Proposal for the Creation of a Designated Emphasis in Computational Social Science

In consultation with the Dean of Graduate Studies, the campus Associate Dean for Graduate Programs, and the L&S Associate Dean for Research and Graduate Studies, we propose the creation of the following Designated Emphasis in Computational Social Science.

1. Description of the Designated Emphasis

Digital technology has not only revolutionized society but also the way we study it. For one, an increasing part of human interaction leaves a massive digital footprint. Studying it allows us to gain unprecedented insights into what society is and how it works, including aspects that had long been evasive, such as intricate social networks and behavioral dynamics through time. Additionally, today’s computational power allows us to both detect hidden patterns through artificial intelligence and to simulate social dynamics. The latter enables us to explore hypothetical situations that may not even exist in reality, but are useful to understand generative mechanisms and causality.

Computational social science provides scholars with the tools to deepen the understanding of long-standings questions in the social sciences, as well as explore new ones. As suggested by the term itself, the approach is per definition interdisciplinary and the DE in Computational Social Science is both interdisciplinary in terms of requiring foundations in computational methods, data analysis, and social science theory, and it is multidisciplinary in terms of blurring the traditional boundaries between disciplines in the social sciences.

Across its diverse departments, UC Davis offers many of the required courses to become a leader in the exploitation of the current opportunities. This DE aims at creating synergies among the existing courses and research initiatives by bringing them together in a coherent way. It allows students with computational and mathematical skills to deepen their understanding of social science theory and to study unanswered social science research questions; and it allows students from the social sciences to improve their analytical skills in areas like big data analysis, computer simulations, network analysis and machine learning. In 2018, we live in an economy where five out of the six most valuable companies in the world are built on business models that are driven by computational social science approaches, most of them headquartered not far from UC Davis. This DE provides new and complementary dimensions to existing graduate programs, creates synergies and increases UC Davis’ visibility in a field of inquiry that has much more demand than supply of human resources. This increases the competitiveness of our students for employment and of our faculty projects for external funding.

2. Description of the Academic Nature of the Designated Emphasis

A. Affiliated Ph.D. Programs List

The following Ph.D. programs are initially affiliated with the DE (letters in Appendix B):

i. Communication
ii. Economics
iii. Computer Science
iv. Geography
v. Linguistics
vi. Political Science
vii. Psychology
viii. Sociology
Faculty from Physics and Statistics also support this DE, although their PhD programs is not officially affiliated at this time of foundation.

B. Dean’s Letters
Appendix A provides a letter of support from the Elizabeth Spiller, Dean and Professor, College of Letters and Science (L&S), including her elaboration on resources and indication of support for the proposed Designated Emphasis. All initially affiliated programs are part of the College of L&S, or are Graduate Groups with membership from L&S faculty.

C. Chairs’ Letters
Appendix B provides letters from the Chairs of each of the initially affiliated Ph.D. programs.

D. Affiliated Faculty
Appendix C provides letters from interested faculty members. The list includes (ordered by the following alphabetical index):

i. Communication
   1. Seth Frey
   2. Martin Hilbert
   3. Cindy Shen
   4. Jingwen Zhang

ii. Computer Science (GG Computer Science)
   5. Raissa D’Souza
   6. Vladimir Filkov
   7. Felix Wu

iii. Economics
   8. Colin Cameron
   9. Burkhard C. Schipper

iv. GG Geography and Environmental Science and Policy
   10. Mark Lubell
   11. Tyler Scott

v. Linguistics
   12. Raul Aranovich
   13. Kenji Sagae

vi. Physics
   14. Daniel Cox
   15. Jim Crutchfield
   16. John Rundle

vii. Political Science
   17. Rachel Bernhard
   18. Amber Boydstun
   19. Ryan Hübert

viii. Psychology
   20. Shelly Blozis
   21. Drew Fox
   22. Mijke Rhemtulla

ix. Sociology
   23. Xiaoling Shu
   24. Jacob Hibel
   25. Robert Faris
	x. Statistics
E. Admissions Criteria

PhD students from currently affiliated programs are eligible for admission. The candidate should apply to the Chair of the DE by sending the standard form from Graduate Studies (https://grad.ucdavis.edu/sites/default/files/upload/files/current-students/gs323-de-app.pdf). Applications should include a separate letter stating how admission to the DE will enhance the applicant’s doctoral work. Applications will be reviewed and selections made by the DE executive committee.

F. Curriculum

The proposed curriculum is described below. Courses consist of existing courses. The DE requires at least 4 courses totaling 16 units, consisting of one required course (CMN 275Y (detailed outline provided in Appendix D)) and 3 electives, with one elective required from each of 3 different categories.

