# CSE574
# Project Guidelines

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These slides are available on-line at:

http://www.cse.wustl.edu/~jain/cse574-22/

**Student Questions**

## Overview

**Student Questions**

- Project Requirements, End-Goal
- Literature Search
- Outline: Preparation Process, Mind Maps
- Writing: Organization, List of Acronyms, References
- HTML Style Guidelines
- Draft Submission
- Final Submission

# Project Requirements

❑ Comprehensive Survey:
Technical Papers, Industry Standards, Products

❑ Will be published on my website,
Better ones may be submitted to magazines or journals

**Student Questions**

http://www.cse.wustl.edu/~jain/cse574-22/

# Project Requirements (Cont)

❑ No copyright violations:
⇒ You need to re-draw all figures.
⇒ You need to summarize all ideas in your *own* words.
⇒ Cannot copy any part of the text or figure unmodified
⇒ Short quotes ok
⇒ Any unmodified figures need permission.
Any infringement will result in forfeiture of grades even after graduation.

❑ See papers in previous courses, e.g.,
http://www.cse.wustl.edu/~jain/cse567-13/index.html
http://www.cse.wustl.edu/~jain/cse571-11/index.html
http://www.cse.wustl.edu/~jain/cse574-10/index.html

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# End-Goal

❑ Paper that can be published as a survey paper in any magazine, journal, conference

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# Google Search Modifiers

- filetype:pdf, doc, ppt, pptx
- site:wustl.com
- intitle:trend
- inurl:trend
- allintitle:Networking Trends
- Allinurl:
- " " $\Rightarrow$ Exact Phrase
- OR
- AND
- + $\Rightarrow$ Must include
- - $\Rightarrow$ Not include
- ~X $\Rightarrow$ X or similar
- * $\Rightarrow$ Wildcard

**Student Questions**

# Google Search (Cont)

❑ Google search, https://en.wikipedia.org/wiki/Google_Search

❑ How to search Google, http://www.wikihow.com/Search-Google

❑ Google Guide Quick reference: Google advance operators cheat sheet, http://www.googleguide.com/advanced_operators_reference.html

❑ Search Tips & Tricks –Inside Search – Google, http://www.google.com/intl/en_us/insidesearch/tipstricks/all.html

❑ How to search on Google: 31 Advanced Google Search Tips, http://blog.hubspot.com/blog/tabid/6307/bid/1264/12-Quick-Tips-To-Search-Google-Like-An-Expert.aspx

❑ Search Operators, https://support.google.com/websearch/answer/2466433

**Student Questions**

# Project Homework 1

❑ Search web pages, books, and journal articles from IEEE XPlorer, ACM Digital Library, MOBIUS, Safari books, ILLIAD at Olin Library for **one** of the following topics:

1. Wireless Networking Trends
2. Mobile Networking Trends
3. Internet of Things

❑ On the web, try the following search points:

➢ http://library.wustl.edu/findart.html
➢ http://library.wustl.edu/fulltext/
➢ http://scholar.google.com
➢ http://books.google.com
➢ http://dl.acm.org/
➢ http://ieeexplore.ieee.org/Xplore/home.jsp

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# Project Homework 1 (Cont)

❑ Ignore all entries dated 2017 or before.
Ignore all entries that do not indicate the topic or
similar words in the title. List others in the following format (5 each):
  ➢ Author, "Title," publisher, year, ISBN. (for five books)
  ➢ "Title," URL [One line description] (for 5 web pages)
  ➢ Author, "Title," source (for five technical/magazine articles)
❑ For the books, include whether the book is available at WUSTL, MOBIUS, Safari, or ILLiad
❑ Serially number the references and submit in canvas.
❑ Make a list of other interesting search points and share in class.

**Student Questions**

# Common Mistakes in Project Homework #1

❑ Not indicating where the book can be found in WUSTL

❑ Listing books/Magazines/journals that have little to do with the topic – may show up in search engines because of a minor mention of the topic or words

❑ Web Pages – No one-line descriptions

❑ Incomplete bibliographic data for journal articles. Need volume, issue, year, and pages.

❑ Missing journals. Need names of journals dealing with the topic chosen.

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# Survey Topics

1. O-RAN
2. Open RAN
3. Computing in Communication Networks
4. Deep Learning for the Physical Layer
5. OTFS and Delay-Doppler Communications
6. Quantum Communications
7. High-Altitude Platforms: Balloons or Planes
8. LEO Satellite Communications
9. Private 5G: 5G for in-company use
10. 5G Advanced
11. 6G
12. Composable Networks
13. Open APN
14. Service Mesh
15. Time Sensitive Networking
16. Container Networking
17. Light Communications
18. Next Generation Vehicle-to-X
19. EDMG IEEE 802.11ay
20. Wireless Charging
21. Nano radio

**Student Questions**

# Literature Search

❑ Conduct searches in two phases. In the first phase, use the title words of your project. After reading these, conduct another more comprehensive search.

