

College of Arts & Sciences Faculty Meeting

Tuesday, April 20, 2021

3:30 p.m. – 5:00 p.m.

Via Zoom

Register in advance:

<https://unl.zoom.us/meeting/register/tJckce6vqj8sGdM2w8bletF8e47zqepMTDb5>

**AGENDA**

1. Dean's Welcome
2. Approval of Minutes from the Fall Faculty Meeting held on December 10, 2020. (See Appendix, pages 2-5.)
3. Updates from the Dean
  - a. Strategic Plan
  - b. Experiential Learning
  - c. Research Update
  - d. Budget and IBB timeline
4. Opportunity for faculty to ask questions arising from annual reports of the various college committees. (See appendix, pages 6-12.)
  - a. Executive Committee (pages 6-7)
  - b. Promotion and Tenure Committee (page 7)
  - c. Curriculum and Advising Committee (pages 7-9)
  - d. Committee on Student Academic Distinction, Awards, and Appeals (pages 9-10)
  - e. Assessment Committee (page 10)
  - f. Research Advisory Committee (pages 10-11)
  - g. Endowed/College Professorships Committee (page 11)
  - h. Research Space Committee (page 11)
  - i. Inclusion, Diversity, Equity, and Access (IDEA) Committee (page 11)
  - j. Academic Freedom and Freedom of Speech Committee (page 12)
5. Recommendation from the Academic Freedom Committee to endorse the proposed college statement on *Academic Freedom in Teaching and Learning*. (See Appendix, pages 13-15.)
6. Recommendation from the College Curriculum and Advising Committee to approve. (See Appendix, pages 16-36.)
  - a. New Mathematical Data Science Major (pages 16-36)
  - b. CAS Experiential Learning (new college CDR; no additional credit hours) (page 37-38)
7. Questions and Feedback

## APPENDIX

### 2. Approval of Minutes from the Fall Faculty Meeting held on December 10, 2020. Fall 2020 CAS Faculty Meeting Minutes (10 Dec 2020)

3:30 pm: The meeting was called to order by Dean Mark Button

#### 1. College Updates and information items

##### a. Updates from the Dean

Everyone was thanked for completing the fall semester under these extraordinarily challenging conditions due to the COVID-19 pandemic. The staff and faculty took unprecedented steps this summer and fall to help keep our community safe and healthy.

The College has continued to advance its critical mission in liberal arts education. There are nearly 5000 majors and 900 graduate students. There was a 4.4% increase in first-time freshman enroll in the College this fall (800 students) and the most diverse first-time undergraduate cohort: 27.8% identify as URM; 23.8% First Generation; 32% increase in new transfer students.

The number of sponsored research proposals from the college is higher at this point in the year than over the previous four years (with a total of 222 proposals). Total research expenditures have also remained stable in comparison to the same time last year.

This Fall, the College implemented its new distribution requirement -Human Diversity in U.S. communities. It also launched the CAS Cares Fund to support college degree completion for students most at risk of leaving college with no degree. With generous support from donors and friends of the college – including many faculty and staff – it was able to quickly raise \$100k and has already provided financial support to 30 students – both undergraduate and graduate. The NU Foundation has been a great champion of this initiative.

#### *Update 1 – Budget Reductions*

Phase 1 reductions were administrative and have already been implemented -- in the college this amounted to \$512,000.

Phase 2 underwent review by the Academic Planning Committee and this week were approved by the Chancellor for nearly \$5.4M. The College initiated its response to Chancellor Green's request for FY2021 budget reduction by meeting with all Chairs and Directors on May 7. Then, all units submitted budget reduction contingency plans and the Dean's Office drafted a College-wide budget reduction plan. This plan was discussed with the College's Budget Advisory Committee on May 22. This committee has broad faculty and staff representation from the college. A second meeting of the College's Budget Advisory Committee was held on May 27 prior to the College's budget reduction plan submission at the end of May. The college will continue to meet with Budget Advisory Committee for advice on the implementation of budget reductions and planning for the future. For details, see the Chancellor's Budget Web Page <https://www.unl.edu/chancellor/phase-two-proposed-budget-reductions-2021-2023>.

Assistant Dean Alicia Kimbrough provided a budget cut overview. The state-aided budget includes categories for Faculty Salary, Admin Salary, Staff Salary, Travel, Operating.

#### *Update 2 – CAS Strategic Plan.*

The College was in the midst of developing a five-year strategic plan in response to N2025 when the pandemic caused it to stall. Over 320 people have now participated in the important process of drafting the plan. The current draft of the plan is available online at: [https://cas.unl.edu/strategicplan/CAS\\_Strategic\\_Plan\\_12.3.2020\\_a.pdf](https://cas.unl.edu/strategicplan/CAS_Strategic_Plan_12.3.2020_a.pdf).

The next step is to set key priorities and goals for each year of this plan. The College can and will be a leader for advancing diversity, equity and inclusion on our campus. It is critical to complete our plan so that it drives the College's allocation of scarce resources, especially in the context of the new incentive-based budget model at UNL. All units will submit feedback to the Dean's Office by February 12th, and the College anticipates sharing this plan at our spring faculty meeting in April.

*Update 3 – New Guidelines for Lecturers.*

The College continues to develop new guidelines for lecturers. The major issues are responsibilities, compensation, and contract length. With the support and collaboration of EVC Spiller, the College is also working to address the salaries of lecturers in the college. This is a sizable issue since the College has nearly 50 lecturers with .50 FTE or greater. Many of them have over 10 years of dedicated service to UNL. In addition, their teaching contributions represented 23% of all SCH within the college last academic year.

The new guidelines (included with the agenda for this meeting) were based upon the final report of the CAS Ad Hoc Committee on Lecturers that was chaired by Debbie Minter and David Woodman. The process involved multiple consultations with Chairs and Directors, the college's Executive Meeting, and an open meeting held early this fall with college lecturers.

These guidelines clarify our teaching standards and expectations for excellence in the classroom; encourage longer contracts of 2-3 years (based on teaching need and budget); clarify teaching load across the college; and ensure annual performance evaluations with connections to mentoring and professional development opportunities.

*Update 4 – Upcoming Spring Semester*

*Mandatory covid testing.* The university will operate a mandatory saliva testing program in the spring 2021 semester. All UNL students living within Lincoln and Lancaster County must participate in the program. Faculty and staff who regularly come to campus are also required to test prior to Jan. 25 and every other week thereafter. Those faculty and staff who come to campus infrequently are required to test within two weeks ahead of coming to campus, ideally within two to three days of visits. Testing locations are scheduled to open Jan. 19. Please consult the FAQ page that has been created: <https://covid19.unl.edu/spring-testing>

*Named spaces and programs.* As a follow-up to last year's N150 Celebration, Chancellor Green asked a small team of faculty and staff to create a master-list of individuals who have been honored or memorialized by the naming of physical structures or major academic programs on our campus. This includes the names of current buildings, internal spaces (e.g., conference rooms, galleries, laboratories, lounges or activity areas), external spaces (e.g., gardens, courtyards, playgrounds, fields), artifacts (e.g., statues, fountains, displays), and major academic and scholarly programs. The College is working with chairs and directors to develop the list.

*Option to extend tenure clock has been extended.* The Tenure-clock extension request process has been revised again in response to the coronavirus pandemic. Any tenure-track faculty member who was employed by University for any portion of the period January 1, 2020 through June 30, 2021 (and has not been given notice of non-reappointment) is eligible to request a one-year extension of their tenure clock. This option continues to apply equally to all faculty members who may have received previous extensions for other reasons.

*College Executive Committee nominations.* Please nominate faculty for the College Executive Committee. It is an important deliberative and consultative body.

2. Procedural business

- a. The Secretary: Mark Griep was elected as Faculty Secretary during our fall faculty meeting last year. This is a two-year term and Mark is able to continue in this role.
- b. Minutes from the Spring Faculty Meeting (April 16, 2020). There were no proposed changes to the minutes. The vote was unanimously in favor.
- c. Appointment of Parliamentarian. During the first meeting of the academic year, the Dean must appoint a Parliamentarian. Dr. Robert Gorman has been so appointed.

3. Recommendation from the Dean and the College Executive Committee to approve the proposed changes to the Bylaws of the Faculty, Article II, Section 1. Members of the Faculty – to include Lecturers in the definition of Faculty and better align the College's Bylaws and faculty governance practices with University policies (see UNL Bylaws 3.1.3.1).

Button: The College Exec Comm made this recommendation. It was moved and seconded to approve this motion. The inclusion of lecturers with greater than 50% FTE as faculty aligns the College with Faculty

Senate guidelines with regard to curricular governance.

Debbie Minter (Engl): Faculty Senate recognizes lecturers at greater than 50% FTE as faculty. An open question is the issue of requiring them to serve on committees in the absence of compensation given their workload.

Question on Chat: The lecturer guidelines use the term “student course evaluations.” I can’t remember what the new terminology is for the new university-wide instrument is but it seems that the document should use the current terminology.

Button: The College can certainly make that change.

Question on Chat: Why should teaching for lecturers count .125 per 3 cr hour course, when our regular faculty only get .100 per course? For them 4 classes/semester is 100% when 2 classes/semester only counts as 40% for faculty.

Button: The college is currently looking at the standardization of apportionments across the college. A complexity is that lecturers are used differently across the college.

Michael Herman (Bios): The guidelines for lecturers states they can vote on curricular matters within the college. What is the guidance for departments for including lecturers in departmental meetings where votes are taken.

Button: The college will continue to work on aligning its bylaws with those of departments and to clarify the process for electing college committees; we encourage all departments to include lecturers in department meetings and to include lecturers in decisions and voting related to curriculum.

Nora Peterson (ModLang): This motion acknowledges the important contributions of lecturers.

Amanda Metcalf (CAS Staff): There are no more questions on Chat.

Button: Launch the poll to vote.

62 yes, 0 no, 7 abstain

#### 4. Recommendation from the College Curriculum and Advising Committee to approve for the 2021-2022 Undergraduate Catalog. See Appendix, pages 12-89.

Scott Stoltenberg (Psych): The CCAC has five elected faculty members, the Advising Center Director, and two undergraduates. The recommended changes were summarized from the agenda.

Kristen Hoerl (CommStudies): Noticed that many of the Communication Studies courses were cut from the Film Studies curriculum but didn’t know this change was being considered.

James Brunton (Film): The retained Communication Studies courses had explicit links to the curriculum. The others were deemed to have less direct connections.

Marco Abel (Film): The requirements for a Film Studies major was changed to focus on film studies methodologies. Film Studies offered to meet with CommStudies to discuss which other courses meet the Film Studies curricular goals.

Kelly Stage (English): The Renaissance Studies program will remain at 18 credits, but the minor will be restructured. The agenda incorrectly says it will be reduced to 15 credits.

Assoc Dean June Griffin: A number of the proposed changes were driven by insufficient numbers of students graduating. A number of other programs are restructuring. The math major changes allow students to earn either a BA or BS in all their programs.

Stoltenberg: Programs are also making adjustments to their options.

Abel: Jody Kellas via Chat proposed to retain “Comm and Pop Culture” from Film Studies rather to delete now and add it back later.

