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## Proposal to the Senate Educational Policy Committee

**PROPOSAL TITLE:** Proposal to Establish the Bachelor of Science in Computer Science and Advertising within the College of Media.

**SPONSORS:**

Jacqueline C. Hitchon, Head, Charles H. Sandage Department of Advertising  
[hitchon@illinois.edu](mailto:hitchon@illinois.edu), and Leonard Pitt, Associate Head, Department of Computer Science  
[pitt@illinois.edu](mailto:pitt@illinois.edu).

**COLLEGE CONTACT:**

Tracy Sulkin, Interim Executive Associate Dean, College of Media  
333-2350, [tsulkin@illinois.edu](mailto:tsulkin@illinois.edu)

**BRIEF DESCRIPTION:**

The major in Computer Science and Advertising is a flexible program for undergraduate students who plan to pursue careers in the advertising field that have a technology focus. Cloud computing, the availability and ubiquity of data, and the rapid and pervasive adoption of mobile technology have created a paradigm shift in the advertising industry. Projected areas of growth in advertising and communications will be located in Search Engine Optimization, web analytics, Computational Advertising, and other areas of emerging technology/media<sup>1</sup>. The degree will prepare students for advanced study at the graduate level, as well as immediate entry into the workforce at advertising agencies, businesses with in-house advertising and marketing divisions, and technology companies.

**JUSTIFICATION:**

We live in an era of ‘big data’ – where 2.5 quintillion bytes of data are created daily. Billions of individual ads, search queries, page impressions, photo uploads and purchases are analyzed by Google, Facebook, and Amazon to identify, understand, and predict social relationships and patterns. Insights from these data are used to create customized messages for consumers related to movies, health, finance, politics, and myriad other categories.

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<sup>1</sup> Rossheim, John. "2012 Marketing Jobs Outlook." Monster.com. Monster.com, n.d. Web. 09 Oct. 2012. <<http://career-advice.monster.com/job-search/company-industry-research/marketing-jobs-outlook-2012/article.aspx>>.

For example, **computational advertising**, which seeks to find the best match between an individual user in a given media context and a relevant advertisement, is the future of advertising and the web (Essex – CACM 2009). Using data mining, machine learning, computational techniques, microeconomics, and psychology, computational advertising can help media producers, media sellers, and businesses focus on using data and information for crafting new models of content delivery that can actually benefit the consumer. This new paradigm requires both the mechanics and science of data manipulation (**Computer Science**) as well as the art, sociology and psychology of understanding messages and people (**Advertising**). This is one example of an area of the industry wherein a CS+ADV degree would serve well. Others include data analytics, mobile advertising, application design and development, etc. A joint CS+Advertising degree will **enhance the reputation of Illinois** by being the first institution to introduce a cross-disciplinary curriculum in these two fields. To date, a few of our peer institutions in Advertising (e.g., Michigan State, UT-Austin) recommend a specialization or certificate in information technology or computing, but these courses are not tailored to the Advertising audience nor are there any cross-disciplinary offerings. In Computer Science, Georgia Tech offers a B.S. in Computational Media with courses in film and games but none related to advertising or consumer analytics. Stanford University offers a course entitled Computational Advertising through the Department of Management Science & Engineering. Yet, despite the obvious synergies between CS and ADV, no advertising department or computer science department offers an explicit cross-discipline curriculum. Illinois is the perfect place to do so.

The CS+ADV students will be a different population of students from current Advertising students. While there may be a minority of current Advertising students who would pursue a CS+ADV degree, the majority would choose to remain in the Advertising major. Advertising students can choose careers in strategy, social science research, and creativity, none of which arenas mandates a CS+ADV degree. The new degree program is intended to appeal to a new population of students who wish to apply their strong CS skills to the advertising industry, where there is a recent and growing, acute need for data managers. For the university, the new degree offers growth potential with respect to its undergraduate body.

Finally, the new major will advance the goals of both departments:

- The Advertising Department aims to become a resource and leader in advertising of the future. Advertising models and audience consumption of media are shifting rapidly into digital spaces. The most sought-after graduates must not only understand, analyze and shape media content (advertising), but also be able to create new software, analyze complex data, and develop algorithms that make use of such data in innovative ways to create novel relationships between consumers and companies (computer science).
- The CS Department is committed to spreading the understanding and application of computational methods widely outside of the engineering universe. This new major is modeled on, and will nicely complement, the recently approved “CS+X” degree, which pairs foundational study of computer science with application disciplines from LAS. Advertising is a natural direction for CS, because of the applicability of data mining algorithms, the relevance of social media, and the relationships with numerous areas such as algorithmic game theory, security, and privacy, to name a few.