❑ Remove articles that are not useful

❑ No limit to the number of references

❑ Follow the references in the references

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# HTML Style Guidelines

❑ See papers from previous classes on my website for details

❑ Use plain text editors with simple html

❑ No Java, flash, animation

❑ Do not use HTML generated by MS Word. It will not pass any HTML validation test. Save the word file as plain text and add HTML tags.

❑ Learn to use special characters in text and reference URLs. See

➢ http://www.w3schools.com/tags/ref_urlencode.asp

➢ https://perishablepress.com/stop-using-unsafe-characters-in-urls/

❑ HTML5 only

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❑Can/should we use CSS? For a paper, I imagine it would improve the look.
*Yes.*

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P-13

# Header

<!DOCTYPE html>

<html lang="en">

<head>

<title>

<meta name="Author"

<meta name="robots"

<meta name="Keywords"

<meta name="Description"

</head>

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# Body

<body>

<h1>Title</h1>

<B>Author</B>, Permanent-Email

<h2>Abstract:</h2>

...

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http://www.cse.wustl.edu/~jain/cse574-22/

# Body (Cont)

`<h2><a id="toc"></a>Table of Contents:</h2>`

`<ul>`

`<li><a href="#sec2">2. 10-Gigabit Ethernet Overview</a></li>`

`<ul>`

`<li><a href="#sec2_1">2.1 Benefits of 10-Gigabit Ethernet</a></li>`

`...`

`</ul>`

`</ul>`

`<hr>`

## Student Questions

❑ If we put a dropbox file link in the 'href' tag, how can we show a pure PDF without the dropbox appearance?

*All filesharing services offer a link to share the file. Just use the link.*
*<A href="link">filename</A>*

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# Body (cont)

<h2><a id="intro"></a>Introduction</h2>

...

<p>[<a href="#grow99">Grow99</a>]

<p>

...

<br>

# Project Homework 2

❑ Prepare a short webpage (written manually) using most of the tags indicated in this handout

❑ Include one image/photo on the page

❑ Validate the page using:

➢ https://www.onlinewebcheck.com/check.php

➢ https://www.freehtmlvalidator.com/

❑ Check the Google-friendliness of the page: https://varvy.com/

❑ Submit a zip file containing all the html source files.

❑ Remember:

➢ To add all meta tags specified in the handout

➢ Validate the page

### Student Questions

❑ Are we required to submit:
1. Validation proof
2. Webpage printout
2. HTML source files
3. URL

*A zip file with all source files and validation proof is sufficient.*

❑In point 4, submit a URL of what? I think this is in case we were able to publish the website, correct?

*If you have access to an ad-free space, you can create an URL. Some of the online validation tools require an URL.*

❑I'm curious, what does an HTML validator do?

*It checks for the correctness of the HTML so that all browsers will give the same output.*

# Project Homework 2

❑ Prepare a short webpage (written manually) using most of the tags indicated in this handout

❑ Include one image/photo on the page

❑ Validate the page using:
  ➢ https://www.onlinewebcheck.com/check.php
  ➢ https://www.freehtmlvalidator.com/

❑ Check the Google-friendliness of the page: https://varvy.com/

❑ Submit a zip file containing all the html source files.

❑ Remember:
  ➢ To add all meta tags specified in the handout
  ➢ Validate the page

❑ **Common Mistakes in Homework 2**

  ➢ Not using parameters for meta tags

  ➢ Not validating

## Student Questions

❑ Is there a specific theme for the HTML page?
*No. This is just for practice.*

❑ What would the actual content of the page include?
*Some text and at least one picture*

❑ Do we have a specific topic, or could we write about anything we want?
*No particular topic. Most students use this as a starting point for their bio/resume.*

❑ How can we load the page in an ad-free area?
*I have requested IT. However, it is no longer required for this homework.*

❑ Can I use another way to publish it?
*Yes. Any ad-free area will do.*

# WUSTL Engineering Student Webpages

❑ IT will create the URL:
http://students.cec.wustl.edu/cse574s_sp16/<wustlkey>

❑ For example:
http://students.cec.wustl.edu/cse574s_sp16/jain/

❑ On Linux this corresponds to:
/project/websites/cse574s_sp16

❑ On Windows this corresponds to:
\\warehouse.cec.wustl.edu\websites\cse574s_sp16

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# Project Homework

⇒

- **Project Homework 3**: Project selection
  - Indicate your preference for the top 4 choices among the topics listed
  - You will be assigned one of these if at all possible
- **Project Homework 4**: References
  - Search and collect at least 15+ references on your topic
  - Ignore all entries older than five years.
    Ignore all entries that do not indicate the topic or similar words in the title. List others in the following format:
  - Author, "Title," publisher, year, ISBN. (for books, if any)
  - "Title," URL [One line description] (web pages)
  - Author, "Title," source (technical/magazine articles)
  - For the books, include whether the book is available at WUSTL, MOBIUS, Safari, or ILLiad
  - Serially number the references and submit the list.
- **Project Homework 5**: Survey Outline
  - Please submit an initial Table of Contents (Section and Subsection titles) with outline (at least one sentence) about each subsection.
  - You can change this outline as you complete writing the paper.

