Will Wright

PhD candidate, math and computer science

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Image processing

Jan 2017 – Present

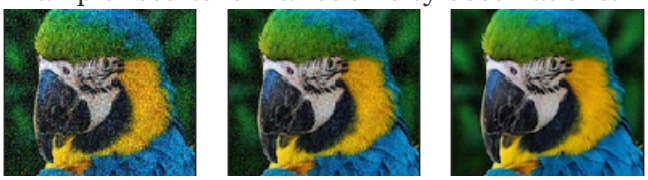
Phase retrieval denoising

Phase retrieval is the process of recovering phase of an unknown signal using the magnitudes of signal observations. The state-of-the-art method for noisy phase retrieval is a computationally expensive eigenvalue optimization problem.

Contributions:
- implemented **efficient numerical methods** for eigenvalue subproblem
- established convergence theory to support early termination and **quick convergence**
- proved probability of signal optimality to guarantee results are **still state-of-the-art**

Applications:
- speech processing
- astronomical imaging
- x-ray crystallography, electron microscopy

Example results for various noisy observations:



noise = 50% *noise* = 30% *noise* = 10%

Machine learning

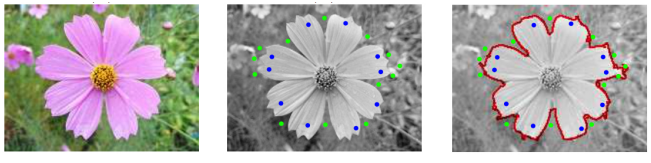
2016

Semi-supervised image segmentation

Normalized cuts (NCuts) is an image segmentation method which separate an image into distinct, meaningful regions. The most expensive step is computing the adjacency matrix. The Python *scikit-image* subroutine requires $\mathcal{O}(\text{pixels}^2)$ operations.

Contributions:
- developed method for computing adjacency matrix in $\mathcal{O}$**(pixels) operations**
- implemented new semidefinite programming method for solving NCuts in **50-80% fewer iterations**

Image segmentation example:



original *with constraints* *segmented*

Education

2013 – Present	**PhD, Mathematics** UC Davis *Advisor: Zhaojun Bai*
2010 – 2013	**MS, Applied Math** CSU East Bay
2001 – 2006	**BA, Political Science & Philosophy** Penn State

Internship/Co-op

June – Dec '16	**Software engineer** Apple, Inc.

Contributions:
- prototyped optimization methods
- contributed **performance-critical C++ code** to team repository
- prepared final report and presentation advising management of prototype method

Software experience

Phase retrieval denoising (MATLAB)
implemented and tested modern eigenvalue methods, developed extensive experiment scripts

Image segmentation (Python)
implemented segmentation method, integrated SDP software package, developed tests

Image deburring (Python)
developed gradient/Newton crossover method for basis pursuit denoising

Software skills

Experienced	LaTeX, MATLAB
Intermediate	C++, git, Julia, Python

Interests

Running, brewing beer, boardgames, guitar, audiobooks and podcasts (e.g., the Expanse, Stormlight Archive, Freakonomics)