Web Crawling

INF 141: Information Retrieval
Discussion Session
Week 4 – Winter 2008

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Open Source Web Crawlers

Heritrix

Nutch

WebSphinx

Crawler4j

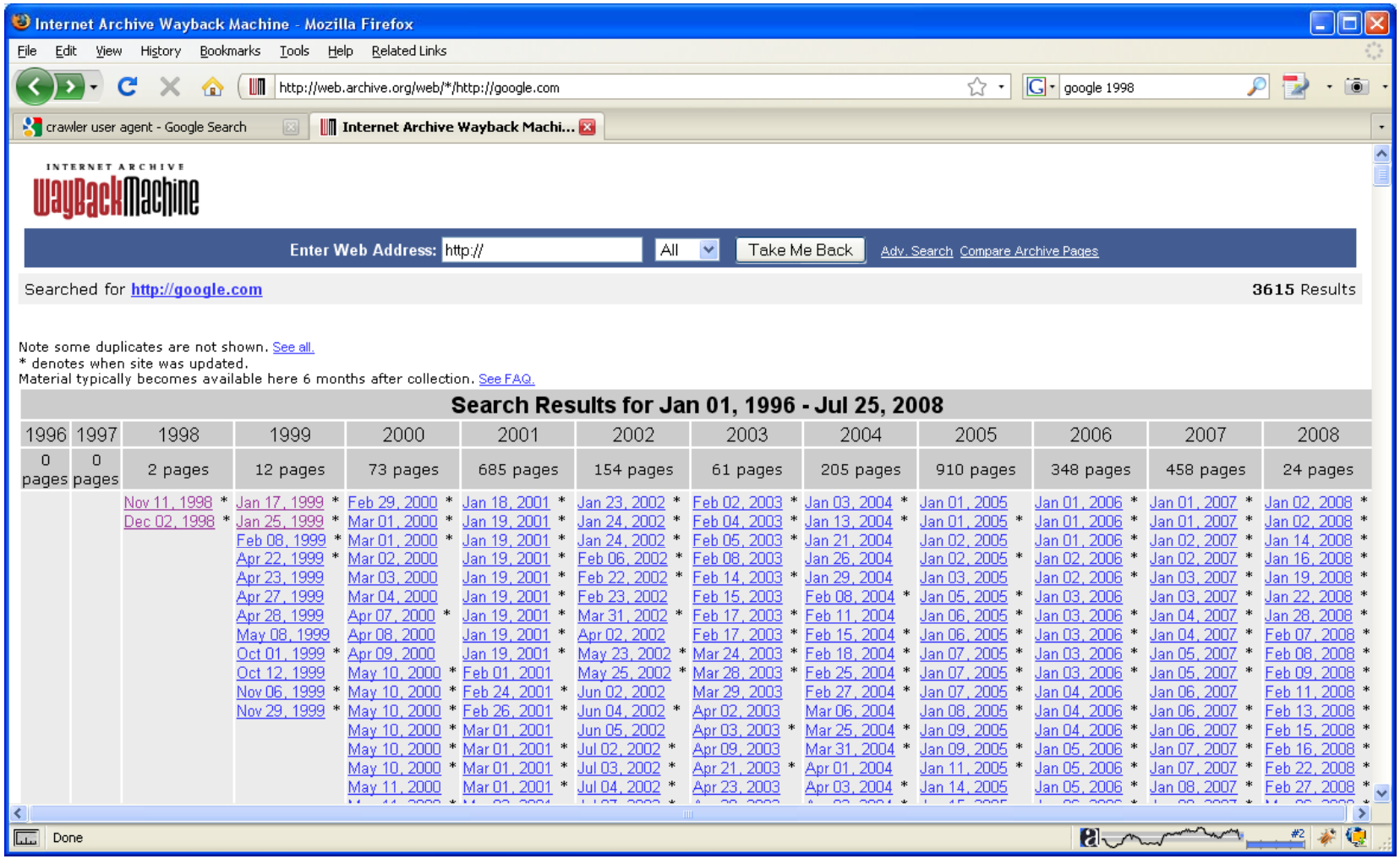
Heritrix

- Extensible, Web-Scale
- Command line tool
- Web-based Management Interface
- Distributed
- Internet Archive’s Crawler