## Student Questions

❑The references are due before Outline, can we add or delete some references when doing PHW-5: Survey Outline.

*Yes. Everything is tentative and changeable until the final submission.*

❑What is the style to use for the references? Is it Chicago style?

*The style is described right here in the slide.*

❑ Do we need to submit both the text document and PowerPoint?

*Either one is fine.*

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# Project Homework

❑ **Project Homework 3**: Project selection
  ➢ Indicate your preference for the top 4 choices among the topics listed
  ➢ You will be assigned one of these if at all possible

❑ **Project Homework 4**: References
  ➢ Search and collect at least 15 references on your topic
  ➢ Ignore all entries older than five years.
    Ignore all entries that do not indicate the topic or
    similar words in the title. List others in the following format:
  ➢ Author, "Title," publisher, year, ISBN. (for books, if any)
  ➢ "Title," URL [One line description] (web pages)
  ➢ Author, "Title," source (technical/magazine articles)
  ➢ For the books, include whether the book is available at WUSTL, MOBIUS, Safari, or ILLiad
  ➢ Serially number the references and submit the list.

❑ **Project Homework 5**: Survey Outline
  ➢ Please submit an initial Table of Contents (Section and Subsection titles) with outline (at least one sentence) about each subsection.
  ➢ You can change this outline as you complete writing the paper.

---

### Student Questions

❑ What we will submit for the Survey Outline? Will it just be composed of long paragraphs and figures?

*Two-level table of contents and one sentence about each subsection. No long paragraphs.*

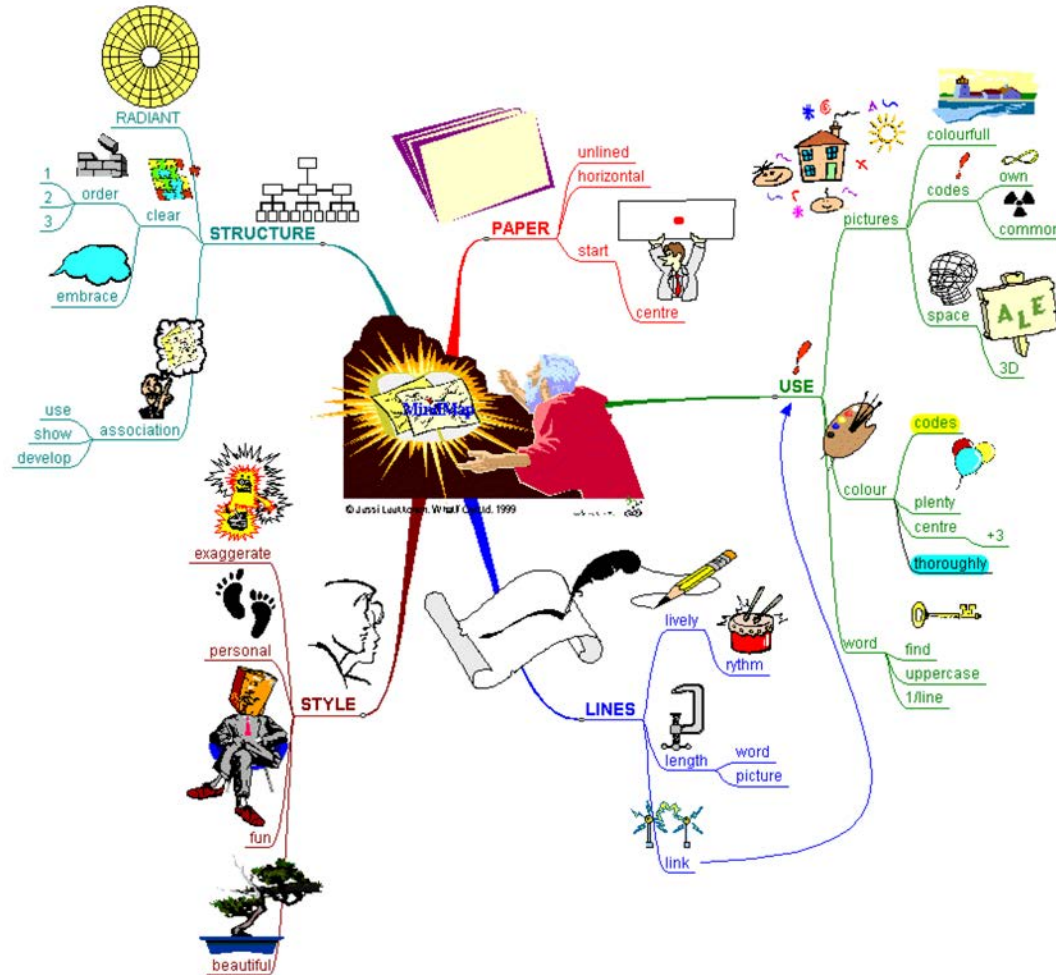❑ It seems like an example is being shown but we cannot see it. Could you please show us again the example?

