

A rich internet application for remote visualization, collaborative annotation, and automated analysis of large-scale biomages

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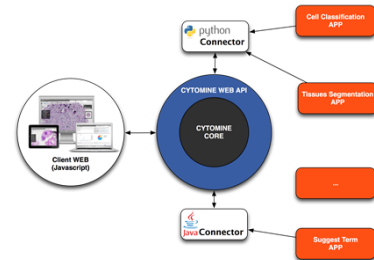


Context

It is challenging to efficiently share, annotate and analyze high-resolution, high-throughput, images due to their distinct geographical localizations, their high dimensionality, and their numerous sources of variability. Given existing software limitations, annotations or quantifications are also often performed manually by isolated experts and stored locally in specific formats.

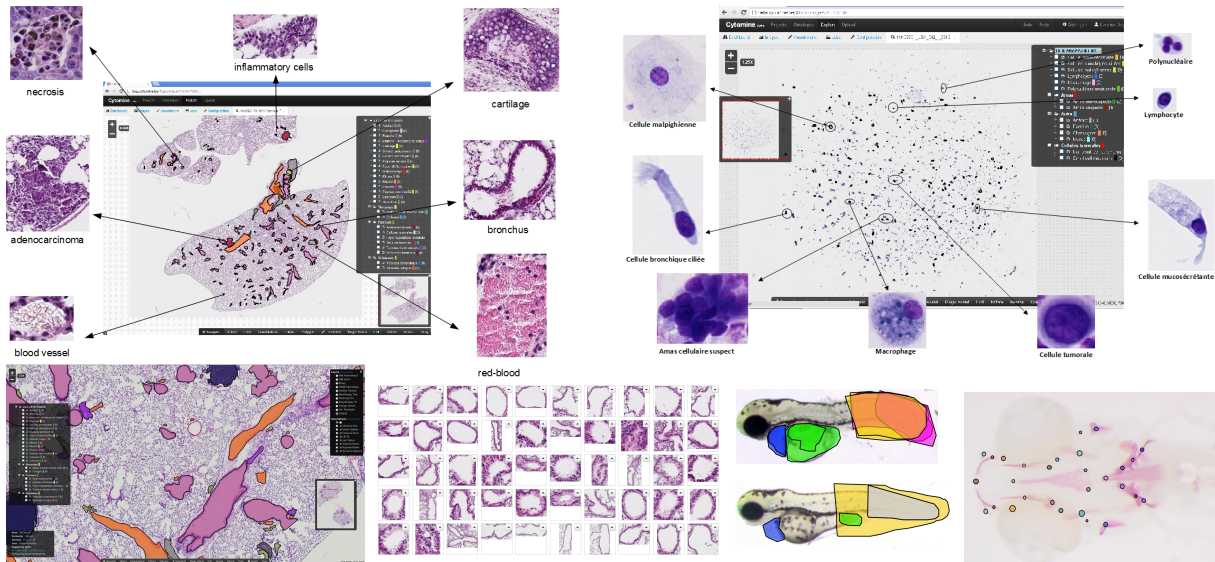
Architecture and data model

We integrated recent web technologies and generic methods to ease visualization and annotation of large-scale images through the Web [1]. On server-side, our data model allows to create and manage projects, where each project corresponds to a specific experimental study. A project is described by a list of authenticated users, a list of images, an user-defined, structured, ontology, and annotations (ROI) drawn by users and described by ontology terms. All data are stored in a spatial, relational, database and accessible through a RESTful web API.



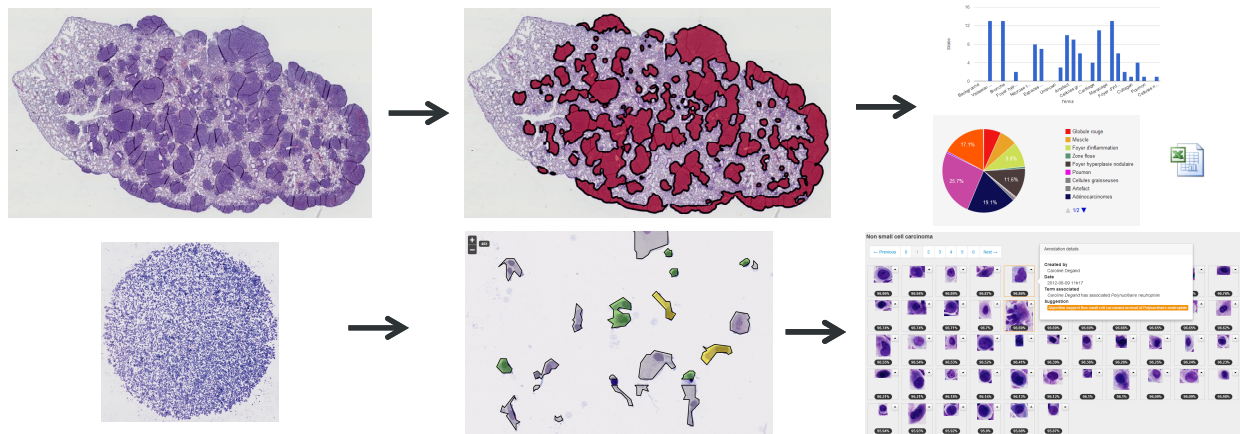
Remote visualization and collaborative annotation

Using this tool our collaborators are using regular Web browsers to build atlases of thousands of annotations related to cell and tissue types in lung studies, or related to embryonic phenotypes in Zebrafish developmental studies.



Automated image analysis

Based on manual annotations, we have implemented client softwares using tree-based machine learning methods [2] in order to automatically detect and label regions of interest in new images (e.g. tumors or specific types of cells). These softwares are exchanging data through the API and automatic annotations are reviewable directly in the web interface. Users are then able to derive statistics describing the content of their data (thousands of images, where each image is typically > 50k x 50k pixels).



References

- [1] Marée et al., *A rich internet application for remote visualization and collaborative annotation of digital slides in histology and cytology*, Accepted for publication in BMC Diagnostic Pathology, 2012
- [2] Marée et al., *Extremely randomized trees and random subwindows for image classification, annotation, and retrieval*, invited chapter to appear in book « Decision Forests in Computer Vision and Medical Image Analysis » (eds. A. Criminisi, J. Shotton, and E. Konukoglu), Advances in Computer Vision and Pattern Recognition, Springer, 2013

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