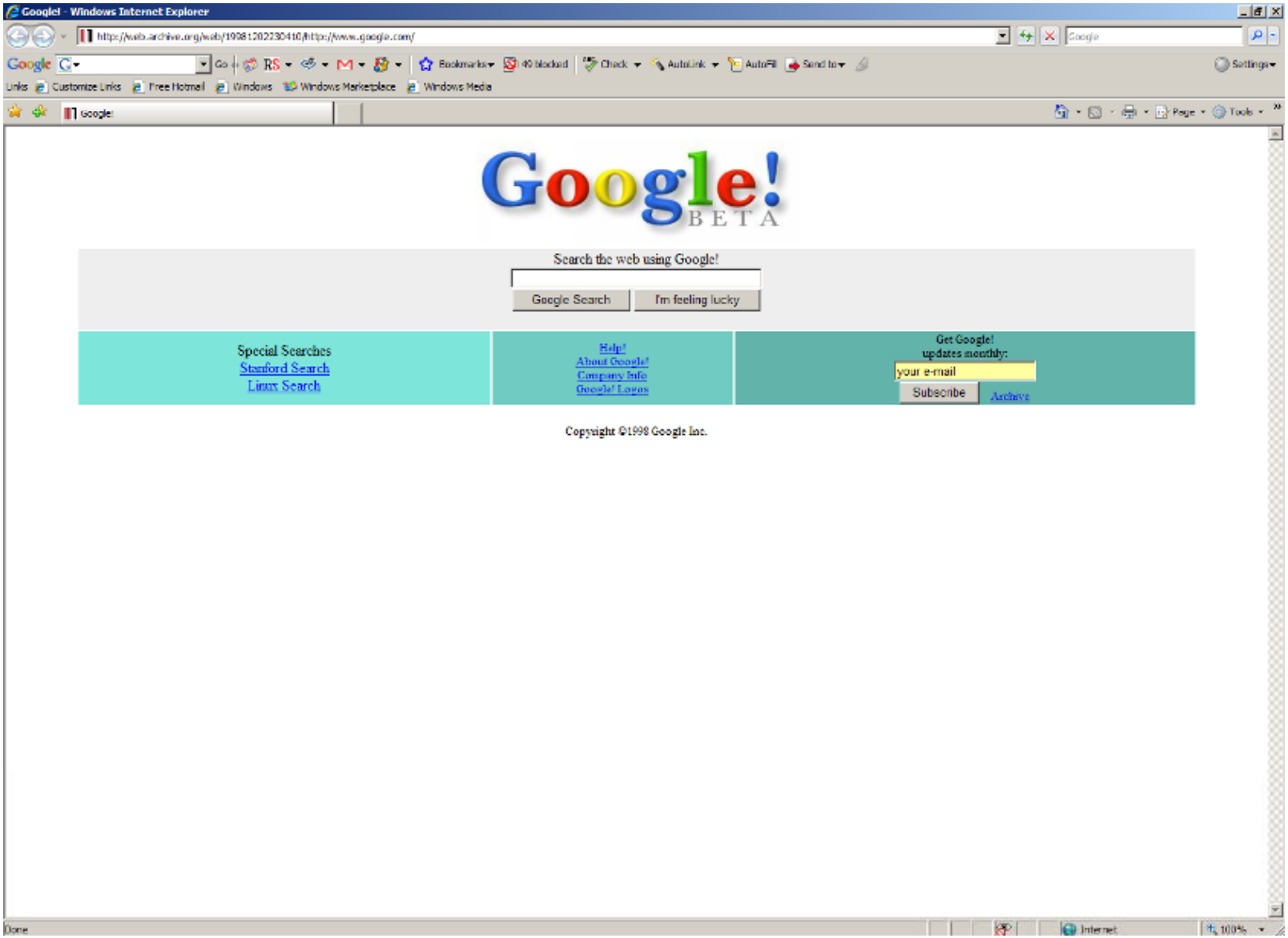
Internet Archive

- dedicated to building and maintaining a free and openly accessible online digital library, including an archive of the Web.

