aiforia®
AI for image analysis

AI supported diagnostics drives the digital transformation in pathology

August 2024

Jukka Tapaninen, CEO

Aiforia Technologies Plc

The challenge

Population in relation to the number of pathologists[1]

Rising rates of disease like cancer, ..

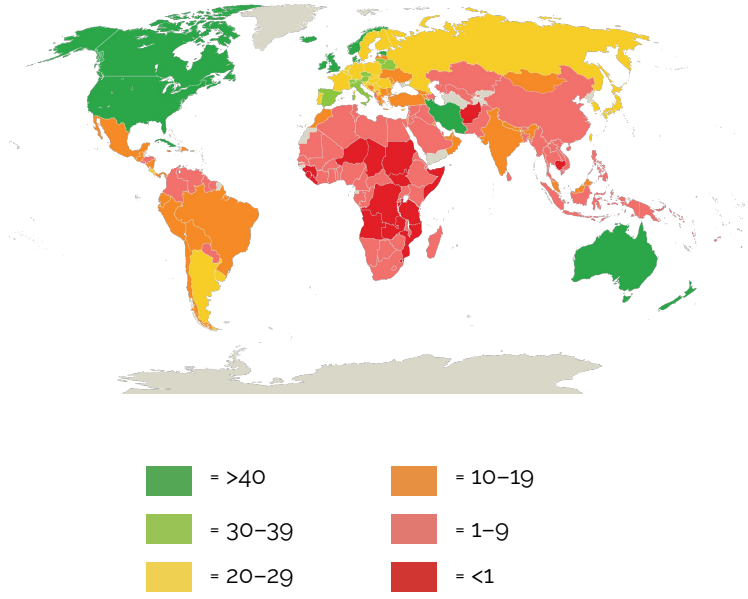
30% increase in cancer rates
in the US in past 50 years

...create a huge burden on pathologists, an already dwindling medical specialty...

2.03% drop to 1.43% in pathologists
as a % of total physicians in past 10 years

41.73% workload increase

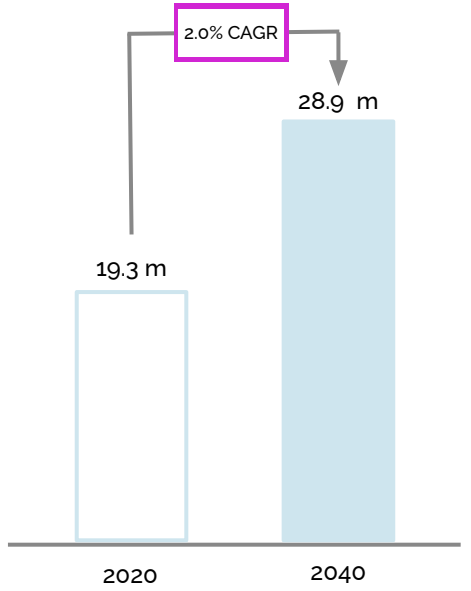
Pathologists Per Million



The shortage of pathologists makes the job stressful and require in some cases overtime work frequently. The pathologists retiring early further exaggerates the shortage problem.

... with no reduction of sample volumes in sight

Estimated global cancer increases cases 2020-2040[4]



The growing cancer incidence rates, estimated to increase by 49.7% during 2020-2040, will lead to increasing number of pathology tests. Constantly increasing number of new diagnostic tests increase the workload and require new expertise.

JAMA 2020: doi:10.1001/jamanetworkopen.2020.27738; JAMA 2019: doi:10.1001/jamanetworkopen.2019.4337; BMJ 2013: http://dx.doi.org/10.1136/bmjqs-2012-001615; 4) International Agency for Research on Cancer. Only certain Aiforia® Clinical AI models and the Aiforia® Clinical Suite Viewer are CE-IVD marked for diagnostic use in EU and EEA countries, see here for the full list: www.aiforia.com/aiforia-clinical-suite. In all other countries, the use is limited to Research Use Only, not for use in diagnostic procedures.

Digital transformation in pathology is becoming mainstream

% pos cells?
5%?
Moderate? ++?
Weak? +?

