COMPUTER SCIENCE 373

Senior Research Seminar

CSCI 373 Handbook

Twenty-Sixth Edition

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Handbook for CSCI 373, 26th Edition

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Course Overview

Course description, objectives, expectations and frequently asked questions (FAQs).

T he Computer Science Department Senior Research Seminar (CSCI373) is a capstone course for Computer Science majors in their senior year. It is the alternative to an Honors Thesis and can be considered a more highly structured and regulated thesis development process, with a special emphasis on topics for students who will become professionals in the computing field. Computer science is a rapidly changing field. Successful professionals in this field must keep up with new research and development, even after leaving an academic setting, and must be able to communicate clearly and convincingly on new topics. Overall, this course is intended to equip successful students with an appreciation for and desire to continue their education in computer science and related fields, and to further improve their research and communication skills in computer science and technology.

Course Vision

The primary goals of CSCI 373 are for **you** to become **the campus expert** on your course topic *and* to build the skills to **independently** become an expert on new topics in the future.

Imagine you see an announcement of a speaker coming to campus to give a talk on your favorite computer science topic. You are interested in attending because you watched a video and read a blog by that person and know that person is an expert on the topic. You want to know the speaker's latest ideas, ask questions, and understand more about the topic. *The primary purpose of this course is to make you **that person** for your selected course topic and to **build skills** to independently become an expert on new topics in the future.*

By the end of the semester, you will acquire a collection of resources, assimilate them into a collection of rich mental models of your topic, write a significant research report, and give a final presentation that demonstrates your expertise, taking questions from the

audience and providing interesting and thought-provoking responses. By the end of the course, *you will be the campus expert on your topic.* Also, by the end of the semester, you will learn the skills to independently become an expert on new topics as needed in your future career.

Course Objectives

Upon successful completion of this course, students should have made substantial progress in the following ways:

1. **Research**: Students will have an ability to conduct research in new science and technology areas using library resources, journals, online videos, podcasts, courses and materials, search engines, news groups, subscription services and informal communications. Thorough research is important to provide context for new work and to avoid redundancy (and the associated embarrassment). Through research, students will be aware that new science and technology is not developed in isolation. In particular, it is important to be aware of the history that leads to new developments, to be sensitive to any ethical issues related to new developments, and to be aware of future research and development trends.

2. **Writing:** Students will improve their abilities in scientific and technical writing. The written word carries an influence that is independent of the writer. Well-written text can have an influence that exceeds the time and breadth of any other form of communication. Technical reports, position papers and even email can have tremendous sustained value for the purposes of retaining and communicating technical information. The ability to write well is essential for the students' long-term success.

3. **Live Speaking and Audience Engagement:** Students will improve their speaking skills, developing a sense of comfort and authority. They will learn to choose the scope of their presentations to best hold audience attention and make points clearly and efficiently. They will learn to respond to audience questions and comments with deep and meaningful replies. Good speaking and audience interaction skills compliment good writing skills. Both are important to any computer professional who wants to succeed beyond the role of an individual contributor on a project.

4. **Recorded presentations:** Students will learn to develop effective recorded presentations for the purposes of informing and instructing listeners and viewers. Audio and video recordings are ubiquitous and provide a preferred mode of learning for many people. Audio podcasts, YouTube and TikTok

videos, TED[1] talks, Khan Academy[2] lectures, MOOCs[3] and recorded conference presentations are just a few of the sources for knowledge delivery. Like written content, recorded presentations can have broad and sustained impact.

5. **Discussion:** Students will improve discussion skills, learning how to carefully listen to other participants, contribute clearly and succinctly, and elicit contributions from all members. Good discussion skills are important for clear communication in professional setting, building a respectful and comfortable work environment and developing strong professional relationships.

6. **Continuing Education:** Students will increase their appreciation for the value of continued, self-initiated education in computer science and technology, and the role of technology in society. Furthermore, they will experience concrete approaches for building habits that will foster this continuing education. Computer science is a rapidly changing field and its impact on society is always changing. Thus, it is very important that professionals develop habits to promote continued education from a variety of information sources. Broad awareness of new science and technology, even outside a person's core field, increases opportunities to adapt to and even lead in development of disruptions from new approaches outside that field.

Course Expectations

Students of this course are expected to do the following:

1. **Attendance:** Attend all class sessions, or receive prior approval for absence from the instructor.

2. **Discussion:** Participate in class discussions. We will have a variety of in-class discussions and exercises. Exercises will include activities to develop good skills in technical discussion, title and abstract writing, and technical presentation. You will develop the ability to discuss technical topics with peers at a concrete and abstract level, using basic skills of respectful discourse, inclusion of all group members, eliciting contributions from all members and bringing decision-making discussions to group consensus.

