Tucson Python Meetup

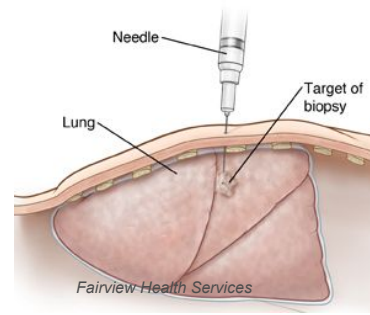How I Use Image Analysis & Processing at Work

Franklin Ventura

March 8, 2016

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- BS Biomedical Engineering UofA
- MS Software/Systems Engr ASU
- Ventana Medical Systems 5 yrs
  - Biomedical/Software Engineer
  - Technology and Applied Research
  - Digital Pathology
  - Cancer Diagnostics
- Applied Imaging Systems Team
  - Karl Garsha, Dustin Harshman, Taras Golota
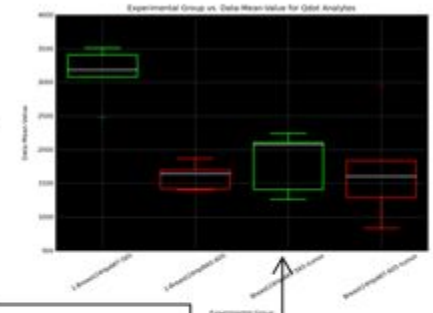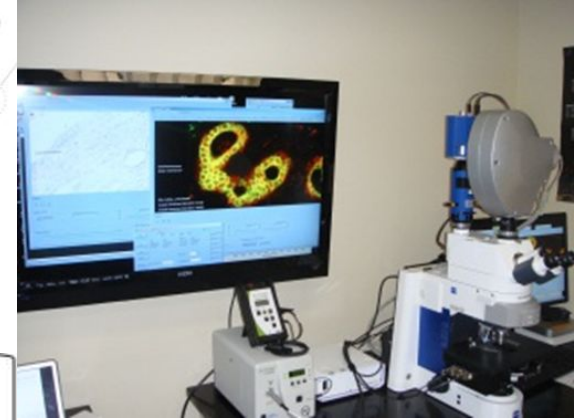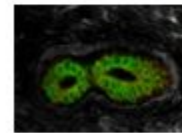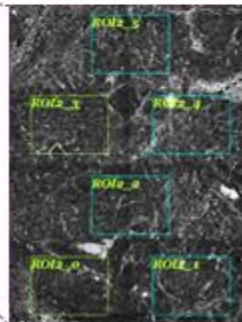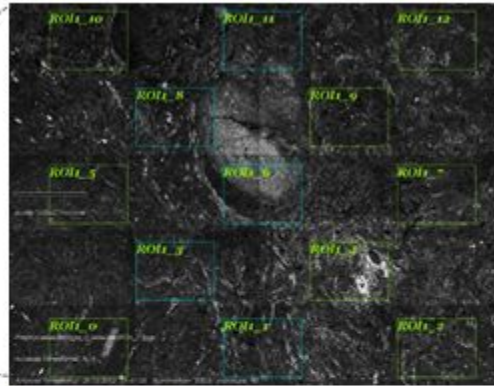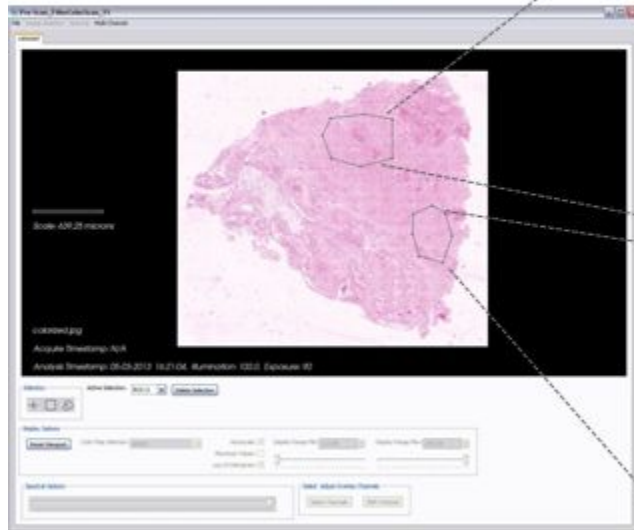
Research Development