Descriptive visual

Digitalization + AI

No of cells: 57 673
IHC pos: 13 234
Percentage: 22.9 %

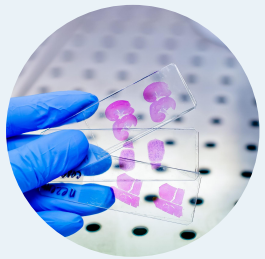
Tissue types:
Epithelium: 34%
Stroma: 60%

Quantitative automated

Adoption of AI in pathology is accelerating

Clinical pathology workflow with AI supported diagnosis

Tissue sample



Any type of biological sample or staining is compatible with Aiforia

Microscope Scanner

Majority of scanner and file formats are supported

Image upload

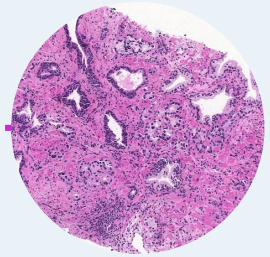


Image is transferred to PACS/IMS and immediately uploaded to Aiforia for automated AI analysis

Use of AI

AI-supported diagnosis

The AI results help pathologists to analyse the samples more objectively, effectively and accurately. Aiforia provides numerical results directly to the pathologist's report.

Report for the clinician treating the patient

Benefits and result:

- Automates manual tasks such as cell counting
- Produces objective and accurate data
- Improves workflow efficiency, brings results faster for the benefit of the patient

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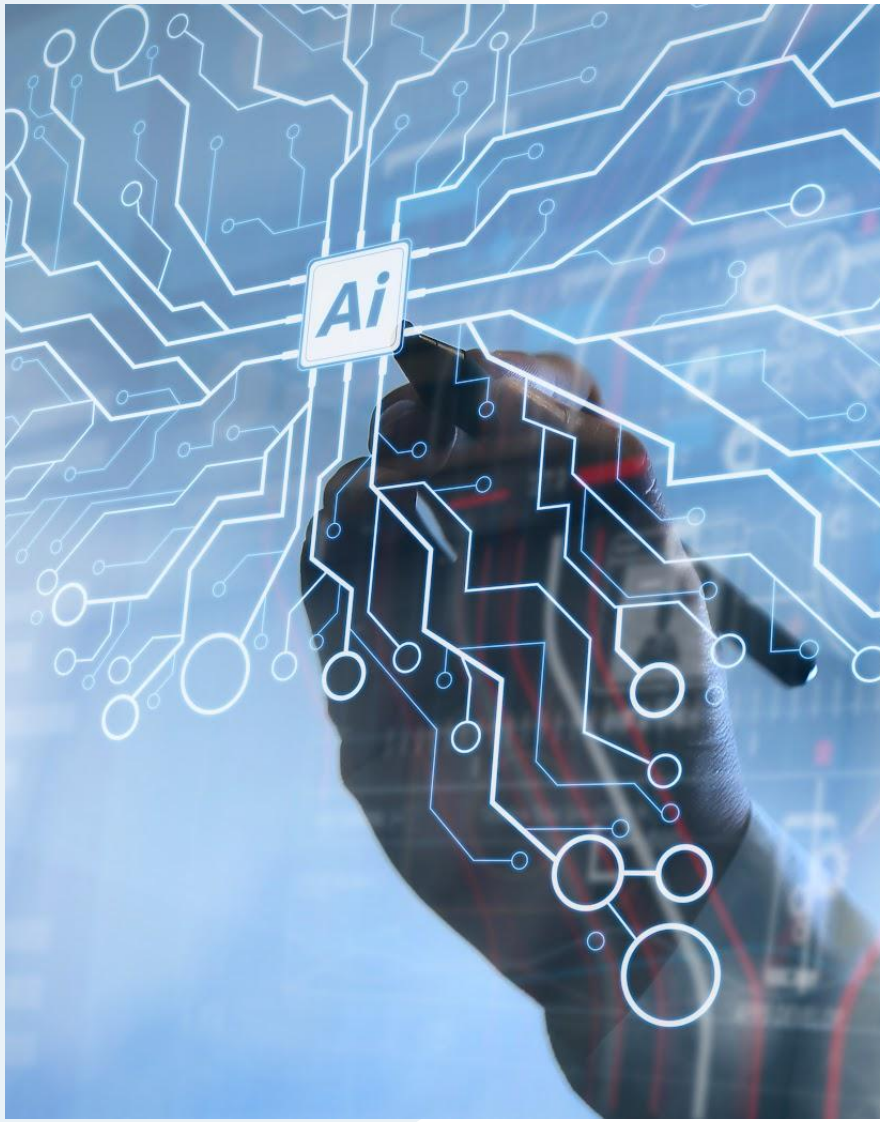


Gartner forecast: Between 2023 and 2027, $3 trillion will be spent on AI

By 2027

GenAI will represent 36% of total AI spending.