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[1] Technology, Entertainment and Design (TED) provides a large collection of short presentations on many topics, http://www.ted.com.

[2] Khan Academy provides a large collection of instructional talks and other material in many academic subjects, https://www.khanacademy.org.

[3] Massive Open Online Courses (MOOCs) are an alternative and complement to in-person classroom learning. http://en.wikipedia.org/wiki/Massive_open_online_course.

3. **Assignments:** Complete all assignments on time, following general class guidelines as well as specific assignment instructions. Late assignments will not be accepted unless the instructor grants prior approval.

4. **Self-teaching reflections:** On designated days, you are assigned to submit a reflection on articles, discussions, and presentations you have read, viewed, or heard, as described in the recurring assignments discussion in Chapter 5. You may not make up missed assignments since the whole point is to help you build a habit of self-teaching through regularly learning new ideas on your own.

5. **Resources:** Use credible sources for research content. Integrate and synthesize source material into an informed personal perspective on a topic. **Plagiarism will not be tolerated. It is grounds for dismissal from class and further discipline at the college.**

6. **Generative AI tools:** The emergence of generative AI tools, e.g., GitHub Copilot and ChatGPT, represent a new resource in developing content. In this course, we will use these tools as part of our content development process and explore the meaning of authorship in the process.

7. **Holistic communication strategies:** Some people find traditional academic communication approaches such as reading and writing less effective than using audio and video. In my own experience, this is particularly true for people in technical fields. Fortunately, the ubiquity of audio and video media enables powerful communication techniques beyond traditional approaches. If you tend to be challenged by traditional academic communication approaches, or simply want to explore a more holistic approach to technical communication, please contact the course instructor to talk about strategies for incorporating new approaches into your efforts for this class.

Academic and Real World

One overarching theme of this course is to help you experience "real world" situations in an academic setting. Several experiences in this course might be unusual for you:

1. **Paper lengths:** *You will not be asked to write papers of a minimum length in this course.* You will be asked to provide sufficient content to satisfy the assignment and be given an indication of approximately how

> One day I will find the right words, and they will be simple.
> — Jack Kerouac

> If you can't explain it simply, you do not understand it well enough.
> — Albert Einstein

many words that might require. However, even that value is a suggestion. In fact, as in real life, you will be expected to use **as few words as possible** to convey your ideas.

Our class motto is: *Enough words, no more.*

2. **Topic repetition:** *By the end of the course you will write about and present your topic several times.*
    You will have both the opportunity and requirement to write and present your topic material several times. This is good from the perspective of building expertise, but also rewards good self-discipline to take advantage of the opportunities to delve deeper into your topic.

3. **Owning the topic:** *You are the owner of your topic, especially the details of what you will study and develop.*
    In most professional settings, you will have latitude and responsibility to define your work agenda. This may not be true immediately, but will become a greater part of your role as you gain experience. Having control over the details of your work can be extremely satisfying and rewarding.

4. **Intellectual challenge:** *Your topic will present you with significant intellectual challenges that you must face and own.*
    Your topic (if it is a good one) will present a significant challenge for you intellectually. You will have technical papers and other resources that require significant study, and you will not understand them right away. You will need to find additional resources (papers, faculty members, community experts) to help you understand the required concepts, and you must find them.

5. **Structured content:** *Large projects require several elements for delivering content. You will need to package content in several ways for various audiences.*
    Your presentations, abstracts and conclusions play an important role to help your potential audience understand and want to learn more about your work.

6. **Self-learning:** *You will be in charge of what you learn after graduating.*
    The computing field changes rapidly from year to year, at least on the surface. The "future you" will thank the "present you" if you build a habit of continued learning. Many resources are available for self-learning, including excellent online courses, technical web portals and thought leader blogs.

7. **Growth mindset:** *New technical tools enable new solutions.* The computing field is creating new tools that solve existing problems, but also enable new ways to solve other problems. And these new tools often create new problems of their own. As a computing professional, you will be in the midst of creating and using new tools, and designing solutions that were not possible before.

Cultivating a growth mindset will better enable you to see new and exciting ways to use your skills for the betterment of society.

> The significant problems we face cannot be solved by the same level of thinking that created them.
> — Albert Einstein

Frequently Asked Questions (FAQs)

1. **How do I select a topic for my project?**
   This is the most important question to answer well. Chapter 3 discusses this issue in detail.

2. **Can I fail this course?**
   Yes, it is possible to fail this course.

3. **What happens if I fail this course?**
   You will need to repeat it or write an Honors Thesis in order to graduate as a computer science major.