◎ *Flexible System*
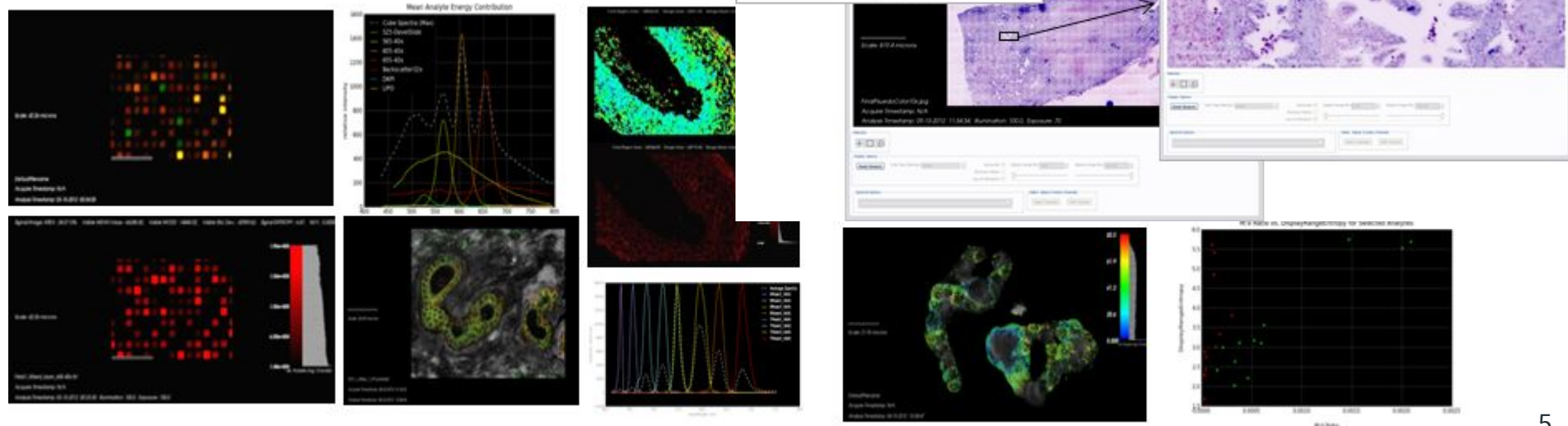◎ *Fluorescence*
  ○ *WS 10-80GB*
  ○ *Study ~3TB*

Core Libraries

◎ VTK
  ○ Image rendering and manipulation
◎ ITK
  ○ Image registration
◎ Matplotlib
  ○ Plotting
◎ Scikit-learn
  ○ Machine learning
◎ Scikit-image
  ○ Image processing
◎ Scipy
  ○ Scientific functions
◎ PIL
  ○ Simple image display and manipulation

◎ Numpy
  ○ Math functions, array manipulation
◎ Omero
  ○ Image database integration
◎ LaTeX/ReportLab
  ○ Report/Documentation Generation
◎ Micromanager
  ○ Connect to camera, microscope, etc.
◎ PywinAuto
  ○ Automation
◎ cx_Freeze and Innosetup
  ○ Compiler and installation

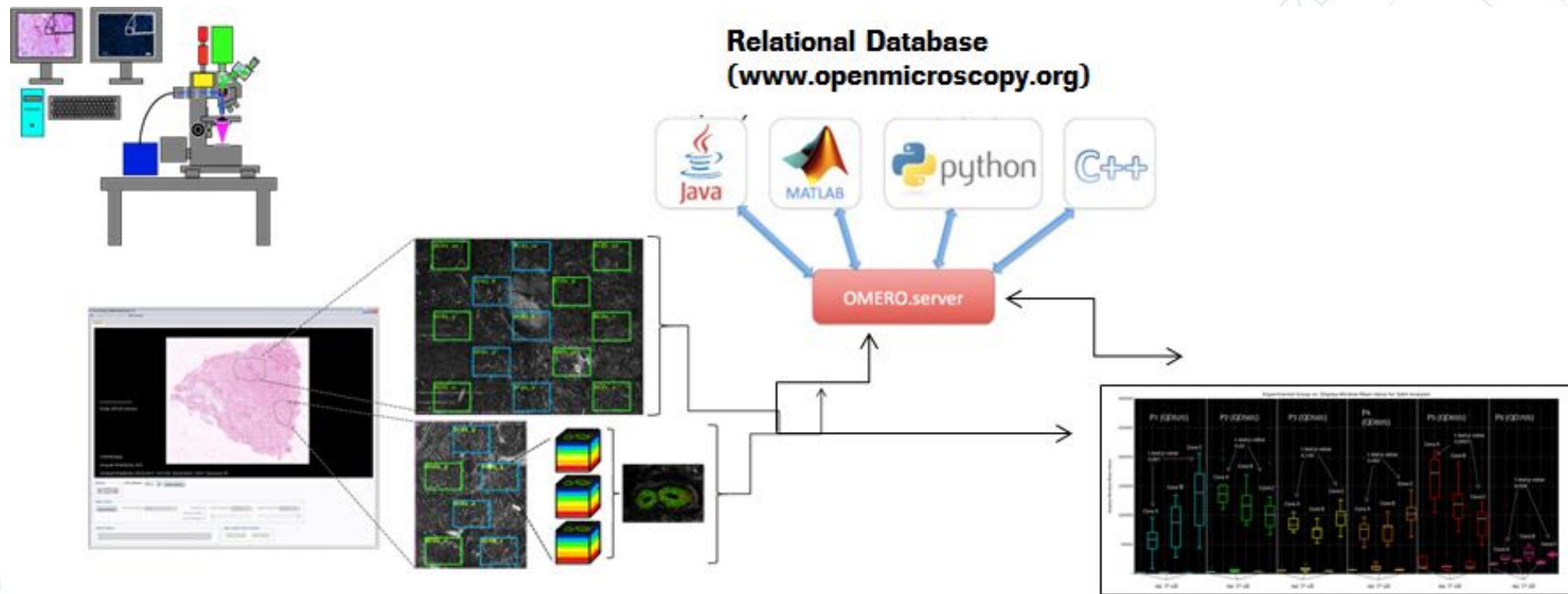◎ wxPython
  ○ GUI
◎ mlabwrap
  ○ Matlab incorporation