By 2030

- Every dollar of GDP created anywhere on the planet will be influenced by AI
- 100% of global IT spending will be directly on AI or indirectly supporting AI
- 100% of IT development will incorporate AI in the design development, testing or supporting production

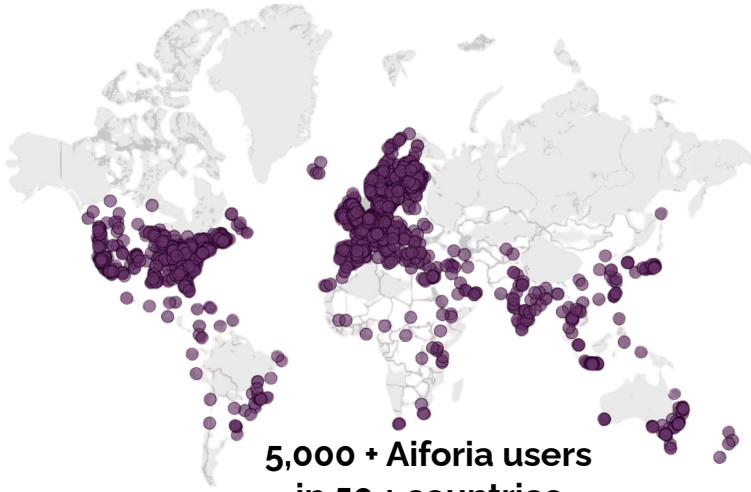
Aiforia's offering

aiforia®

Overview of Aiforia Technologies

Medical software company, founded in 2013

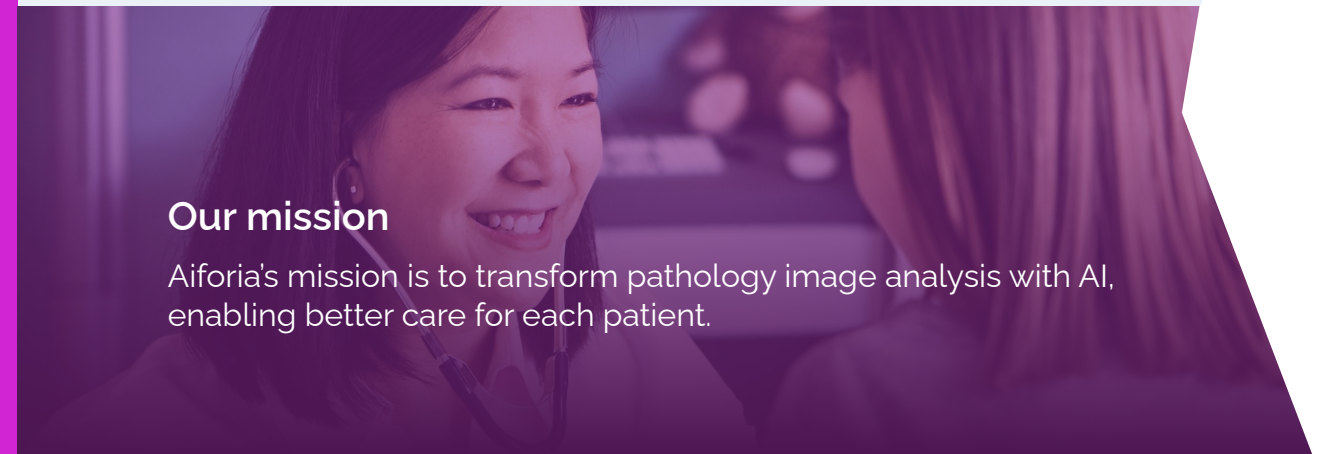
- Equips pathologists and scientists in clinical, pre-clinical, and academic labs with powerful deep learning AI and cloud-based technology
- The diverse team includes experienced pathologists, medical scientists, AI and software developers, and a dedicated commercial team
- Listed on Nasdaq Helsinki First North Growth Market



5,000 + Aiforia users in 50 + countries

Global organization

- ~ 100 team members
- HQ Helsinki, Finland
- US Offices in Cambridge, MA and Rochester, MN
- Sales & commercial teams in Finland, the US, the UK, the Netherlands, France, Hungary, and Norway



Our mission

Aiforia's mission is to transform pathology image analysis with AI, enabling better care for each patient.

