COLLECTIONS OF CLASSIFIERS TUNED FOR CELL FINDING WITH AN APPLICATION TO BUILDING DIGITAL CELL ATLASES OF DROSOPHILA EMBRYOS

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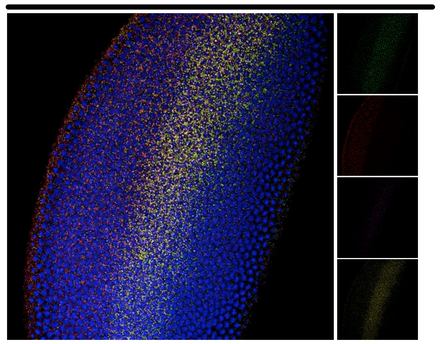
Data



Goals

Biology:

- quantitative analysis of image data
- Digital cell atlas

Computer Science:

- Classifier based algorithms (object detection)
- Classifier reuse (definition, storage, distribution, ...)

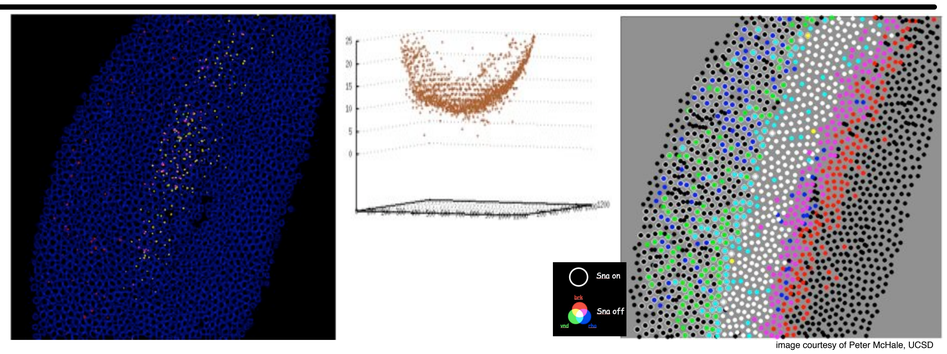


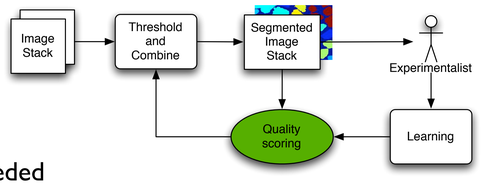
image courtesy of Peter McHale, UCSD

Challenges

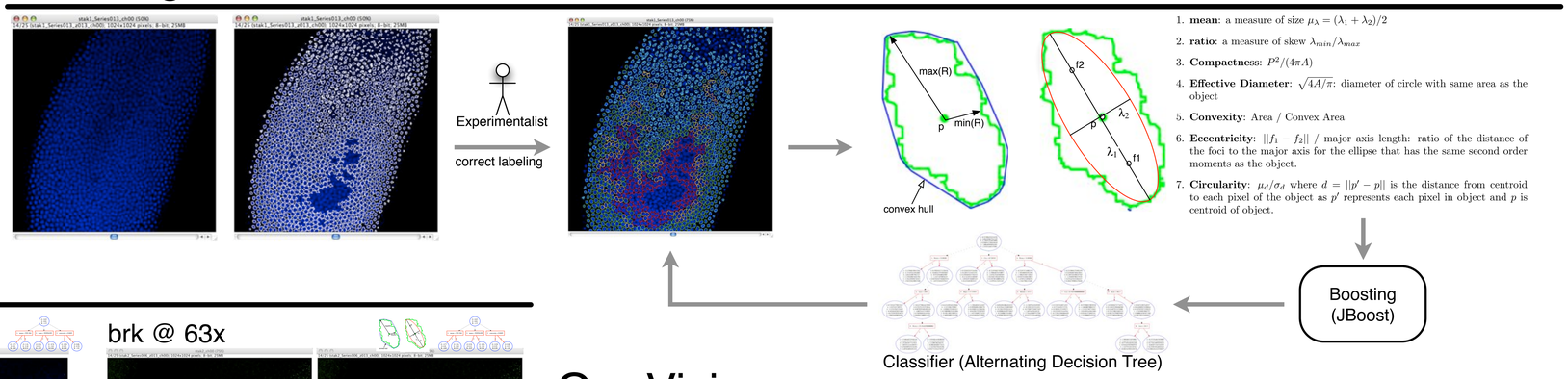
- Tuning is required for computer vision algorithms (for both initial use and as experimental conditions change)
  - Tuning requires computer vision expertise
  - experimentalist ≠ computer vision expert (typically neither side wants =)
- Building classifiers not as easy as it should be
- Sharing classifiers not as easy as it should be

Approach

- use machine learning to *mimic* biologist
- intuitive software interface engages biologist in training machine
- learn many classifiers as needed

