

How to read a research paper

Research papers are a peculiar kind of document; for the uninitiated, it will take some getting used to. There are two types of research papers that we may read:

- conference papers — shorter papers (typically 6–8 pages in robotics) generally subject to peer review, written and presented in conjunction with a conference meeting.
- journal papers — longer and more complete papers, subject to a more thorough peer review, and published in an (archival) journal

We will be reading several journal and conference papers from the robotics literature this semester. Some of the main journals and conferences in robotics are:

- IEEE Transactions on Robotics and Automation
- International Journal of Robotics Research
- Autonomous Robots
- IEEE Conference on Robotics and Automation (ICRA)
- IEEE/RSJ Conference on Robots and Systems (IROS)

The Rensselaer library has all these journals and conference proceedings. They are available online through the library. The library also has hardcopy up until the past few years.

To search for research papers on a topic, try the INSPEC database (available through the library website under Engineering databases) or try one of the following:

<http://citeseer.ist.psu.edu/>
<http://scholar.google.com/>

Many researchers (at least in the U.S.) put their papers online on their web page. Sometimes this is a better version than what you can find through the official online sources because conference proceedings often have scanned/reduced quality figures and images. However the published version is definitive.

Questions to ask while reading a research paper

It is important that you learn to read research papers critically, so here are some questions to ask yourself as you read:

- What problem(s) are they solving? Why are these problems important?
- What did they really do? (as opposed to what the authors say or imply they did)
- What is the contribution of the work? (i.e. what is interesting or new to the field?)
- What methods are they using?
- Would you have solved the problem differently?
- Do all the pieces of their work fit together logically?
- What were the results? Did they do what they set out to do?

Tips on reading research papers

- You need not read a research paper sequentially from beginning to end. Here's one possible sequence:
 - Read the title. (What is the paper about?)
 - Read the abstract. (Should give you a concise overview of the paper.)
 - Read the introduction. (Look for motivations, relation to other work, and a more detailed overview.)
 - Look at the structure of the paper. (What do the remaining sections address? How do they fit together?)
 - (Read the previous/related work section. (How does this work relate? What is new or different about this work?))
 - Read the conclusions. (What were their results?)
 - Read the body of the paper. You may want to skip over all the equations the first time through.
- The references won't mean much to you if you're not familiar with the literature. Sometimes important parts of the work may be contained in the references, particularly in conference papers since space is limited.

The references are very important when you are researching a topic — they point you to related research as well as the research upon which the current paper builds upon.
- Sooner or later, you will come across something that you don't understand. What can you do? You should try to figure out what it is and how it is being used (even though you still don't understand it). For further reading, see the references!