Main customer segments

CLINICAL DIAGNOSTICS SECTOR,

including hospitals, health systems and clinical diagnostic companies

PRE-CLINICAL SECTOR,

including pharma and biotech companies, contract research organizations and academic research

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Recent clinical deals and collaborations

MAYO CLINIC

- Breast cancer diagnostics
- +70 pathologists using Aiforia Platform in translational research
- +30 ongoing research projects utilizing the Aiforia's technology at the Mayo Clinic
- An exclusive licensing agreement to globally commercialize an AI model that improves prediction of colorectal cancer recurrence

FIMLAB LABORATORIES

- 6 year framework contract
- First order confirmed for breast and prostate cancer diagnostics

CASTILE AND LEÓN REGION HEALTH MANAGEMENT

- 3 year contract
- Breast, prostate and lung cancer diagnostics

VENETO REGION HEALTH AUTHORITY

- 12 hospital units
- 3 year contract
- Breast, prostate and lung cancer diagnostics

CATANIA REGION HEALTH AUTHORITY

- 1 hospital unit
- 3 year contract
- Breast and prostate cancer diagnostics

PATHLAKE PLUS CONSORTIUM / NHS

- 3 year framework contract for lung and prostate cancer diagnostics
- First deal signed with a NHS Trust for lung cancer diagnostics

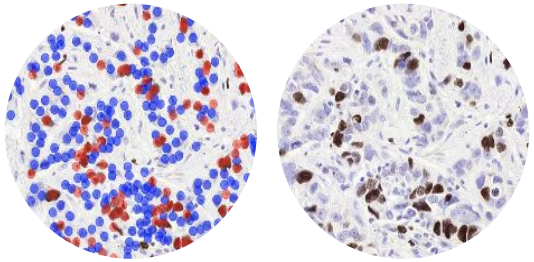
One cloud-based platform for multiple needs

AI model development tools to create, customize and validate proprietary deep-learning AI models, both for research and clinical use cases

Ready-to-use CE-IVD certified AI models and Clinical Suites that are easily integrated with existing laboratory IT infrastructures

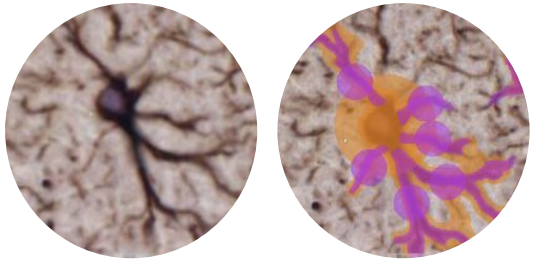
Aiforia currently provides regulatory approved AI models for some of the most prevalent cancers worldwide, including prostate, breast, and lung.

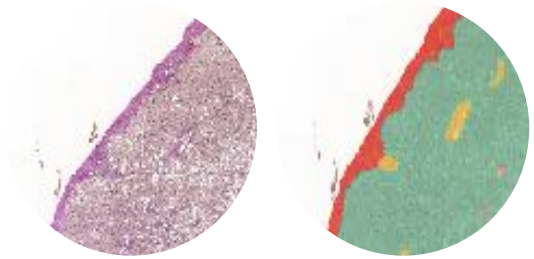
Aiforia® Create enables different types of image recognition and classification in pathology



Object detection
in breast cancer tissue

Instance segmentation
in nerve tissue





Semantic segmentation
in liver tissue

Multi-class Object detection

- Positive and negative cells, pathogens, etc.

Instance segmentation

- Object detection and semantic segmentation simultaneously
- True cell borders, their sizes and dimensions