Visualization Toolkit (VTK) - Kitware

3D computer graphics, modeling, image processing, volume rendering, scientific visualization, and information visualization

Omero - Image Database

Relational Database
(www.openmicroscopy.org)
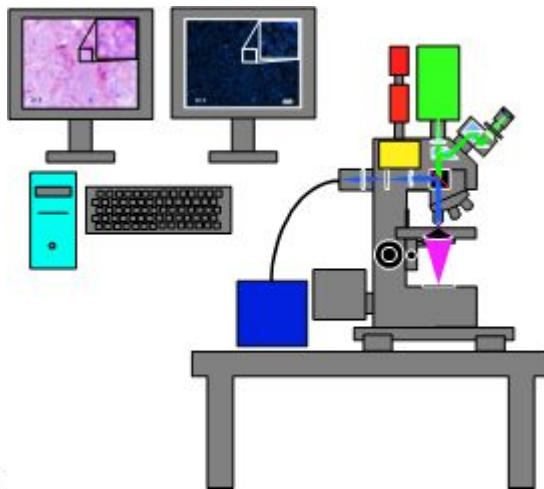
Micro-Manager - Hardware Control

Motorized Microscopes

- **iMic** - From Till Photonics
- **LeicaDMI** - Leica DMI and DM microscopes
- **LeicaDMR** - Leica DMR microscopes (and D
- **MoticMicroscope** - Motic BA600 microscop
- **NikonTE2000** - Nikon TE2000 motorized m
- **NikonTI** - Nikon Ti microscope
- **NikonAZ100** - Nikon AZ100 Zoom microsc
- **Olympus** - Olympus IX81 (Inverted)/BX61
- **ZeissCAN** - Zeiss CAN-bus (not CAN29) co
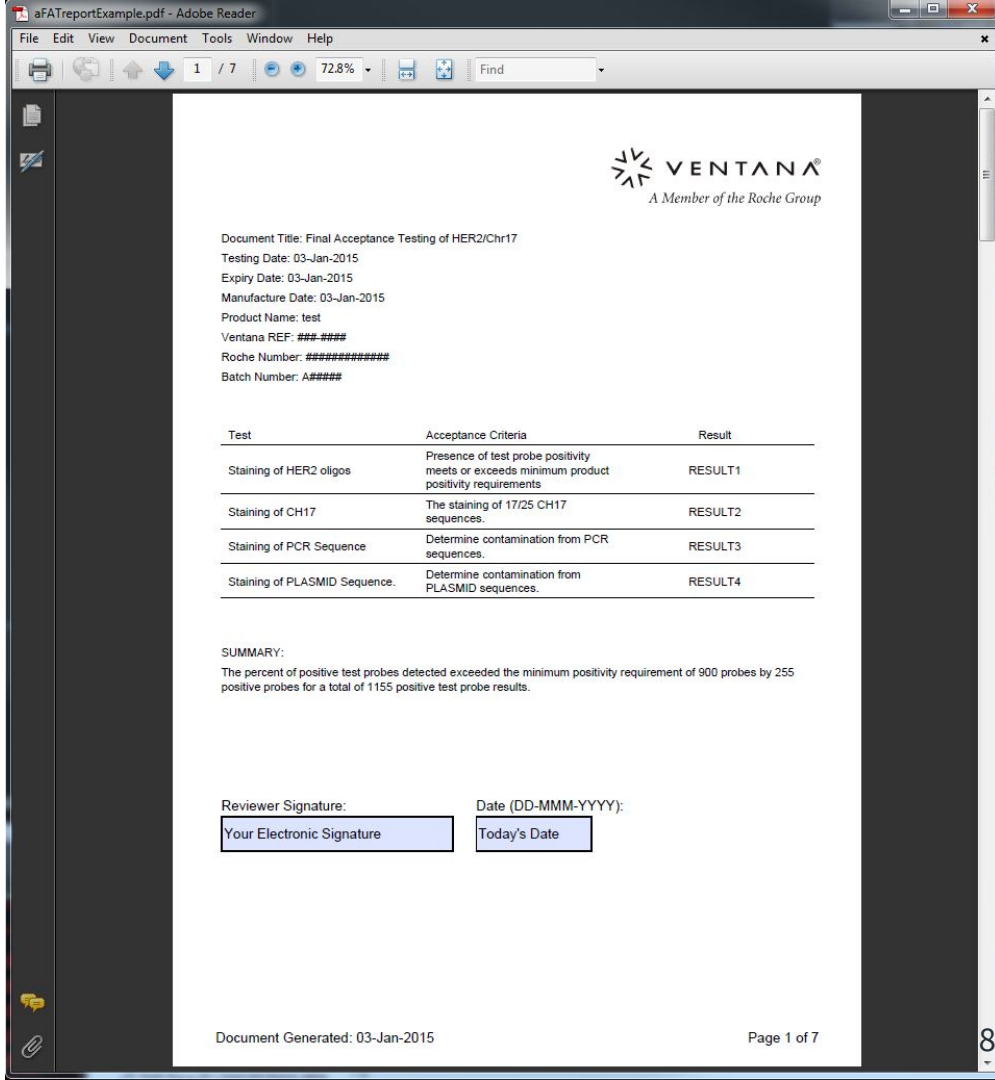- **ZeissCAN29** - Zeiss CAN29-bus compatible

Cameras

- **ABSCamera** - Cameras from ABS Gesellsc Jena