*See new Slides 11-55 through 11-57.*

---

# Outline Preparation Process

❑ Read abstract and stop if irrelevant

❑ Underline the critical points in the paper

❑ Write the critical summary on the first page of the paper

❑ Prepare a text document with the fundamental ideas

❑ Keep adding to this text document from different papers with [refs, page, paragraph]

❑ Import the text document in PowerPoint

❑ Add figures and clean up the outline

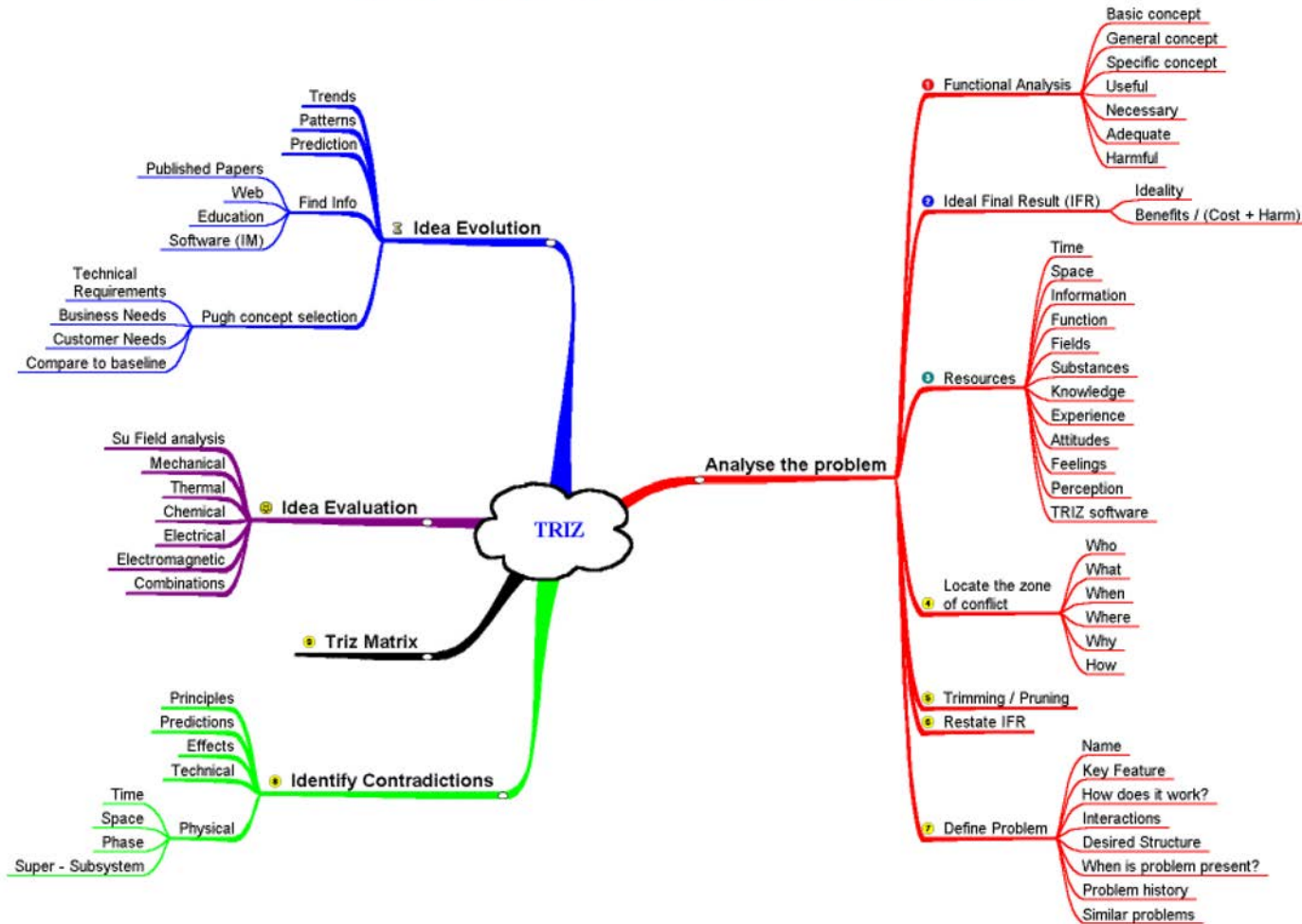❑ Like getting ready to make a presentation to the class

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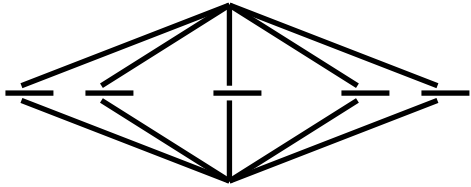
# Mind Maps

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# Mind Maps (cont)

# Diamond Writing Style

❑ Each paper should start with an introduction and end with a summary.