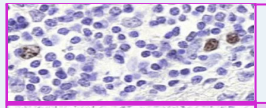
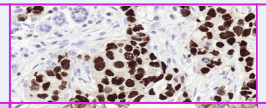
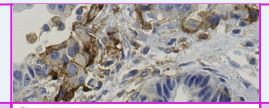
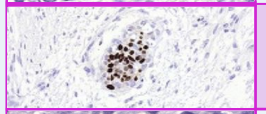
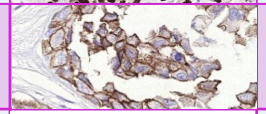
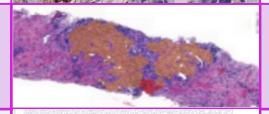
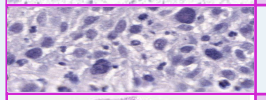
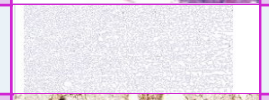
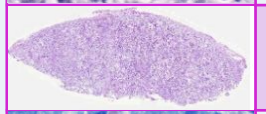
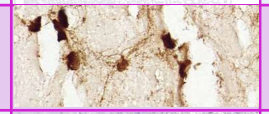
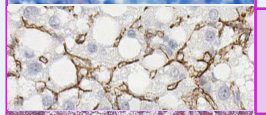
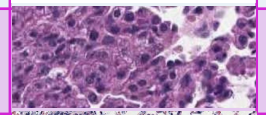
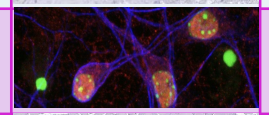
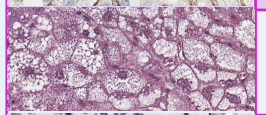
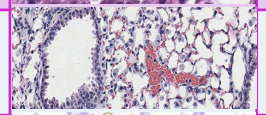
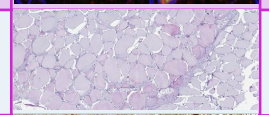
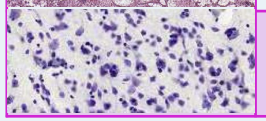
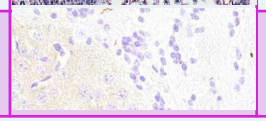
Multi-class Semantic segmentation

- Detection of tissue, different classes of tumors, cells, artefacts
- Typically the first layer of detection to find the area of interest

Regression

- Detection of continuous values, e.g. staining intensity

Thousands of AI models have been built with Aiforia Create for research and discovery

	**Breast Cancer Ki67**		**Breast Cancer Estrogen Receptor** Detection of positive and negative ER cells		**Lung Cancer PD-L1 Exp Analysis** quantifying pos & neg cells in NSCLC tumor epithelium
	**Breast Cancer Progesterone** Detection of positive and negative PR cells		**Breast Cancer HER2 Analysis** quantify HER2 pos & neg cells and HER2 scoring		**Prostate Cancer Gleason Grading**
	**Breast Cancer Grading** - Mitosis Scoring		**Liver parenchyma & cytokeratin quantification**		**Malaria infected red blood cell analysis** healthy / malaria infected / white blood cell
	**Kidney glomeruli counting** quantify the number of viable and sclerotic glomeruli in kidney biopsy		**Liver non-alcohol related steato-hepatitis & fibrosis scoring**		**Rat motor neurons** detect and quantify motor neurons in rat brain tissue samples
	Acid Fast Bacteria Myco- bacterium tuberculosis mZN		**Liver steatosis, inflammation, ballooning & fibrosis classification**		**Rat microglia iba1 analysis** detection & quantification microglia in spinal cord tissue
	**Mouse liver lobular fibrosis** Collagen-I IHC		**Mouse Lung NSCLC tumor grading**		**Multi-Channel IF Neuron Culture** Intensity analysis in the nuclear & somatic compartments
	**Mouse Liver Steatosis** Quantification Classification		**Mouse Lung tuberculous** granulomas detection		**Atlantic salmon skin segmentation** of Connective Tissue/Dermis/Epidermis/Adipose Tissue
	**Human brain thionine** glial cells & neurons counter in a thionine stained human brain		**Mouse alpha-synuclein** detect and count neuron cell bodies with Lewy bodies in a mouse brain		**Rat astrocytes counter GFAP** identify and quantify astrocytes in GFAP stained rat spinal cord sections

& many more

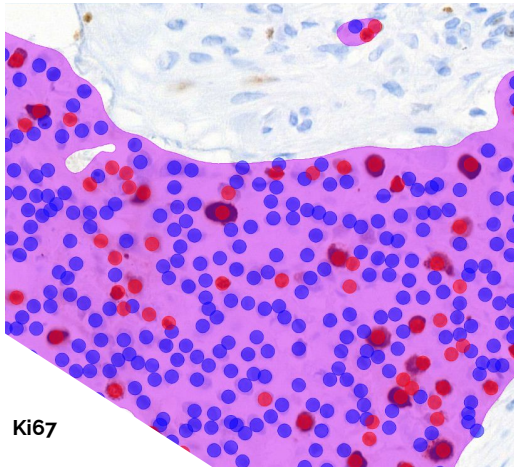
Aiforia® Clinical Suites

Breast Cancer

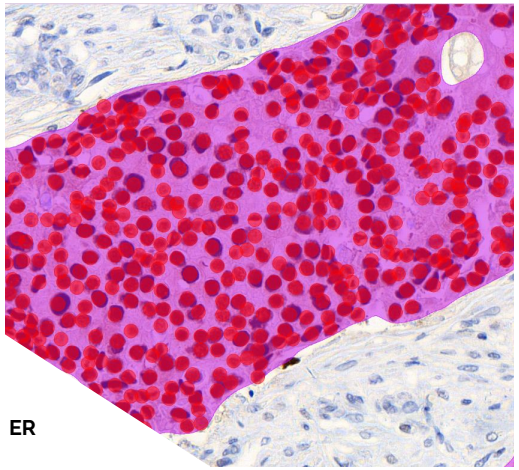
✔ Aiforia® Breast Cancer Ki67 (CE-IVD)