4. **I cannot find resources for my topic. What should I do?**
   First, read Chapter 3 to make sure you have considered all of the suggested approaches. If you are still having trouble finding sources, you should consider broadening the topic scope, if possible. As a last resort you should consider switching topic areas.

5. **I have too many resources for my topic. What should I do?**
   In this case, you should try to reduce the scope of your topic, focusing on a subset of the original scope.

An Overview of a State-of-the-Field Project

Overview of a state-of-the-field project and discussion of its components.

T he overall focus of this course is a state-of-the-field (SOTF) project involving the full development of a topic that is of current interest in the scientific or technological community. The class website has some examples of past papers. Some topic areas in past years have been:

1. Machine Learning and Artificial Intelligence.

2. Computing on Emerging Architectures.

3. Natural Language Processing.

4. Computational Financial Modeling.

State-of-the-Field Components

Understanding the present state and future trends of any given topic requires an understanding of its related history and of the societal issues that may be important to current and future developments. As a result, an SOTF project contains the following four components:

1. **Survey:** Who do I need to credit for past work I used to understand my topic? What foundational information does an 'intelligent but ignorant reader' need to know in order to understand my topic?

2. **Technical Analysis:** What are the key technical components of my topic? What kind of diagram gives the big picture? What is a common step-by-step understanding of the topic? What is the detailed description of a particular aspect of the topic?

3. **Future trends:** What are the likely developments in the next 6 months to 3 years, backed up by credible data, analysis, and expert opinion?

4. **Demonstration:** In a 2 – 3-minute video, what experiment or protoyping can I perform to demonstrate my understanding of my topic?

Details for each assignment are found in Chapter 5.

Why a State-of-the-Field Project?

There are many forms of content creation and organization that are appropriate for scientific and technical material. Our motivation for focusing on a state-of-the-field project is that it gives you an opportunity to experience several styles of writing, presenting, and audience engagement, while keeping focus on a single topic area. Also, the SOTF form appears in many professional settings. It is a composite form of communication that allows the writer to both inform and influence the reader. For professionals in computer science and related fields, situations often arise where this type of communication is essential.

How To Succeed in this Course

General policies and advice for succeeding without unnecessary effort.

T here are several issues that, if well-addressed, will help a student succeed in this course. Probably the most important is the selection of a good topic.

Select a Good Topic

We cannot overstate the importance of selecting an appropriate topic for success in this course. Two aspects are important:

1. **Topic Area:** The broad description of the topic of interest, e.g., Neural Networks. We often refer to this as your topic.

2. **Topic Scope:** The specific breadth and level of detail you will address within the topic area.

Generally we first focus on selecting the topic area and an approximate topic scope. It is generally easy to adjust the topic scope as needed during the course, but it is very difficult to change topic areas. For most students, topic scope will become narrower and deeper as we proceed through the course due to a better understanding of one element of the scope and the lack of time to explore the original scope at the needed depth.

The first phase of selecting a topic is best described as brainstorming, listing multiple topics in computer science or computer-related fields that are of potential interest to

you. A good way to seed this process is to review a number of general computer science journals and magazines such as Communications of the ACM, IEEE Computer, or IEEE Spectrum and to watch or listen to introductory online audio and video. Once you have listed several topics, consider the following questions for each topic (**Good topic checklist)**:

1. Does it have a significant computer science component? (Does it require your computer science background in order to do the research?)

2. Are there sufficient high-quality resources at your disposal?

3. Is it an active field in the computer science community?

4. Can I develop a demonstration or prototype capability in this topic area?

5. Is there intellectual substance to this topic?

Often, a good way to limit the scope of a topic area is to look at the intersection of a technology and an application area. For example, if you start with the broad topic of artificial intelligence, you may want to first narrow it to artificial intelligence as applied to recommendation systems. If your topic of interest is iris recognition, you may want to focus on iris recognition in security applications. Looking at an application area as well as a technology helps to sharpen focus on specific issues regarding the technology.

Phases of Understanding

-   **Phase 1 – Sketching a preliminary mental model: You don't know what you don't know.** When you begin exploring a potential topic area, you will not know enough about the topic to even understand what about the topic you do not understand. This initial phase is perhaps the most challenging because it requires you to dive into one or several potential topic areas and boot-strap your understanding without any prior knowledge. *In this phase, there is no substitute for dedicating hours-long blocks of time reading, watching and listening to resources that can help you build an initial mental model of your topic area.*

-   **Phase 2 – Building a robust mental model: You know what you don't know.** After establishing a preliminary mental model, you will have names for the terms and concepts you do not understand and you can then start learning about them.

-   **Phase 3 – Establishing expertise: You know.** In this phase you build true expertise in your topic area within the narrow scope you can explore within the span of the course. By the end of the course, you will communicate with expertise and can answer questions with authority.