Internet Archive's WayBack Machine



Google - 1998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Nutch

- Apache's Open Source Search Engine
- Distributed
- Tested with 100M Pages

WebSphinx

- 1998-2002
- Single Machine
- Lots of Problems (Memory leaks, …)
- Reported to be very slow

Crawler4j

- Single Machine
- Should Easily Scale to 20M Pages
- Very Fast

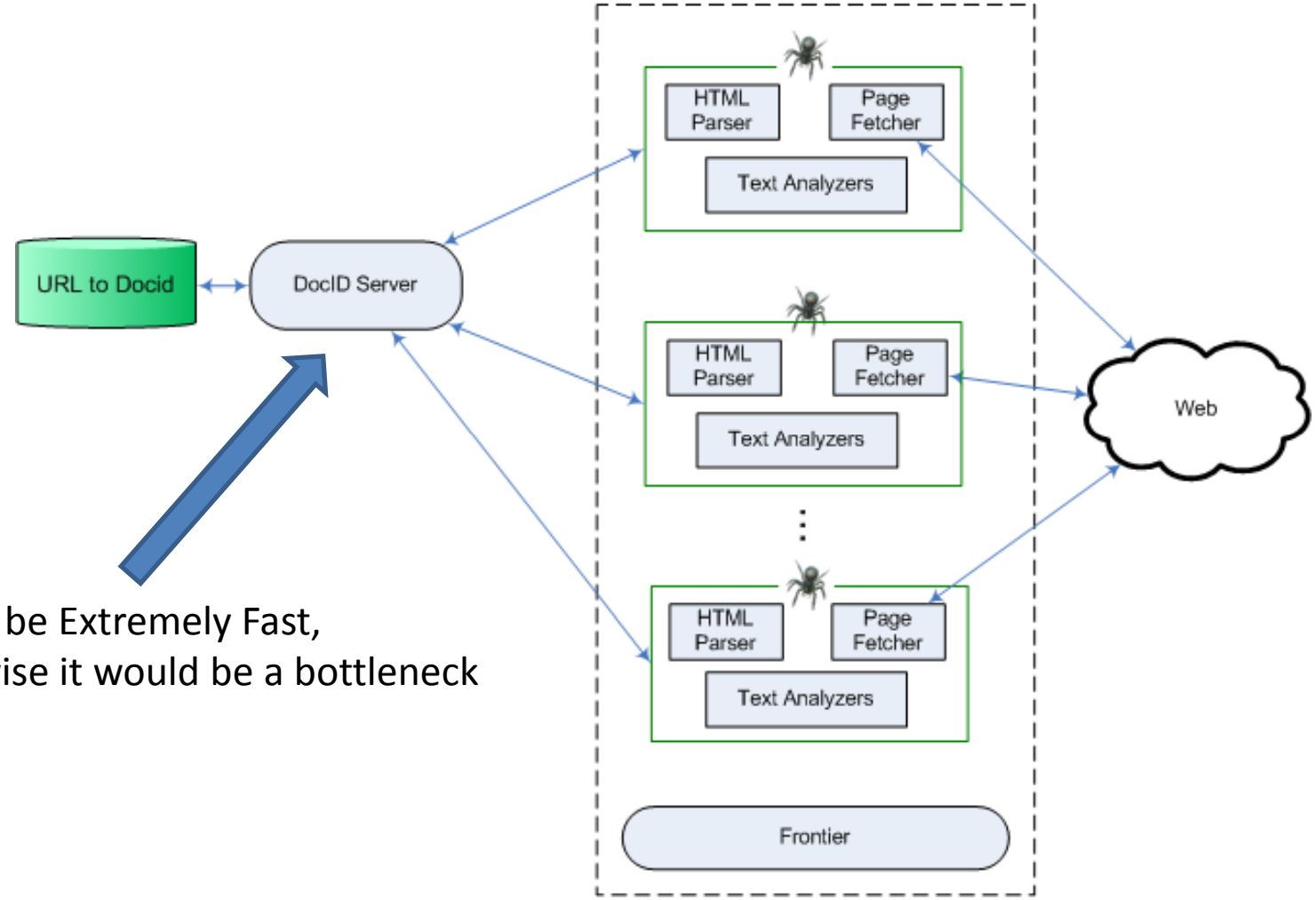
  Crawled and Processed the whole English Wikipedia in 10 hours (including time for extracting palindromes and storing link structure and text of articles).

What is a docid?

- A unique sequential integer value that uniquely identifies a Page/URL.

- Why use it?
  - Storing links:
    - “http://www.ics.uci.edu/”-”http://www.ics.uci.edu/about” (53 bytes)
    - 120-123 (8 bytes)
  - …

Docid Server



Should be Extremely Fast,
otherwise it would be a bottleneck

Docid Server

```
public  static  synchronized int getDocID(String URL) {
        if (there is any key-value pair for key = URL) {
                return value;
        } else {
                lastdocid++;
                put (URL, lastdocid) in storage;
                return lastdocid;
        }
}
```

Docid Server

- Key-value pairs are stored in a B+-tree data structure.
- Berkeley DB as the storage engine

Berkeley DB

- Unlike traditional database systems like MySQL and others, Berkeley DB comes in form of a jar file which is linked to the Java program and runs in the process space of the crawlers.
- No need for inter-process communication and waiting for context switch between processes.