✔ Aiforia® Breast Cancer ER (CE-IVD)

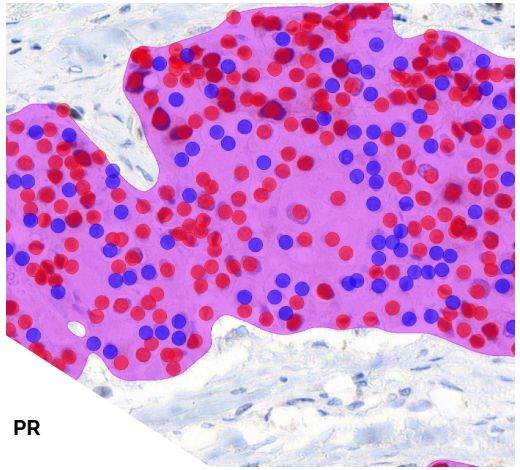
✔ Aiforia® Breast Cancer PR (CE-IVD)



Ki67



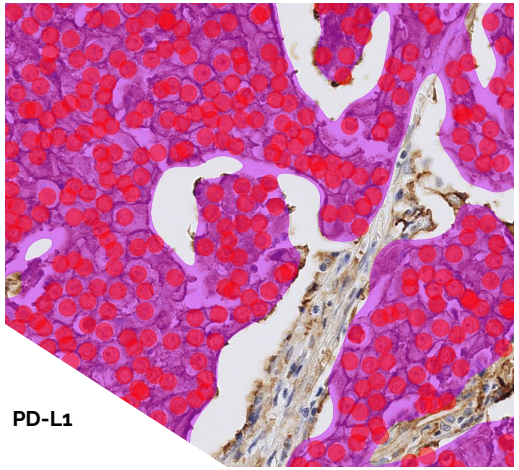
ER



PR

Lung Cancer

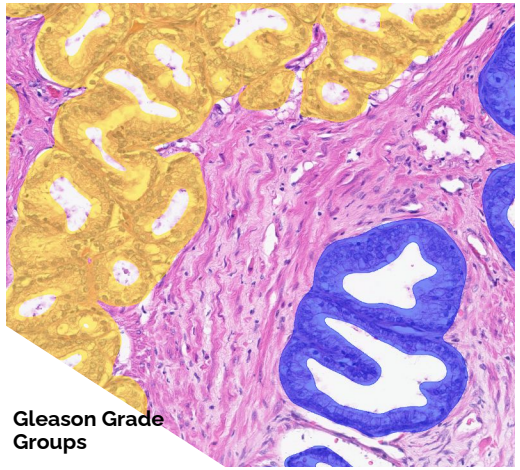
✔ Aiforia® Lung Cancer PD-L1 (CE-IVD)



PD-L1

Prostate Cancer

✔ Aiforia® Prostate Cancer Gleason Grade Groups (CE-IVD)