Plan Ahead, Work Ahead

The nature of this course and how it is scheduled allows the motivated student to complete much of the work in the early part of the course.

> If I had eight hours to chop down a tree, I'd spend six hours sharpening my ax.
> — Abraham Lincoln

In particular, you should consider the following issues:

1. **Plan ahead:** Once you have selected your topic, it is in your best interest to identify and gather research material early in the course. Finding credible, relevant resources takes time; both an investment of your time, and patience waiting for the arrival of remotely located resources.

2. **Work ahead:** Your final SOTF paper and presentation is a synthesis of your previous papers and presentations. High quality work on early assignments not only improves your grade but also makes your final paper and presentation easier to complete.

Locate Credible and Relevant Resources

The Internet and the ever-growing availability of online information has been a great asset for gathering research materials. At the same time, it is a challenge to isolate credible resources amidst all of the information we can find. This is sometimes referred to as "finding a needle in a needle stack." If you do not plan ahead, or do not make an effort to go beyond a first-level web search on your topic, you will not find sufficient high-quality resources for your work. To improve the quality of your resources, consider the following approaches:

1. **YouTube:** An excellent way to build the initial mental model (Phase 1 of understanding, mentioned above) of your topic area is to find video content, especially on YouTube. Almost any topic area for our course will have some introductory content that provides a basic mental model for someone who is just getting started. Other online platforms such as Udacity, Coursera, and related, may offer free or low-cost introductory material.

2. **ACM Digital Library:** We have access to the ACM digital library, which provides a wealth of journal articles and conference proceedings that will provide a foundation for your research.

3. **Web of Science**: Through the CSB/SJU Library, we also have access to Web of Science, a comprehensive citation data source for scientific content.

4. **Web searches engines:** Although web search engines are usually not sufficient for finding credible, relevant resources, they can be a good starting point. Careful selection of key words can help to identify issues related to your topic and, even more importantly, the leaders doing work in your topic area. Overall, search engines are bad way to directly find topic resources, but an excellent way to identify potential resources.

5. **Library search engines:** Our library websites contain excellent search engines that go beyond what is readily available on the Internet. These tools search a variety of collections of peer-reviewed publications that are the most reliable and high-quality source of material on your topic. These search engines are available from the main library website.

6. **Inter-library loan:** Our libraries have access to almost any printed material (via inter-library loan) in original form as a book, as a photocopy of a journal article, or in electronic form. This is an excellent resource, but it requires planning ahead.

7. **Bibliographies:** One of the best ways to obtain resources is from the citations of articles and books you have already acquired. This is probably the best way to get a complete picture of what is important in your topic area.

8. **Generative AI Tools:** Tools such as OpenAI's ChatGPT tools provide valuable content throughout the development of your project. At the same time, these tools can be spectacularly wrong with full confidence. We will learn how to use generative AI tools as knowledge assistants in our work.

9. **Contact experts:** Once you have identified an expert in your topic area, an excellent way to get more information is to contact this person. Experts are accustomed to answering queries and are often excited when a new person shows interest in their subject matter.

How Many Resources Do I Need?

A healthy project will typically have 15-20 resources (books, articles, experts or substantial websites) that you study and understand well. If I were to point to one of these resources, you should be able to tell me about it and how it informs your own work. This is what we mean by understanding it well. You will usually acquire these resources through the first half of the course and assimilate their content during the first two-thirds of the course. These resources form the foundation for your project.

Own Your Work

You will be learning from many resources. At the same time, you must synthesize and express your knowledge from your own understanding, using your own words. An act of plagiarism has severe consequences, up to and including dismissal from class and the college. Own your work.

> I just came up with a new word. It's plagiarism.
> — Joshua Hehe

Generative AI Tools

Generative AI tools provide valuable services while exploring and creating research papers, presentations, and related content. While copy-and-paste of content from other sources has been possible for many years, the emergence of tools that produce seemingly novel output blurs the distinction between what content is generated by the author and what is imported from someone and somewhere else. Clear guidance and policy are still emerging as is our internal sense of what is appropriate. Even so, there are a few guiding principles we can state:

1. Clearly identify content that is yours as the author and content that was obtained from others.

2. Find and cite sources for content obtained from others.

3. Acknowledge the use of generative AI tools but do not cite them.

Our class policy on generative AI tools is:

1. We will embrace generative AI tools in this course.

2. We must take responsibility for the content of our papers and presentations.

3. Generative AI tools can only be used to accelerate the finding and learning process, not replace it.

DO'S AND DON'TS

Communicating

General rules for improving your skills

T his chapter lists a set of general rules-of-thumb for improving your writing, presenting, and dialogue. These are not hard and fast rules to be obeyed blindly, but are suggestions that can be useful to many people.

