Affordable Materials Grants, Round 21:

Transformation Grants

(Spring 2022-Spring 2023)

Proposal Form and Narrative

# Notes

* The proposal form and narrative .docx file is for offline drafting and for our review processes. Submitters must use the online Google Form for proposal submission, including uploading this document.
* The only way to submit the official proposal is through the Google Form. The link to the online application is on the [Round 21 RFP Page](https://www.affordablelearninggeorgia.org/about/rfp_r21).
* The italic text provided below is meant for clarifications and can be deleted.

The Round 21 Kickoff will include an asynchronous training module, required for all team members to complete, followed by the synchronous Kickoff Meeting on March 25, 2022 from 1pm-4pm. At least two team members from each awarded team (unless the award is for one individual) are required to attend the synchronous Kickoff Meeting.

# Applicant and Team Information

*The* ***applicant*** *is the proposed Project Lead for the grant project. The* ***submitter*** *is the person submitting the application (which may be a Grants Officer or Administrator). The submitter will often be the applicant—if so, just list leave the submitter blank.*

| Requested information | Answer |
| --- | --- |
| Institution(s) | Georgia Southern University |
| Applicant name | Weitian Tong |
| Applicant email  | wtong@georgiasouthern.edu |
| Applicant position/title | Tenure-track Assistant Professor |
| Submitter name  | Weitian Tong |
| Submitter email  | wtong@georgiasouthern.edu |
| Submitter position/title | Tenure-track Assistant Professor |

Please provide the first/last names and email addresses of all team members within the proposed project. Include the applicant (Project Lead) in this list. Do not include prefixes or suffixes such as Ms., Dr., Ph.D., etc.

| Team member | Name | Email address |
| --- | --- | --- |
| Team member 1 | Weitian Tong | wtong@georgiasouthern.edu |
| Team member 2 | Lixin Li | lli@georgiasouthern.edu |
| Team member 3 | Yao Xu | yxu@georgiasouthern.edu |
| Team member 4 |  |  |
| Team member 5 |  |  |
| Team member 6 |  |  |

If you have any more team members to add, please enter their names and email addresses in the text box below.

|  |
| --- |
|  |

# Project Information

| Requested information | Answer |
| --- | --- |
| Priority Category / Categories*Projects in these categories will receive three extra points in the final score for fitting a priority of these particular rounds of Transformation Grants. The type of funding for the project is determined by the funding categories criteria above. As of Round 18, projects can be a part of more than one category. Note that the below categories only indicate priority, not which applications qualify for a grant. Select all that apply.* | * *Student Participation in Materials Evaluation and/or Development*
* *Departmental Scaling Projects*
 |
| Requested Total Amount of Funding*$30,000 maximum total award per grant* | $16,076.5 |
| Final Semester of Project | Spring 2023.  |
| Using OpenStax Textbook?*This is to indicate to OpenStax that they can provide additional support and resources to your team during the adoption process.* | No |

# Impact Data

Please fill in the data below with impact data in below with one course (all sections) in each table, and only include courses and instructors that are specifically part of the scope of this grant proposal. Add or remove tables as needed. **Please only put a single averaged or totaled (as appropriate) number in each box. Do not put ranges or mathematical equations in any of these boxes.** If the materials used by different instructors in a course vary drastically, it is possible to enter one course per instructor.

For a multi-course project, if a significant amount of students are assumed to take courses in a sequence and only one textbook is used for these courses, please take this into account in your total *(i.e. only include that book in the first course they would purchase it for OR adjust the number of students affected. Please explain in the notes section if making such adjustments).*

## Course 1

| Row # | Requested information | Answer |
| --- | --- | --- |
| N/A | Course title and number | CSCI 7130 Artificial Intelligence |
| N/A | Course instructors | Weitian Tong |
| 1 | Average number of students enrolled per section | 15 |
| 2 | Average number of affected course sections scheduled in a summer semester | 0 |
| 3 | Average number of affected course sections scheduled in a fall semester | 1 |
| 4 | Average number of affected course sections scheduled in a spring semester | 1 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 2 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 30 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | 1. Stuart Russell and Peter Norvig. Artificial Intelligence, a Modern Approach. 4th edition.