#### **BUDGETARY AND STAFF IMPLICATIONS:**

1) Resources

a. *How does the unit intend to financially support this proposal?*

1. Any additional needs will be financed through tuition differential that Engineering students incur. Students in the CS+ADV major will follow the current arrangement for CS+X: students will be coded under ENG for tuition assessment. MEDIA and ENG have agreed to evenly split both the tuition differential and the majors fee that is reimbursed on a per-major basis for CS+ADV students. For example, 2017-18 resident base tuition is just over \$12K. The Advertising rate is about \$12.8K, and the Engineering rate is just over \$17K. The departments would split the difference between the Engineering rate and the base rate – about \$5K in total.

b. *How will the unit create capacity or surplus to appropriately resource this program? If applicable, what functions or programs will the unit no longer support to create capacity?*

Both ADV and CS will use funds from the differential tuition and majors fee to accommodate any increase in advising or teaching loads. However, since students will be taking a core sequence of courses in CS that are already being taught, together with a core sequence of courses in ADV that are already being taught, existing faculty in both departments are effectively staffing the new degree. In other words, CS+ADV students will join CS students and ADV students in many classes. The two additional/new courses are Computational Advertising and the project course. The project course has been taught several times and has received positive feedback from students and instructors. The Computational Advertising course will be taught by Prof. Sundaram, the recent CS/ADV Strategic Excellence joint hire in Computational Advertising. Computer Science faculty member Ruta Mehta can also teach this course. Recent and anticipated hires in Advertising will also be able to contribute to the educational experience of CS+ADV students. For example, Associate Professor Mike Yao is already offering a course to both CS and ADV students: Advertising Content and Technologies. New hire this semester, Assistant Professor Harsh Taneja, can offer courses on Social Media Analytics and Network Theory. Also, a search is underway for a new assistant professor dedicated to social media analytics.

c. *Will the unit need to seek campus or other external resources? If so, please provide a summary of the sources and an indication of the approved support.*

No.

d. *Please provide a letter of acknowledgment from the college that outlines the financial arrangements for the proposed program.*

Attached.

## 2) Resource Implications

- a. *Please address the impact on faculty resources including the changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc.*

We anticipate 20-25 majors per year. The CS and ADV courses required for majors have capacity or can be expanded through the use of differential tuition. The College of Engineering does not believe that there would be a challenge to CS advising for this increase. If demand far exceeds 25 students, we plan to re-evaluate the admission and advising process. If this is the case, there will be more tuition revenue to support additional course sections and advising loads.

Some students currently in CS in the College of Engineering might choose to transfer into the proposed major, shifting half of the Engineering differential tuition, and shifting the majors fee from Engineering to the College of Media. However, many of these would likely be students who would otherwise leave CS and Engineering, so this may be a net gain for Engineering, instead of a net loss. Regardless, CS applications in Engineering have grown dramatically in recent years, with no end to this trend in sight, and hence there is no shortage of CS students. In addition, with the CS+X program growing, there is an additional stream of students and revenue flowing to the Engineering College.

CS, with input and advice from ADV, will assume initial responsibility for advising. As students complete their foundational CS coursework they would also consult with advisers in the College of Media Student Services Center (for ADV) in selection of their advertising core courses. This additional advising will not be a burden to the College of Media advising staff, nor will they need additional training. The students in this major will be enrolling in the same core curriculum as other advertising majors, with the exception of the computational advertising and project courses (see appendix).

Applications will be submitted to the Department of Computer Science. A committee of faculty/representatives from Computer Science and Advertising will determine whether students are admitted to the program. Students will be evaluated on the criteria for admission to the Department of Computer Science. Transfer applications will be handled in the same way, two times per academic year. We recommend that students with fewer than two years remaining towards their degree not be allowed to transfer into the major, unless they are currently Advertising or Computer Science majors.