Brunton: Agrees to the amendment

Robert Gorman (Parliamentarian): The College should see the written amendment.

Jody Kellas (CommStudies): Asked to create an amendment to keep Comm 280 “Comm and pop culture” and Comm 452 “Media and culture” on the list rather than deleting and re-add later.

Button: Marco would you like to make the motion?

Abel: The motion is to not delete Comm 280 “Comm and pop culture” or Comm 452 “Media and culture” from the Film Studies program changes

Gorman (Parliamentarian): The motion should be to add something.

Abel: Motion is to retain COMM 280 and COMM 452 back into the existing proposal for the revised Film Studies major

Griffin: Just a clarification that these courses are part of the options. Seconded the motion.

Button: Should The College proceed with a single amended vote?

Gorman (Parliamentarian): Everyone appears to understand the motion

Button: Launch the poll to vote.

64 yes, 0 no, 2 abstain

5. Recommendation from the College Curriculum and Advising Committee to approve required changes to majors and minors housed in the Department of Computer Science and Engineering as part of their transition to the College of Engineering as their sole college. See Appendix, pages 90-124.

Stoltenberg: The recommended changes were summarized from the agenda.

Button: These recommendations are the final changes as the CSE moves fully to the College of Engineering.

It refers back to a 2019 Memorandum of Understanding to create a School of Computation. It was important to allow students to pursue their current degree paths until they graduate. There is an agreement for CAS to recoup losses from some recent investments in CSE. CAS departments will continue to build computational and data science capacity and faculty members from CSE and CAS will continue to engage in research and programmatic collaborations.

Griffin: The minors are not being eliminated but are being moved.

Ken Bloom (Physics): Asked whether it was a problem to vote to move these programs to a program that doesn't exist.

Button: The timing for the proposed School has been delayed, but the move to COE is required.

Griffin: The School of Computing is being approved and budgeted but has not yet been finalized.

Minter: Although CAS is going to grandfather current majors, the college is not in a position to provide oversight to those majors in the absence of CSE faculty.

Griffin: All courses are being moved to College of Engineering

Bloom: Asked whether we could make this motion contingent upon creation of the School.

Button: The creation of the School is in the final stages.

Clint Rowe (EarthAtmos): Should we just vote to move it to College of Engineering instead of worrying about the School of Computing?

Button: According to the motion, we are voting on the move to the College of Engineering.

Bloom: Some of the motions and appendices mention the School.

Button: It was moved and seconded to add: Pending approval of the School of Computing.

Button: Launch the poll to vote.

50 yes, 1 no, 8 abstain

6. Questions and Feedback

Button: The floor is open for any questions or feedback.

Discussion

Griffin: Acknowledged everyone's hard work under the trying circumstances of the last semester.

4:55 pm: The meeting was adjourned

Submitted by Mark Griep, CAS Faculty Meeting Secretary

#### 4. Opportunity for faculty to ask questions arising from annual reports of the various college committees.

##### a. Executive Committee

The college Executive Committee is chaired by Dean Button and consists of the Associate Deans and 8 faculty members, five elected and three appointed. The committee members for 2020-21 were:

##### **Member name, department, appointment date and term end year**

- Stephen Burnett, Classics and Religious Studies (Humanities) appointed; 2021
- Adam Houston, Earth and Atmospheric Sciences (Science) appointed; 2021
- Casey Kelly, Communication Studies (Social Sciences) appointed; 2021
- Lisa Crockett, Psychology (Social Sciences) elected; 2022
- Ken Bloom, Physics and Astronomy (Sciences) elected; 2022
- Katrina Jagodinsky, History (Humanities) elected; 2022
- Sabrina Russo, School of Biological Sciences (Sciences) elected; 2021
- Lory Dance, Sociology (Social Sciences) elected; 2021
- Associate Dean June Griffin
- Associate Dean Pat Dussault
- Associate Dean Will Thomas

The Executive Committee serves in an advisory role to the dean regarding significant policy initiatives and general welfare of the college.

This year the committee provided significant feedback to the college Strategic Plan draft.

The committee also worked on the Student Learning Experience survey as part of the faculty evaluation process (merit, reappointment, promotion and tenure).

The committee provided feedback to the Dean's Office on budget reduction plans.

The committee had continued discussions on the proposed Lecturer guidelines.

The committee began reviewing the College Handbook to advise the college on needed updates.

The committee reviewed and provided feedback for updates to the college mission statement located within the College Handbook.

The committee discussed college award names, the process of determining recipients and how that relates to other college committees. A suggestion was made to create an awards subcommittee made up of members from all college committees.

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An ad hoc committee (Profs. Crockett, Houston, and Jagodinsky) considered nominations for College and University teaching awards, the CAS Outstanding Research and Creativity Awards (College ORCA), the CAS Engagement Awards, the CAS Mentoring Awards. The awardees will be honored at various events including an event during the Fall 2021 semester.

College Distinguished Teaching Award winners are:

Katherine Castle, Communication Studies

Lynne Elkins, Earth & Atmospheric Sciences

Anna Hiatt, School of Biological Sciences

Emily Kazyak, Sociology/Women's and Gender Studies

Matthew Van Den Broeke, Earth and Atmospheric Sciences

Nathan Wakefield, Mathematics

The Hazel R. McClymont Distinguished Teaching Fellow Award recipient is David Woodman, School of Biological Sciences.

The Committee selected one nominee for the Annis Chaikin Sorensen Award to forward to the Office of the Executive Vice Chancellor. Amelia Montes (English and Ethnic Studies) was recently announced as the Sorensen awardee for 2021.

The College Outstanding Research and Creative Activity Awardees are:

Roland Végső, English  
Eileen Hebets, School of Biological Sciences  
Maital Neta, Psychology

One nomination for the Harold and Esther Edgerton Junior Faculty Award was forwarded to the Office of the Executive Vice Chancellor. Marc Garcia (Sociology; Institute for Ethnic Studies) was recently announced as the recipient of the Edgerton award.

The awardees for the CAS Engagement Awards are:

Clinical Psychology Training Program (group)  
Abla Hasan, Modern Languages and Literatures (individual)

The awardees for the CAS Mentoring Awards are:

Marianna Burks, School of Biological Sciences (staff)  
Courtney Hillebrecht, Political Science (individual)

b. Promotion and Tenure Committee

The annual review of tenure and promotion recommendations began in early November. The committee reviewed 12 recommendations regarding promotion to Associate Professor with tenure, 1 recommendation for tenure, 6 recommendations regarding promotion to Professor, 5 recommendations for promotion to Associate Professor of Practice, and 1 recommendation for promotion to Professor of Practice.

2020-2021 Committee members: Mark Van Roojen (Philosophy), Mohammad Rammaha (Mathematics), Alan Christensen (School of Biological Sciences), William Spaulding (Psychology), Iker Gonzalez-Allende (Fall semester; Modern Languages and Literatures), Jeannette Jones (Spring semester; History and Ethnic Studies), Regina Werum (Sociology), Associate Dean Pat Dussault, and Dean Mark Button, Chair

c. Curriculum and Advising Committee

The committee reviewed:

- 12 new course with ACE proposals;
- 5 change/Add ACE proposals;
- 2 decertify/remove ACE proposals;
- 41 new course proposals;
- 101 change course proposals;
- 16 course inactivation (remove/delete) proposals;
- 11 course proposals for CDR Diversity;
- 1 new major proposal
- 1 new minor proposal
- 1 delete major proposal
- 1 delete minor proposal
- 16 substantive change proposals for various majors and minors
- 14 non-substantive change proposals for various major and minors
- 2 two new graduate certificate proposals
- 1 accelerated MA program proposal
- Middle 9 Project proposals (~260)
- New Cross-list Guidance proposal
- Experiential Learning proposal

The Committee forwarded to the faculty the following recommendations:

- to approve the proposed new major in Mathematical Data Science
- to approve the proposed new minor in Racial Justice, Equity and Inclusion
- to approve the deletion of the major in Medieval and Renaissance Studies
- to approve the deletion of the minor in Great Plains Studies
- to approve the proposed changes to the major in Biological Sciences
- to approve the proposed changes to the major and minor in Film Studies
- to approve the proposed changes to the major in Mathematics
- to approve the proposed changes to the minor in Medieval & Renaissance Studies
- to approve the proposed changes to the minor in Arabic
- to approve the proposed changes to the minor in Czech
- to approve the proposed changes to the minor in Japanese
- to approve the proposed changes to the major in Political Science
- to approve the proposed changes to the major and minor in Women's & Gender Studies
- to approve required changes to majors and minor housed in the Department of Computer Science and Engineering as part of their transformation to the School of Computing housed solely in the College of Engineering

The Committee approved non-substantive changes majors and minors. The following changes went directly to the catalog editor.

- Anthropology Major
- Biochemistry Major
- Computer Science Major and Minor
- Software Development Minor
- Geology Major
- Economics Major
- Global Studies Major and Minor
- Human Rights and Humanitarian Affairs Minor
- LGBTQ/Sexuality Minor
- Microbiology Major
- Spanish Major
- Philosophy Major

Middle 9 Project: Over 260 course change proposals were approved part of this project. The goal was to update course numbers and titles for courses with 9 as the middle digit. Courses were re-titled and re-numbered for consistency with the numbering system put in place more than 10 years ago. Other things reviewed and adjusted was variable credit, max credit per term and max credit for the degree to create consistency across the college. This project was spearheaded by CAS Advising Staff.

CAS Cross-listed Course Guidance and MOU form: The committee recognized a number of long-standing concerns about cross-listed courses; the pandemic brought additional challenges to light and the CCAC paused proposals adding cross-listed classes while initiating conversations about the pros/cons of cross-listing with the Undergraduate Education Working Group where an ad hoc committee was convened to discuss the issue in greater detail. A draft was developed and feedback was sought from the Undergraduate Education Working Group, Chairs and Directors, and the Academic Solutions Council, and the UUCC. The committee approved the guidance, created a cross-list MOU form, and resumed review of cross-list proposals.

Experiential Learning: The CAS Curriculum and Advising Committee followed the Academic Solutions Council's recommendations and proposed guiding principles for how a transcripted graduation requirement for experiential learning might be implemented effectively and equitably for all undergraduate students in CAS. We are the first college to propose an experiential learning requirement.

Finally, the committee made nominations for vacancies on the College Curriculum Committee for the 2021-2022 AY

The chair for the 2021-2022 academic year will be decided at the next committee meeting.

**2020-2021 Committee Members:** Professors Scott Stoltenberg, Chair (Psychology), Huijing Du (Mathematics), Amanda Gailey (English), Eric Malina (Chemistry), Julia Frengs (Modern Languages and Literatures); Ana Hingorani and Sawyer Smith (Student Advisory Board Representatives); Christina Fielder (Director, CAS Advising Center); Amy Beyer (non-voting, CAS Advising Center); Michael Dodd (non-voting, University Undergraduate Curriculum Committee-CAS Representative, Psychology); and Associate Dean June Griffin (Executive Secretary).

d. Committee on Student Academic Distinction, Awards and Appeals

Distinction:

This report covers the period of three graduations: August 2020, December 2020, and May 2021. The College of Arts & Sciences awarded degrees with distinction as follows:

- based on academic record and submission of a thesis – 69 total
  - 41 degrees with Highest Distinction
  - 9 degrees with High Distinction
  - 19 degrees with Distinction
- based on academic record only – 189 total
  - 118 degrees with High Distinction
  - 71 degrees with Distinction

For the past several years the college has made a concerted effort to increase our numbers by emailing juniors and seniors encouraging them to write a thesis as well as asking major advisors to encourage their students. The chart below details the upward trend of students earning distinction with or without a thesis over the last five years.