General

1. **Avoid grandiose language:** Avoid superlatives such as "huge", "fantastic", "are endless". These are essentially meaningless terms that belong in a marketing brochure, not a technical presentation or document.

2. **Justify strong assertions:** When you make a strong assertion such as "X is the best method for…" justify your assertion with:

    a. Objective data.

    b. Extrapolation of existing data.

    c. Quotes from recognized experts in the field.

    d. Correlation to trends in a related field.

3. **Avoid informal and imprecise language:** Phrases such as "X is flaky", "Y will take over the industry" are not appropriate for professional presentations or documents.

4. **Use spelling and grammar tools:** Use the spelling and grammar checking tools in your document management software.

5. **Read for spelling and grammar errors:** Automatic tools are not perfect. You should still read the text for errors. For example, grammar tools will not detect use of "lead" where "led" should have been used.

Writing

Writing your ideas into paragraphs, or using software tools to accomplish the same effect, is often the most important process for

> Writing is nature's way of letting you know how sloppy your thinking is.
> — Richard Guindon

clarifying your thoughts. A well-written paragraph is the indivisible "atomic unit" of good writing.

Writing a complete idea in a few sentences best generates a good paragraph, worrying first about capturing the full idea you want to express. The paragraph is improved by iteration:

1. Correct grammar and spelling errors.
2. Confirm word selection in order to say precisely what you mean.
3. Reduce word count while retaining original message.
4. Repeat.

For the writer who is used to producing a paper the night before it is due, this process will be foreign, but will help produce shorter and better documents. This kind of process is the foundation for good written content.

For most of your academic life you have likely been told to write your papers with a minimum length measured in pages or word count. In contrast, in professional life, almost

> Enough words, no more.
> — Class Motto

everything you write will be limited to a *maximum* page, word, or character count. In this course we will emphasize efficient and effective use of words and time.

Consider the following general rules when writing your papers.

1. **Say what you will say, say it, say what you said, but not quite:**
   a. **Intro:** Provide motivation and background for your readers, bringing them into the context you will create.
   b. **Body:** Present your major ideas in tightly written, compact paragraphs that flow logically from one to the next. Imagine
   c. **Conclusion:** Review your main points and synthesize points that were implicit, so that your conclusion has impact. One way to think of the conclusion is to imagine you are walking home with a friend from a movie. You describe the highlights knowing that your friend just saw the movie too.

2. **Enough words, no more:** This is our class motto for writing[4]. Each paragraph should be compact, using only a sufficient number of words. The best way to create a compact paragraph is through iteration; repeatedly review the paragraph until it cannot be improved.

> All good writing is done by compression.
> — Terry Moore

3. **Complete a draft of your paper before the due date, then iterate:** Almost certainly, an unreviewed draft of your paper can be improved. Plan for this and complete it 2 – 3 days before it is due, then iterate on it using the recommendations in this chapter.

> Rewrite. Rewrite. Rewrite. No piece of writing is ever done; it merely meets a deadline.
> — Catherine Rampell

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[4] Our original class motto was, "Use enough words, no more." A new candidate motto is "Enough words only." Iteration can be applied to mottos!

Presenting

Giving a good presentation is challenging. It is not like giving a classroom lecture; so avoid that assumption. Instead it is more like being an actor in a play.

> As an actor engages with the scene, so should you interact with your slides.

When acting, would you recite the scene description? No, these facts are obvious from the scene itself. Would you display the spoken script on the screen and then read it word for word? No, your audience would become bored. In the same way, in a presentation your spoken words and slide content should complement and enhance each other.

In a technical presentation, slides are very useful for diagrams, pictures, detailed lists of items and quotes. You may describe a slide's content, but do not repeat the words that are on it. Your audience can read much more quickly than you can recite!

Consider these additional general rules when preparing for and giving a presentation.

1. **Overall presentation impact:** Your presentation should address two fundamental questions for an audience member. "What should I care about?" And, "Why should I care about it?" Make sure the overall structure and delivery of your presentations addresses these two questions.

2. **Your presentation is advertising for your paper; your paper is advertising for your work:** It is not possible or effective to cover all of the concepts and information in your paper while giving a talk. Instead, focus on giving your audience enough information in a compelling way that they will want to read your paper.

3. **Assume a comfortable, authoritative presentation position:** Look at the wall projection with us or at the audience, not the computer screen. Avoid a rigid stance behind the podium.

4. **Avoid "My topic is…":** Avoid "My topic is…" as the introduction to your presentation.

5. **Avoid "They say…":** Avoid "They say…". Who is "they"?