- You can think of it as a large HashMap:

Crawler4j

- It is not polite
  - Does not respects robots.txt limitations
  - Does not limit number of requests sent to a host per second.
    - For example:
      - Wikipedia's policy does not allow bots to send requests faster than 1 request/second.
      - Crawler4j has a history of sending 200 requests/second
  - Introduces itself as a Firefox agent!
    - Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.9.0.4) Gecko/2008102920 Firefox/3.0.4
    - Compare with Google's user agent:
      - Mozilla/5.0 (compatible; Googlebot/2.1; http://www.google.com/bot.html)

Crawler4j

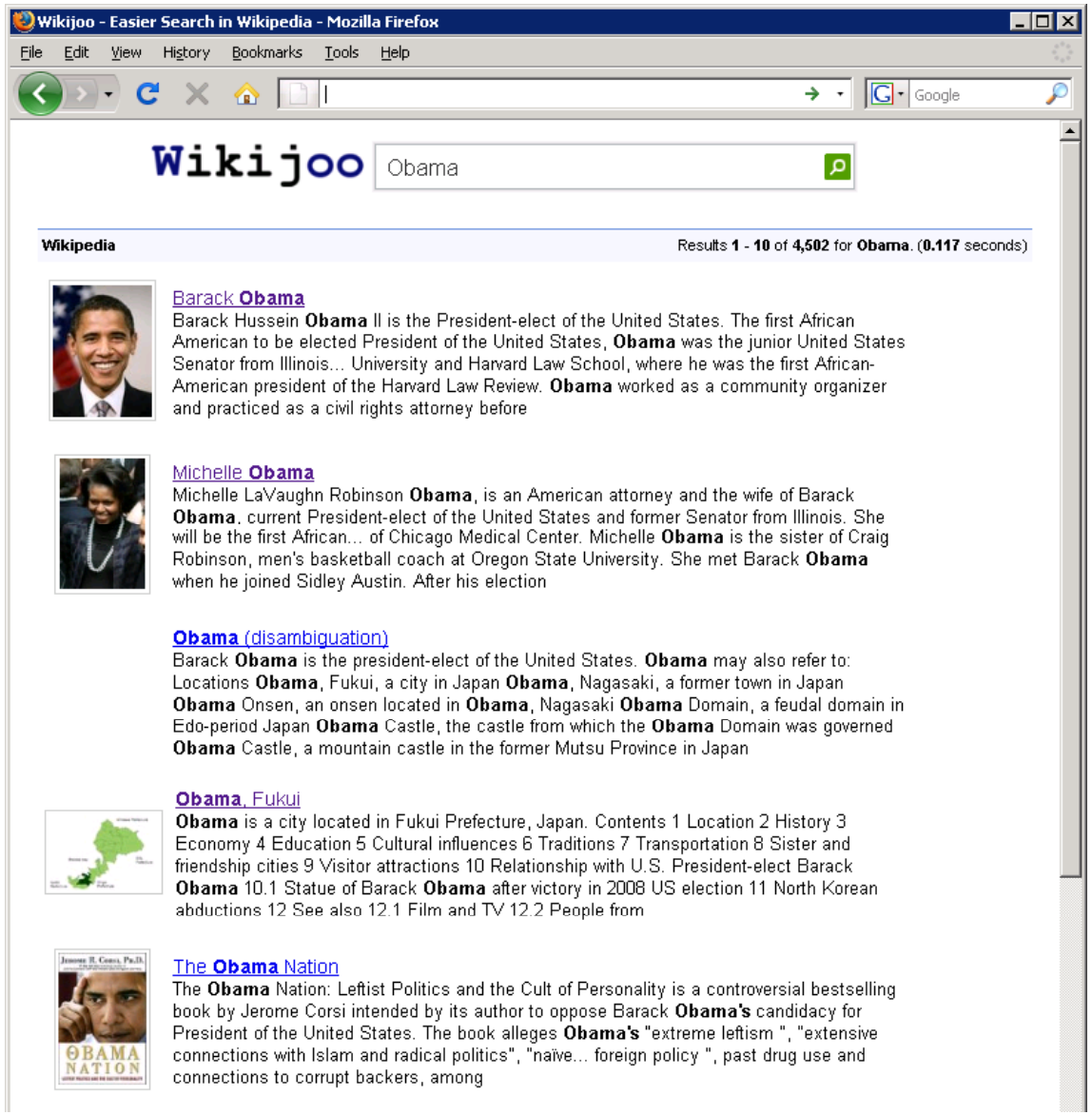
- Only Crawls Textual Content
  - Don’t try to download images and other media with it.

