

The Emergence of the Web Computer

an hands-on view from the trenches of computational pathology

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Abstract. The need to contextualize data about an experiment or a patient is increasingly achieved with reference to Big Data resources such as The Cancer Genome Atlas (TCGA). This exercise faces numerous obstacles, from the logistics of traversing a very large and constantly growing data set (the number of files hosted by TCGA doubles every 7 months) to the protection of patient privacy. It also includes an absolute need for “weak AI” to reach domain experts increasingly immersed in mobile platforms. These challenges are not unique to Biomedicine but are, in many regards, particularly difficult to meet in this domain. Correspondingly, the pursuit of solutions is part of the core mission of the new sub-discipline of Computational Pathology. This presentation will overview early stage solutions with applications ranging from image analysis in cytology to the personalization of cancer treatment. These illustrative applications will be used as part of an argument for the central role played by Web Technologies, with particular emphasis on Semantic Web frameworks and code distribution directly to the ubiquitous Web Platform supported by the modern web browser.

Summary:

1. Computational Pathology - [context](#) + [recent emergence](#). [pic + medical training].
 - 1.1. Constraints: down to two options, [thin clients](#) or the **web browser**.
 - 1.2. [Consumer-facing](#) commoditization + actionable, immersive UIs.
2. Using the Web Browser for image and sequence analysis:
 - 2.1. [Cytology](#)
 - 2.2. [Molecular Pathology](#)
 - 2.3. [Sequence Analysis Algorithms](#)
3. TCGA & ICGC
 - 3.1. An argument for discussion: Semantic Web helps you think.
 - 3.2. Illustrating argument with [TCGA roadmap](#) + [DSL](#) + WebApp...
 - 3.3. ... and with the critical value of APIs ([cbio](#), [icgc](#))
4. In the [post-MapReduce World](#)
 - 4.1 The Web now evolving from a global data space into a global processing space?
 - 4.2. HPC no problem? ([QMachine](#), [evalSpace](#))
5. [Knowledge Engineering Bottleneck](#): we are part of the problem.
 - 5.1. Remember [CaBIG](#).
 - 5.2. The [S3DB experiment](#).
 - 5.2. Illustrative solutions in the server ([VM/Service](#)) and client ([kinomics/FFHsm](#), [SGen](#))