Year	With Thesis			Total w/Thesis	No Thesis		Total no Thesis	TOTAL Degrees with level of Distinction
	Highest	High	Distinction		High	Distinction		
20-21	41	9	19	69	118	71	189	258
19-20	30	9	21	60	79	64	143	203
18-19	30	12	20	62	77	65	142	204
17-18	22	6	24	52	64	56	120	172
16-17	14	12	19	45	59	51	110	155

Scholarships:

The college continues to partner with the Office of Scholarships and Financial Aid with the application process.

2021-2022 Academic year awards:

- 792 applicants did the college portion of the application. The committee considered just over 330 applicants for the awards controlled by the college.
- We just received fund balance information so no awarding has been done. We anticipate having awards made and all notifications out by the end of May.
- Our awards will be a mixture of need based and merit-based awards.

Summer 2021 and AY 2021-22 Dean’s Experiential Learning Awards:

- 29 applicants submitted a narrative for the Dean’s Experiential Learning Award.
- Anticipate making 20-25 awards for \$1500 each.

- The awards will be made from seven scholarship funds designed for this purpose.

Grade Appeal:

No appeals were elevated to the college level during this academic year.

2020-2021 Committee Members: Alexander Sinitskii (Chemistry), Angela Palmer-Wackerly (Communication Studies), Stephen Behrendt (English), Ross Secord (Earth & Atmospheric Sciences), Robert Shepard (School of Global Integrative Studies); Stella Uiterwaal (Graduate Student Representative), Ana Hingorani and Salan Hundai (Student Advisory Board Representatives), Kaitlin Ferris (CAS Advising), Associate Dean June Griffin

e. Assessment Committee

No report. There was no committee needed for 2020-2021.

f. Research Advisory Committee

The Research Advisory Committee was chaired by John Osterman, from April to December 2020, as the acting Associate Dean for Research, and now by William G. Thomas III, Associate Dean for Research and Graduate Education (ADRGE).

Committee members are appointed by the Associate Dean for Research and Graduate Education and serve staggered two-year terms. A few of the members stayed on for a third year to provide guidance to the new ADRGE. Committee members for 2020-2021 were:

Member name, department, appointment date

- Barry Cheung, Chemistry (Sciences), 2018
- Carolyn Heitman, Anthropology (Social Sciences), 2018
- Becca Brock, Psychology (Social Sciences), 2019
- Emily Kazyak, Sociology/Women's & Gender Studies (Social Sciences), 2019
- Kristi Montooth, School of Biological Sciences (Sciences), 2019
- Jordan Stump, Modern Languages and Literature (Humanities), 2019
- Shireen Adenwalla, Physics (Sciences), 2020
- Jeannette Jones, History/Ethnic Studies (Humanities), 2020
- Alice Kang, Political Science/Ethnic Studies (Social Sciences), 2020
- Colin McLear Philosophy (Humanities), 2020
- Brie Owen, English (Humanities), 2020
- Alex Zupan, Math (Sciences), 2020
- John Osterman, Chair (April 2020 – December 2020)
- William G. Thomas III, Chair (January 2021 – present)

The CAS deans thank the committee members for serving on the CASRAC this year. The committee met twice in the fall and monthly during spring to advise the college on the advancement and development of research and research funding.

Because of the Covid-19 pandemic, the College did not allocate internal research award funding in the 2020-2021 academic year.

In Spring of 2021, the committee reviewed the CAS internal research funding categories and discussed how to better align the faculty research awards with the College of Arts and Sciences strategic plan. CASRAC members advised that CAS funding support interdisciplinary teams, concentrate resources on early career and mid-career faculty, and integrate graduate students into faculty research programs. The

committee discussed a proposed set of award categories, such as CAS Interdisciplinary Research Teams, CAS Spark Grants, CAS Research Dissemination and Travel Grants, and a CAS Strategic Priorities Grants (with the 2021-22 call to be focused on Anti-racism and Racial Equity).

This spring, the Research Advisory Committee provided guidance for holding the first CAS Faculty Research Funding Roundtable. The theme for the first Roundtable was Racial Equity, concentrating on special calls for proposals from the Spencer Foundation and the Ford Foundation. The goal of this event was to build momentum among faculty for pursuing grant support, introduce funding opportunities, and clearly articulate the role of University of Nebraska Foundation Relations Team, ORED & OSP. The event was held on Thursday, April 8 via zoom. Twenty-nine faculty registered for the event. The Committee also discussed plans for Research Funding Roundtables in the 2021-2022 academic year on other strategic priorities, such as climate resilience and health disparities.

g. Endowed/College Professorships Committee

The Committee reviewed and recommended 2 renewal applications for College professorships and 7 renewals for University professorships to the Dean. The Committee reviewed and made recommendations on 17 nominations for University professorships to the Dean.

2020-2021 Committee Members: Cary Savage (Psychology), Dawn O. Braithwaite (Communication Studies), Eileen Hebets (School of Biological Sciences), Petronela Radu (Mathematics), John Brunero (Philosophy), and Associate Dean Pat Dussault, Chair.

h. Research Space Committee

No report. There was no committee needed for 2020-2021.

i. Inclusion, Diversity, Equity, and Access (IDEA) Committee

The Committee evaluated the nominations for the 2nd annual Inclusive Excellence and Diversity Award for the College of Arts and Sciences in faculty/unit and student/staff categories. Two awards were made, one to a graduate student and one to a member of the faculty and announcements are forthcoming. The committee also met with the Dean and provided input on the diversity and inclusion aspects of the CAS Strategic Plan.

The committee had numerous discussions of local and national issues as they arose such as 2020 federal policies about critical race theory, incidents of race/ethnicity-based violence, and guidance around diversity and inclusion in the classroom. Action items or recommendations were communicated to appropriate people. The committee is developing an initiative for diversity and inclusion training for staff and staff supervisors that will carry into next academic year.

The committee is supporting a virtual writing retreat hosted by the Writing Center in May 2021 with particular encouragement for CAS faculty at the associate level to participate to help move towards promotion.

2020-2021 Committee Members: Faculty: Debra Hope (Psychology, committee co-chair), Leen-Kiat Soh (Computer Science, committee co-chair), Thomas Gannon (English/Ethnic Studies), Rachel Azima (English/Writing Center), Christine Kelley (Mathematics), Kwakiutl Dreher (English), Staff: Lindsey Witt-Swanson (Bureau of Sociological Research), Lindsay Augustyn (Center for Science, Mathematics, and Computer Education), Nicole Green (English/Writing Center for Rachel Azima who was on FDL Spring semester), Students: Jamaica Baldwin (English), Anthony Budell (Political Science), Duncan Works (Biochemistry).

j. Academic Freedom and Freedom of Speech Committee

AY 2020-2021 marked the first year of new membership for this committee in its transition from an ad hoc to a standing committee in the college. The committee accordingly spent time in reading and discussion in an effort to educate itself in the history and purpose of the committee and the basics of academic freedom.

At the end of the Fall semester, the committee voted to bring to the college a statement on Academic Freedom in the Classroom, with the goal of making it an official college document to be used for education, discussion, and general guidance. During Spring 2021, the committee presented the document to the college Chairs and Directors and the general faculty, led discussions on its contents and took suggestions for its improvement. At the end of March, the committee revised the statement according to the feedback received from college faculty and presented it for a vote as part of the Spring 2021 CAS Faculty Meeting.

The committee also sought nominations for two new members to begin in Fall 2021. These will replace Kevin Smith and Julia Schleck, who will be cycling off after having served on the committee since its inception.

2020-2021 Committee on Academic Freedom and Freedom of Speech: Julia Schleck (Committee Chair, English), Dawne Curry (History & Institute for Ethnic Studies), David Harwood (Earth & Atmospheric Sciences), Anna Hiatt (Biology), Ari Kohen (Political Science & Judaic Studies), Kevin Smith (Political Science), Patrick Dussault (Dean's Office), ex officio.

## *Academic Freedom in Teaching and Learning*

Academic Freedom protects the ability of teachers and learners to explore and to share the results of their inquiries with one another. It is a right held collectively by all teachers by virtue of their profession, in which the work of individual teachers is subject to academic peer review. Intellectual exploration is key to the discovery and innovation that lie at the heart of higher education. The Bylaws of the Board of Regents describe the commitment of the University of Nebraska to the central principle of academic freedom for students, faculty, and the communities we serve:

The University serves the people of Nebraska and the common good through learning, teaching, extension work, research, scholarship, and public service. Fulfillment of these functions requires the preservation of intellectual freedoms of teaching, expression, research, and debate. The right to search for truth, to support a position the searcher believes is the truth, and to disagree with others whose intellect reaches a different conclusion is the fiber of America's greatness. It is, likewise, the strength of a great University, and its preservation is vital. Members of the professional staff are entitled to freedom in the classroom in discussing their subjects. (Section 4.2)

Freedom to teach and freedom to learn are inseparable facets of academic freedom. The responsibility to secure and to respect general conditions conducive to the freedom to learn is shared by all members of the academic community, including ensuring a fair hearing for divergent viewpoints. Equally central to the academic endeavor is the weighing of such viewpoints. In contrast to first amendment speech rights, which assume a legal equality of all speech, academic freedom presumes the necessity of assessing such speech and assigning greater or lesser value to different intellectual positions, based on standards in the field.

In their professional role, **teachers**<sup>1</sup> should encourage the free pursuit of learning in their students. Teachers should demonstrate respect for students as individuals and adhere to their proper roles as intellectual guides. In particular, teachers must respect the rights of students to hold beliefs differing from their own. Teachers must avoid any exploitation, harassment, or discriminatory treatment of students, and encourage a collegial environment in classroom discussions.

It is, however, neither harassment nor discriminatory treatment of a student for a teacher or a peer to closely scrutinize an idea or viewpoint the student has implied, proposed or advanced. Participants in a classroom discussion should not limit or avoid ideas that are germane to a subject under consideration because a student with particular beliefs or values might take offense. Some might assume that students have a right not to have their beliefs—even deeply held beliefs--challenged but this assumption contradicts a central purpose of higher education: to challenge students to examine and think hard about their own perspectives, whatever those might be.

In their role as learners, **students** are encouraged to express opinions, challenge ideas, take reasoned exception to data or views offered in any course of study, and reserve judgment about

<sup>1</sup> The term "teachers" is understood to include anyone acting in an instructional capacity at UNL, classroom or otherwise, regardless of rank or title.

matters of opinion. However, students are responsible for learning the content of any course of study for which they are enrolled, and will be assessed on how well they demonstrate the content and methods of the course. Students must also respect the rights of teachers to hold beliefs and present positions differing from their own, and avoid any harassment or discriminatory treatment of teachers.