- Assumes that page is encoded in UTF-8 format.

Crawler4j

- There is another version of crawler4j which is:
  - Polite
  - Supports all types of content
  - Supports all encodings of text and automatically detects the encoding
  - Not open source ;)

Crawler4j – Crawler of Wikijoo



Your job?

```java
public class MyCrawler extends WebCrawler {

    Pattern filters = Pattern.compile(".*(\\.(css|js|bmp|gif|jpe?g"
            + "|png|tiff?|mid|mp2|mp3|mp4" + "|wav|avi|mov|mpeg|ram|m4v|pdf"
            + "|rm|smil|wmv|swf|wma|zip|rar|gz))$");

    public MyCrawler() {
    }

    public boolean shouldVisit(WebURL url) {
        String href = url.getURL().toLowerCase();
        if (filters.matcher(href).matches()) {
            return false;
        }
        if (href.startsWith("http://ics.uci.edu/")) {
            return true;
        }
        return false;
    }

    public void visit(Page page) {
        int docid = page.getWebURL().getDocid();
        String url = page.getWebURL().getURL();
        String title = page.getTitle();
        String text = page.getText();
        String html = page.getHTML();
        ArrayList<WebURL> links = page.getURLs();
    }
}
```

Your job?

```
public class Controller {
    public static void main(String[] args) throws Exception {
        CrawlController controller = new CrawlController("/extra/grad_space/yganjisa/crawl");
        controller.addSeed("http://ics.uci.edu/");
        controller.start(MyCrawler.class, 10);
    }
}
```

Crawler4j Objects

- Page
  - String html: getHTML()
  - String text: getText()
  - String title: getTitle()
  - WebURL url: getWebURL()
  - ArrayList<WebURL> urls: getURLs()
- WebURL
  - String url: getURL()
  - int docid: getDocid()

Assignment 03

- Feel free to use any crawler you like.

- You might want to filter pages which are not in the main namespace:
  - http://en.wikipedia.org/wiki/**Wikipedia:**Searching
  - http://en.wikipedia.org/wiki/**Category:**Linguistics
  - http://en.wikipedia.org/wiki/**Talk:**Main_Page
  - http://en.wikipedia.org/wiki/**Special:**Random
  - Image:, File:, Help:, Media:, …

- Set Maximum heap size for java:
  - java –Xmx1024M –cp .:crawler4j.jar ir.assignment03.Controller

Assignment 03

- Dump your partial results
  - For example, after processing each 5000 page write the results in a text file.

- Use *nohup* command on remote machines.
  - nohup java –Xmx1024M –cp .:crawler4j.jar ir.assignment03.Controller

Shell Scripts

run.sh:

```
#!/bin/bash
cp="."
for f in $(ls lib/*); do
    cp=$cp:$f
done
java -Xmx2048M -classpath $cp ir.assignment03.Controller
```

Available online: http://www.ics.uci.edu/~yganjisa/TA/

Shell Scripts

run-nohup.sh:

```
#!/bin/bash
cp="."
for f in $(ls lib/*); do
    cp=$cp:$f
done
nohup java -Xmx2048M -classpath $cp ir.assignment03.Controller > crawl-log.txt
```

Check logs:

```
tail -f crawl-log.txt
```

Available online: http://www.ics.uci.edu/~yganjisa/TA/

Tips

- Do not print on screen frequently.
- Your seeds should be accepted in the shouldVisit() function.
  - Pattern: http://en.wikipedia.org/wiki/*
  - Bad seed:
    - http://en.wikipedia.org/
  - Good seed:
    - http://en.wikipedia.org/wiki/Main_Page

Openlab

- From a Linux/MAC machine:
  - Connecting to shell:
    - ssh myicsid@openlab.ics.uci.edu
  - File transfer:
    - scp or other tools
- From a Windows machine:
  - Connecting to shell:
    - Download putty.exe
      - http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html
  - File transfer:
    - WinSCP (http://winscp.net/)

QUESTIONS?