- **Andor** - Andor cameras
- **AndorSDK3** - New model Andor cameras
- **Apogee** - Apogee cameras
- **AxioCam** - Zeiss AxioCam medium resolut
- **BaumerOptronic** - Leica DFC camera (thr
- **dc1394** - Firewire cameras that adhere to
- **DECamera** - Direct Electron Cameras
- **DemoCamera** - Virtual, emulated equipme
- **DemoStreamCamera** - Virtual, emulated
- **DSLRRemoteCamera** - Canon DSLR came
- **GigECamera** - GigE Vision- and GenICam-
- **GPhoto** - Canon and Nikon DSLR cameras
- **Hamamatsu** - Hamamatsu cameras (throu

```
import MMCorePy
mmc = MMCorePy.CMMCore()
mmc.loadDevice("cam", "PVCAM",
"Camera-1")
mmc.initializeDevice("cam")
mmc.setProperty("cam", "Exposure", 100)
mmc.setProperty("cam", "Binning", 2)
mmc.snapImage()
img = mmc.getImage()
```
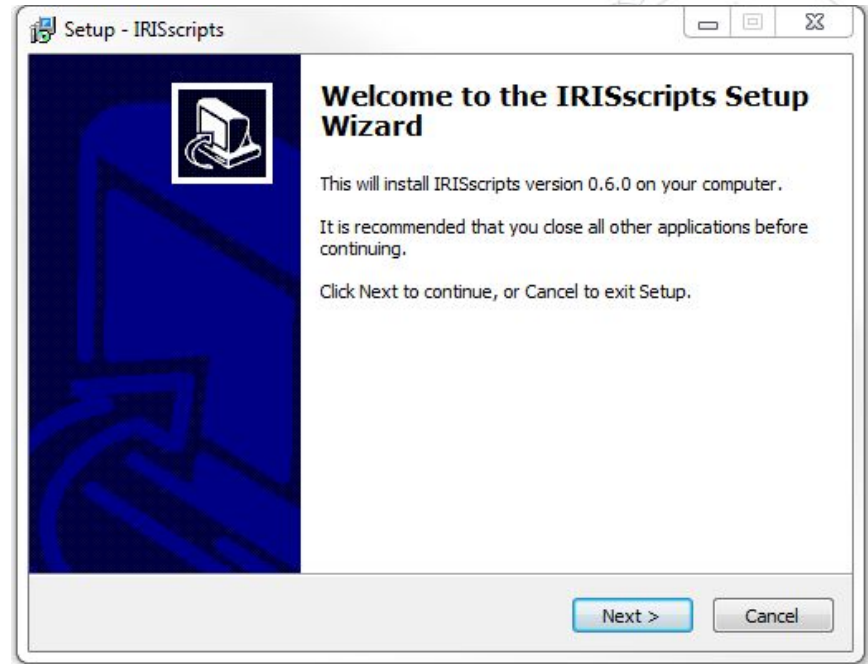
ReportLab