### Should controversial subjects be discussed in the classroom?

As stated in the Board of Regents Policy on Free Expression and the American Association of University Professors (AAUP) 1940 *Statement of Principles*, teachers “are entitled to freely discuss topics in the classroom”; however, they “should be careful not to introduce into their teaching controversial matter [that] has no relation to their subject.” This statement is not intended to discourage the teaching of what may be deemed “controversial.” Indeed, controversy is often at the heart of the free academic inquiry that the tenets of academic freedom are designed to foster. This statement seeks to underscore the need for teachers to focus on discussion of material germane to the subject of the class. Occasional discussion of material not directly relevant to the course is to be expected. However, it is the teacher’s duty to keep time spent on irrelevant material, whether introduced by students or the teacher, to a level that does not distract from the central pedagogical goals of the class.

### Should classes be required to present material in a balanced way?

When people insist that teachers need to present their subject material in a “balanced” way, they often mean that a teacher should impartially engage all potentially relevant points of view. The ideal of balance makes sense, however, only in light of a teacher’s obligation to present all aspects of a subject matter *that professional standards would require to be presented*. Balance is determined by the teacher in light of the relevant disciplinary knowledge and professional standards.

### What is Teaching vs. Indoctrination?

It is teaching and not indoctrination when, as a result of research and study, teachers assert to their students that in their view particular propositions are true, even if these propositions are controversial within a discipline. Only if a teacher advances such propositions in ways that do not allow students to challenge their validity or advance alternative understandings, is the teacher engaging in indoctrination and failing to encourage the free pursuit of learning. The assertion of a proposition or a viewpoint, however controversial, should be a path to engagement in argumentation and discussion—an engagement that lies at the core of academic freedom. Such engagement is essential if students are to acquire the practice and skills of critical independence. The essence of higher education does not lie in the passive transmission of knowledge but in the inculcation of a mature independence of mind.

Some teachers may prefer to dissect dispassionately every question presented, engaging in an impartial examination of them all. Some may prefer to expound a preferred theory. One style may resonate better with some students than with others. A good teacher will strive to promote student learning regardless of the style they choose and adopt and modify it when appropriate to achieve this goal. The fundamental point is that freedom in the classroom applies as much to

controversial opinions as to dispassionate surveys. So long as opinion and interpretation are not advanced and insisted upon as dogmatic truth, and all such expressions ultimately serve the pedagogical mission of the class, the style of presentation is at the discretion of the teacher, subject to peer review.

Sources:

American Association of University Professors, 1940 *Statement of Principles* and 1970 *Interpretive Comment*.

American Association of University Professors, *Statement on Professional Ethics* (2009).

American Association of University Professors, *Freedom in the Classroom* (2007).

American Association of University Professors, *Joint Statement on Rights and Freedoms of Students* (1967).

Bylaws of the Board of Regents of the University of Nebraska.

Board of Regents of the University of Nebraska Policy Commitment to Free Expression; Guide for Facilities Use; and Education (January 12, 2018).

UNL Faculty Senate, *Professional Ethics Statement* (2016).

## University of Nebraska-Lincoln New Undergraduate Major or Degree

### I. Descriptive Information

<b>Name of Institution Proposing New Major or Degree</b>
University of Nebraska - Lincoln
<b>Name of Proposed Major or Degree</b>
Mathematical Data Science
<b>Degree to be Awarded to Graduates of the Major</b>
Bachelor of Arts OR Bachelor of Science, depending on the student's program of study
<b>Other Majors or Degrees Offered in this Field by Institution</b>
None
<b>CIP Code</b>
30.7001 Data Science
<b>Administrative Units for the Major or Degree</b>
Department of Mathematics, College of Arts and Sciences, University of Nebraska - Lincoln
<b>Proposed Delivery Site</b>
University of Nebraska – Lincoln campus
<b>Program will be Offered</b> <i>[full program, not individual courses]</i>
<input checked="" type="checkbox"/> On-campus only <input type="checkbox"/> Distance only <input type="checkbox"/> Both (on-campus and distance)
<b>Date Approved by the Governing Board</b>
<i>[leave blank]</i>
<b>Proposed Date the New Major or Degree will be Initiated</b>
Fall 2022

### II. Details

#### A. Purpose of the Proposed Major or Degree:

The purpose of the Mathematical Data Science major is to prepare students with skills and competency in data analysis and interpretation, algorithm design and implementation, and help them develop aptitudes for interdisciplinary problem solving. Thus this program *enables students to take advantage of career and employment opportunities across diverse fields involving data-rich, data-driven systems and applications*. Ultimately, this will help *address the increasing societal and economic need for qualified workforce in today's digital age*.

According to the NSF sponsored report "Data Science for Undergraduates: Opportunities and Options" published by the National Academy of Sciences, Engineering, and Medicine (available at <http://nap.edu/25104>):

“Today, the term “data scientist” typically describes a knowledge worker who is principally occupied with analyzing complex and massive data resources. However, data science spans a broader array of activities that involve applying principles for data collection, storage, integration, analysis, inference, communication, and ethics. In future decades, all undergraduates will benefit from a fundamental awareness of and competence in data science. “ The report makes several recommendations for developing data science in **all** undergraduates, develop faculty to teach in the field, attract students with various backgrounds and prepare them for successful careers in data-science related fields through a diversity of educational pathways (e.g. full degrees, a range of minors and certificates).

Moreover, the letter from the Co-Chairs of the ACM Education Board, as part of the release of the ACM Data Science Task Force report on “Computing Competencies for Undergraduate Data Science Curricula” (Draft 2, December 2019) [1] states: “In 2009, Turing award winner Jim Gray spoke of data science as a fourth paradigm of science (empirical, theoretical, computational and data-driven) arising from and capitalizing on the huge amount of data that is now available for investigation. The confluence of the availability of data and increasingly sophisticated tools, processes, and algorithms for analyzing and drawing knowledge and insight from data has impacted every area of scientific engagement. It has also opened up exciting new opportunities for interdisciplinary work across the many fields including (but certainly not limited to) computer science, mathematics, statistics, and information science from which it draws foundational knowledge.” The design of this proposed major is aligned with the elements emphasized in the idea of data science being a *fourth paradigm of science*.

The goal of the **curricular content** of the Mathematical Data Science major is to *develop foundational knowledge and expertise* in: (a) the mathematical and computational aspects of data science (processing, analyzing, modeling, and implementing software solutions for large data sets) and (b) the application of computing and modeling to multidisciplinary problems, and to *develop professional skills and familiarity in communication, teamwork, problem solving in interdisciplinary settings and domains*. In addition, students select a field-of-interest focal area from a constellation of approved areas. These areas include Artificial Intelligence, Software Applications, Mathematical Modeling, and Applied Computing. The curriculum and approved areas also facilitate double majors in the focal discipline and Mathematical Data Science. The choice of computing-related courses also follows the guidance from the aforementioned report by ACM Data Science Task Force [1].

The goal of the **curricular structure** of the Mathematical Data Science major is to prepare graduates to *solve multidisciplinary problems as professional members of interdisciplinary teams*. This structure engages student teams with real-world problems for which they have passion and see meaningful impacts. By completing the major, graduates are better prepared by this structure for the multi-faceted nature of Data Science in professional careers and graduate studies.

The goal of the curricular design of the Mathematical Data Science major is three-fold. First, as described in Section III later, the Mathematical Data Science major is designed to **fill a significant demand from the industry** for workers skilled and knowledgeable in data science to practice and carry out effective and efficient data-driven problem solving. Not all such job positions require a computer science graduate as not all such positions require workers to have a high level of programming skills and algorithm development knowledge, or involve the development of large software systems. Second, the Mathematical Data Science major is designed to **facilitate double majoring with other disciplines** such as journalism and sociology. The set of field-of-interest focal areas will allow students to double major and graduate in a timely manner while preparing students better for a competitive job market in their chosen focal discipline with additional skills and expertise in data science, or for a graduate research career, or for an interdisciplinary position that solves complex, real-world problems. Third, **the Mathematical Data Science major is designed with meeting the N2025 strategic vision in mind**, to broaden participation in computing by making data science accessible to our students, strengthening

student pipelines for advanced, post-graduate research work, and accelerating data-rich, data-driven faculty research.

## B. Description of the Proposed Major or Degree:

### B.1. Student Learning Outcomes

The primary student learning outcomes of Mathematical Data Science major are:

- foundational knowledge and expertise in the analysis of large-scale data sources from the interdisciplinary perspectives of applied computer science, data modeling, mathematics, and statistics.
- foundational knowledge and expertise in the application of computing, informatics, and modeling to solve multidisciplinary problems; and
- abilities and professional skills to solve multidisciplinary data science problems as a member of an interdisciplinary team.

### B.2. Admission Procedures

Admission requirements for the Mathematical Data Science major are the same as admission to the University of Nebraska – Lincoln and the College of Arts and Sciences. In particular, the program will seek:

- Students who demonstrate analytical interests and capabilities.
- Students with various fields-of-study and interests in multidisciplinary problem-solving.
- Equity with respect to gender, economic status, age, culture, disability, color, and national origin.
- Links to financial support that enable students to obtain their degree.

### B.3. Requirements

The Mathematical Data Science major has three components, for a total of at least 42 required credit hours:

- Data Science Foundations, including statistics [at least 24 credits].
- Data Science Focus Area Electives [15 credits], with depth in a field-of-focus area and breadth in another.
- Data Science Professional Experience [3 credits]

### Core Requirements

Data Science Foundations [24-28 credits]	
CSCE 155T, CSCE 155E, CSCE 155N, CSCE 155H, or CSCE 155A: Computer Science I	3
CSCE 311: Data Structures & Algorithms for Informatics or CSCE 310: Data Structures & Algorithms	3
CSCE 320: Data Analysis	3
MATH 104: Applied Calculus or MATH 106: Calculus I	3 or 5
MATH 203/203J: Contemporary Mathematics or MATH 107: Calculus II	3 or 4
MATH 315: Linear Algebra for Data Science [NEW] or MATH 314: Linear Algebra	3
Select two courses from the following: (ECON 215 or EDPS 459 or SOCI 206 or STAT 218), STAT 318, STAT 380. Or: STAT 101 and STAT 102	6 or 7
Data Science Professional Experience [3 credits]	
MATH 435: Math in the City	3
<b>Total Core Courses</b>	<b>27-31 hrs</b>

### Additional Major Requirements

Data Science Focus Area Electives [15 credits]: Select 5 courses from 2 of the subareas below for at least 15 hours

*Artificial Intelligence*

- CSCE421 Foundations of Constraint Processing
- CSCE472 Digital Image Processing
- CSCE473 Computer Vision
- CSCE474 Introduction to Data Mining
- CSCE475 Multiagent Systems
- CSCE476 Introduction to Artificial Intelligence
- CSCE478 Introduction to Machine Learning
- CSCE479 Introduction to Deep Learning

*Software Applications*

- CSCE361 Software Engineering
- CSCE378 Human-Computer Interaction
- CSCE412 Data Visualization
- CSCE460 Software Engineering for Robotics
- CSCE461 Advanced Topics in Software Engineering
- CSCE464 Internet Systems & Programming
- CSCE466 Software Design and Architecture
- CSCE467 Testing, Verification and Analysis
- CSCE468 Advanced Topics in Software Engineering