❑ Each section should start with a short introduction and end with a summary with a lead into the next section. The same applies to subsections.

❑ All subsections should be of comparable length.

❑ Add an appendix with all abbreviations

❑ Add a list or discussion of related products

## Student Questions

❑ If the main content of a section is about just one paragraph, do we have to include a summary section?

*All sections should be of comparable length. One-paragraph sections are not a good idea.*

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# Writing Style

❑ Readers want to get to the information fast. Keep the unnecessary stuff at the end.

❑ Check thoroughly for grammar and spelling.

❑ Avoid excessive use of abbreviations.

❑ Be consistent in case and usage: MOBILE, Mobile, mobile

**Student Questions**

❑Is there an effective way to check the issues like Mobile & MOBILE, i.e., are there some tools? I keep making mistakes, but they are hard to spot before others point them out.

*Check every uppercase letter. Is this a common noun or a proper noun?*

# Organization

❑ Every paper should have an introduction and a summary.

❑ Divide the paper into sections.

❑ Every section should have a lead-in paragraph.

❑ Header level should correspond to the level in the table of contents.

**Student Questions**

# Organization (Cont)

- Title
- Author
- Abstract
- Keywords
- Table of Contents
- Introduction
- Other Sections
- Summary
- References
- List of Acronyms
- Date Last Modified:

**Student Questions**

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# Organization (Cont)

❑ Table of Contents

➤ Sections and subsections

➤ Numbering n.n

➤ 3-7 subsections per section

➤ 3-7 sections per paper

➤ Include one first and 2nd level headers n. and n.n

➤ Do not include 3rd and higher levels, e.g., n.n.n

**Student Questions**

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# Title/Keywords/Abstract

❑ Title
  ➢ Based on the Table of contents
  ➢ Searchable
❑ Abstract
  ➢ Based on Table of Contents
  ➢ 3-7 sentences
  ➢ Emphasize what part, of course, was used in the paper
❑ Key Search words
  ➢ Based on the Table of contents
  ➢ Acronyms and full names
❑ Description:
  ➢ One line based on ToC and Abstract

**Student Questions**

# Organization (Cont)

❑ Introduction
  ➢ Explain what the topic is about.

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# Other Sections

❑ Each section is less than three pages.

❑ Each section needs at least one introductory paragraph. Do not start with a subsection.

❑ Each subsection has at least 1 paragraph.

❑ All sections/subsections should be numbered n. n.n

❑ If you borrowed several sentences from some source, italicize the text and indicate the source.

> Never write a sentence with the original source in front of you. This will block you from writing it in your own words. Write ideas from source, merge ideas from different sources, and then write the ideas in your own words.

**Student Questions**

# Other Sections (Cont)

❑ Always include citations for sources of ideas, even if the expression is yours.

❑ Redraw the line drawings. Avoid copying and pasting as much as possible (e.g., for photographs).

❑ If there is no author, e.g., a web page, use the site name followed by a number, e.g., [wikipedia02] in the body of the text, with the full title and url in the reference list.

❑ If multiple papers in the same year from the same last name, use [lastnameyya] [lastnameyyb],… in the text.

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# Summary

❑ One or more sentences about each issue.

❑ Based on Table of Contents

❑ Key lessons

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# References

❑ Style of References
  ➢ Author, "Title," publisher, year, ISBN for books
  ➢ "Title," URL [One line description] for web pages
  ➢ Author, "Title," source, year, pp., URL for technical/magazine articles

❑ All authors: First-initial. Last-Name or
First-Name Last-Name.
Do not use Last-Name, First-Name, or First-Initial.

❑ All URLs should show up as well as have a link.

  ➢ This allows URLs to show in the printed version.

❑ In the text, point to the end
In the end, point to the actual URL. Provide URL.

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# References (Cont)

❑ Find URLs for published papers

❑ Do not include references that are useless.

❑ In the text, use [Authoryy] notation, e.g., [Jain99]
Exceptions: Standards, company documents, RFCs.

❑ Shorten IEEExplore URLs to include only *arnumber*, e.g.,
http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=4301304

❑ All references should consistently use the same style

**Student Questions**

# List of Acronyms

❑ Search the text

❑ Define on first use

❑ Avoid acronym use if used less than five times.

❑ Exception: Commonly used acronyms, e.g., CPU, I/O, IP, …

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# Figures/Tables

❑ All figures should be numbered 1, 2, ...

❑ All tables should be numbered 1, 2, ...

