| Contract for CSS 497  **Computer Science and Software Engineering Capstone** | 18115 Campus Way NE · Box 358534 · Bothell, WA 98011-8246 (425) 352-5279 <http://www.uwb.edu/css> | |
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| **SECTION A STUDENT INFORMATION** | | |
| Weldon Alexander | | **1727037** |
| **Full Name** *(Last, First)* | | **Student ID** |
| **STOP:** Are you ready for your capstone experience?  Have you completed all core courses and 10 credits of CSS electives? (please check answer) ** YES  NO**  If you are missing **any** of the required prerequisite courses (CSS 301, CSS 342, CSS 343, CSS 350, CSS 360, CSS 370, CSS 422, CSS 430, and 10 credits of CSS electives), you must speak with your faculty advisor about whether you will have the necessary skills for your capstone. If (1) your faculty advisor feels that you will be prepared **and** (2) your missed classes match any of the cases a-d in the following table, then you must provide a justification in Section E of this contract.   | **Case** | **Core missing** | **Electives missing** | **Action** | | --- | --- | --- | --- | | a | 1 course | 0 | Justify in 497 contract | | b | 0 | 5 credits | Justify in 497 contract | | c | 1 course | 5 credits | Justify in 497 contract | | d | 0 | 10 credits | Justify in 497 contract | | e | 2 courses | 0 | Justify in petition form | | f | All other cases | | Capstone denied in most cases. See CSS Academic Advisor |   If you are missing two core courses (case e), but your faculty advisor feels that you are ready to begin your capstone, you must submit a Course Petition form to the CSS Academic Advisor.  Capstone contracts submitted by students missing **more than two prerequisite courses** (case f) will be denied. | | |

| **SECTION B CREDIT DISTRIBUTION**  *(Credits from all quarters must equal 10)* | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **First Quarter** | | | | | **Second Quarter\*** | | | | | **Third Quarter\*** | | | |
| **Summer** | **2022** | | **10** | |  |  | |  | |  |  | |  |
| Quarter | Year | | Credits | | Quarter | Year | | Credits | | Quarter | Year | | Credits |
| **Grade Option** (Check only one) | | | | | □ Decimal □CR/NC | | | | |  | | | |
| **Faculty Advisor: Dr. A. Retik** | | | | | | | | | | | | | |
| **\* NOTE: The grade will be an "N" grade (meaning in progress) until the end of the term in which the student has completed both (1) their CSS 497 AND (2) their CSS 497 prerequisites.** | | | | | | | | | | | | | |
| **SECTION C CAPSTONE INFORMATION**  *Please answer the following questions regarding your proposed Capstone project.* | | | | | | | | | | | | | |
| **Project Title:** | | Remote machine learning based video game cheating | | | | | | | | | | | |
| **Option:** (Circle/highlight one) | | **1**  Sponsored Capstone | | **2**  Current Employer | | | **3** Faculty Research | | **4** Individual Project | | | **5**  Group Project | |
| **Capstone Sponsoring Organization(s): Alumni, CS Professional** | | | | | | | | | | | | | |
| Did you sign a non-disclosure statement or agreement with the Sponsoring Organization? □ Yes □ No | | | | | | | | | | | | | |
| **Brief Description (75-125 words)** | | | | | | | | | | | | | |
| My responsibility on the project will be to create a software product with functionality to demonstrate a potential way to bypass kernel 0 anti-cheat systems that have begun to appear on the market. These anti-cheats are extremely invasive with kernel 0 access meant to detect and program that could possibly be running to cheat on the game it seeks to protect. This program is a demonstration of a possible future of cheating on online games and an analysis of the possible countermeasures to the future of cheating. | | | | | | | | | | | | | |

| **SECTION D** *Please answer the following questions regarding your proposed Capstone project.* |
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Answer every question in detail directly after the question (refer to <http://courses.washington.edu/css497/contract.html>). Please describe clearly and with grammatically correct, complete sentences. Hand written contracts will not be accepted.

If you are currently unable to provide this level of detail, check this box. You will be required to submit an updated proposal by week 3. Approval contingent upon updated proposal.