*Data Pipeline*

- STAT251 Statistical Computing I: Data Wrangling
- STAT251 Statistical Computing II: Data Management and Visualization
- CSCE411 Data Modeling for Systems Development
- CSCE413 Introduction to Database Systems
- CSCE436 Advanced Embedded Systems
- CSCE438 Internet of Things
- CSCE458 Molecular and Nanoscale Communication
- CSCE463 Data and Network Security
- CSCE465 Wireless Communication Networks

*Mathematical Modeling*

- Math 208 Calculus in three dimensions
- Math 221 Differential Equations
- Math 415 Theory of Linear Transformations
- Math 424 Partial Differential Equations
- Math 428 Principles of Operations Research
- Math 433 Nonlinear Optimization
- Math 440 Numerical Analysis
- Math 450 Combinatorics
- Math 452 Graph Theory
- Math 447 Numerical Linear Algebra
- Math 471 Introduction to Topology
- Math 487 Probability Theory
- Math 489 Stochastic Processes

*Applied Computing: Journalism + Humanities*

- HIST 461 Geospatial Approaches in Digital Humanities and Social Sciences
- HIST 470 Digital History
- JOMC 358 UX/UI Design
- JOUR 307 Data Journalism
- JOUR 407 Data Visualization
- NSST 376 Analysis for the National Security Establishment
- SPMC 350: Sports Data Visualization and Analytics

*Statistical Modeling*

- STAT212 Statistical Design
- STAT301 Mathematical Statistics and Modeling
- STAT302 Mathematical Statistics and Modeling II
- STAT325 Statistical Collaboration I
- STAT412 Advanced Statistical Design
- STAT414 Survey Sampling
- STAT432 Introduction to Survey Statistics
- STAT443 Statistical Analysis of Genomics Data
- STAT450 Introduction to Regression Analysis
- STAT462 Introduction to Mathematical Statistics I: Distribution Theory
- STAT463 Introduction to Mathematical Statistics II: Statistical Inference
- STAT464 Model Selection and Prediction
- STAT474 Introduction to Nonparametric Statistics
- STAT475 Introduction to Categorical Data
- STAT478 Time Series Analysis
- STAT486 Introduction to Bayesian Analysis

*Applied Computing: Sociology*

- SOCI 310 Applied Sociology: Community-Based Research
- SOCI 333 Applied Research in Public Opinion Research
- SOCI 430 Advanced Social Network Analysis
- SOCI 407 Strategies of Social Research: Qualitative Methods
- SOCI 463 Advanced Social Research Methods
- SOCI 465 Survey Design and Analysis
- SOCI 485 Agent-Based Social Simulation

*Applied Computing: Natural Resources*

- NRES 312 Introduction to Spatial Sciences
- NRES 412 Introduction to GIS
- NRES 415 GIS for Agriculture and Natural Resources
- NRES 418 Introduction to Remote Sensing
- AECN 401 Advanced Farm Management and Linear Programming
- AECN 406 Commodity Price Forecasting
- AGRO 420 Bioinformatics Applications in Agriculture
- AGRO 431 Site-specific Crop Management
- MSYM433 Equipment and Tractor Testing

<b>Total Elective Courses</b>	<b>15 hrs</b>
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#### B.4. Example Four-Year Program of Study

<b>First Semester</b>	<b>Hours</b>
CSCE 155T (ACE 3)	3
MATH 104 or 106	3
Elective (ACE 1, Writing)	3
Foreign Language III (CDR Lang)	3
Elective (ACE 6, Social Science)	3
<b>Total</b>	<b>15</b>

<b>Second Semester</b>	<b>Hours</b>
CSCE 311	3
MATH 203 or 107	3
Elective (ACE 5, Humanities)	3
Foreign Language IV (CDR Lang)	3
Elective (CDR Humanities)	3
<b>Total</b>	<b>15</b>

<b>Third Semester</b>	<b>Hours</b>
Statistics 1	3
MATH 315 or 314	3
Elective (ACE 4, Science)	3
Elective (CDR Writing)	3
Elective (ACE 8, Ethics)	3
<b>Total</b>	<b>15</b>

<b>Fourth Semester</b>	<b>Hours</b>
CSCE 320	3
Statistics 2	3
Focus Area Elective 1	3
Elective (ACE 2, Communication)	4
Elective (CDR Science + Lab)	3
<b>Total</b>	<b>16</b>

<b>Fifth Semester</b>	<b>Hours</b>
Focus Area Elective 2	3
Focus / 2 <sup>nd</sup> major 1	3
Focus / 2 <sup>nd</sup> major 2	3
Elective (ACE 7, Arts)	3
Elective (ACE 9, Diversity)	3
<b>Total</b>	<b>15</b>

<b>Sixth Semester</b>	<b>Hours</b>
Focus Area Elective 3	3
Focus / 2 <sup>nd</sup> major 3	3
Focus / 2 <sup>nd</sup> major 4	3
Elective (CDR Social Sciences)	3
Elective (CDR Human Diversity)	3
<b>Total</b>	<b>15</b>

<b>Seventh Semester</b>	<b>Hours</b>
MATH 435 (ACE 10)	3
Focus Area Elective 4	3
Focus / 2 <sup>nd</sup> major 5	3
Elective (or Focus / 2 <sup>nd</sup> major 7)	3
Elective (or Focus / 2 <sup>nd</sup> major 8)	3
<b>Total</b>	<b>15</b>

<b>Eighth Semester</b>	<b>Hours</b>
Focus Area Elective 5	3
Focus / 2 <sup>nd</sup> major 6	3
Elective (or Focus / 2 <sup>nd</sup> major 9)	3
Elective (or Focus / 2 <sup>nd</sup> major 10)	3
Elective (or Focus / 2 <sup>nd</sup> major 11)	2
<b>Total</b>	<b>14</b>

#### B.5. Program Details

In the Mathematical Data Science major, described here and offered by the Mathematics Department (with supporting courses from CSE and Statistics Departments), the Data Science Foundations, Focus Areas, and Professional Experience comprise the major. The design of the proposed major is motivated with three key elements in mind: (1) analysis of large-scale data and its associated processes, (2) interdisciplinary contexts and experiences, and (3) professional development grounded on application-driven problem solving.

**The Mathematical Data Science Foundation courses consist of a set of core courses in Computer Science (CS), Statistics, and Mathematics, customized for topics in Data Science.** These courses will provide a strong foundation for students to pursue more advanced courses at a later stage of their Data Science degree program, in particular: computational thinking, fundamental programming skills, data structures, algorithm development and evaluation, statistical analysis, mathematical thinking, calculus, and linear algebra. Furthermore, the field-of-study areas Artificial Intelligence, Software Development, Data Pipeline, Mathematical Modeling, and Statistical Modeling will allow students to acquire more advanced knowledge and skills in large scale data analysis and its associated processes such as representation and modeling.

**The Mathematical Data Science program has a strong interdisciplinary component.** First, the Mathematical Data Science program requires interdisciplinary coursework where students from different disciplines work as a team to solve an interdisciplinary problem, guided by faculty of different disciplines collaborating on data intensive projects. Second, another emphasis of the program is to partner with interested undergraduate degree programs to design and chart viable pathways to dual-matriculate in a timely manner with the proposed Data Science degree and another degree program.

**The Mathematical Data Science program has a strong application-driven, real-world component.** As alluded to above, the Focus Area courses and the Professional Experience course will encourage and facilitate real-world projects in advanced research and application development that are data-driven, data-rich.

Also note that with the explosion of knowledge in the information age, the above still is not enough to provide deep coverage of all important topics in data science, but it is sufficient, especially with the Focus Area courses, to provide broad literacy and fluency in Data Science and the focal discipline and the basis for life-long learning and for mastery in select sub-fields.

Together, the Mathematical Data Science curriculum meets several general education and college requirements and enrich students' experiences with interdisciplinary practice and professional development.

To illustrate, the example four-year program of study, totaling 120 credits, meets Achievement-Centered Education (ACE) and College of Arts and Sciences Degree Requirements (CDR). Specifically, MATH 104 or MATH 106 meets ACE 3 and MATH 435 will meet ACE 10. A student may earn a Bachelor of Science degree by completing a 60-credit scientific base. The Mathematical Data Science Foundations and electives, ACE 4 elective, and CDR Science elective courses can provide up to 46 credits of the required 60 credits, so students desiring a Bachelor of Science degree must complete another 14 approved science credits (e.g., in a focal area or as electives).

The Data Science Focus Area Electives allow students to pursue topics of interest in breadth or depth. Students must complete 15 credits across two of the following areas:

- *Artificial Intelligence*
- *Software Development*
- *Data Pipeline*
- *Mathematical Modeling*
- *Statistical Modeling*

- *Applied Computing: Journalism & Humanities*
- *Applied Computing: Sociology*
- *Applied Computing: Natural Resources*

*Note: Students that are Mathematical Data Science majors are not eligible for a Math major on the Statistics and Data Science option or a Math minor.*

The initial list of courses in each subarea is subject to change and the Mathematical Data Science Curriculum Committee and the Math Department will maintain a list of courses in each subarea. We expect other units will add elective courses as the synergy developed in the Mathematical Data Science program grows (and before the initial batch of students reach their third-year in 2022). Most of these courses do not have any prerequisites beyond the Mathematical Data Science Foundations courses; several have prerequisites that count as Mathematical Data Science Foundations or Focus Area electives; and a few courses (mostly the mathematical, statistical, and numerical methods courses) have prerequisites that do not count for the Mathematical Data Science major. Most of the Mathematical Data Science Focus Area electives are offered every year or more often; some are offered every-other-year; and a few are offered irregularly (i.e., less frequently than every-other-year). This extensive list of frequently offered electives allows students to easily meet the electives requirement without taking additional prerequisites, but also allows students with particular interests to choose electives that require additional preparation.

## **B.6. Course Descriptions**

The Mathematical Data Science Foundations course descriptions follow.

- **CSCE 155T COMPUTER SCIENCE I: INFORMATICS FOCUS**  
**Prerequisites:** Appropriate score on the CSE Placement Exam or CSCE101; MATH 103 or equivalent  
**Description:** Introduction to computers and problem-solving with computers. Topics include problem solving methods, software development principles, computer programming, and computing in society.  
**Credit Hours:** 3  
**ACE:** ACE 3 Math/Stat/Reasoning
- **CSCE 311 DATA STRUCTURES AND ALGORITHMS FOR INFORMATICS**  
**Prerequisites:** Grade of "Pass" or "C" or better in CSCE 155A, CSCE 155E, CSCE 155H, CSCE 155N, CSCE 155T, or SOFT 160.  
**Description:** An introduction to algorithms and data structures for informatics. Foundational coverage of algorithms includes both problems (such as indexing, searching, sorting, and pattern matching) and methods (such as greedy, divide-and-conquer, and dynamic programming). Foundational coverage of data structures includes lists, tables, relational databases, regular expressions, trees, graphs, and multidimensional arrays. The topics will be studied in the context of informatics applications.  
**Credit Hours:** 3
- **CSCE 320 Data Analysis**  
**Prerequisites:** CSCE 220.  
**Description:** Practical experience on how to model data through existing techniques including object-oriented and relational models. These models then can be used at the center of systems to promote efficient and effective data processing and analysis.  
**Credit Hours:** 3

*Note: CSCE 320 will be updated with new name (e.g., “Data Modeling and Visualization”), prerequisites (including “CSCE 311”), and description.*

- **MATH 104 APPLIED CALCULUS**

**Prerequisites:** Appropriate score on the Math Placement Exam; or grade of P, C, or better in MATH 101, MATH 102, or MATH 103

**Description:** Rudiments of differential and integral calculus with applications to problems from business, economics, and social sciences

**Credit Hours:** 3

**ACE:** ACE 3 Math/Stat/Reasoning

- **MATH 203/203J CONTEMPORARY MATH**

**Prerequisites:** None.

**Description:** Applications of quantitative reasoning and methods to problems and decision making in the areas of management, statistics, and social choice. Includes networks, critical paths, linear programming, sampling, central tendency, inference, voting methods, power index, game theory, and fair division problems.