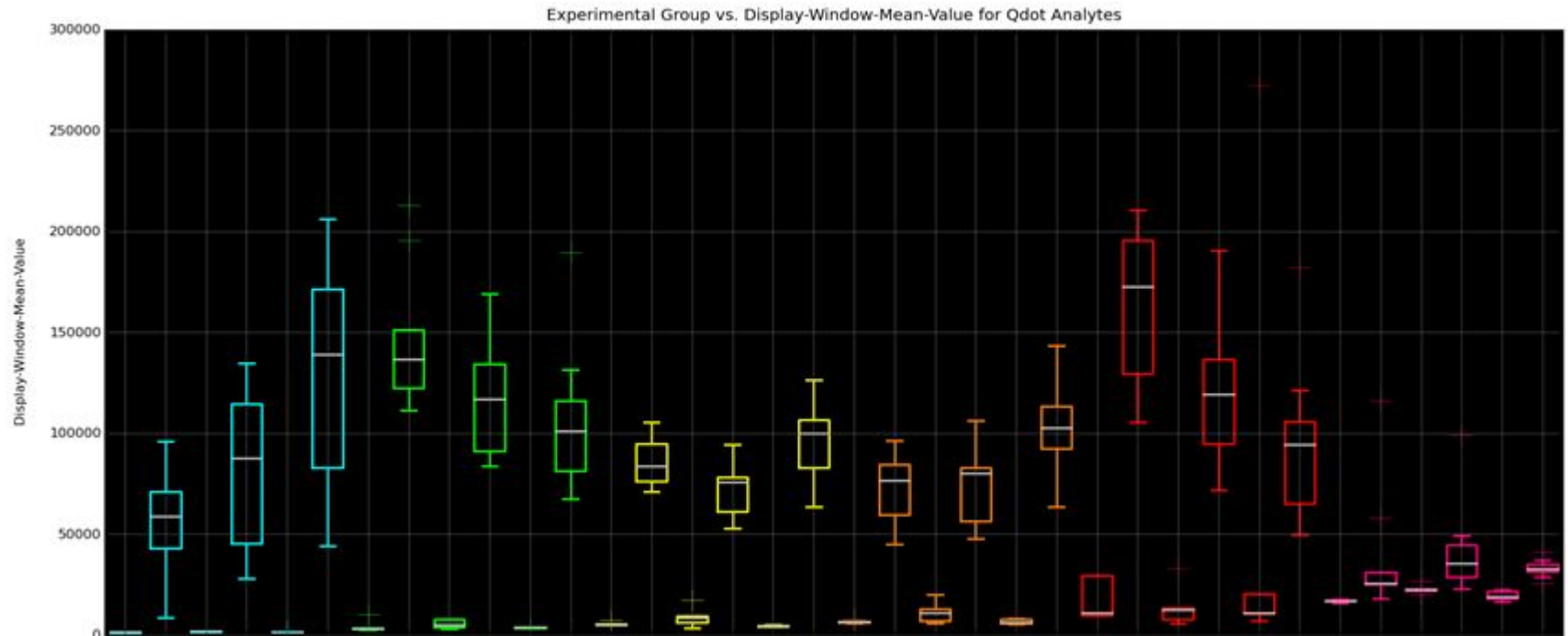"Create documents in Adobe's Portable Document Format (PDF) using the Python programming language