- b. *Please address the impact on course enrollment in other units and provide an explanation of discussions with representatives of those units. (A letter of acknowledgement from units impacted should be included.)*

All required lower-level and general education courses are already required of CS and/or Advertising students, so no net effect on enrollments in other units is expected.

c. *Please address the impact on the University Library*

As both CS and Advertising degrees already exist as do all of the courses, there should be no additional resources needed for the library. A letter from the University Librarian is attached.

d. *Please address the impact on technology and space (e.g. computer use, laboratory use, equipment, etc.)*

Existing facilities are adequate now and will be improved as needed through the use of the differential tuition paid by students in the program and split evenly between both colleges.

For new degree programs only:

3) Briefly describe how this program will support the University's mission, focus, and/or current priorities. Include specific objectives and measurable outcomes that demonstrate the program's consistency with and centrality to that mission.

- *The university's mission:* "The University of Illinois at Urbana-Champaign is charged by our state to enhance the lives of citizens in Illinois, across the nation and around the world through our leadership in learning, discovery, engagement and economic development."
  - This new program provides an opportunity for the University of Illinois to become a leader in the quickly growing area of computational advertising, by offering one of the first integrated undergraduate programs that embraces this field.
- *The university's strategic plan, goal 2 (provide transformative learning experiences), initiative (a), says:* "... Support transformative learning by offering programs and initiatives that aspire to provide integrative co-curricular activities and student support services committed to helping students fulfill their academic promise."
  - This degree program, sponsored by two departments and colleges, is directly aligned with these initiatives. The field of computational advertising is inherently interdisciplinary, and offers learning experiences that span across the humanities (creative expression), the social sciences (economics, psychology, sociology), and mathematics and computer and information technologies (machine learning, data analytics).
- *The university's strategic plan, goal 3 (make a significant and visible societal impact), initiative (a), says:* "Develop our students to be future leaders with strong communication skills and who are engaged in their communities."
  - Students graduating from a joint program run by two top ranked departments in their respective fields will be well-situated to take leadership positions in the advertising industry.

We will measure the success of the program by the number of graduating students (we shall start slowly, but will expect 20-25 graduates per year once the program ramps up), and by their successful placement in industry and in graduate schools.

- 4) *Please provide an analysis of the market demand for this degree program. What market indicators are driving this proposal? What type of employment outlook should these graduates expect? What resources will be provided to assist students with job placement?*

Online advertising is one of the fastest growing businesses on the Internet today. Internet advertising revenues in the US totaled \$16.9 billion in the second quarter of 2016, an increase of 18.1% from the 2015 second-quarter total of \$14.3 billion. If we look at revenues for the first six months of 2016, the \$32.7 billion total exceeds the corresponding total of \$27.5 billion in 2015 by an impressive 19.1%. This growth is broadly attributed to the role of digital screens, especially mobile screens, in offering immersive experiences and real-time engagement to consumers.

Computational advertising has emerged as a new interdisciplinary field in response to the growth in online advertising. Simply stated, it is evolving to address how unprecedented amounts of data on consumers can best be used to insure that the right person is reached at the right time at the right price. Forging collaborations between computer scientists, statisticians and advertisers, computational advertising scholars demonstrate that targeting a consumer via internet behavior can improve advertising campaign performance by as much as 750%. Internet performance behaviors include Click Through Rate (CTR), Cost Per Click (CPC), and Return On Investment (ROI).

The largest pre-conference session ever (in attendance) at the American Academy of Advertising (AAA) annual convention took place at the 2014 “Big Data” conference. Further, 2017 will see a pre-conference session dedicated to “Computational Advertising.” Academic leaders for such sessions are primarily based at the University of Illinois, Northwestern and Michigan State, demonstrating our leadership position as the new field continues to evolve.

One of our responsibilities as a leader in computational advertising is to insure that Illinois graduates are able to fill the jobs afforded by the need to collect, analyze and interpret Big Data. The Bureau of Labor Statistics projects that computing jobs will comprise over 60% of all STEM jobs through 2020. And, the number of computing jobs available annually through that time will outpace the number of students graduating with a four-year degree by almost a factor of three. Students with strong computational skills whose knowledge sits at the intersection of Computing and Advertising should thus have no trouble finding jobs not only at many of the major players in the field whose revenue is driven by advertising (Google, Yahoo, Twitter, Facebook....) and who regularly recruit at CS career fairs, but also in just about any sector of the economy as businesses seek to maximize the impact of their digital presence and develop strategies for advertising in a digital world.