**Credit Hours:** 3

**ACE:** ACE 3 Math/Stat/Reasoning

- **MATH 315 LINEAR ALGEBRA FOR DATA SCIENCE**

**Prerequisites:** A grade of P, C, or better in MATH 104 and MATH 203

*Note: MATH 315 cannot be used toward a major in Mathematics.*

**Description:** Fundamental concepts of linear algebra, including properties of matrix arithmetic, systems of linear equations, vector spaces, inner products, determinants, eigenvalues and eigenvectors, and diagonalization, with emphasis in data science applications.

**Credit Hours:** 3

*Note: Students that would like to pursue a math major will be advised to take Math 106, Math 107, and Math 314 instead of 104, 203, and 315. Students that would like to pursue a computer science major will be advised to take CSCE 155E and CSCE 310 instead of CSCE 155T and CSCE 311 in addition to the alternative math courses previously listed. Students that are Mathematical Data Science majors are not eligible for a Math major on the Statistics and Data Science option or a Math minor.*

- **STAT 101 INTRODUCTION TO DATA (NEW)**

**Prerequisites:** Removal of all entrance deficiencies in mathematics

**Description:** An introduction to statistics through exploratory data analysis and data visualization. Topics include data types, chart types, methods for working with and reducing data, simple regression, regression diagnostics. Focuses on how to communicate statistical information and how to critically consume statistical information presented in the media and popular press.

**Credit Hours:** 3

**ACE:** ACE 3 Math/Stat/Reasoning

*\* Note: This is the first course of a 2-course sequence for Statistics Option 2*

- **STAT 102 PRINCIPLES OF STATISTICAL ANALYSIS (NEW)**

**Prerequisites:** Stat 101, Concurrent enrollment in STAT 151 (Introduction to Statistical Computing)

**Description:** An introduction to statistics through exploratory data analysis and data visualization. Topics include data types, chart types, methods for working with and reducing data, simple regression, regression diagnostics. Focuses on how to communicate statistical information and how to critically consume statistical information presented in the media and popular press. Introduction to formal statistical inference and elementary probability for statistics majors. Explores the practical

application of statistical techniques to meaningful scientific problems. Inference topics will be implemented using both simulation-based approaches and classical, theory-based methods.

**Credit Hours:** 3

**ACE:** ACE 3 Math/Stat/Reasoning

*\* Note: This is the second course of a 2-course sequence for Statistics Option 2*

*\* Note: Students that would like to pursue a math or statistics major will be advised to take Math 106, Math 107, and Math 314 instead of 104, 203, and 315. Students that would like to pursue a computer science major will be advised to take CSCE 155E and CSCE 310 instead of CSCE 155T and CSCE 311 in addition to the alternative math courses previously listed. Students who intend to complete courses in the statistics focus area will be advised to take Stat 101 and Stat 102 instead of Stat 218, 318, 380, or 462.*

The Data Science Professional Experience course description follows.

- **MATH 435 MATH IN THE CITY**

**Prerequisites:** Grade of “Pass” or “C” in MATH 104 (or MATH 106), MATH 203 (or MATH 107), and MATH 315 (or MATH 314).

**Description:** A research experience modeling problems of current interest to the local community, businesses, or government. Professional practice through interactions with local collaborator.

**Credit Hours:** 3

**ACE:** ACE 10 Creative or Scholarly Product

### Advising

Students with a Mathematical Data Science major will be assigned an advisor in the Mathematics Department.

### B.7. Changing Majors

Transfers into and out of the Mathematical Data Science major are straightforward in the sophomore year, but later transfers might require additional time to graduation, summer and/or online courses, and/or special permissions. Since the proposed program is not cohort-based, students should be able to fulfil the requirements in a timely manner.

- Students who transfer into the Mathematical Data Science major from a MATH major will be able to use their MATH 106, MATH 107, and MATH 314 courses towards the Mathematical Data Science major.
- Students from the Mathematical Data Science major that have taken the sequence MATH 106, MATH 107, and MATH 314 will be able to immediately apply these courses towards a MATH major.
- Students who transfer into the Mathematical Data Science major from a CSE major (Computer Science, Computer Engineering, or Software Engineering) will be able to apply their CS and Mathematics coursework directly to the Foundations requirements.
- Students who transfer out of the Mathematical Data Science major to a CSE major would be able to apply their CSCE and/or SOFT credits to their new major.

## III. Review Criteria

### A. Centrality to UNL Role and Mission

The first students graduating from this major in 2025 look forward careers stretching past 2065 and lives stretching to the end of the 21<sup>st</sup> century. We are now only at the beginning of the age of artificial intelligence and robots. What changes will these technologies bring in our society and workplaces? How should UNL prepare its graduates for an age that rapidly is being transformed with these

technologies? What skills must the 21<sup>st</sup>-century workforce have in the age of artificial intelligence and robots? What lifelong learning skills and technical backgrounds must the 21<sup>st</sup>-century workforce have in order to be able to acquire and adopt rapidly changing technologies and solutions in data analytics and informatics?

According to the NSF: “[T]he notion that only future computer scientists or IT professionals need training in computer science is no longer true. Outside of the IT industry, knowledge of computer science and computer programming is becoming a necessary skill for many professions including jobs in science and technology, and also careers in marketing, advertising, journalism and the creative arts.... As computers are becoming mainstream tools in the fields of journalism to creative arts, professionals in those fields are becoming increasingly called on to utilize their computer programming skills on the job.” [3]

In answering these challenges of the Information Age, this proposed major addresses the imperative needs and demands for foundational knowledge and expertise in computing and informatics and the abilities and skills to apply those technologies in virtually every aspect of human endeavor. “[UNL] is the state’s primary intellectual center providing leadership throughout the state through quality education and the generation of new knowledge.” [4] With this proposed major, UNL will provide intellectual leadership in its “fundamental mission” of educating students for the 21<sup>st</sup> century.

In Section B below, we will further identify the relationship of the proposed Data Science program with the N2025 Strategic Plan [10] published in February 2020, a plan that was anchored by the N150 Commission report. In Section C below, we will also identify the relationship of the proposed Data Science program with the NU Strategic Framework [5] published in 2015.

## **B. Relationship of the proposal to the N2025 Strategic Plan**

The N150 Commission laid out a bold vision over the next 25 years for UNL [9], based on which the N2025 Strategic Plan for the next five years was drafted [10].

There are six specific aims in the N2025 Strategic Plan:

- Innovate student experiences that prepare graduates to be life-long learners and contributors to the workforce in Nebraska and the world
- Establish a culture at Nebraska committed to increasing the impact of research and creative activity
- Focus research, scholarship, creative activity, and student experiences to foster innovative, interdisciplinary endeavors and solve challenges critical to Nebraska and the world
- Broaden Nebraska’s engagement in community, industry, and global partnerships
- Create a climate at Nebraska that emphasizes, prioritizes, and expands inclusive excellence and diversity
- Prioritize participation and professional development for all Nebraska students, staff, and faculty

Our design of the Data Science degree program is (1) inclusive and flexible, allowing students to *personalize their undergraduate experiences and training* with the focus areas, (2) highly interdisciplinary, facilitating *meaningful interactions* and pipeline and *community building*, (3) intentional on professional development of students, and (4) driven by emphases in big data from both the computational and mathematical solutions to real-world applications, allowing *our research and creativity to transform lives and learning*. The joint administration of the proposed Mathematical Data Science program also integrates training on foundational and applied knowledge in Mathematics, Computer Science, and Statistics.

Students in the new program will learn about interdisciplinary problem solving and the skills—both technical and soft—needed to succeed in such an environment. Driven by the interdisciplinary aspect, the new program is inclusive: its design has in mind also for dual matriculation, the inclusion of courses

from other disciplines in its list of technical electives or focus areas, and an interdisciplinary professional experience.

As our world moves towards digitization and interconnectedness such as the Internet of Things (IoT) and the consequent data-rich problems and their data-driven solutions, our program provides a wonderful opportunity for both faculty and students. Faculty will be able to bring their research and creative activity into the program through the Professional Experience course, Math in the City, while students will be exposed to research opportunities early and trained to work hands-on on real-world data and problems. The new program is inherently interdisciplinary, focused on big data and the science behind it (Math, CS, and Statistics), and driven by real-world applications.

The new program will engage community, industry, and global partnerships. It will leverage the existing capabilities, processes, and resources that the Department of Mathematics has acquired and improved on over the past few years of engaging community and industry partnerships.

The new program will expand inclusive excellence and diversity. Our design is inclusive and will attract both students and faculty to this new program. It is flexible and allows students to choose technical electives from a host of focus areas, from different disciplines. These design elements will make the program more personalizable and more accessible. Faculty interested in participating in the program could also propose to have new courses added to the technical electives, or to have a new focus area added to the program, or serve as guest speakers in the Math in the City course.

Finally, the new program also prioritizes participation and professional development for the students in this program as well as staff and faculty involved, especially in interdisciplinary problem solving and team building.

### **C. Relationship of the proposal to the NU Strategic Framework**

This section references specific objectives from the University of Nebraska Strategic Framework [5], quoted in italics.

*1.a. The university will strive to increase affordability and ensure qualified students are not denied access based on economic circumstances.*

*5.c. Allocate resources in an efficient and effective manner.*

The Mathematical Data Science major delivers computing and informatics instruction in a cost-efficient unified program serving multiple fields and units, thereby potentially limiting more costly duplication of such instruction across those units.

*1.b. Increase the percentage of Nebraska high school graduates (the state “college-going rate”) who enroll at and graduate from the university.*

*1.c. Increase the diversity of those who enroll at and graduate from the university, employing measures permitted by state and federal law.*

*3.b. Increase proportion of the most talented Nebraska high school students who attend the University of Nebraska.*

*3.c. To attract talent to the state, increase the number of nonresident students who enroll at the university.*

The Mathematical Data Science major provides a unique educational experience with interdisciplinary and cross-disciplinary elements that will attract high-school graduates, including high-achieving students from Nebraska and elsewhere, and appeal to more diverse demographics than are the current STEM-focused majors at UNL, thereby increasing enrollments and the diversity of students.