Gleason Grade Groups

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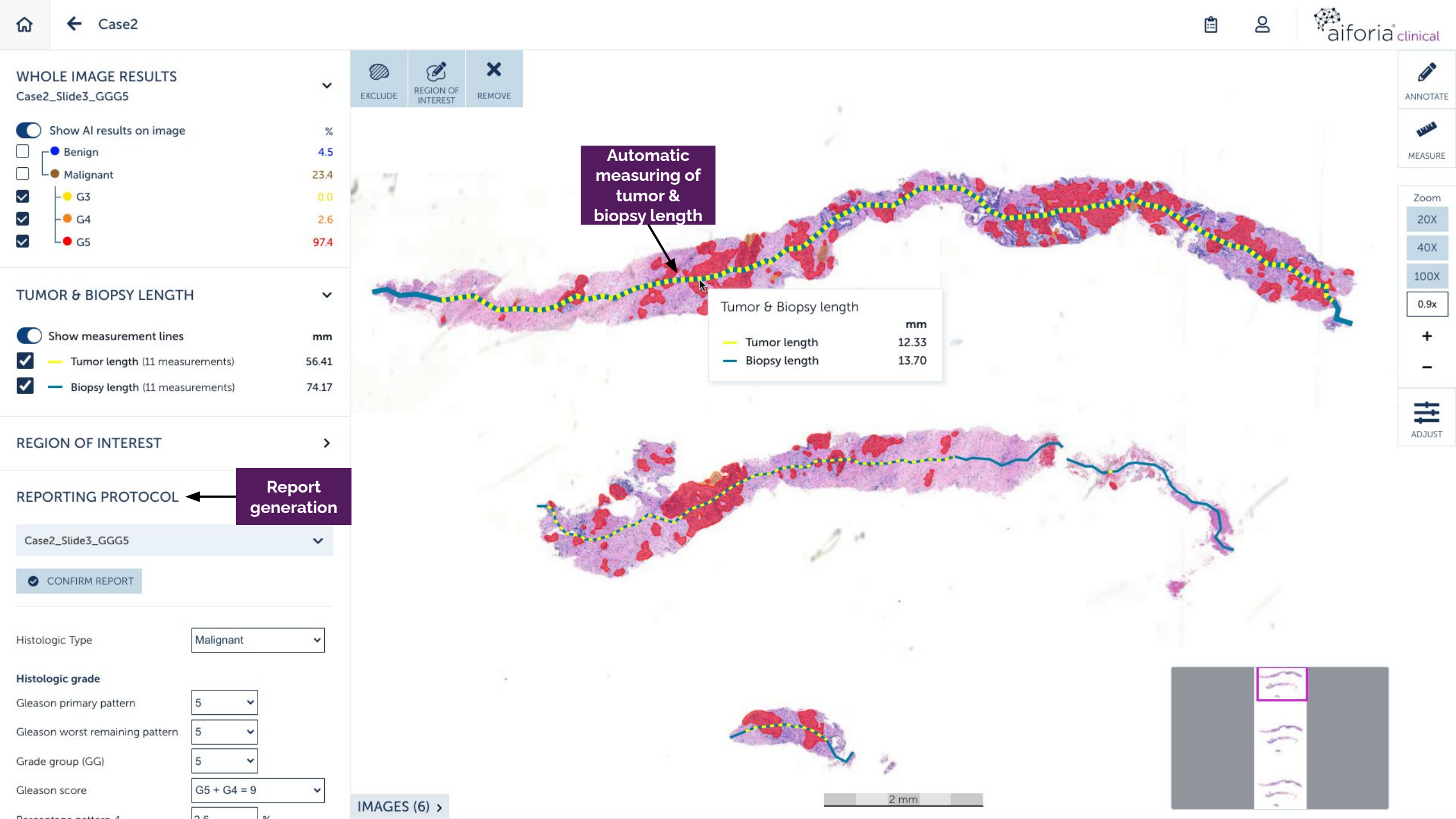
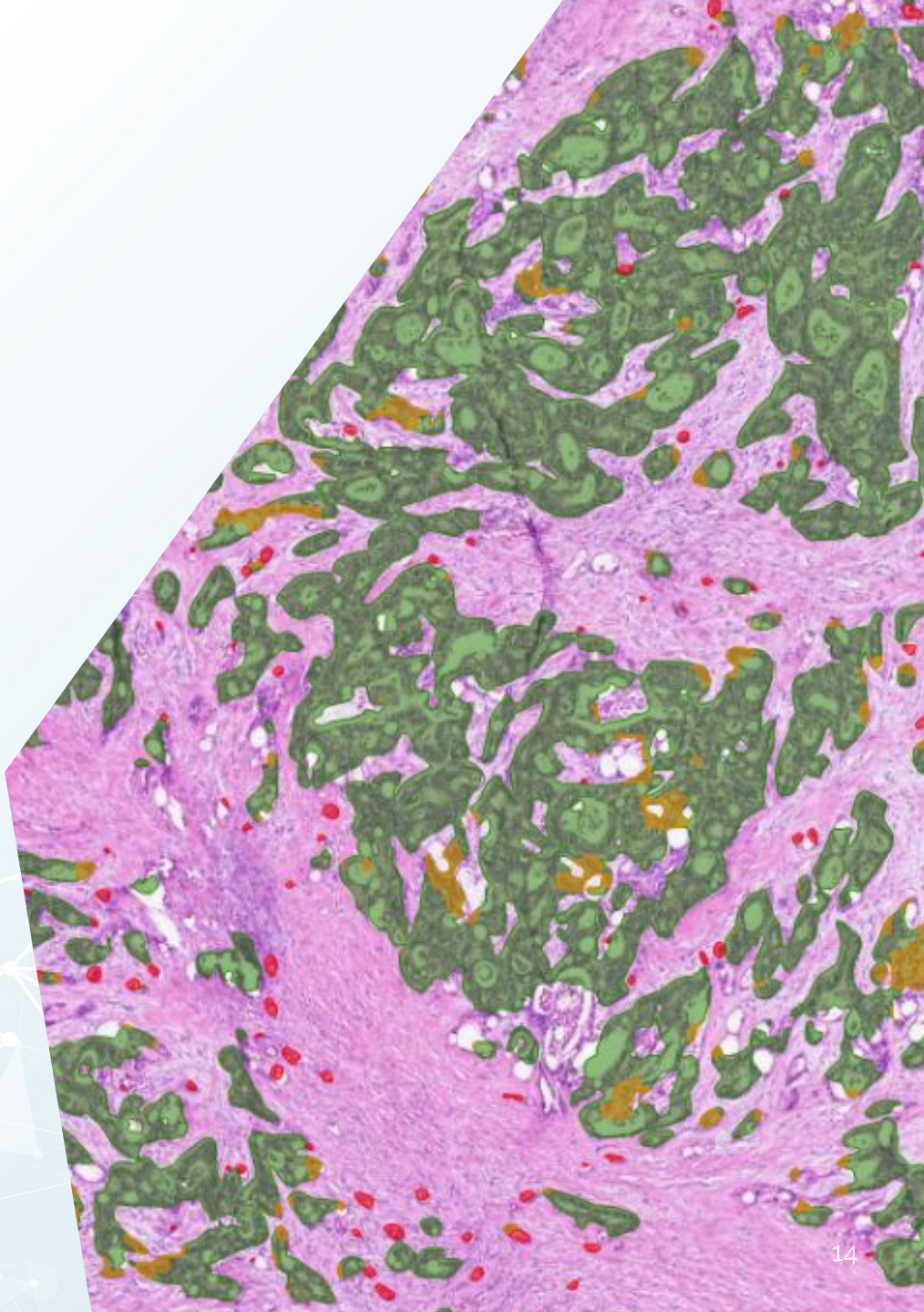