❑ All figures should have a title <u>below</u> the figure

❑ All tables should have a title <u>above</u> the table

❑ All figures/tables should be referenced in the text and explained.

❑ Should be placed close to their references.

❑ To prepare figures in Windows, use blank slides in PowerPoint using the font sizes used in the paper. Group the figure as one object. Copy and "<u>paste special</u>" as "Enhanced Windows Metafile (EMF)" for best quality.

❑ Do not rescale figures in Word. Rescaling the fonts reduces their quality.

❑ All Figures and Tables should have a max width of 6.5" (to allow printing on a letter size paper)

❑ Use only .jpg, .png, .gif files for figures. No fig?.pdf

**Student Questions**

# Draft Submission

❑ Submit a word document

❑ In the draft:

➢ For review purposes, the author's name and email should be removed. Substitute the last three digits of your student ID.

➢ Add keywords after abstract

❑ Spell check using MS Word

❑ Grammar Check: https://app.grammarly.com/

❑ Plagiarism check: http://www.scanmyessay.com

## Student Questions

❑ What do you mean by submitting 4 hard copies for the draft?

*See the revised text on the left. Just submit a word document so that reviewers can mark and comment.*

❑ For the paper draft, should it be in PowerPoint or Word file format?

*Word.*

❑ Can you share the assessment feedback form to see how points are given for what?

*Yes. Now it is on the course website.*

# Draft Submission

❑ Submit a word document

❑ In the draft:

   ➢ For review purposes, the author's name and email should be removed. Substitute the last three digits of your student ID.

   ➢ Add keywords after abstract

❑ Spell check using MS Word

❑ Grammar Check: https://app.grammarly.com/

❑ Plagiarism check: http://www.scanmyessay.com

### Student Questions

❑ Are there any papers we should use as examples of particularly good writing style?

*See student papers at*

*https://www.cse.wustl.edu/~jain/cse 574-16/index.html*

*All are not necessarily good writing styles. The first one is an implementation project. Second onwards are surveys.*

❑ What percentage of our grade does this project make up?

*See Slide 1-19. 15%.*

# Editorial

- ❑ Check all acronyms. All acronyms should be defined on first use.

- ❑ Check capitalization. No unnecessary capitalization. Headers are usually capitalized.

- ❑ Spell Check entire document.

- ❑ K=1024, k=1000. Disk storage is measured in KB. Network link speeds are measured in kb. kbps, not Kbps.

- ❑ Leave a space between numbers and units, e.g., 15 km, not 15km.

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# Editorial (Cont)

❑ Look for special characters

❑ American English: Signaling, Synchronization

❑ Check for continuity

❑ Break long paragraphs.

❑ Single space between paragraphs.

❑ The paper should be 10-15 pages long

❑ If you copy any figures, give reference and credit

❑ Use the template supplied

**Student Questions**

# Common Mistakes in Writing

❑ No Figures

❑ Figure/equations fonts too large

❑ Figures with no title or number or reference

❑ Figures/tables overflowing the margins

❑ References with no annotation

❑ References not cited

❑ Key pieces of information w/o references

❑ Tables w/o references

❑ Papers too short

**Student Questions**

# Common Mistakes (Cont)

- ❑ No comparison of different alternatives
- ❑ No Acronyms
- ❑ No summary
- ❑ Incorrect reference style
- ❑ No keywords

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# HTML Guidelines (Cont)

❑ File name: index.html, fig1.gif, fig2.gif, ..., fig.ppt

❑ Keep PowerPoint figure source files in the same directory, although these may not be referenced in the paper

❑ Keep the whole paper in one file, "index.html," with figures in fig$n$.gif in the same directory. No Subdirectories.

❑ All file names should have eight characters or less for name and three characters or less for extension (MS/DOS compatible). The only exception is index.html

**Student Questions**

❑ What do you mean by "PowerPoint figure source file"?

*How did you prepare the figures? Include the editable source file.*

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# HTML Guidelines (Cont)

❑ All filenames and extensions should be lowercase and contain no spaces.

❑ Ensure there is a link attached to

  ➢ Every line in the Table of contents

❑ Spread references throughout the document. Use mnemonic references with a link attached to them, e.g., [Cisco99]

❑ Keep all internal anchor names and ids lowercase without spaces or special characters, e.g., cisco99.

❑ Use only id (not name):
<A id="xx">

❑ All images should have alt.

**Student Questions**

# HTML Guidelines (Cont)

❑ Do not resize images in html. Resize them before using them. Prepare figures so that there is no rescaling required. Use 12-point fonts in PowerPoint.

❑ Center all figures, tables, and equations

❑ Serially number all figures as 1, 2, … not 1.1, 2.1, etc.

❑ Serially number all tables as 1, 2, …

❑ No <font ..> tags

❑ Check that keywords tags in the header are appropriate and exhaustive.

❑ Check that description in the header is appropriate.

