Speeding up Scientific Imaging Workflows: Design of an Automated Image Annotation Tool

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Michigan State University

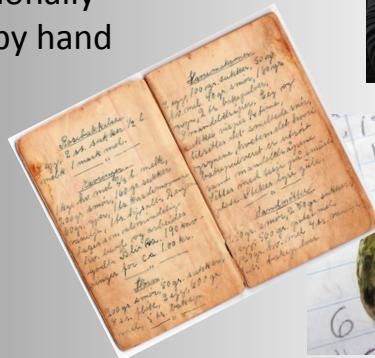Institute for Cyber-Enabled Research

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User Centered Computer Vision, UCCV 2013

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Visual Science

- Long history
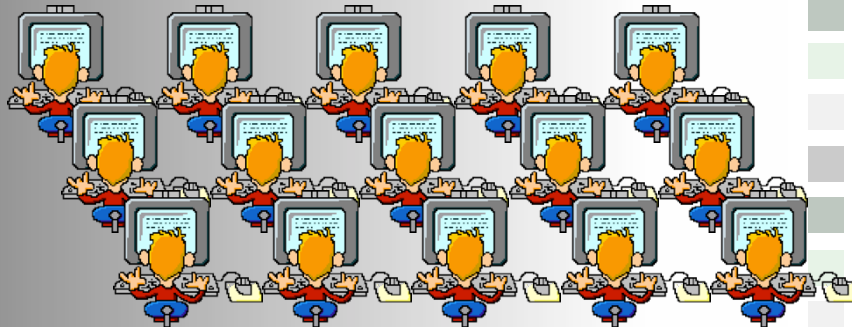 in Science (especially biology)

- Traditionally
  done by hand

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How are digital images analyzed?

Graduate students are cheap…
Undergraduates are even cheaper!

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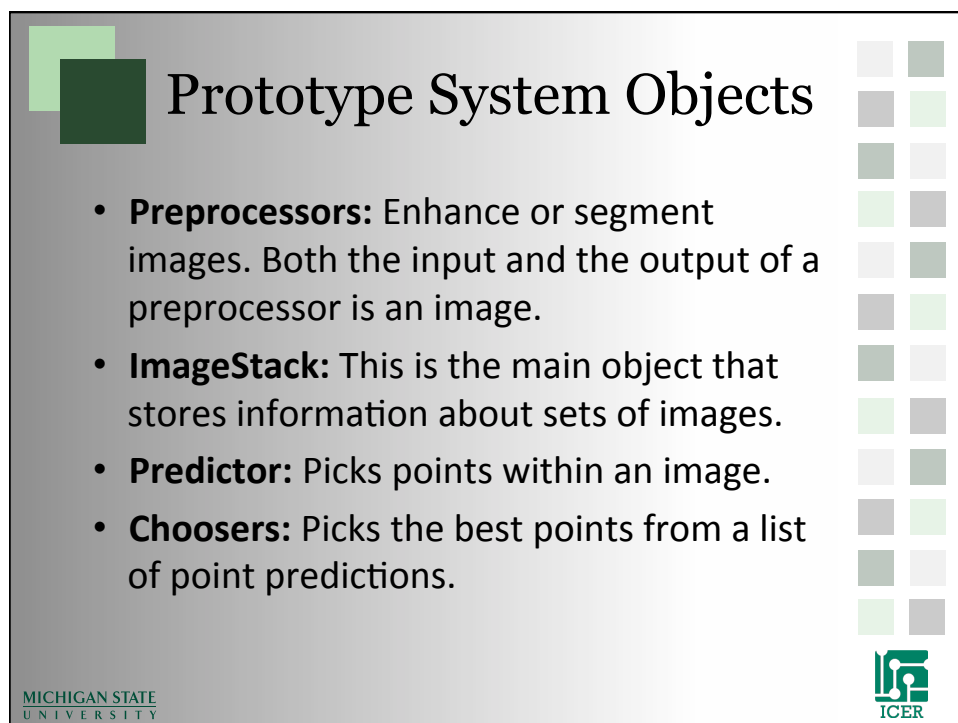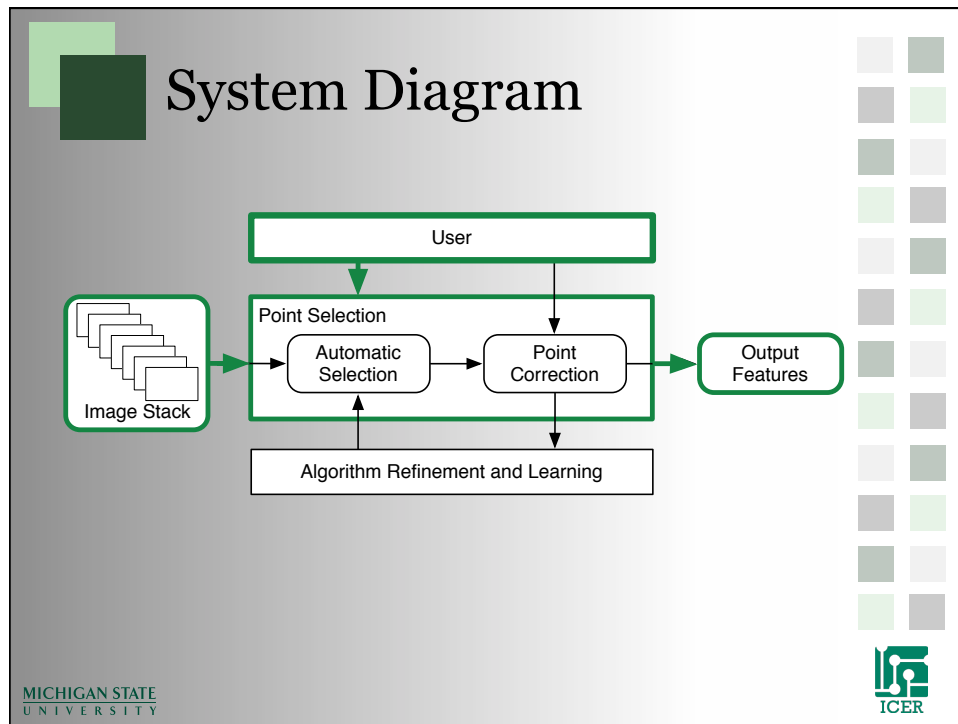Also, easy to run in parallel