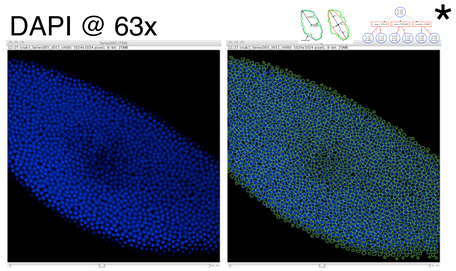


Learning Process

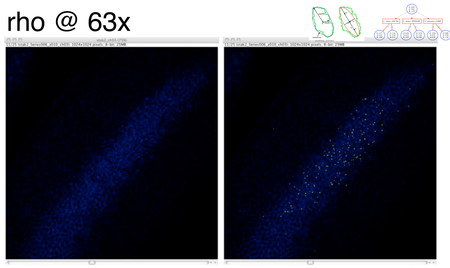


Results

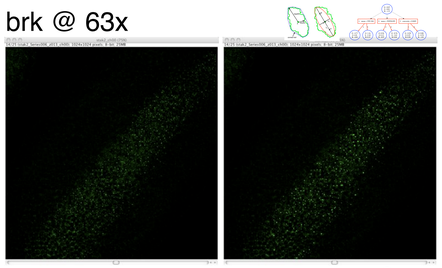
DAPI @ 63x *



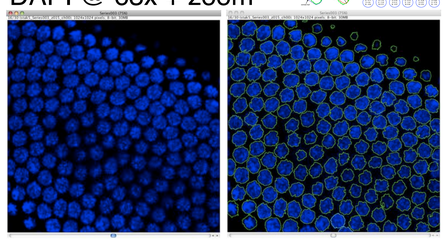
rho @ 63x



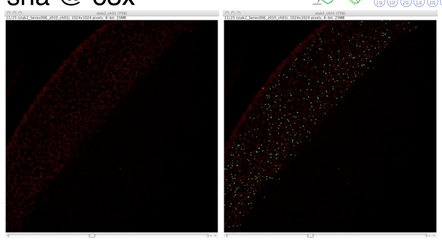
brk @ 63x



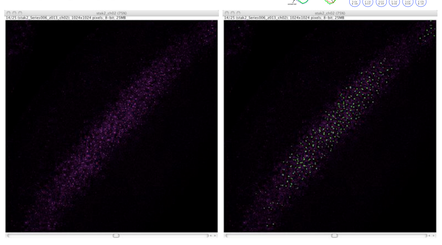
DAPI @ 63x + zoom



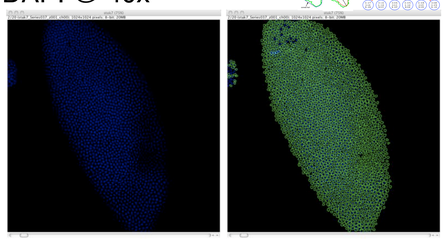
sna @ 63x



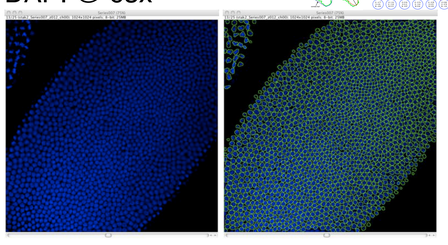
vnd @ 63x



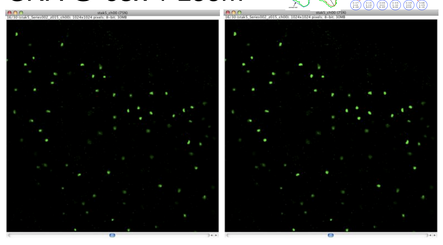
DAPI @ 40x



DAPI @ 63x *

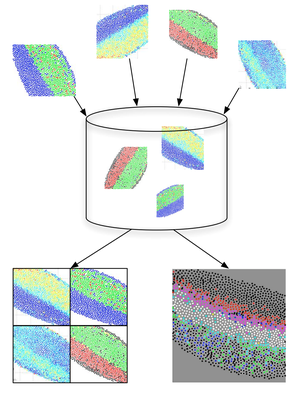


SNA @ 63x + zoom



Our Vision

Individual spatially & temporally aligned models allow quantitative comparison and aggregation of experiments



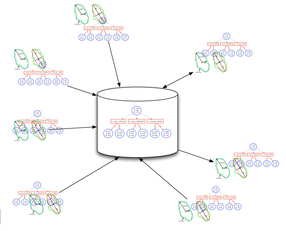
Construct models of embryonic development that can be queried

Provide tools to drive interactive inquiry and experimentation

Store classifiers and training data in a central repository. Standardizes interfaces & metadata

Collections of classifiers used, on demand, for:

- reuse in existing algorithms,
- development of new algorithms,
- repurposing of classifiers,
- adaption of existing classifiers
- many other uses....



Allow external entities access to classifiers, algorithms and tools

Other experimentalists/labs contribute classifiers back to classifier repository

More details and references for this project are available at http://eye.ucsd.edu