6. **Be prepared to answer questions:** If you mention a term or concept in your presentation, or make an assertion, be prepared to answer questions about it. If you are not familiar with the idea, leave it out of your presentation.

7. **Do not use slides as note cards:** Use figures, pictures, icons and (modest amounts of) motion in your slides. Avoid large amounts of text on slides. With the exception of quotes, do not read from your slides.

8. **Perform sanity test:** Before you give your presentation, walk through the process of setting it up.

9. **Deliver key points in conclusion:** A typical audience member will remember only a handful of key points from a presentation. Because of this, you should design your presentation as follows:

   a. Develop a draft of your presentation.

   b. After reviewing the draft, decide what handful of points you want your audience to remember. These points will be your conclusions.

   c. Remove content from your presentation that is not essential to making your key points.

   d. Add content that will support your key points.

   e. Foreshadow your key points, individually or as a thesis, in the introduction of your presentation.

Dialogue

The deepest form of communication is dialogue. Within a community, knowledge is created when people engage in dialogue and build a better understanding than would be possible for any individual.

> Dialogue is essential: Knowledge is created on the edges.

Because generative AI tools can create content of similar style, depth, and quality as a person, a large portion of your course grade will be determined from how you demonstrate your knowledge in interactive dialogue throughout the course.

Your level of expertise, as determined from periodic dialogue during the semester, will be the primary focus for this course. Since generative AI tools can produce near-perfect prose, high-quality writing is expected from everyone but will not be the primary basis for determining success in the course.

Course Assignments

Detailed descriptions of course assignments for the entire course

This chapter describes all major course assignments in detail. In addition to the assignments described here, we will have smaller exercises as part of class discussions.

Recurrent Assignment: Self-teaching reflections

Due: **Every Friday by 12 noon, except official semester breaks (Thanksgiving, Spring Break, Easter and similar).**

Description: One of the primary objectives of this course is to foster habits of continuing education. In support of this objective, each student will complete regular learning assignments.

Requirements:

1. Read one article and watch or listen to one audio/video resources.

2. At least one source must be peer-reviewed. Any of the journals published by the Association for Computing Machinery (ACM) would be appropriate.

3. The other source can be from any resource including business and technology newspapers, as long as the article has some connection to computing. TED talks, YouTube videos, Khan Academy, or similar resources are acceptable.

4. Before each class meeting, the student will submit (using an online form available from the class website) reflections on the content from their sources The reflections should include any reaction you had to its contents.

5. NOTE: After the first two assignments, sources must be selected from **outside** your SOTF topic area.

6. As class schedules permit, we will discuss some of the submitted reviews in class. Come prepared!

7. **NOTE: Excessive failures to submit these assignments is grounds for failing the course.**

Recurrent Assignment: Class Discussion

Due: During in-class discussion and exercises.

Description: Discussion of scientific and technical information requires the ability to communicate using precise language, good listening skills, persistence in clarifying technical ideas, respect for discussion participants and inclusion of all participants. If decisions are to be made as part of the discussion, a good discussion leader will work to reach consensus and identify points of contention. All discussion members will respect the time of others by speaking clearly and succinctly.

Requirements:

1. Complete any pre-class preparations.

2. Participate in discussions as part of in-class exercises.

3. Exercises will include practice of basic scientific and technical discussion skills, and group exercises on title and abstract writing and presentation development.

4. We will also discuss current topics in computer science on a regular basis using articles or books that were assigned for reading between classes.

5. Class members are expected to come prepared for discussion, participate by speaking, listening, drawing others into the conversation and treating others with respect. Furthermore, when appropriate, group members should work toward bringing the group to consensus when making decisions.

Recurrent Assignments: Technical Writing

Due: As directed on class website.

Description: We will learn about and practice writing content in the form of abstracts, position papers, essays, and via generative AI tools. These assignments will be scheduled throughout the semester.

Assignment 1: Survey

Description: A survey project is focused on finding previous work in a research topic area. In this assignment you will find and assimilate a core collection of articles, videos and audio recordings that help you to form your first mental model of your topic area.

To prepare for your survey, you will collect articles, generated content, videos, and audio recordings that help you understand the core principles of your research topic. These first resources are essential for getting a good foundation for the rest of the semester.

If you have a topic area whose foundation is related to other students, you are encouraged to share resources you find with those other students. Your instructor will help you identify possible resource sharing opportunities.