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Why is this hard?

- In order to automatically analyze images you need a new tool for every problem
  - Every domain is different
  - There is no one tool that will solve all problems
  - General tools (like ImageJ) need to be assembled to make automated tools
  - It takes time to develop domain specific tools
  - For many researchers it is just faster to "do it by hand"

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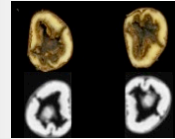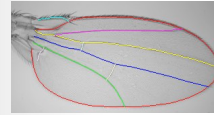# Our Goal

- Focus on the workflow of making tools, not on the individual tools themselves
- Make it easer to make new tools
- Should not take longer than "doing it by hand"

- How?

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System Diagram

Prototype System Objects

- **Preprocessors:** Enhance or segment images. Both the input and the output of a preprocessor is an image.
- **ImageStack:** This is the main object that stores information about sets of images.
- **Predictor:** Picks points within an image.
- **Choosers:** Picks the best points from a list of point predictions.
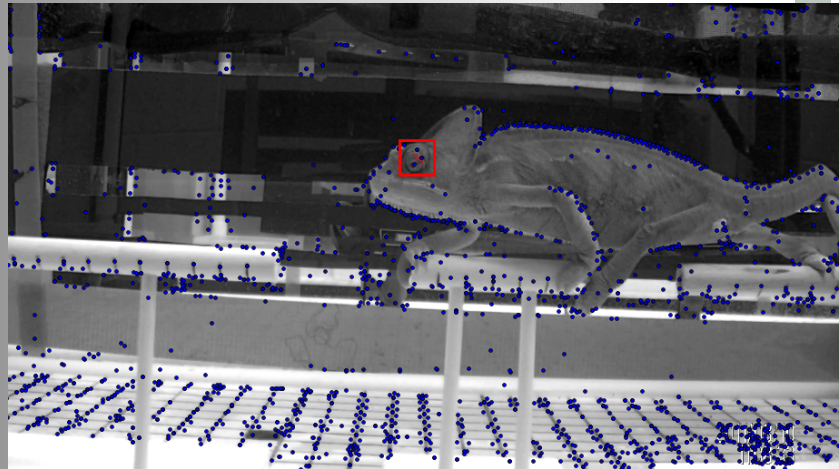
Example

