What Grad School is About

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Research
What Research is All About

- You spend a lot of time learning.
  - Reading papers, re-implementing algorithms, talking with other students, taking relevant classes.
- But your learning tends to be directed towards a more narrow goal.
- Doing something new
  - Try to solve difficult problems.
  - Often, the most important part is trying to figure out what problem to try to solve.
- Work as a community.
  - Learn from others, work with others, try to contribute something that others will be able to use.
Research

- Pro: You work on a problem no one has ever solved before. Fascinating and rewarding
- Con: You work on a problem no one has ever solved before. Frustrating
- Pro: Extremely flexible schedule. Freedom
- Con: Extremely flexible schedule. Must be disciplined.
- Pro: You get paid for this.
- Con: Pay is low.
- Pro: You are always learning. Work is very interesting.
- Con: You are always learning. Never an expert.
Vision is inferential: Light

(http://www-bcs.mit.edu/people/adelson/checkershadow_illusion.html)
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What is it like to do computer vision?

• A very diverse field
  – Important work comes from people belonging to many different fields: Computer Science; Electrical Engineering; pure math; applied math; physics; neuroscience; psychology.

Common language is math
  – Diversity of goals: building useful systems; understanding biological vision; fundamentals of vision; testbed for learning or optimization.
  – Diversity of tools: math; optimization; system building (including real time systems); AI; learning…
Modes of Operation: Possible steps in doing a vision thesis

• Starting points
  – A practical problem: activity recognition; leaf recognition; real-time tracking.
  – An unresolved issue in a fundamental problem: role of occlusions in stereo; effect of motion on pose and shading.
  – A technique: fast multipole methods; Kalman filtering; belief propagation.
• First steps:
  – Implement benchmark algorithms.
  – Find a simple, toy domain to solve mathematically.
  – Look for flaws in current algorithms and try to improve them.

• Influential work:
  – Solve a fundamental math problem, especially one that gives rise to new algorithm.
  – Show importance of technique from other field.
  – Create a new problem.
  – Build impressive system that demonstrates new ideas or potential effectiveness of existing ones.
What makes a good vision researcher?

• Core competency in many areas: programming, math, knowledge of other fields.

• But can excel in many ways:
  – System building
  – Math/Algorithms
  – Vision and ...(graphics, hci, psychology, learning).