Amazon Price: $152.41Amazon Link: https://www.amazon.com/Artificial-Intelligence-A-Modern-Approach/dp/0134610997 |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $ 206.65 |
| 9 | Average post-project cost per student section enrollment | $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $ 206.65 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $ 6,199.5 |

## Course 2

|  |  |  |
| --- | --- | --- |
| Row # | Requested information | Answer |
| N/A | Course title and number | CSCI 7432 Algorithm Analysis and Data Structures |
| N/A | Course instructor | Yao Xu |
| 1 | Average number of students enrolled per section | 10 |
| 2 | Average number of course sections scheduled in a summer semester | 0 |
| 3 | Average number of course sections scheduled in a fall semester | 1 |
| 4 | Average number of course sections scheduled in a spring semester | 1 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 2 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 20 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | 1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein. Introduction

to Algorithms (3rd edition, MIT Press)Amazon Price: $99.00Amazon Link: <https://www.amazon.com/Introduction-Algorithms-3rd-MIT-Press/dp/0262033844>1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd edition

Pearson Price: $143.99Amazon Link: https://www.amazon.com/Introduction-Design-Analysis-Algorithms-3rd/dp/0132316811 |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $239.89 |
| 9 | Average post-project cost per student section enrollment | $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $239.89 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $4797.8 |

## Course 3

|  |  |  |
| --- | --- | --- |
| Row # | Requested information | Answer |
| N/A | Course title and number | CSCI 7090 Knowledge Process for GIS Data |
| N/A | Course instructor | Lixin Li |
| 1 | Average number of students enrolled per section | 16 |
| 2 | Average number of course sections scheduled in a summer semester | 0 |
| 3 | Average number of course sections scheduled in a fall semester | 1 |
| 4 | Average number of course sections scheduled in a spring semester | 0 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 1 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 16 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | 1. P. Revesz. “Introduction to Databases: From Biological to Spatio-Temporal”, Springer-Verlag

Amazon Price: $92.35Amazon Link: https://www.amazon.com/Introduction-Databases-Biological-Spatio-Temporal-Computer/dp/1849960941 |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $ 92.35 |
| 9 | Average post-project cost per student section enrollment | $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $ 92.35 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $1477.6 |

# Narrative Section

## 1. Project Goals

The graduate programs in our Computer Science Department have been developing rapidly since the consolidation and now we have the largest Master program in our college. This Transformation Grant project will initiate transforming MSCS (MS in Computer Science) courses in our department to prepare for the fast-growing graduate programs. We aim to design no-cost open educational resources (OER) materials for three essential graduate computer science courses, i.e., CSCI 7090 Knowledge Process for GIS Data, CSCI 7130 Artificial Intelligence, and CSCI 7432 Algorithm Analysis and Data Structures. Following the learning outcomes, our team members will identify and develop cost-free, up-to-date, and interactive learning materials for each learning module to achieve better teaching effectiveness compared with traditional textbooks. We will organize these learning materials in an adaptive way so that the courses can be delivered under different modes (e.g., Face-to-Face, Face-to-Face Site-Asynchronous, Online Asynchronous, Online Asynchronous, Hybrid) to against unpredicted situations such as the COVID pandemic. Meanwhile, the schedule of learning modules and materials will be designed to ease self-study for students beyond the class time. All designed learning materials will be created under a Creative Commons Attribution License and with basic accessibility standards required by Affordable Learning Georgia (ALG).

## 2. Statement of Transformation

**Current State of Courses:**

CSCI 7130 Artificial Intelligence is a core graduate course in our department. The AI course introduces basic concepts and core algorithms of artificial intelligence including agents, rationality, search, heuristic, game-playing, planning, perception, knowledge representation, logic-based reasoning, probabilistic representation and reasoning, and machine learning (neural networks, deep learning, etc.).

CSCI 7432 Algorithm Analysis and Data Structures is also a core graduate course in our department. Advanced topics in algorithm design and analysis and data structures for implementing these algorithms will be introduced. Problems considered from areas of information storage and retrieval, graph theory, cryptology and parallel processing. The students are expected to complete small research projects by the end of the semester, demonstrating ability to apply appropriate algorithmic design paradigms and data structures for solving real-world problems.

CSCI 7090 Knowledge Process for GIS Data is an elective graduate course in our department. This course helps students to understand the limitations of relational databases and introduces some advanced databases such as constraint databases as alternative and more powerful database management systems. Geographic Information Systems (GIS) is introduced as a database management system for spatial and spatiotemporal data.

As three important MSCS courses, CSCI 7130 and CSCI 7432 are offered each semester, and CSCI 7090 is offered once a year.

Since the consolidation of Georgia Southern University and Armstrong State University, multiple course delivery modalities have been explored and adopted to satisfy more students on both campuses, i.e., Statesboro campus and Armstrong campus. Additionally, the COVID pandemic has prompted more flexible course delivery modalities. Currently, Georgia Southern offer various course delivery modalities, such as Face-to-Face, Face-to-Face Site-Asynchronous, Online Asynchronous, Online Asynchronous, Hybrid. As a result, there is a need for strongly adaptive learning materials to align with different course delivery modalities.