- 5) *If this is a proposed graduate program, please discuss the programs intended use of waivers. If the program is dependent on waivers, how will the unit compensate for lost tuition revenue?*

N/A

**DESIRED EFFECTIVE DATE:**

Fall, 2018

## STATEMENT FOR PROGRAMS OF STUDY CATALOG:

### Computer Science

<http://www.cs.illinois.edu>

Department Head: Vikram Adve

Department Office: 2232 Siebel Center, 201 N. Goodwin Avenue, Urbana, (217) 333-3373

### Advertising

<http://www.media.illinois.edu/advertising>

Department Head: Jacqueline Hitchon,

119 Gregory Hall, 810 South Wright, Urbana, (217) 333-1602

## Curriculum in Computer Science and Advertising

[www.cs.illinois.edu](http://www.cs.illinois.edu) or [www.media.illinois.edu/advertising](http://www.media.illinois.edu/advertising)

This major is sponsored jointly by the Departments of Computer Science and Advertising. The major in Computer Science and Advertising is a flexible program for undergraduate students who plan to pursue careers in the advertising field that have a technology focus. Cloud computing, the availability and ubiquity of data, and the rapid and pervasive adoption of mobile technology have created a paradigm shift in the advertising industry. Projected areas of growth in advertising and communications will be located in Search Engine Optimization, web analytics, Computational Advertising, and other areas of emerging technology/media<sup>1</sup>. The degree will prepare students for advanced study at the graduate level, as well as immediate entry into the workforce at advertising agencies, businesses with in-house advertising and marketing divisions, and technology companies.

E-mail: [academic@cs.illinois.edu](mailto:academic@cs.illinois.edu) or [media-ssc@illinois.edu](mailto:media-ssc@illinois.edu).

### **Degree title: Bachelor of Science in Computer Science and Advertising**

Minimum required major and supporting course work normally equates to 68 hours, plus 12 additional hours of College of Media requirements. All Campus General Education and foreign language requirements must be met. The minimum hours required for graduation is 124. At least twelve hours of 300- and 400-level coursework must be taken on this campus

A Major Plan of Study Form must be completed and submitted to the Department of Computer Science office of undergraduate affairs by the beginning of the fifth semester (60-75 hours). Please see the computer science advisor in 1210 Siebel Center, as well as the advertising advisor in the College of Media Student Services Center.

Departmental distinction: TBD; Minimum GPA suggested.

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<sup>1</sup> Rossheim, John. "2012 Marketing Jobs Outlook." Monster.com. Monster.com, n.d. Web. 09 Oct. 2012. <<http://career-advice.monster.com/job-search/company-industry-research/marketing-jobs-outlook-2012/article.aspx>>.

To graduate from the Computer Science and Advertising curriculum, a student must complete the following courses, all of which must be taken for a traditional letter grade.

| <b>HOURS</b>       | <b>REQUIREMENTS</b>  |
|--------------------|--|
| <b>24 hours</b>    | <p><b>Computer Science Core</b></p> <p>CS 125, Introduction to Computer Science (4 hours)</p> <p>CS 126, Programming Studio (3 hours)</p> <p>CS 173, Discrete Structures (3 hours)</p> <p>CS 225, Data Structures (4 hours)</p> <p>CS 240, Introduction to Systems (3 hours) [<i>new course</i>]</p> <p>CS 374, Theory and Algorithms I (4 hours)</p> <p>CS 421, Programming Languages and Compilers (3 hours)</p>   |
| <b>6 hours</b>     | <p><b>Computer Science Technical Electives</b></p> <p>Two courses selected from an approved list of technical electives</p>  |
| <b>12-13 hours</b> | <p><b>Mathematical Foundations</b> (also fulfills the quantitative reasoning I and II requirements)</p> <p>MATH 220 or 221, Calculus I (4-5 hours)</p> <p>MATH 231, Calculus II (3 hours)</p> <p>MATH 225, Introductory Matrix Theory (2 hours)</p> <p>CS 361, Probability and Statistics for Computer Science (3 hours)</p>   |
| <b>12-13 hours</b> | <p><b>College of Media Foundations</b></p> <p>PSYC 100 or SOC 100 or ANTH 103 (3-4 hours)</p> <p>ECON 102 and either ECON 302 or ECON 103 (6 hours total)</p> <p>BADM 320 (3 hours)</p> <p><i>Note: The STAT 100 requirement of the College of Media is covered by CS 361, Probability and Statistics for Computer Science, listed above.</i></p>  |
| <b>27 hours</b>    | <p><b>Advertising Core</b></p> <p>ADV 150, Introduction to Advertising (3 hours)</p> <p>ADV 281, Research Methods (3 hours)</p> <p>ADV 283, Advertising and Brand Strategy (3 hours)</p> <p>ADV 284, Consumer Insights (3 hours)</p> <p>ADV 390, Content Creation (3 hours)</p> <p>ADV 460, Innovative Communication (3 hours)</p> <p>ADV 483, Audience Analysis: Contact &amp; Connections (3 hours)</p> <p>CS/ADV 4XX, Computational Advertising (3 hours) [<i>New course in</i></p> |