Requirements:

1. **Paper:** Each student will write a survey paper. The survey paper has two purposes: **inform your reader on basic concepts and cite the resources you have used to learn what you know.**

   a. **Inform the reader:** Your paper will provide a good high-level description of the foundational ideas for your topic area. For example, if your topic is machine learning for image recognition, you will provide a basic description of machine learning concepts and then talk about some common machine learning algorithms used for image recognition. At this point in the semester, you will not necessarily understand image recognition algorithms in detail, but you will know the names of these algorithms. In other words, you will know what you don't know.

   b. **Cite resources:** Most survey papers have many citations, at least five, often ten or more. The reason for this is that you are just getting started in the topic area and everything you are learning will come from reading watching or listening to someone else, learning from them.

   c. There is no minimum or maximum length for this paper. It should be long enough to accomplish the two purposes listed above. A typical paper may have about 1000 words of **compact** text.

2. **Video:** Each student will record a 30 – 45 second video that gives the viewer an essential idea of your topic. We will show all videos in class.

3. **Dialogue:** After showing your video, we will ask questions to assess your progress in building your knowledge of the topic.

Assignment 2: Technical Analysis

Description: You will write a paper with an in-depth description and analysis of one or more technical aspects of your individual topic. You will also describe current progress on your knowledge demonstration project. You will create a recorded presentation to be viewed in class and lead a discussion on your topic.

Requirements:

1. **Paper:** Identify the technical aspect(s) of your topic, explain the relevance to your topic, and provide an in-depth description and analysis of the technical component along with issues and open research questions. Think in terms of algorithms, architecture, system design, etc. For example, if your topic is digital rights management, you might compare and contrast different algorithms for digital watermarking.

    a. You must have at least one mental model diagram that identifies the major entities related to your topic and the key relationships between these entities.

    b. You must have at least 10 authoritative sources that you understand well. 15-20 is even better.

    c. A typical paper may have 3000 – 5000 words of **compact** text.

    d. Although this paper will eventually become part of your final state-of-the-field paper, it must be a complete paper for this assignment. It must have an introduction and conclusion.

    e. As part of your submission, you will include a statement of how you have addressed all writing rules listed on page 25 except rule 10 and what gaps you need to address all rules in the final paper.

2. **Video:** Recorded presentation will be 5 - 7 minutes.

4. **Dialogue:** After showing your video, we will ask questions to assess your progress in building your knowledge of the topic.

Assignment 3: Future Trends

Description: You will write a section on future trends for your final State-of-the-Field paper and presentation.

Requirements:

1. Based on your informed opinion, predict what the state-of-the-field will be like for your topic area in the next six months to a year.

2. Provide evidence to support your claims; avoid exaggerated claims and substantiate your predictions with:

    a. Observed Data. – Similar setting.

    b. Observed Trends.– Observed data over time.

    c. Known constraints. – Global min/max.

    d. Mathematical models.

    e. Expert opinion.

3. Build your predictions using the mental models you developed for your technical analysis paper.

4. Length will typically be 1000 to 1500 words of **compact**, original content.

5. **This content will be a section of your final state-of-the-field paper and will provide content for your final presentation. It will not be a stand-alone paper.**

Assignment 4: State-of-the-Field

Description: You will write a paper, give a presentation, and lead a discussion on the state-of-the-field for your topic. This assignment is a synthesis and comprehensive revision of previous papers and presentations.

Requirements:

1. You will give a detailed assessment of the state-of-the-field for your topic, including all appropriate material you have previously developed throughout this course.

2. **Paper:** You will write your paper using LaTeX and the IEEETran document class. It will include a survey, a technical analysis, and future trends.

    a. You will include a 3 – 5 paragraph appendix section (using \appendix LaTeX command) that explicitly identifies the previous course work and experience you used to complete the current course project. You will also identify how the current project has deepened and integrated previous course work and experience.

    b. Include charts and diagrams to illustrate trends. Most or all figures should be your original work. Include table of contents, lists of figure/tables, section headings and other navigational aids.

    c. There is no minimum or maximum length required for the paper. Presentations will be given in formal setting and will be 15 minutes long.

    d. You will include a statement when you submit your paper via email that you have addressed all writing rules listed on page 25.

    e. **Note:** The paper you write for this assignment will be much longer than those for the previous assignments. As are result, structuring your document becomes much more important. In particular, the following elements will be necessary:

        i. An abstract or substantial introduction (or both) previewing the thesis and content of your document.

        ii. Table of Contents, Lists of Figures, Tables, generated automatically by LaTeX.

3. **Live Presentation:** You will give an 8-minute presentation on your topic.

    a. Your presentation should cover a subset of your topic content and conclude with a handful of key points.

b. Your presentation will include a 2-minute recording (which is part of your 8 minutes) of your demonstration or prototype and use it to illustrate or justify conclusion or ideas you present.

4. **Dialogue:** After your presentation and video, we will ask questions to assess your knowledge of the topic.