Our team has searched on OpenALG and did not find any project that transforms textbooks for AI course and Knowledge Process for GIS Data course. For the Algorithm course, there is one related project for the course “CS4306/04 Algorithm Analysis” sponsored by Textbook Transformation Grant in Round 13. This project, however, is designed for undergraduate students. Although the Internet is flooded with free and open-source learning materials, they are usually disorganized and quite a few even contain inaccurate information. There is a need for well-organized learning materials that help graduate students to achieve self-paced learning effectiveness beyond the class time.

As shown in Section “Impact Data”, the currently adopted textbooks are pricy. Besides, Computer Science is developing face, which makes traditional textbooks get outdated quickly. Therefore, it is not worth purchasing expensive textbooks that are easily out of step with the times. Besides, the cost of textbooks can be a burden for low-income students. There is a need for low-cost and up-to-date learning materials in these courses.

These listed CS courses introduce plenty of basic concepts and algorithms, which are based on “tedious” math. Interactive learning materials such hands-on problems, coding examples, and real-life projects will better involve students in the learning process and therefore improve their learning experience. Thus, there is a need for interactive learning materials in these courses.

**Overall Project:**

This project will develop and collect cost-free, up-to-date, and interactive learning materials and organize them in an adaptive way to engage students in the learning process under different course delivery modalities. Students will be invited to contribute to this project by sharing their course projects. Students will also be hired to help creating course materials. All learning materials will comply with the accessibility standards required by ALG and will be released under a Creative Commons Attribution License.

**Project Impact:**

The impact and feasibility of this project are reflected in the following aspects.

First, students can enjoy completely free yet high-quality learning materials. Releasing the burden of costly textbooks for students, particularly the students from low-income family, will greatly promote the inclusiveness of the teaching-learning environment.

Second, the programs in our department become more affordable to students, which may increase the enrollment in the department. Meanwhile, cheaper programs potentially help students graduate sooner as students may willing to take more affordable courses each semester, which may increase the graduation rate in the department.

Third, the up-to-date, interactive, and adaptive learning materials will make students more engaged and thus improve students’ learning experience. Besides, the learning materials are organized to align with student learning outcomes of our programs. Students will achieve better success rates, which may result in better retention, progression, and graduation rates.

Fourth, the up-to-date learning materials will help students keep up with the pace of the development of AI and machine learning techniques. This will make students more competitive on the job market after graduation.

Fifth, all our learning materials will be made available to the public through OpenALG and the GALILEO Open Learning Materials repository. Therefore, more institutions and more students will benefit from our project in the future.

**Investigators’ capability**:

Team members in this project have rich teaching and research experience in related fields. Our team has initiated the OER learning materials in the Department of Computer Science at Georgia Southern and received the Affordable Materials Grant in Round 13. Having the experience of successfully completing the ALG project, our team is well-prepared for the proposed transformation under the lead of Dr. Weitian Tong. As another potential Affordable Materials Grant in our department, our team is fully committed to the development of no-cost learning materials for the proposed courses.

## 3. Action Plan

Dr. Weitian Tong will serve as the project lead and all team members will work together for the project implementation. The following table shows the responsibilities of each investigator involved in this project.

Table: PIs’ Roles and Responsibilities

|  |  |  |
| --- | --- | --- |
| Primary Investigator  |  Course | Responsibilities |
| Dr. Weitian Tong | CSCI 7130 | Project Lead. Subject Matter Expert and developer; course coordinator; instructor of record |
| Dr. Lixin Li | CSCI 7090 | Subject Matter Expert and developer; course coordinator; instructor of record |
| Dr. Yao Xu | CSCI 7432 | Subject Matter Expert and developer; course coordinator; instructor of record |

As stated in the previous section, there are no ALG-sponsored textbook transformation projects for AI course and Knowledge Process for GIS Data course. For the Algorithm course, there is one related project for the course “CS4306/04 Algorithm Analysis” sponsored by Textbook Transformation Grant in Round 13. This project, however, is designed for undergraduate students.

We plan the following tasks for the transformation of the no-cost learning materials. The whole transformation process will go through four semesters from Spring 2022 to Spring 2023.

**Spring 2022: Preparation (Each PI spends at least 20 hours.)**

* Design anonymous survey questionnaire to collect students’ feedback on their learning experiences and the effectiveness of the learning materials.
* Update current IRB status to achieve the permission to conduct the designed survey.
* Analyze and identify the weakness of the learning materials, such as consistency between the learning modules and the course learning outcomes, inflexible course schedule, outdated examples, and problems, etc.
* Search for cost-free learning materials that are available under open licenses.

**Summer 2022: Implementation (Each PI spends at least 50 hours.)**

* Redesign the learning modules to better align with the course learning outcomes as well as our program outcomes.
* Screen and identify high-quality learning materials for each learning module.
* Design all ancillary course materials, including slides, assignments, quizzes, test banks, hands-on exercises, and course projects.
* Develop study guidelines and/or lecture notes to help students get prepared for classes.
* Reorganize materials and redesign syllabi for adaptive and self-paced learning.
* Hire students to prove-read all designed learning materials and collect their feedback.

