



PATHOMIQ

**Survival Starts with Early
Action: Diagnosing
Prostate Cancer in
Minutes**

 **MANTRA LABS**



Client



PathomiQ Inc., headquartered in Silicon Valley, California, is a **computational pathology and multi-omics platform** to assist Pharmaceutical and Healthcare Industries with faster, cost-effective drug development and scalable personalized therapy design.

The company is founded by the veterans of biomarker research, data scientists and clinical pathology.



Problem Statement

- ◆ PathomiQ required a mechanism to detect different patterns of **prostate cancer** for a given slide.
- ◆ Cancer grading is a daunting task because of the enormous data size and very subtle differences between cancer and benign glands. For example, 1 WSI (Whole Slide Image) contains over **6 billion pixels** and the probability of the presence of high-grade cancerous cells (GP5) is **< 0.005%**.

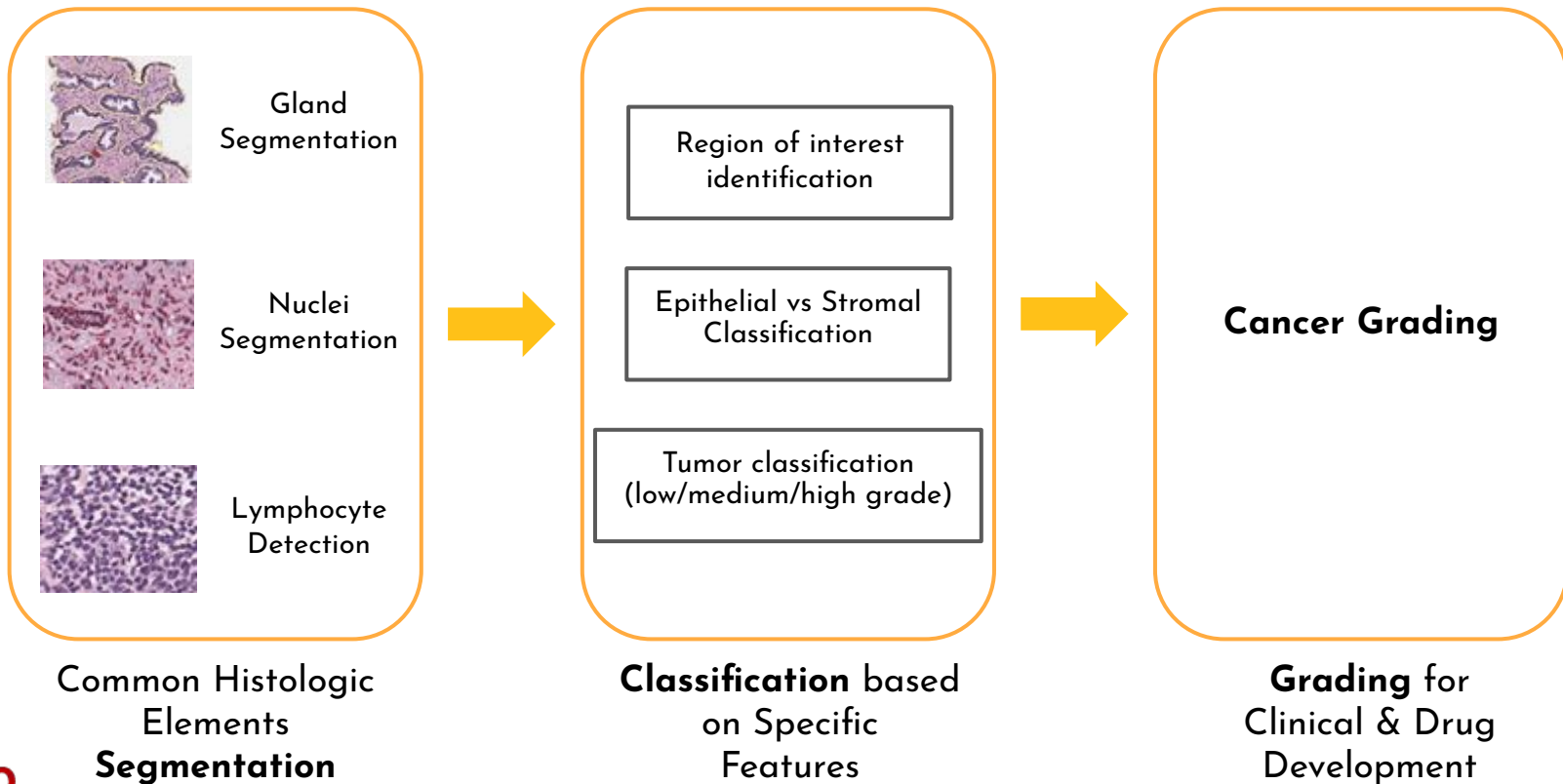


Solution Components

- ◆ **Hybrid Deep Learning Architecture** for Cancer Grading. (Combination of Classification & Segmentation Neural Networks)
- ◆ **Multi-scale model** to capture nuclear detail as well as glandular context.
- ◆ **Fine-tuning model** to make the algorithm sensitive to the minuscule amount of high-grade cancer cells.



System Architecture

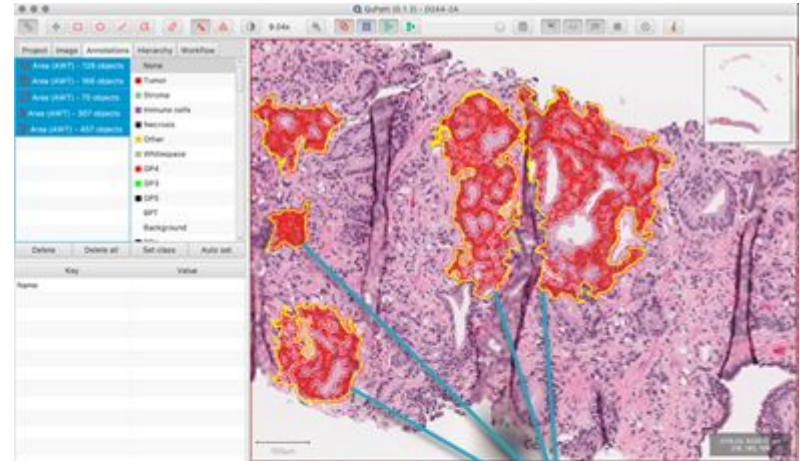




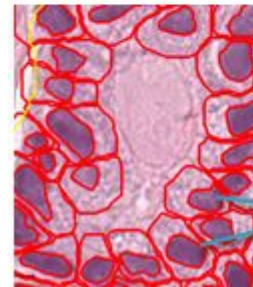
Data Preparation

The grading models are trained by extracting nuclei indices of different cancer patterns **annotated by pathologists**.

- Loading the annotated XML files on the QuPath.
- Drawing the annotation.
- Extracting the centroid X,Y coordinates of the nuclei cells and storing them into the file.