cx_Freeze and Inno Setup

◎ cx_Freeze
   ○ Cross platform freeze Python scripts into executables
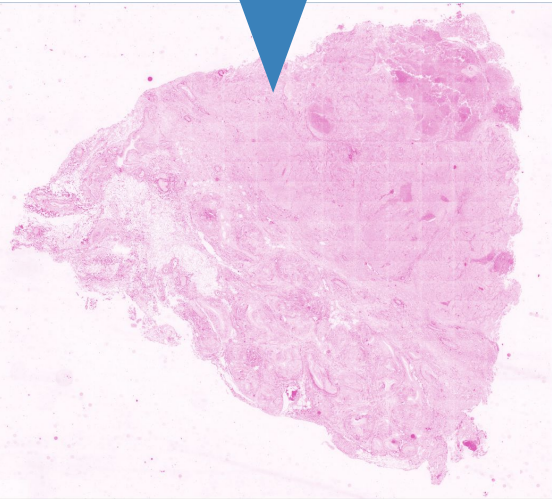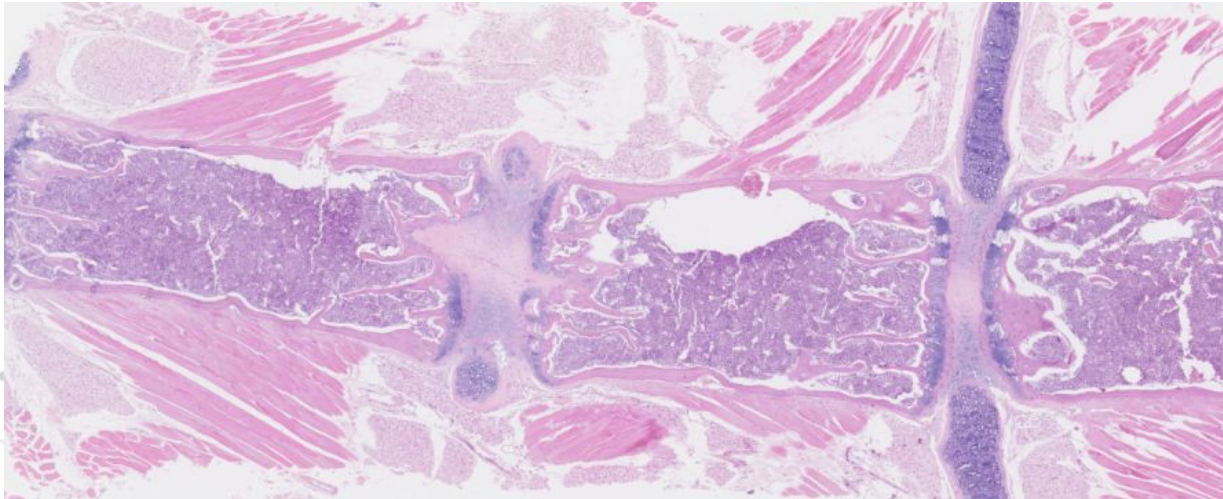◎ Inno Setup
   ○ Installer for Windows programs
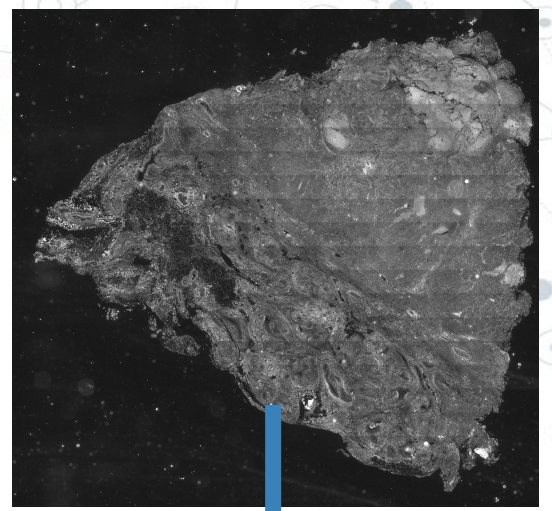
Scipy and Numpy