*2.b. Pursue excellence through focus on targeted programs in areas of importance to Nebraska where the university can be a regional, national and/or international leader.*

*4.e. Focus resources on areas of strength in research where the university has the opportunity for regional, national and international leadership and in areas of strategic importance to the health and economic strength of Nebraska*

The UNL Mathematics, CSE, and Statistics Departments are all highly ranked programs for the University of Nebraska [6, 7]. This program will leverage the internationally recognized excellence of the Math, CS, and Statistics faculty in areas of importance (Data Science) to Nebraska.

*3.e. Encourage and facilitate the commercialization of research and technology to benefit Nebraska.*

*3.f. Develop and strengthen internship and service learning opportunities with business, education, government, military, and nonprofit organizations.*

*4.b. Increase undergraduate and graduate student participation in research and its application.*

*5.d. Support entrepreneurship education, training and outreach.*

*5.f. Maximize potential of information technology to support the university's activities.*

The Professional Experience program will incorporate instruction in entrepreneurship and undertake projects drawn from real-world business, education, government, military, and non-profit stakeholders and involve undergraduates in R&D activities of the faculty and the university. The experience will strengthen graduate research pipelines and facilitate prototyping of innovative and creative efforts of faculty participating in the courses and capstone project.

*3.h. Pursue excellence in educational attainment aligned with the long-term interests of the state.*

*5.a. Support economic growth, health and quality of life through policy initiatives consistent with university mission.*

*5.c. Support Nebraska's economic development.*

Across virtually every field of human endeavor, the workforce of the future will be more engaged with analytical, design, and computing methods and technologies for data analytics, informatics, robotics, intelligent systems, etc. These developments will allow workers to tackle ever more difficult and complex multidisciplinary problems which require interdisciplinary collaboration. Nebraska's future economic growth and development depend on having an educated workforce proficient in these ways. The Mathematical Data Science major provides foundations in computing methods and technologies and in interdisciplinary collaboration to meet multidisciplinary challenges. This program will help the University of Nebraska deliver "robot-proof higher education in the age of artificial intelligence" [8].

*4.c. Encourage and support interdisciplinary, intercampus, inter-institutional and international collaboration.*

The structure of the major involves students in interdisciplinary instruction and collaborative team projects infused with multidisciplinary problems and solutions.

#### **D. Consistency with the Comprehensive Statewide Plan for Post-Secondary Education**

The Nebraska Coordinating Commission for Post-Secondary Education's *Comprehensive Statewide Plan for Postsecondary Education* (CSPPE) [12] states: "Institutions will see a growing demand from business and from students for specialized knowledge and skill certifications (in professional, vocational, and technical areas such as information technology) to meet workforce needs." The revolutionary changes of the still-emerging information age are profound and Nebraska's institutions for post-secondary education face significant challenges to provide, as termed by Joseph Aoun [8], "robot-proof education in the age of artificial intelligence" for its students and a highly effective workforce and citizenry for the state's economic and societal future. Accordingly, one of the CSPPE's major goals is that: *Nebraska colleges and universities will foster critical thinking skills and provide their graduates*

*with the knowledge and workplace skills needed to be successful employees, innovative entrepreneurs, and responsible citizens on a global stage.*

The proposed Mathematical Data Science program recognizes that an information-age education requires quantitative and analysis skills not only for professionals with mathematics, statistics, computer science and engineering degrees, but also for professionals across business, life sciences, agriculture, social sciences, education, journalism, humanities, arts, etc. This program is designed to provide an educational foundation in computing and informatics, but with a focus on their applications that encourages for a student's field of interest to guide personalization of their program and that supports diverse multidisciplinary problems.

Information-age educational programs that deliver value to students are fundamental to addressing demographic challenges. The CSPPE notes: "Overall, institutions of higher education will see increased competition for traditional-age, in-state students." In response, the CSPPE calls for Nebraska institutions to intensify efforts to recruit and retain Nebraska students, out-of-state students, and students from demographically under-represented groups. Accordingly, one of the CSPPE's major goals is that: *Nebraska's institutions and policymakers will increase participation and success in postsecondary education, particularly for low-income and underrepresented populations, and ensure that all Nebraskans are able to access and successfully complete postsecondary education appropriate to their individual needs and abilities, unrestricted by age, culture, disabilities, religion, race, ethnicity, gender, sexual orientation, gender identity, nationality, socioeconomic status, or geographic location.*

Information-age education that produces a future-ready workforce is fundamental to addressing economic challenges. The CSPPE notes: "Employers are demanding a workforce that can keep pace with an explosion of knowledge and rapid technological change. Businesses are seeking technical assistance in using technology to become more productive and profitable. Economic growth in Nebraska is limited by shortages of workers, especially those with technical training." Accordingly, one of the CSPPE's major goals is that: *Higher education in Nebraska will be responsive to the workforce development and ongoing training needs of employers and industries to sustain a knowledgeable, trained and skilled workforce in both rural and urban areas of the state.*

The proposed program addresses the increasing need for workers with a foundational education in computing and information systems, particularly as computing is applied in diverse disciplines. Because computing and information systems are increasingly ubiquitous across domains, organizations frequently struggle to find computing personnel who have a sufficient foundation in the operational domains of the organization and domain personnel who have a sufficient foundation computing and information systems. There is a great and growing need in the workforce for personnel who can span or bridge both roles. The proposed program is specifically designed to educate students in using computing and information systems to solve multidisciplinary problems in diverse fields, using real-world examples from stakeholders such as business, government, and non-profit organizations.

The CSPPE recognizes the growing "competition for state funding" and demands for "accountability and performance" in higher education. Accordingly, one of the CSPPE's major goals is that: *Higher education in Nebraska will be effective in meeting the needs of students and the state, will be efficient in its expenditure of the state's resources, and will be accountable for developing, sustaining, and demonstrating exemplary teaching, learning, research, and public service.*

This new Mathematical Data Science program will help break down silos within the university so that units across UNL will collaborate in an effective, exemplary program in an area of significant need and demand and will do so with cost-effective shared operations that mitigate against costly duplication.

## **E. Evidence of Need and Demand**

1. Need: *[Address institution, community, region, state and nation. Evidence may include quantifiable and/or qualitative data regarding workforce needs, job and educational opportunities for graduates, potential for the program to contribute to society and economic development.]*

One of the most notable and disruptive impacts of the emerging age of artificial intelligence and robotics is the replacement of human work by ever-more-capable computing systems and associated machinery. These trends already are challenging the equilibrium of our society. Educational institutions have a great responsibility to prepare its graduates for the workforce of the twenty-first century, in which the workplace, lives, and careers will be significantly altered by these technologies.

The replacement of jobs in manufacturing is the leading edge of the broader revolution. Of course, this revolution creates jobs for math and computer science majors, but there are broader needs related to the broader changes. For example, Aoun cites:

- An executive at Wells Fargo who notes the replacement of tellers, bankers, and accountants with data scientists and applications developers who create, modify, and use sophisticated financial models based on massive stores and streams of financial data and provide diverse online customer services. These workers need analytical and computational skills, but also financial expertise.
- A CEO of a legal technology company who notes the replacement of legal professionals for research, fact-checking, and cross-referencing by AI systems that are more rapid, more accurate, and less expensive. Successful team members will understand how to effectively deploy and employ these computing and information technologies to meet legal needs.
- Executives in the media industry who note the increasing reliance on the power of big data and advanced analytics software to structure and deliver content and advertising. Media companies require employees who can understand and utilize these tools effectively and creatively.
- A vice president of an advanced engineering and manufacturing firm who notes the impact of sensors and the Internet of things (IOT) not only for product engineering and manufacturing, but also for monitoring and maintenance of products even at customer sites, changing the nature of customer services. Employees in engineering, advanced manufacturing, maintenance, and customer service must utilize increasingly sophisticated product information systems.
- Medical experts who note the emerging use of AI for medical research, assistive diagnoses, and personalized medicine, and of robots for surgery. Creating and using these systems will require workers with proficiencies in data analytics, computing and informatics technologies, and medicine.

A theme across these examples is that the future workforce will require employees with foundations in both computing technologies and a field of application, but, beyond that, the ability to solve domain and multidisciplinary problems with computing technologies in an organizational context.

Projections about such a dynamic future are difficult and there are few sources for projections about the growth of technology-related jobs in diverse fields. (Most projections, e.g., from the Bureau of Labor Statistics, break down jobs by discipline without regard to the changing nature of those jobs.) However, IDC projected 14 million new jobs related to just cloud computing, with a 27% compound annual growth rate (CAGR) in banking, 28% CAGR in insurance, 26% in healthcare, and similar rates in other fields [13]. Taking just the banking industry, issues such as open banking, regulatory compliance, robo-advisers and voice assistants, cybersecurity, biometrics, and blockchain applications will transform the industry [14].

Furthermore, at the heart of these advances and emerging technologies is data. According to a report by World Economic Forum [15], “Volumes of data are growing at a rate of 40% per year and will increase 50 times by 2020. A measure of the speed of growth is the estimate from Singapore-based Aureus Analytics that 90% of all data in the world was created in the last two years. As mobile usage goes up, so do personal data volumes. Over half (51%) of all internet users worldwide are in Asia: China has 1.3

billion mobile subscriptions out of a population of 1.36 billion, while India has 0.91 billion mobile subscriptions out of a 1.25 billion population.” Microsoft reported with the advances brought forth by cloud computing, there will be new jobs related to data science (e.g., big data analysts) created because of data volumes growing at a rate of 40% per year due to cloud computing [16].

Indeed, Data Scientist was ranked #1 on Best Jobs in America ([https://www.glassdoor.com/List/Best-Jobs-in-America-LST\\_KQ0,20.htm](https://www.glassdoor.com/List/Best-Jobs-in-America-LST_KQ0,20.htm)) in 2016, 2017, 2018, and 2019, and is ranked #3 in 2020, with a Job Satisfaction rates of at least 4.0 out of 5 each year. The demand for Data Scientist in terms of the number of job openings has increased each year from 1,700+ to 6,000+, and is expected to grow further.

Additional indications of need are provided by other research universities that offer informatics degrees, even if they differ with the innovative program proposed for UNL. The University of Indiana Luddy School of Informatics, Computing, and Engineering offers a Bachelor of Science in Informatics degree, which requires more informatics coursework and less coursework in the cognate focal area and which does not have an interdisciplinary core [17]. The program’s class of 2017 & 2016 graduates had a 96% placement rate (with 86% in jobs and 10% in graduate school) and class of 2018 & 2017 graduates had a 95% placement rate (with 84% in jobs and 11% in graduate school) [18]. The University of Washington Information School offers a Bachelor of Science in Informatics degree, with five concentrations including one in data science, and the curriculum does not particularly emphasize interdisciplinary aspects [19]. It has a 90% employment rate in various fields, including IT, consulting, business/finance, and retail [20], with the median starting salary for full-time employment is \$85,000. In addition, 89% of the survey respondents completed at least one internship [20], indicating the demand for students with skills in informatics as well as a practicum opportunity for better preparing and training students. At the University of Illinois, there is a related program called CS+X programs where the X is an Arts and Sciences field [21]. The program focuses more on applying computer science in particular and mathematical problem solving to an area in X, and does not necessarily emphasize large data science or data-specific techniques as outlined in the proposed Data Science program in this document. However, the flexibility provided by the CS+X programs is akin to that provided by the focus areas of the proposed Data Science, which we expect to expand as the proposed Mathematical Data Science program matures over time if implemented. The CS+X programs have been cited as a factor in leading to jump in overall student applications to enroll in the University of Illinois [22] and have been “cited as an example of a growing trend towards integrating computer and data science into a variety of disciplines, even as the computer science enrollment boom strains colleges”, in a 2020 article published in The Chronicle of Higher Education, as a discipline that is transforming higher education [23].