- Preliminary Point Pickers:
  - Kinetic
  - Template Matching
  - SIFT Features

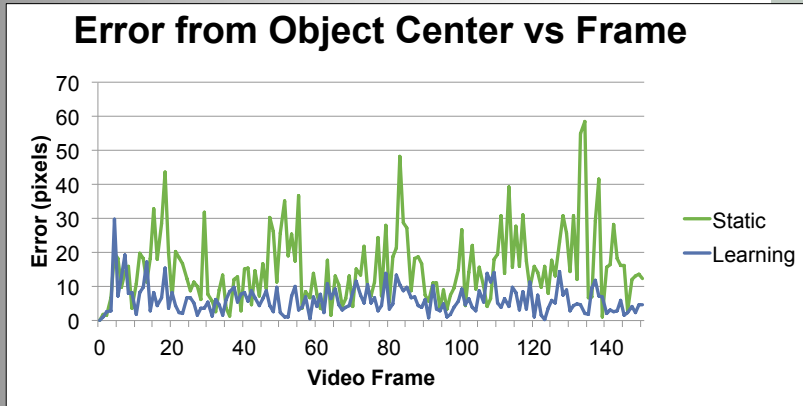MICHIGAN STATE
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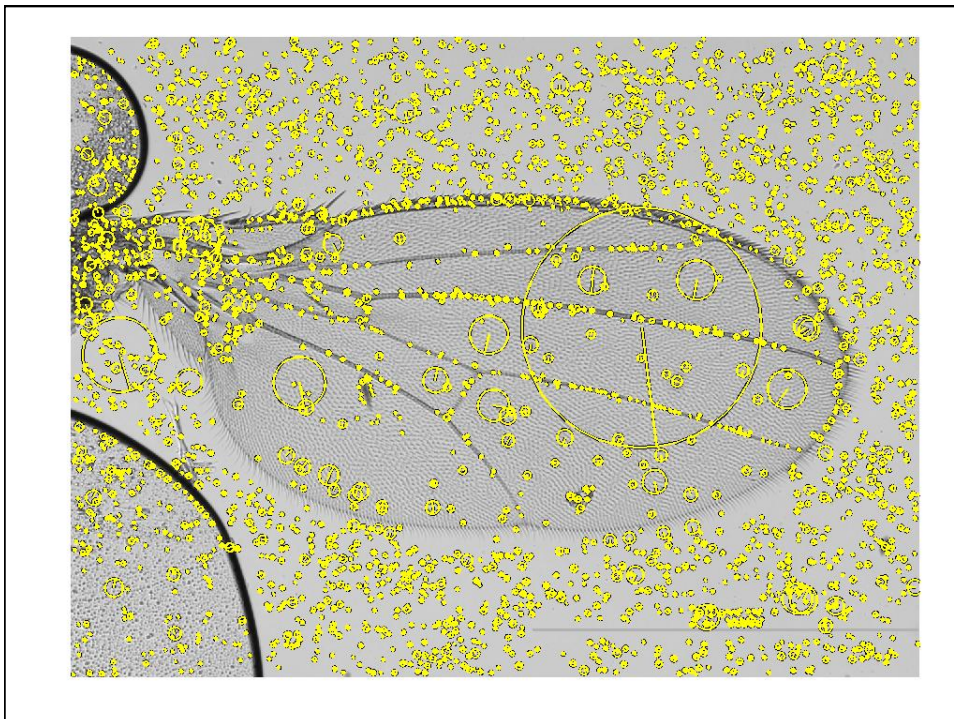# Point tracking on Chameleons

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Preliminary SIFT Results

Error from Object Center vs Frame

Patrick Korth, CSE University of Michigan

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Future Challenges

- More pickers
- More projects
- More than just points
- Automated search though the algorithm space
- Automated tweaking of algorithm parameters
- Bigger datasets (Run on the HPC)in the background
- Intelligent feedback to the researchers

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Concluding Thoughts

- Researcher Centered Computer Vision
- Keep the Researcher "In The Loop"
- Should not take longer than manual task

Questions?

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