1. Describe the capstone.
   1. Include any relevant background information.
      * This software product is a designed functionality on a potential way to bypass kernel 0 anti-cheat systems that have begun to appear on the market. These anti-cheats are extremely invasive with kernel 0 access meant to detect and program that could possibly be running to cheat on the game it seeks to protect. This program is a demonstration of a possible future of cheating on online games and an analysis of the possible countermeasures to the future of cheating.
      * The program will function by capturing the video content of a player playing a game and transferring it to a secondary pc. The secondary PC analyses the content stream and uses visual learning to track targets in the game. A machine learning algorithm then calculates and feedback commands to the first PC on to move the mouse to the target. Achieving aim botting without having a program running on the first PC
   2. Clearly describe the benefits of the proposed project (e.g., ‘What is this project going to accomplish?’).
      * This project is designed to examine a possible future of cheating in video games given the trend of kernel zero anti-cheat systems. Predicting a possible new attack vector video game cheaters could use allows the exploration of how to counter these new cheating methods.
      * More benefits to follow
2. Provide a clear, detailed description of the academic merit of proposed project. Academic merit is defined as ways in which you will further develop your core and advanced technical competencies. Please list the competencies you will focus on and provide a brief description of how each one will be further developed by your involvement in this project. (For more information, see “Core & Advanced Competencies” at [www.uwb.edu/bscss/css497/student-guide/competencies](http://www.uwb.edu/bscss/css497/student-guide/competencies) )
   1. Systematic thinking
      * I will focus on systematically breaking down each step of this program into smaller components that I will have to approach methodically and manage my own time accordingly to deliver the product by august 19th
   2. AI algorithms
      * I created my own AI heuristics to satisfy a given problem in CSS 382: introduction To Artificial Intelligence however this project will require me to create my own constraint problem and expand my knowledge and practice in Artificial intelligence by creating my own constraints given a problem and figure out how to develop a heuristic
   3. AI visualization
      * CSS 382 never covered AI and visual content so this we be an entirely new avenue for me to expand my learning and knowledge on. I will have to develop my understanding of how to build an AI that can seek out targets and recognize specific images within a digital feed
   4. Security Analysis and deductive reasoning
      * I have done security analysis on corporations in previous cyber security courses however this project will require me to examine possible theoretical security technologies via inventing the attack vector that would possibly be used in the future. It will require me to use deductive reasoning and more systematic thinking.
   5. Learning by Doing
      * By working with my own implementation that has likely not been done before I will most likely have to do implementation and software practices I have never done before. I will most likely not find too many resources online I can rely on so I will have to learn a lot of things through practice
   6. More benefits I have yet to experience as I am sure this project will teach me even more
3. Identify what specific software development tools you will use to complete this project and describe why are they appropriate.
   1. I will be using
      * Google docs to track and upload documents, reports, and Demos
      * Pycharm for programming components of the visual AI section of the project and the machine learning target acquisition section of the program in python.
      * A game program TBD to test the AI on
4. List all computer equipment, office/lab space, human resources and/or financial support that are required to complete this capstone.
   1. I will be using
      * A primary pc to run the game on
      * A secondary pc to run the machine learning system on
      * A capture card to stream the game content from the primary PC to the secondary PC in high enough quality that the machine learning algorithm can easily discern objects.
5. Provide a list of potential barriers and/or problems that may slow down or potentially prevent the successful completion of this capstone.
   1. Most of the barriers I am worried about pertain specifically to each stage of the project such as having issues with the hardware technology of the capture card, The software implementation of the visual AI section or the AI target acquisition/selection algorithm. Most of these I have parallel experience with but not direct experience with the technologies themselves. Otherwise, I have all the hardware and software tools to complete this project.
6. Provide a detailed project plan including proposed deliverables and due dates. The deliverables must include the date of the colloquium you plan to observe prior to the quarter in which you plan to present, and the date of the colloquium when you plan to present.
   1. Observed Colloquium: June 10th
   2. Colloquium Presentation: 2022 August 19th
   3. Weekly Work Report
      * Multiple paragraphs explaining what was worked on during the past week. Contains information on any trouble areas or areas that may need to be reviewed and revised.
   4. Demo of Content being capture and transferred between Pc’s
   5. Demo of AI visual capture selecting targets
   6. Demo of AI sending movement commands back
   7. Demo of AI completing aiming challenges
   8. Security countermeasure analysis
   9. Poster board of project (draft due one week before end date August 19)
   10. Abstract (draft due one week before end date August 19)
   11. Presentation (draft due one week before end date August 19)
   12. Dates

* Week - 2
  + Visual capture of game and streaming to secondary ai
* Week - 4
  + AI visual recognition of a target
* Week - 6
  + Machine learning algorithm prioritizing targets
* Week - 7
  + Machine learning algorithm outputting commands back to the originator pc
* Week - 6
  + Machine learning algorithm completing aiming challenges
* Week – 8
  + Program demonstration video
  + Security countermeasures analysis document
* Week – 9
  + Abstract draft
  + Presentation draft
  + Poster board draft
* Week – 10
  + Colloquium