**Student Questions**

# Final Submission

❏ Validate your page on:
  ➢ https://www.onlinewebcheck.com/check.php
  ➢ https://www.freehtmlvalidator.com/

❏ I use CSE HTML Validator: https://www.htmlvalidator.com/

❏ Check URLs. Check local anchors.

❏ Remember to submit copies of unusual references (not available in the library or the Internet) with the final paper.

**Student Questions**

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# Final Submission (Cont)

❑  No WinWord generated HTML

❑  You can use WinWord for spell-checking the text

❑  Use a plain text editor to insert HTML tags.

❑ Submit the final HTML version as a single zip file

❑ No Tar/tgz files (please submit only one zip file with all files)

❑ Filename: 8-or-less-letters-short-project-name.zpi
Rename the zip file to .zpi for transmission through email.

❑ Email .zpi file to: jain@cse.wustl.edu with the subject field of "CSE574 Project Report"

**Student Questions**

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# Common Mistakes in HTML

❑ Used WinWord generated HTML file.

❑ Did not validate HTML.

❑ Incorrect title.

❑ Images resized in HTML. The height and width attributes in the images do not match those of the actual image.

❑ Used HTML4

❑ WUSTL proxy in URLs

❑ Figures not scaled properly

❑ Table rows not aligned on top

**Student Questions**

# Checklist

T  F
1. ☐ ☐ Are Keywords appropriate?
2. ☐ ☐ Is the title satisfactory?
3. ☐ ☐ Does the abstract summarize the topic discussed?
4. ☐ ☐ Table of Contents logically organized?
5. ☐ ☐ Does the introduction entice you to read the rest of the paper?
6. ☐ ☐ Major ideas and topics received enough attention?
7. ☐ ☐ Are individual sections and subsections of uniform length?
8. ☐ ☐ Are references correctly formatted and spread throughout?
9. ☐ ☐ Include author, title, dates, pages, and URL.
10. ☐ ☐ Did the author follow the diamond explanation principle?
11. ☐ ☐ Acronyms used properly and listed?
12. ☐ ☐ Figures and Tables (Clearly labeled and professional looking, referenced in the text and explained)
13. ☐ ☐ Are paragraphs of the right length (not too long or too short)?
14. ☐ ☐ Do the subheadings clarify the sections of the text?
15. ☐ ☐ Was the material ordered in a way that was logical, clear, and easy to follow?
16. ☐ ☐ Is there any portion of the text that could be omitted?
17. ☐ ☐ Does the summary point out the key results?
18. ☐ ☐ Copyright violations in text, figures, or tables?
19. ☐ ☐ Text checked for Grammar, Spelling, and Punctuation errors
20. ☐ ☐ Is the quality good enough for publication in IEEE Magazine?

## Student Questions

# Anonymizing Your Word Documents

❏ Your submitted draft, draft with reviewers' comments, and review forms should be anonymous.

❏ Only write the last three digits of your student ID as author or reviewer IDs in these documents.

❏ The procedure for anonymizing a word document is as follows:

➢ Make changes and comments as usual.

➢ Save the file.

➢ File → Info → Check for issues → Inspect (leave everything checked in) and click inspect

➢ The next window will show issues that MS found. Select the 2nd from the top (Personal info) and select remove all.

➢ Go back to the document and verify that "Your Name added" has been changed to "Author added."

➢ Save and submit.

**Student Questions**

# Scan This to Get These Slides



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# Related Modules

Introduction to 5G,
http://www.cse.wustl.edu/~jain/cse574-16/j_195g.htm

Low Power WAN Protocols for IoT,
http://www.cse.wustl.edu/~jain/cse574-16/j_14ahl.htm

Introduction to Vehicular Wireless Networks,
http://www.cse.wustl.edu/~jain/cse574-16/j_08vwn.htm

Internet of Things,
http://www.cse.wustl.edu/~jain/cse574-16/j_10iot.htm

Audio/Video Recordings and Podcasts of
Professor Raj Jain's Lectures,
https://www.youtube.com/channel/UCN4-5wzNP9-ruOzQMs-8NUw

**Student Questions**

# Project Selection

❑ You do not need to know the topic.

❑ Goal is to teach how to discover/learn a new area

❑ Search. Look into standards bodies: IEEE, IETF, ETSI, 3GPP, and industry reports

❑ High contention for familiar topics. You may not get it.