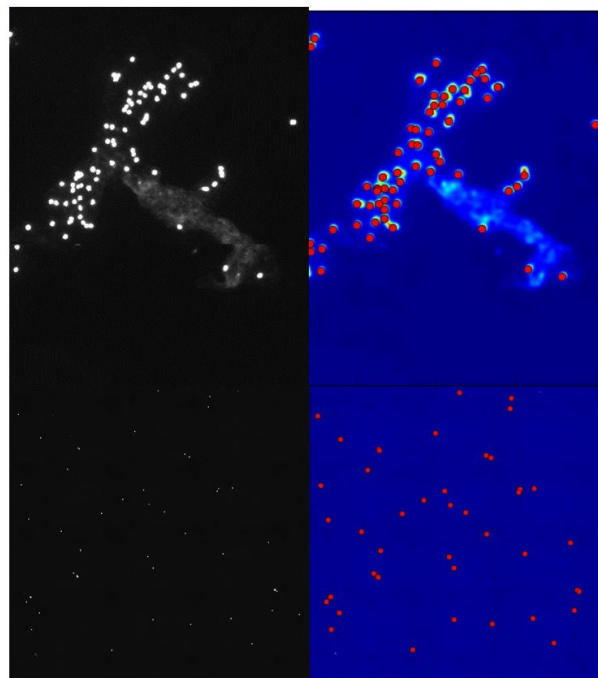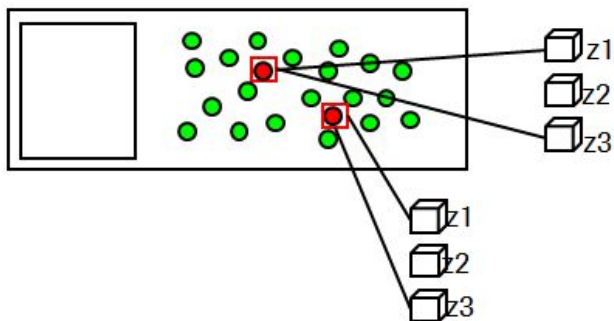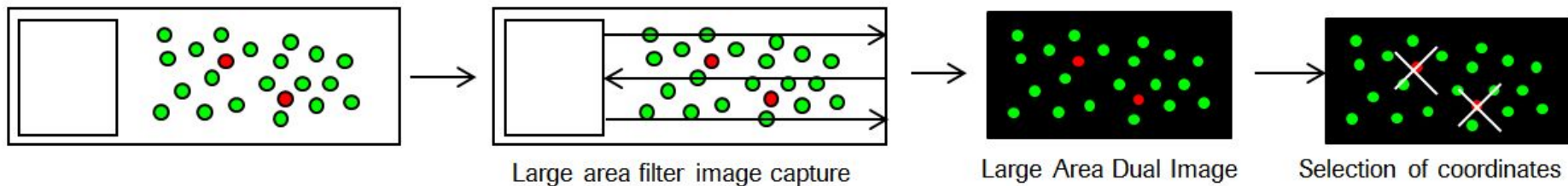Experimental Group vs. Display-Window-Mean-Value for Qdot Analytes

EX1: <u>Tissue Colorization</u> (Click for example)