CS373 Writing Evaluation Form

Your assignment is graded on a five-point scale for each of the following ten writing rules. An additional 50 points is graded for overall paper quality.

Rule #1: Assume your reader is *intelligent* but *ignorant*.   _____
- Did you write an introduction?
- Did you write a paper that is accessible to non-experts?

Rule #2:   _____
1. Tell them what you will say.
2. Say it.
3. Tell them what you said, and more.
   Use the conclusion to make your final clear points, synthesizing content.

Rule #3: Define all terms and acronyms.   _____
- Use the format this is a Brand New Acronym (BNM).
- Provide a description of new terms when you first use them.

Rule #4: When possible, use plain language and avoid jargon.   _____
- Avoid informal language, contractions, slang and imprecise terms.
- Use concise sentences.
- Remember our motto: **Enough words, no more.**

Rule #5: Make consistent use of terms and notation.   _____
- Read through your document to make sure you are defining and consistently using terms.

Rule #6[5]**:** Search the literature and cite other works.   _____
- You should have at least 10 high-quality references that you have assimilated.

Rule #7[6]: Use pictures, charts and graphs, but keep in mind #4.   _____
- Include one or more mental model diagrams with substantial captions.
- A picture is worth a thousand words, or more. Use them.
- Provide a descriptive caption that explains the figure or table.

Rule #8[7]: Use examples to explain complex ideas.   _____
- Any complex topic can benefit from providing a concrete example.
- But make sure the example is truly relevant.

Rule #9[7]: Use: _____
- Headings (Chapter, Section, etc.).
- Bulleted Lists, numbered lists.
to provide structure, clarity and conciseness to your document.
- LaTeX provides excellent support for these document elements.

Rule #10[7]: Provide guidance: _____
- Table of Contents.
- List of Figures, list of Tables.
- Index and Glossary.
- Abstract.
- LaTeX provides these elements as well!

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[5] The Survey papers must have at least 5 high-quality references.

[6] Rules 7, 8 and 9 are required for Technical Analysis and Final SOTF paper only.

[7] Rule 10 is required for Final SOTF paper only.

CS373 Presentation Evaluation Form

Your presentation is graded on a five-point scale for each of the following ten writing rules. An additional 50 points is graded for overall presentation quality.

Rule #1: Tell us a story.　　　　　　　　　　　　　　　　　　　　　　_____
- Do you have a beginning, middle and end?
- Did you explain *what* the audience should care about and *why* they should care?

Rule #2: Pick a realistic scope.　　　　　　　　　　　　　　　　　　　_____
- Pick the most important topic elements for the amount of time you have.
- Stick to a core message, knowing that your paper has more detail.

Rule #3: Make a handful of key takeaway points.　　　　　　　　　　_____
- Put your final key points (at most 3 – 5) on your last slide.
- Your entire presentation should help the audience understand and respect your key points.
- Remove anything from your talk that is not connected to your key points.

Rule #4: Make slide content complement what you say.　　　　　　_____
- Put technical details, dates, names, facts on your slides and trust the audience to read them.
- Include a slide with a "big picture" diagram that illustrates the mental model for your topic.
- When making a point, the slide title should state the point**.**
- Avoid slides that are just an outline of what you will say.

Rule #5: Prepare for disaster.　　　　　　　　　　　　　　　　　　　_____
- Have a copy of your presentation slides available online or on another device.
- Be prepared to speak even if slides are not available.

Rule #6: Be prepared to explain and defend any comments you make.　_____
- Anticipate questions your audience might ask, have backup slides ready if needed.
- Avoid saying things you are not comfortable defending.
- If you don't know how to answer a question, say, "I don't know."

Rule #7: Respect your time limit.　　　　　　　　　　　　　　　　　_____
- Practice your presentation and track how long it takes.
- Be prepared to skip some content to stay on time.
- Be aware of remaining speaking time.
- *Never* speak longer than your allotted time.

Rule #8: Dress up.　　　　　　　　　　　　　　　　　　　　　　　　_____
- Wear clothes from the more formal end of the spectrum of your wardrobe.

Rule #9[8]: Remind us of where we are in your story:　　　　　　　　_____
- For longer presentations, periodically remind us of where we are in the story.
- Use an outline slide with the upcoming story element highlighted, or something similar.

Rule #10[9]: Make your final key points:　　　　　　　　　　　　　　_____
- Make your ending memorable. Focus on the final 3 – 5 takeaways you want remembered.
- Make the points clear and concise, wrapping up the story you told.
- Make sure the key points clearly address what we should care about and why.

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[8] Rule 9 is required for your final SOTF presentation.

[9] Rule 10 is key. *Every* talk should end with its key points.