**Student Questions**

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# Sample Outline

### Paper Outline
Justin Deters

**1**

### Goals & System

- **System:**
  - Cilk runtime on Adams computer
  - 4 socket NUMA machine
  - Vanilla runtime vs Locality aware runtime
- **Goals:**
  - Show that the locality aware runtime has better performance
    - Better speed up
    - Less cache misses
    - Less remote memory accesses

**2**

### Services & Outcomes

- **Services:**
  - General processing
  - Distributed memory
  - Caching
  - Remote access to memory
  - Distributed computation
- **Outcomes:**
  - Assuming there's no bugs in the processor or chipset, all of these should function correctly.
  - If there is failure, the system should respond erratically

**3**

### Metrics

- Execution time
- Parallel speed up
- Number of cache misses
  - Serviced by cache to cache
  - Serviced by Local DRAM to cache
  - Serviced by Remote DRAM to cache
- Ratio of remote vs local memory access

**4**

### Parameters

- **System parameters:**
  - Clock speed
  - Cache size
  - QPI speed
  - Memory size
- **Workload parameters:**
  - Type of runtime
  - Division of work in the computation
  - Size of input
  - Utilization of parallel structures

**5**

### Factors

- **Factors:**
  - Type of runtime
  - Benchmarks
- **Levels:**
  - Type of runtime:
    - Vanilla runtime
    - Locality runtime
  - Benchmarks
    - 6 benchmarks
    - 3 input sizes for each benchmark

**6**

### Evaluation Technique

- The vanilla runtime, locality runtime, and the benchmarks have all be implemented.
- This allows us to complete direct experimentation rather than an analytical model, or simulation.

**7**

### Workload

- **Benchmarks:**
  - Cilksort, Heat, Heat_v, Mat_Transpose_4_way, Matmul_4_way_rm, Matmul_4_way_z
- **Input size**
  - Three separate input sizes:
    - Tiny, small, large
  - Tiny and small should be able to fit into L3 cache
  - Large should be too large to fit into L3 cache

**8**

### Experiments

- We will use a full factorial design.
- Due to the fact that everything is implemented and the process of running and varying the workloads can be automated, it's possible to use a full factorial design.
- Data collection is also automated as well.

**9**

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# Sample Outline (Cont)

**Analysis**

- Perform confidence interval tests to determine if the locality runtime is statistically better than the vanilla runtime.

10

**Literature Review**

11

**Main memory and cache performance of intel sandy bridge and AMD bulldozer**

- Summarizes the layout of the Sandy Bridge EP.
  - This includes the cache hierarchy
  - Also shows where the memory controller and QPI interact with L3
- Includes their own approach to measuring latency between different types of cache accesses both local and remote

12

**The implementation of the Cilk-5 multithreaded language**

- Defines the structure of the Cilk runtime
- Explains the basics of work-stealing
- Gives theoretical bounds on the computation

13

**NUMA (Non-Uniform Memory Access): An Overview**

- Summarizes the NUMA architecture
- Details the different types of memory policies one can use in a NUMA machine
- Details how Linux handles NUMA machines

14

**"(Mis)understanding the NUMA memory system performance of multithreaded workloads**

- Clarifies misunderstandings of NUMA systems
- Provides experimental demonstrations of how programs interact with NUMA
- Explains the strategy of locality aware computation on NUMA machines

15

**Scalable Task Parallelism for NUMA**

- An implementation of a locality aware NUMA runtime
- Defines task parallel computations on NUMA machines
- Proposes a locality aware memory allocation protocol

16

**Topology-Aware and Dependence-Aware Scheduling and Memory Allocation for Task-Parallel Languages**

- Proposes a solution to the NUMA locality problem by focusing on scheduling dependent tasks on the same nodes
- Proposes that memory should be allocated on nodes by grouping tasks together that will all depend on the same memory

17

**Parallel Work Inflation, Memory Effects, and their Empirical Analysis**

- Defines the concept of "work inflation"
- Work inflation is the cost incurred going from a single core operation to a multicore operation
- Provides a theoretical framework for work inflation
- Offers guidelines on how to optimize to reduce work inflation

18

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# Sample Outline (Cont)

**Student Questions**

### Roofline

- Provides an analysis framework for performance on multicore systems
- Proposes the roofline model
  - Allows one to visualize system performance over operational intensity
  - The roofline shows where the performance levels out once the system has been saturated
- Allows programmers to better optimize their programs to avoid hitting the roofline

**19**

### Likwid

- A performance monitoring suite
- Allows easy access to the Intel hardware performance monitoring counters
- Gives programmers an easy way to define specific performance monitoring situations and evaluate their programs

**20**

### Intel 64 and IA-32 Architectures Software Developer's Manual

- A detailed manual on the different features and performance monitoring abilities of Intel processors
- Specifically outlines the bit masks used to define which feature you are monitoring.

**21**

### Intel Xeon Processor E5 Product Family Specification Update

- This document outlines all the bugs within the Sandy Bridge EP architecture that need to be accounted for during performance monitoring

**22**

### Using Intel Vtune Amplifier XE on Xeon E5 Family 1.0

- A presentation by Intel that outlines various suggestions on performance monitoring
- Specifically includes the measurement formula of "back end stall" or cycles spent on servicing cache misses

**23**

### LIKWID: A Lightweight Performance-Oriented Tool Suite for x86 Multicore Environments

- The academic paper that outlines the Likwid suite

**24**