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*design]*

*CS/ADV team/projects course (3 hours): ADV 492 Advertising Content & Technologies [substitutes for ADV 498 The Sandage Project for students in the CS+ADV major.]*

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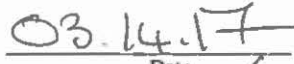
**81-83 Hours Total = 69-70 for Major, and 12-13 for College requirements. 124 total hours to graduate**

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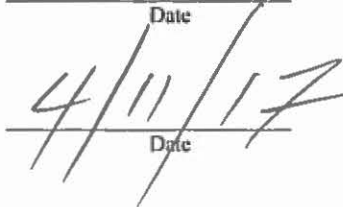
**CLEARANCES:** (Clearances should include signatures and dates of approval. These signatures must appear on a separate sheet. If multiple departments or colleges are sponsoring the proposal, please add the appropriate signature lines below.)

Signatures:

  
Unit Representative: Jacqueline Hitchon (ADV)

  
Date

  
College Representative: Wojtek Chodzko-Zajko (Media)

  
Date

N/A  
Graduate College Representative:

\_\_\_\_\_  
Date

N/A  
Council on Teacher Education Representative:

\_\_\_\_\_  
Date

UNIVERSITY OF ILLINOIS  
AT URBANA-CHAMPAIGN

RECEIVED

APR 18 2017

OFFICE OF THE PROVOST

Department of Computer Science  
201 North Goodwin Avenue  
Urbana, IL 61801-2302 USA



February 19, 2017

Dr. Jacqueline C. Hitchon  
Professor and Department Head  
Charles H. Sandage Department of Advertising

Dear Professor Hitchon,

I am pleased to let you know that the Computer Science faculty enthusiastically approved the CS + Advertising proposal that we have been jointly working on during the last couple years, and is in full support of the new program. Based on the many overlaps outlined in the proposal we think that this is a very natural fit and an excellent opportunity for both departments, as well as for future students whose interests align with the program.

We have evaluated our current course offerings and how they might be affected by the influx of the anticipated CS+ADV majors, and do not anticipate any problems in ensuring that they will have access. Moreover, the impact on course enrollments should be minimal, as these new majors will represent only a very small fraction relative to the current size of those courses. Finally, the CS department is in a growth phase, having added nine faculty (tenure track plus instructional) last year, and plan to hire another eight this year. The addition of these faculty should allow us to grow our course offerings where most needed.

Finally, we understand that the tuition differential and the majors fee that is associated with these students will be split equally between the College of Media and the College of Engineering, and this would fund additional resources should they be necessary.

Sincerely,

A handwritten signature in cursive script that reads "Leonard Pitt".

Leonard Pitt  
Professor and Associate Head  
Director of Undergraduate Programs  
Department of Computer Science  
University of Illinois. Urbana, IL 61801  
Ph: 217-333-7505. Email [pitt@illinois.edu](mailto:pitt@illinois.edu)

UNIVERSITY OF ILLINOIS  
AT URBANA-CHAMPAIGN

EP.18.01

Office of the Provost and Vice Chancellor for Academic  
Affairs

Swanlund Administration Building  
601 East John Street  
Champaign, IL 61820



August 11, 2017

Gay Miller, Chair  
Senate Committee on Educational Policy  
Office of the Senate  
228 English Building, MC-461

Dear Professor Miller:

Enclosed is a copy of a proposal from the College of Media to establish the Bachelor of Science in Computer Science and Advertising.

Sincerely,

A handwritten signature in black ink, appearing to read 'Kathryn A. Martensen'.

Kathryn A. Martensen  
Assistant Provost

Enclosures

c: W. Bernhard  
T. Sulkin  
J. Hitchon  
V. Adve  
L. Pitt