Annotated by
Doctors

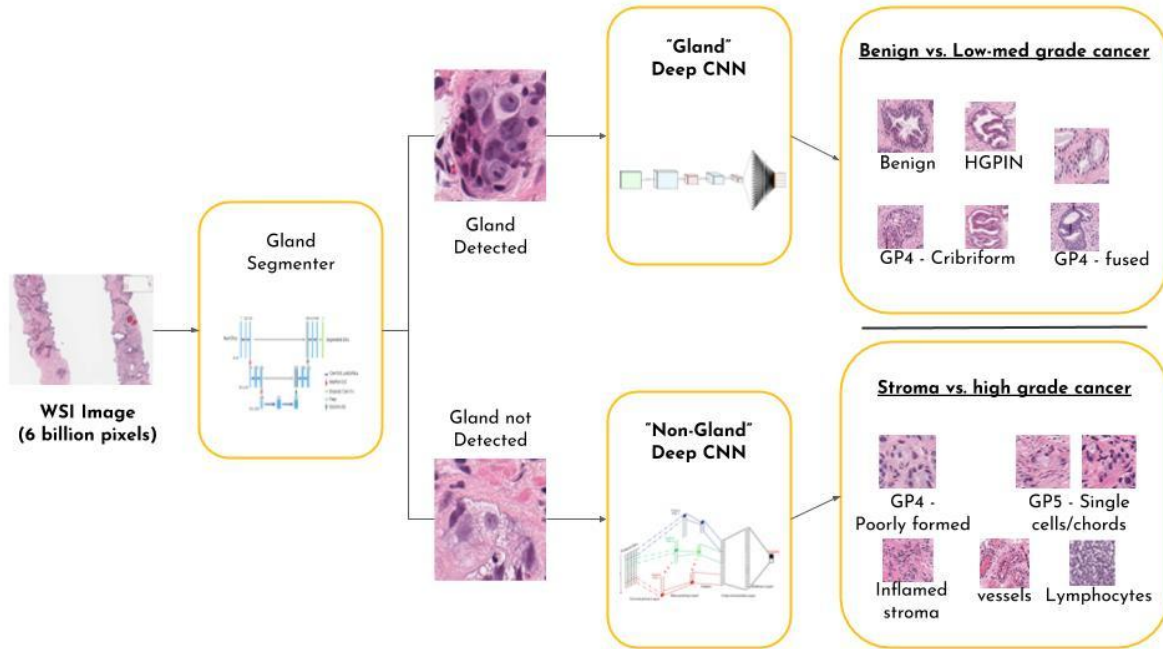


Nuclei cells



Segmentation & Classification Models

The shape of the cells is important for determining the severity of cancer. Segmentation helps in identifying cancerous cell patterns in a more granular manner and classification models help in automated grading.





Project Highlight

The platform has been trained to predict **5 different patterns** of prostate cancer.

- **Stroma** – Normal cells
- **Benign or BPT** – Early stage of cancer cells
- **GP3** – Gleason Pattern 3 cancer cells
- **GP4** – Gleason Pattern 4 cancer cells
- **GP5** – Gleason Pattern 5 cancer cells
(High-grade cancer)





Technology Stack



Software: **QuPath**

QuPath is an open-source software for whole slide image (WSI) analysis and digital pathology.



Libraries

Primary: Theano & Lasagne

Other: Cv2, openslide, numpy
Scipy, matplotlib



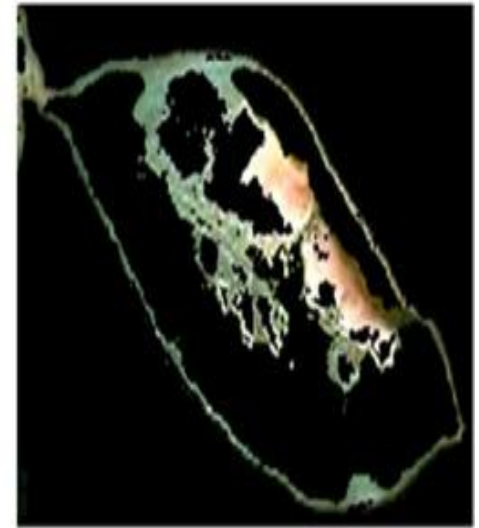
Outcomes

- ◆ **Speed:** High-speed processing and image viewing system.
- ◆ **Automation:** Created a predictive annotation system & pipelined multiple model predictions.
- ◆ **Accuracy:** Pathologists only need to review less than **5%** of data for annotations.



Other Applications of the Model

Similar AI models can be used for **Leaf-disease detection & classification** for a sustainable and scalable agriculture.





Leading Clients





About Mantra Labs

We Build Intelligent Experiences That Matter.



NASSCOM





Thank You.

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