Hematoxylin and Eosin (H&E) staining is most commonly used stains in histology. The stain enables pathologists to observe structure and morphology of cells in a tissue.
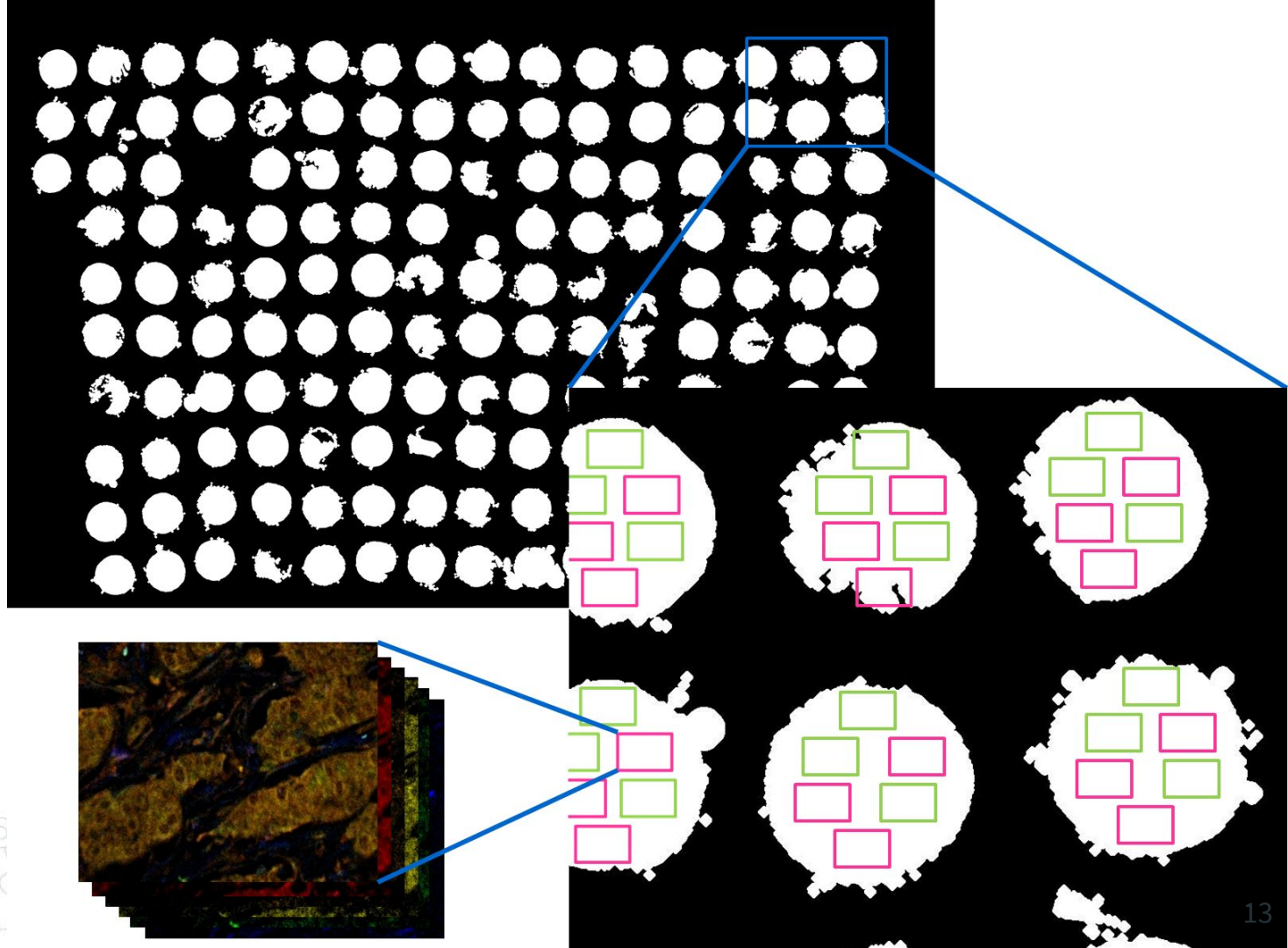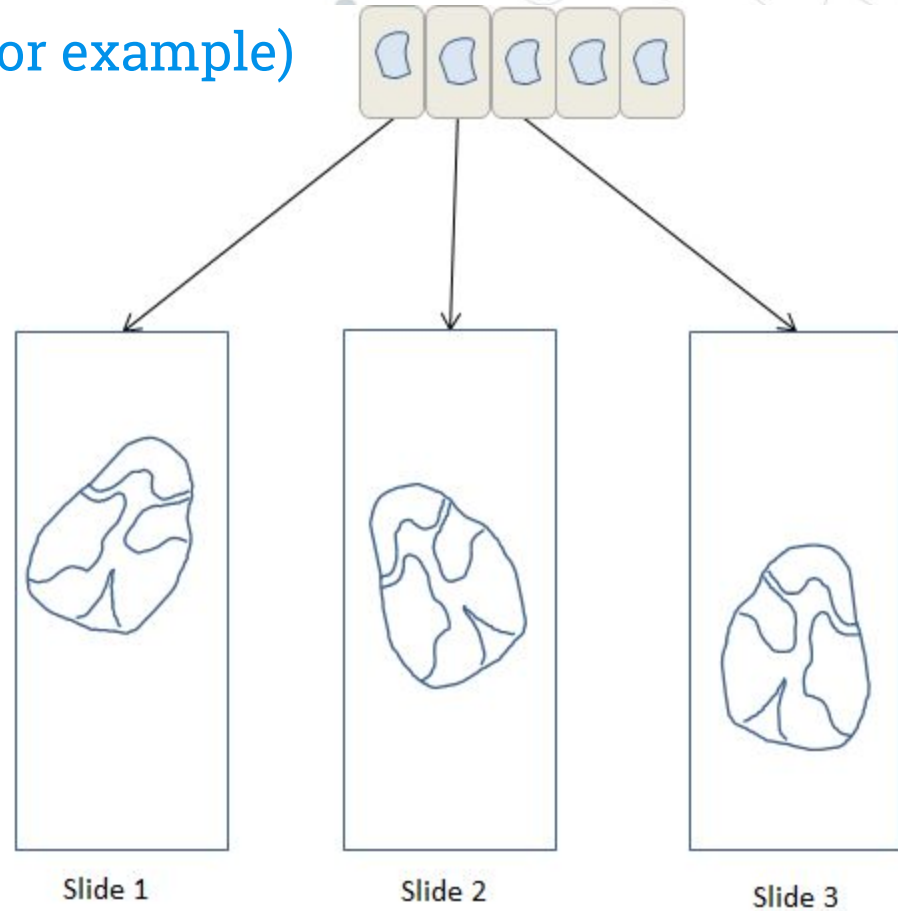
EX2: Finding Cells (Click for example)

Large area filter image capture

Large Area Dual Image

Selection of coordinates

z1
z2
z3

z1
z2
z3

EX3: Finding Tissue (Click for example)

EX4: Tissue Registration (Click for example)

Contributed by: Philipp von Bieberstein

Resources

https://github.com/AcejrAZ/TuPLE/tree/master/ScipyExamples

https://github.com/scikit-image/skimage-tutorials