Case2
aiforia clinical
WHOLE IMAGE RESULTS
Case2_Slide3_GGG5
Show AI results on image
%
Benign 4.5
Malignant 23.4
G3 0.0
G4 2.6
G5 97.4
TUMOR & BIOPSY LENGTH
Show measurement lines
mm
Tumor length (11 measurements) 56.41
Biopsy length (11 measurements) 74.17
REGION OF INTEREST
REPORTING PROTOCOL
Report generation
Case2_Slide3_GGG5
CONFIRM REPORT
Histologic Type
Malignant
Histologic grade
Gleason primary pattern 5
Gleason worst remaining pattern 5
Grade group (GG) 5
Gleason score G5 + G4 = 9
EXCLUDE
REGION OF INTEREST
REMOVE
Automatic measuring of tumor & biopsy length
Tumor & Biopsy length
mm
Tumor length 12.33
Biopsy length 13.70
ANNOTATE
MEASURE
Zoom
20X
40X
100X
0.9x
ADJUST
2 mm
IMAGES (6)

Future of pathology image analysis: prognostic AI models

Prognostic AI model **Aiforia® Colorectal Cancer QuantCRC** identifies important histological features of colorectal cancer and provides a recurrence prediction estimate useful for treatment decisions.

The AI model was developed and validated in collaboration with the Mayo Clinic.



Aiforia® Colorectal Cancer QuantCRC is currently for Research Use Only (RUO) and for Performance Studies Only (PSO) in all market areas.

Strong scientific and regulatory validations

- Aiforia's products have been referenced in **over 80 scientific articles and posters**
- Aiforia holds several globally recognized quality and security certifications such as **ISO13485, ISO27001 and SOC 2 Type II**
- **Multiple patents in the US** related to processing and analysis of images of pathology specimens
- Aiforia complies with applicable **HIPAA regulations**
- Aiforia has initiated a path to secure regulatory approval for its first product in the United States, **application to the FDA** anticipated in 2024.
- Aiforia has **six CE-IVD marked products** in its portfolio
- From research use to clinical: **customer-validated Lab Developed Test (LDT)** pathway

aiforia®
AI for image analysis

For more information

www.aiforia.com

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