1. Describe the methods and criteria you propose for evaluation of this capstone. Be specific.
   1. Does the Project Achieve its goal of presenting a remote AI based aim-bot / cheating algorithm?
   2. Does the project present a security analysis of the cheating strategy and possible counter measure technologies and strategies?
   3. Does the presentation and project create a merit for the investigation of this technology as well as a merit for the investigation of counter measure
   4. **Project Development / Software Engineering evaluation criteria**
      * The development follows SDLC practice by collecting requirements, defining specifications, designing, implementing, and testing the system prototype.
      * The project achieved its goal of presenting a prototype of remote AI based aim-bot / cheating algorithm
      * The project performed a security analysis of the cheating strategy and possible counter measure technologies and strategies
      * The project demonstrated a merit for the investigation of this technology as well as a merit for the investigation of counter measure
   5. **Project Management evaluation criteria**
      * Reports turned in on time
      * Reports show a clear understanding of meeting the academic merit of the capstone.
      * Engaging and interesting Poster and its Colloquium presentation
        + Poster meets the requirements of content accuracy and quality
        + Describes experience during the capstone
      * Presentation at the colloquium
        + Clear presentation
        + Engaging and covering important/interesting details of the capstone

| **SECTION E** *Please complete this section if you are missing any of the Capstone prerequisites (cases a-d from Section A).* |
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To be completed only if you are missing prerequisites for CSS 497 (these courses are CSS 301, CSS 342, CSS 343, CSS 350, CSS 360, CSS 370, CSS 422, CSS 430, and 10 credits of CSS electives). Please write clearly and in grammatically correct, complete sentences.

### Explain why the course(s) you are missing will not affect your capstone experience. That is, look at the course descriptions for the classes you have not taken and explain why you don't need that specific knowledge to be successful in your capstone.

### Complete the table below to indicate (a) how you will spread out the CSS 497 prerequisites courses and (b) when you plan to take the prerequisite course(s) you are missing.

| **CSS 497 Capstone** | **\_\_\_\_\_\_\_\_\_\_\_\_** (Quarter, year) | **\_\_\_\_\_\_\_\_\_\_\_\_** (Quarter, year) | **\_\_\_\_\_\_\_\_\_\_\_\_** (Quarter, year) | **\_\_\_\_\_\_\_\_\_\_\_\_** (Quarter, year) |
| --- | --- | --- | --- | --- |
| **(a) CSS 497 Credits** (identify CSS 497 credit hours to be applied by quarter) |  |  |  |  |
| **(b) Capstone prerequisites**  (indicate when you plan to take remaining core + elective course(s)) |  |  |  |  |

NOTE: Your last CSS 497 credits must be completed in or after the quarter you complete your last CSS 497 prerequisite. You will receive an "N" (meaning in progress) in all of your CSS 497 credits until you complete any missing prerequisites. If you have any questions as you fill out this table, talk with your CSS advisor.

1. Obtain the approval of your faculty advisor.   
   NOTE TO FACULTY ADVISOR: By signing below, you indicate that, in your opinion, this student is sufficiently prepared for their rigorous, academically challenging capstone project. Give an "N" grade (meaning in progress) until the end of the term in which the student has completed both (1) their CSS 497 AND (2) their CSS 497 prerequisites

Faculty Advisor Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Faculty Advisor Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Faculty Advisor Email: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DATE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Student Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DATE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

NOTE: Signatures are required in the Signature Section, as well.

| **SECTION F SIGNATURE SECTION** |
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Student, Faculty Advisor & Capstone Sponsor  
**Statement of Agreement**

1. By initialing each box, the **Student** agrees to:

[ AW ] Perform to the best of his or her ability and to the satisfaction of the Capstone sponsor(s) those assigned tasks related to the cooperative component of this contract and adhere to all personnel rules.

[ AW ] Perform to the best of his or her ability learning activities negotiated with the faculty advisor as stated in the contract, including communicating with the faculty advisor according to the scheduled course meetings and other scheduled events as indicated in the contract.

[ AW ] Talk with the Capstone sponsor, faculty advisor, CSS Capstone Coordinator, and other program representatives with regard to any changes, revisions, or concerns regarding the Capstone project. Meet with the CSS Academic Advisor to complete an audit of your degree completion.

[ AW ] Complete all deliverables as described in the contract, present a poster and an oral presentation at the CSS colloquium.

[ AW ] Prepare a final report if required by faculty advisor. For example, a final assessment of your Capstone experience including any “lessons learned” and advice for future students.

[ AW ] Prior to the completion of CSS 497, prepare an abstract that is approved by the faculty advisor and the Capstone sponsor. The approved abstract needs to be turned in to the CSS Capstone Coordinator.

[ AW ] Attend a colloquium prior to the one in which you present and attend the entire duration of the colloquium at which they present.

1. By initialing each box, the **Faculty Advisor** agrees to:

[ -AR ] Provide instructional support and guidance by communicating regularly with students about their on-site experiences, pertinent readings, theoretical frameworks, and project designs.

[ -AR ] Utilize meeting times with the student, for example, as an opportunity to develop writing skills by reviewing one or more drafts of the final paper, Colloquium poster and presentation, and/or software project, and the abstract.

