with Chinese-named inventors dominating the top positions by filing volume. This reflects both the high volume of Chinese patent filings and the practice of listing multiple inventors. Among Western inventors, notable contributors include Shelton IV Frederick E (302 families), Wood Jr Lowell L (278), Leuthardt Eric C (268), and Comanciu Dorin (209, Siemens), indicating concentrated expertise in specific technology niches such as surgical robotics and medical imaging AI.

6.3. Language Distribution

The language analysis provides additional perspective on the geographic distribution of patent activity. English is the dominant language with 238,759 documents, followed by

Funded by the European Union
This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

Chinese (134,019), Korean (28,271), Japanese (25,690), German (18,375), and French (13,802). The prominence of German and French language filings further underscores Europe's significant contribution to the global patent landscape in AI healthcare.

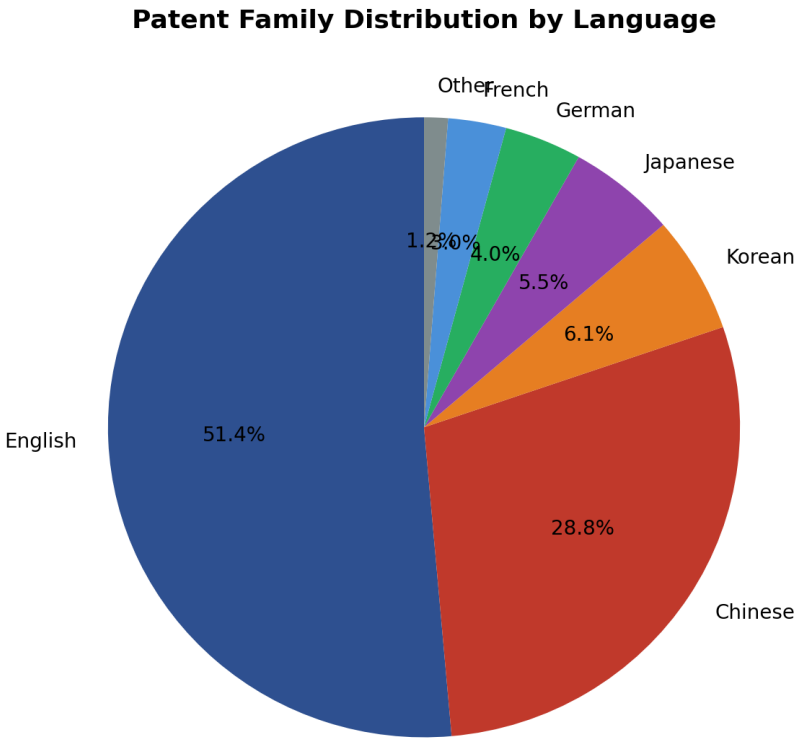

Figure 10 Language Distribution

Funded by the European Union
This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

7. CONCLUSIONS AND STRATEGIC OUTLOOK

This patent landscape analysis of 241,842 patent families reveals a field undergoing explosive growth and rapid technological convergence. Several key conclusions emerge:

- **Unprecedented Growth Trajectory:** The field has grown from a few hundred annual publications in the early 2000s to over 37,500 in 2025. This trajectory shows no signs of slowing, with both publication and priority date data confirming sustained acceleration.
- **COVID-19 as a Structural Catalyst:** The pandemic drove a measurable surge in AI healthcare patenting (2019-2021: +59%), creating a lasting elevation in innovation activity that persists well beyond the pandemic period.
- **Europe's Quality-Focused Leadership:** While China leads in filing volumes, the EU holds distinct strategic advantages. EU companies like Philips and Siemens are among the top global innovators. The EPO is the world's leading CPC classification office. EU patents tend to represent high-value, internationally protected innovations with strong clinical validation pathways.
- **Health Informatics Dominance:** G16H classifications (health ICT) dominate the landscape, with data analysis, electronic health records, and clinical decision support as the primary focus areas.
- **Deep Learning as the Core AI Technique:** Neural networks (G06N3) and machine learning (G06N20) are the dominant AI methods applied in healthcare patents, with convolutional neural networks particularly prominent in medical imaging applications.
- **Diverse Competitive Landscape:** Competition spans major medtech corporations, technology giants, pharmaceutical companies, and research universities. The co-existence of corporate and academic applicants indicates a field where fundamental research and commercial application are deeply intertwined.

The AI healthcare patent landscape represents one of the most dynamic and strategically important technology domains of the current decade. Europe, with its world-class research institutions, globally leading medical technology companies, robust regulatory frameworks, and the EPO's central classification role, is exceptionally well-positioned to continue driving high-impact innovation in this transformative field.

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

8. APPENDIX: METHODOLOGY AND DATA SOURCES

8.1. Search Strategy and Data Collection

This analysis is based on patent data retrieved from Espacenet, the European Patent Office's comprehensive patent database. The search was executed in March 2026 with a CPC-based query covering AI and healthcare technology intersections. Total results: 241,842 patent families. All figures are based solely on the data extracted from Espacenet and no external data sources have been used. The 2026 figures are partial (data available only through early 2026) and should not be interpreted as full-year values.

8.2. Analytical Limitations and Interpretive Caveats

Publication Lag: Patents typically publish 18 months after filing. The most recent innovations (filed in late 2024 or early 2025) may not yet appear in the dataset. Cutting-edge developments may be underrepresented.

Patent Counts vs. Innovation Impact: This analysis treats all patents equally. However, a single breakthrough patent may have more industry impact than hundreds of incremental improvements. Quantitative patterns require qualitative interpretation of technological and commercial significance.

Geographic Attribution Complexity: Multinational corporations, complex ownership structures, and R&D distribution across borders mean applicant and inventor country data imperfectly represent innovation origins or commercial control. Trends are meaningful; individual attributions should be verified for critical decisions.

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948

PROSPECTS 5.0

PROSPECTS5-0

PROSPECTS5-0

PROSPECTS5_0

PROSPECTS5-0.EU

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101135948