2. Demand: *[Include the extent of student interest in the proposed program. Evidence may include quantifiable and/or qualitative data regarding expected number of students to enroll in each of the first five years of operation, and minimum number of students required to make the program viable.]*

The increasing demand from students for coursework and degrees in the computing field can be seen in the numbers of students in the Math and Computer Science Departments. In particular, there are over a dozen students already enrolled in the new Statistics and Data Science option offered by the Department of Mathematics in Fall 2020. We believe that the proposed Mathematical Data Science major will attract new students who come to UNL because of this major. This program will be unique in the Big 10 region; although there are programs with some similarities, e.g., the CS+X programs at Illinois and the Informatics program at Indiana, none offer the integrated program that is proposed. It is somewhat difficult to quantify the numbers, but high student interest in computing and the career opportunities indicate that there will be more than a viable number of students.

The structure of the program requires at least one viable batch of approximately 20 entering students. We have sized the program with up to 20 students for the soft rollout in 2021-22 and then ramping up to 40 entering students per year for a steady-state of 160 majors within five years.

Note also that based on data from the National Center for Education Statistics (NCES)'s Integrated Postsecondary Education Data System (IPEDS), using all six-digit CIP codes related to Data Science, there has been a steady growth in terms of number of bachelor degrees conferred:

<b>Year</b>	<b># Bachelor Degrees Conferred</b>
2013	3,903
2014	3,633
2015	4,186
2016	4,407
2017	4,907
2018	5,370
2019	6,867

In particular, the University of Indiana's Informatics program's graduation numbers for the past five years are: 2014-2015: 307, 2015-2016: 371, 2016-2017: 433, 2017-2018: 548, 2018-2019: 501, showing steady growth over the years. Meanwhile, the University of Illinois's CS+X program and the University of Washington graduate more than 100 students per year, which indicates viable demand from students. The CS+X program is fairly new and limited to a few arts and sciences fields, but already had enrollments in the fall of 2017 of 172 majors with 69 students in CS+Linguistics, 46 in CS+Chemistry, 31 in CS+Astronomy, and 26 in CS+Anthropology. It graduated 77 students in 2017. Although the University of Illinois is a larger school than the University of Nebraska, the proposed focal areas at UNL span more disciplines and the program features an attractive interdisciplinary core.

#### **F. Avoidance of Unnecessary Duplication**

A key challenge for UNL and other universities is how to address the growing need for computing education across disciplines and, in that, a key issue is how to avoid unnecessary programmatic duplication. The Mathematical Data Science major delivers mathematical modeling, statistics, and computing and informatics instruction in a cost-efficient unified program serving students across fields and units, thereby avoiding more costly duplication of such instruction across those units.

The Department of Mathematics rolled out the Statistics and Data Science option for math majors in Fall 2020, an option that has already seen a lot of interest from our students. This major, however, requires a heavy load of advanced mathematics courses, many of them proof-theory based courses which are not needed by users in many data science fields, where the applicability aspects are more important than the theoretical ones. The proposed Mathematical Data Science major offers a pathway for scientists focused on implementation and communication, rather than design of algorithms with a focus on the interdisciplinarity of the field.

The proposed major shares some elements with existing minor programs at UNL, which also avoids duplication. Two courses, CSCE 155T and CSCE 311, can be taken for the computer science, computational biology and bioinformatics, digital humanities, and informatics minors. Although these minors share some elements with the proposed program, they do not deliver the breadth of content and interdisciplinary professional development for students as the proposed program, do not engender the same level interdisciplinary collaboration among faculty and units as the proposed program as a catalyst for graduate and research programs, do not have the same potential for engagement with external stakeholders, and do not have the potential that a major degree program has for providing a signature attraction for the university.

#### **G. Adequacy of Resources:**

1. Faculty/Staff

The Department currently has adequate resources to support this program for the 2022-23 AY for a small number (at most 20) of mathematical data science majors. Beyond that and as the number of majors increases, additional faculty resourced at 1 FTE per 20 majors will be required to handle the increase in instruction, particularly in the core required courses Math 104, 203, and 315, in the capstone course Math 435, as well as for the administration of the program. Additional staff will also be needed to provide overall support for the program, including support for administration, advising, and recruiting.

## 2. Physical Facilities and Equipment

For 20 majors or less additional physical facilities will not be needed to support the program.

## 3. Instructional Equipment and Informational Resources

No additional instructional equipment and informational resources are required to support the program as described in this proposal.

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**Undergraduate Data Science Program  
University of Nebraska-Lincoln**

The proposed undergraduate Data Science program is a joint, interdisciplinary effort by three departments at the University of Nebraska-Lincoln (UNL): (1) Computer Science and Engineering (CSE), (2) Mathematics, and (3) Statistics. There are also three colleges involved: College of Engineering (COE), College of Arts and Sciences (CAS), and College of Agricultural Sciences and Natural Resources (CASNR).

The effort has led to the development of three “sister” majors of the undergraduate Data Science program, to be offered by the three departments: (1) Computational Data Science (CDS), (2) Mathematical Data Science (MDS), and (3) Statistical Data Science (SDS). The three majors share several common properties: (1) same student learning outcomes, (2) admission procedures, and (3) several elements of the requirements especially: (a) the design of core requirements and focus area electives, (b) facilitating dual matriculation with another non-Data-Science major, and (c) encouraging participation from other academic units across campus. Due to the differences in approaching data science in order to meet diverse student needs towards acquiring different aspects of data science, leverage existing teaching expertise and resources, engage strategic partners and stakeholders, as well as to meet individual departmental and college-specific requirements, the three majors differ in several of the courses. The table below summarizes the commonalities and differences across the three majors in terms of required courses. [Note also there are additional differences due to college-level requirements—e.g., CASNR residency requirements, CAS college distribution requirements, COE professional requirements—beyond these major courses that are not listed in this document.](#)

	Computational DS	Mathematical DS	Statistical DS
<b>Data Science Foundations</b>	<b>Same set of three CS courses [9 hours]</b>		
	<b>Same set of three Math courses [9 hours]</b> ( <i>Note: Mathematical DS and Statistical DS allow for substitute courses, which could lead to 12 hours total</i> )		
	<i>Option 1: One out of several statistics* courses [3 hour] Option 2: STAT101 + STAT102 [6 hours]</i>	<i>Option 1: Two out of several statistics* courses [6-7 hours] Option 2: STAT101 + STAT102 [6 hours]</i>	STAT101 + STAT102 [6 hours]
<b>Data Science Professional Practice</b>	<i>Practicum [3 hours] + Capstone [6 hours]</i>	<i>No practicum + Math in the City (Capstone) [3 hours]</i>	<i>No practicum + One of three STAT 400-level courses [3 hours]</i>
<b>Data Science Focus Area Electives</b>	<b>5 courses out of eight focus areas:</b> Artificial Intelligence, Software Applications, Data Pipeline, Statistical Modeling, Mathematical Modeling, Applied Computing: Journalism, Applied Computing: Sociology, Applied Computing: Natural Resources [15 hours] ( <i>Note: 4 or 5 courses for Computational DS for 12-15 hours</i> )		
<b>Hours of Major Courses</b>	45 hours	42-45 hours	42-45 hours

\* several statistics courses offered by other academic units such as Sociology and Psychology.

The effort has also led to the arrangement of a *joint Data Science advisory committee* for these three majors under the umbrella of the Data Science program at UNL. Each of the three departments will have faculty representatives serving on the committee that will reconvene at a regular basis (e.g., once every semester) to review and revise the program, to explore and add new focus areas, to consult on student advising and support, to coordinate course scheduling, and so forth, in order to continually improve the program to better prepare our students to succeed in the program and beyond.

6.b. Recommendation from the College Curriculum and Advising Committee to approve CAS Experiential Learning (new college CDR; no additional credit hours) .

## CAS Experiential Learning

Consistent with the N2025 commitment that each student has the opportunity to co-create their UNL education, the Experiential Learning (EL) requirement supports and enhances students’ educational experiences and career and life goals in flexible, diverse, and individualized ways.

An “Experiential Learning” experience at UNL should include components of significant creative work, skill-development, design, decision making, or stakeholder-based problem solving. These activities should occur in a real-world context and allow for some experience with real-world application, allowing for the enhancement of transferable skills.

The experience should require active engagement in formulating questions and solving problems, such as investigation, applied inquiries, or experimentation, and should provide connections with previous coursework and future career goals. Communication, reflection, and self-assessment are critical components of any EL experience.

### In CAS, Experiential Learning Experiences include

- Internships
- Undergraduate Research or Theses
- Study Abroad
- Field Studies
- Civic Engagement and/or Service Learning
- Case Studies/Simulation/ Reality-based Projects
- Client Work
- Classes with Design/Decision/Problem-solving Components
- Creative Activity
- Practicum or Student Teaching
- Competitions

Note: Special Topics and Independent Study will not be automatically included

### Focus will be on planning, documenting, growth, and reflection

	Pre-requisite	Planning and Documenting	Growth and Reflection
<b>Established Courses</b> (including service learning, ed abroad, fieldwork)	Varies	Syllabus with LOs set for all students	Academic Work
<b>Research or Thesis</b>	Permission (granted after planning)	Agreement between student and faculty on LOs along with expectations for progress, duties, hours, check-ins	Academic Work Progress toward product
<b>Internships</b>	Permission (granted after planning)	Agreement between student, faculty, and employer on LOs, title, location, hours, pay, supervisor	Academic Work Student/Employer Evaluations Career Coaching
<b>Non-Credit Bearing Experiences</b>	Will be considered case by case in the future through a process yet to be determined.		

The CAS Curriculum and Advising Committee follows the Academic Solutions Council's recommendations in proposing the following guiding principles for how a transcripted graduation requirement for experiential learning might be implemented effectively and equitably for all undergraduate students in CAS:

- Units may identify existing courses that already reflect the spirit of the EL requirement or they may develop new courses and opportunities as needed.
- Students may fulfill the EL requirement through any course with an EL designator, including those offered outside of their degree programs or colleges.
- While the EL requirement ensures that each student will complete at least one EL course or co-curricular opportunity prior to graduation, units are encouraged to provide and promote multiple EL opportunities for students as appropriate to the specific discipline.
- Units should work to ensure that EL opportunities are equitable and inclusive for students regardless of financial or social background.

Proposal for approval in the Spring 2021 Faculty meeting:

*The faculty in the College of Arts and Sciences support the N 2025 recommendation that an experiential learning requirement be implemented for all undergraduates pursuing bachelor degrees in the College of Arts and Sciences beginning with the entering first-year class of 2022.*