[ -AR ] Approve an abstract of the project prior to assigning the course grade. At the end of each quarter, assign a decimal grade or credit/no credit grade according to the evaluation criteria identified in the Capstone Contract. (Note: these criteria are reviewed during the program approval process of the Capstone contract.) Incorporate any feedback received from the Capstone sponsor into your final evaluation.

[ -AR ] Give an "N" grade (meaning in progress) until the end of the term in which the student has completed both (1) their CSS 497 AND (2) their CSS 497 prerequisites

1. By initialing each box, the **Capstone Sponsor** agrees to:

[ MD, BW ] Provide a good learning and training environment for the student, keeping routine work, such as typing and filing to a minimum.

[ MD, BW ] Evaluate the proposal and make agreements, if applicable, with the student and faculty advisor pertaining to the following: a) any and all intellectual property rights; b) non-disclosure or confidentiality of specific sponsor methods, technologies and/or business strategies; c) time-limitations for non-compete agreements between all parties; and d) acknowledgement of any and all rights to ownership of pre-existing knowledge.

[ MD, BW ]Work with the student and make explicit arrangements with the student concerning the overall goals described in this contract, communication with the student, expectations, and records of the student’s hours and performance.

[ MD, BW ]Approve an abstract of the project prior to completion of the contract. Complete an evaluation of the student’s performance if specified in Section D 7 and provide it to the CSS Capstone Faculty advisor.

The CSS Division Capstone Coordinator will coordinate the capstone and provide administrative support services as needed by the student, faculty advisor, and Capstone sponsor.

This contract may be terminated or amended by the student, faculty advisor, or Capstone sponsor at any time upon two weeks written notice, which is received and agreed to by the other parties.

Acknowledgement of the completion of the capstone requirement for the Bachelor of Science in Computing & Software Systems will be granted for the Capstone project when the CSS 497 Faculty Advisor has determined that the student has satisfactorily completed the work outlined in Section D 7.

*CSS 497 provides students with the opportunity to earn academic credit while working on a project that has potential benefits for industry or community organizations. Students learn by connecting classroom theory and community-based experience through the completion of an academic project.*

**We, the undersigned, have read and approved the above proposal and understand the requirements of this proposal per the responsibilities identified in the preceding ‘Statement of Agreement’.**

| Dr. A. Retik | | ArkadyRetik | | aretik@uw.edu | | | | 6/26/2022 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Faculty Advisor** | | Signature | | Email | | | | Date |
| Alexander Weldon | | Alexander Weldon | | 206-883-0636 | | | | 6/26/2022 |
| **Student Name** | | Signature | | Phone | | | | Date |
| Benjamin Charles Weldon | | | | | Computer Science Software Engineer | | | |
| **1st Capstone Sponsor Name** | | | | | **Title** | | | |
| Tangent Information Systems | | | | | 206.604.7686 | | | |
| Company/Organization Name | | | | | Phone | | | |
| 9342 Moss Ln NE ` | | | Bainbridge Island | | | Wa | 98110 | |
| Address | | | City | | | State | ZIP | |
| Benjamin C Weldon | | | bweldon@tangentis.com | | | | 06/27/2022 | |
| Signature | | | Email | | | | Date | |
| Morgan Du Bois | | | | | Device Support Engineer | | | |
| **2nd Capstone Sponsor Name** | | | | | **Title** | | | |
| Alumni | | | | | (360) 286 - 6052 | | | |
| Company/Organization Name | | | | | Phone | | | |
| 18420 5th Ave NE | | | Suquamish | | | WA | 98392 | |
| Address | | | City | | | State | ZIP | |
| Morgan Du Bois | | | [Morganduboiis229@gmail.com](mailto:Morganduboiis229@gmail.com) | | | | 6/27/2022 | |
| Signature | | | Email | | | | Date | |
| **After completing the contract give to the CSS Division Capstone Coordinator, Janet McDaniel, Discovery Hall room 352 V** | | | | | | | | |
| CSS Division Authorization  Associate Professor & Chair  William Erdly  erdlyww@uw.edu |  | | | | | |  | |
| **Signature** | | | | | | **Date** | |

Although the CSS Division has taken reasonable steps to ensure a positive learning environment with sponsors, it should be understood that this Capstone agreement has potential risks. In signing this Capstone Contract, the student acknowledges inherent hazards and risks, including but not limited to physical injury and death, and assumes those beyond control of the University staff and faculty.

***In case of emergency, I, the student, give my consent for emergency medical treatment and agree to pay for any charges not covered by my personal health insurance. In addition, I understand my responsibilities as described in the Statement of Agreement on the reverse.***

\_\_\_\_Alexander Weldon\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_6/26/2022\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_alwex27@uw.edu\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
**Student Signature** Date Email