**Fall 2022: Delivery (Each PI spends at least 20 hours.)**

* Disseminate the transformed course materials in our learning management system (i.e., Folio).
* Deliver courses using the developed learning materials.
* Double-check the accessibility of all learning materials such that the ALG’s accessibility standards are complied with.
* Collect and analyze the teaching and learning effectiveness of the developed learning materials.

**Spring 2023: Finalization** **(Each PI spends at least 10 hours.)**

* Fine-tune the learning materials according to the evaluation data and students’ feedback collected at the end of Fall 2022.
* Prepare and deliver the final report.
* Apply a Creative Commons Attribution License for the finalized learning materials and share them to the public through OpenALG and the GALILEO Open Learning Materials repository.

## 4. Quantitative and Qualitative Measures

We will adopt both quantitative and qualitative measures to assess the effectiveness of the developed learning materials. We will compare these measures between the course sections using the developed no-cost learning materials versus sections using traditional textbooks.

**Quantitative and qualitative measures:**

* **Student performance measures (Quantitative):** we will use students’ grades of assignments, quizzes, exams, projects, presentations, and labs to measure the overall class performance. In addition, for each mentioned grading item, we will collect the class average, numerical grades distribution, letter grades distribution, and pass rate.
* **Retention (Quantitative):** we will collect the drop rate, fail rate, and withdrawal rate.
* **Survey on cost-free learning materials (Quantitative and Qualitative):** We will conduct anonymous survey questionnaire to collect students’ feedback on the developed learning materials, respectively. Not only qualitative comments and suggestions on the quality, clarity, and usefulness of different learning materials will be collected, but students’ attitude towards the different learning materials will also be measured numerically with a scale of 1-10.
* **Teaching evaluation (Quantitative and Qualitative**): We will utilize the semesterly teaching evaluation to evaluate and compare the teaching effectiveness.

**IRB application:** Our team would renew our IRB status timely if this project got granted.

## 5. Timeline

The major milestones of the proposed project are shown as follows.

|  |  |
| --- | --- |
| Timeline | Milestones |
| Spring 2022 | * Kickoff Meeting
* Complete tasks listed in “Spring 2022 Preparation”
* Provide semester status report
 |
| Summer 2022 | * Complete tasks listed in “Summer 2022 Implementation”
* Provide semester status report
 |
| Fall 2022 | * Complete tasks listed in “Fall 2022 Delivery”
* Provide semester status report
 |
| Spring 2023 | * Complete tasks listed in “Spring 2023 Finalization”
* Analyze the whole project based on the collected data
* Complete and deliver the Final Report
 |

## 6. Budget

The project requests $16,076.5 to compensate the work for involved faculty and students. The budget details and justifications are as follows.

**Personnel: $16,076.5**

* **Faculty**: each faculty in our team will spend at least 100 hours to develop the no-cost learning materials, conduct surveys, collect data, evaluate the project and develop the reports. $5000 is requested for each faculty as summer compensation (including the 29.95% fringe benefits).

3 faculty × $5000 = $15,000

* **Students**: five students will be hired to prove-read all designed learning materials and collect their feedback in Summer 2022. The Fringe benefits rate for students is 7.65%.

5 students × $10 per hour × 20 hours x (1 + 7.65%) = $1,076.5

## 7. Sustainability Plan

As three essential MSCS courses, CSCI 7130 and CSCI 7432 are offered each semester, and CSCI 7090 is offered every Fall. These courses are usually assigned to our team members, and we promise to maintain and update the learning materials as needed. Further improvement will be made based on the feedback from the semesterly teaching evaluation. We plan to summarize the results from this textbook transformation project and share them through presentations at educational conferences (i.e., ACM Southeast Conference) and/or journal publications.

# Creative Commons Terms

I understand that any new materials or revisions created with ALG funding will, by default, be made available to the public under a Creative Commons Attribution License (CC-BY), with exceptions for modifications of pre-existing resources with a more restrictive license.

# Accessibility Terms

I understand that any new materials or revisions created with Affordable Learning Georgia funding must be developed in compliance with the specific accessibility standards defined in the Request for Proposals.

# Letter of Support

*Please provide the name and title of the department chair (or other administrator) who provided you with the Letter of Support.*

|  |
| --- |
| Dr. David Williams, Acting Chair, Department of Computer Science, Georgia Southern University |

# Grants or Business Office Acknowledgment Form

*Please provide the name and title of the grants or business office representative who provided you with the acknowledgement form.*

|  |
| --- |
| Tina Leggett, Assistant Director, Office of Research Services, Georgia Southern University |