1. Required courses:

Students are required to complete four graduate courses, each of 4 units, relevant to the Designated Emphasis. These include:

- CMN 275Y: Hybrid online course with lecture recordings and weekly face-to-face discussion sessions with participating faculty members – 4 units
- At least one course from each of the three categories of Elective Courses below. At least one of these three courses needs to be taken from a program other than the students PhD program.

**TOTAL REQUIRED UNITS: 16**

2. Elective courses:

In line with F1, students must take three elective courses, totaling 12 units. The choice of further courses in subjects related to the DE will be left to the student and the student’s advisor. The DE recognizes three categories of relevant courses. Students can petition for ad-hoc approval of other elective courses in each category from the Executive Committee of the DE (especially 280s and 290s Special Topics and Seminar courses from the affiliated PhD programs or appropriate undergraduate courses). In this sense, the courses listed below aim at communicating the nature of the three categories, while specific courses can be approved by the Executive Committee in an ad hoc manner.

Computational & Mathematical & Statistical Foundations

- **PHY 256A&B. Physics of Information – 4 units**
- **ECS 222A. Design and Analysis of Algorithms – 4 units**
- **ECS 235A. Computer and Information Security – 4 units**
- **ECS270. Artificial Intelligence – 3 units**
- **ECS271. Machine Learning and Discovery – 4 units**
- **ECS272. Information Visualization – 4 units**
- **ECN 240A. Econometric methods – 4 units**
- **GEO 200CN. Quantitative Geography – 4 units**
- **LIN 277. Computational Linguistics – 4 units**
- **POL 281. Statistical Computing Issues in Political Science – 4 units**
- **STA 243. Computational Statistics – 4 units**
- **STA 250. Special Topic: Data, Computing and Science – 4 units**
- **STA 260. Statistical Practice and Data Analysis – 3 units**
Social Science Theory and Substance:
- CMN 233. Persuasive Technologies for Health – 4 units
- CMN 251. Digital Technology and Social Change – 4 units
- CMN 252. Computer-Mediated Communication – 4 units
- CMN 255. Social Media – 4 units
- LIN231. Syntactic Theory – 4 units
- POL 215. Introduction to Modeling Political Behavior – 4 units
- POL282. Advanced Modeling of Political Behavior – 4 units
- PSC 241. Attitudes and Social Influence – 4 units
- SOC 220. Deviance, Law, and Social Control – 4 units
- SOC 226. Sociological Social Psychology – 4 units
- SOC 265B. Theory in Contemporary Sociology – 4 units
- SOC 280. Organizations and Institutions – 4 units

Applied Computational Social Science:
- CMN 212. Web Science Research Methods – 4 units
- CMN 213. Simulation Methods in Communication Research – 4 units
- CMN 214. Analysis of Communication Networks – 4 units
- ECN 203B. Game Theory – 4 units
- ECN 230A. Public Economics – 4 units
- LIN 227. Text Processing and Corpus Linguistics – 4 units
- POL 279. Political Networks: Methods and Applications – 4 units
- POL 284. Advanced Network Analysis – 4 units
- PSC 211. Advanced Topics in Neuroimaging – 2 units
- PSC 209A Introduction to Programming: Matlab – 4 units
- SOC 206. Quantitative Analysis in Sociology – 4 units
- SOC 207A. Methods of Quantitative Research – 4 units
- SOC 208. Topics in Advanced Quantitative Methods in Social Science – 4 units

3. Qualifying Examination:
The student’s Qualifying Examination Committee must include at least one member of the DE. The Chair of the DE and the student’s Ph.D. program Graduate Adviser must co-sign the Qualifying Examination Committee form, which is submitted to Graduate Studies for approval by the Dean of Graduate Studies. The Qualifying Examination will assess the student’s depth and breadth of knowledge within the area of the DE, as well as the Ph.D. program area. Satisfactory performance on the Qualifying Examination for the Ph.D. will be judged independently from performance on the DE. Thus, an allowable outcome of the Qualifying Examination is that the student’s performance may be “passing” for the Ph.D. but “not passing” for the DE. In this event, the Executive Committee of the DE will define a plan for remediation. The plan may include, but is not limited to re-examination by the DE Executive Committee, coursework, teaching, or preparation of a paper. If the student is re-examined, the outcome is limited to “pass” or “fail”. If the student receives a “fail”, the student is disqualified from the DE.

4. Dissertation Requirements:
The dissertation shall contain original research connected with the DE and its relation to the student’s research in the home program, commonly by applying or developing computational social science methods. The student’s Dissertation Committee shall be selected in accordance with the regulations of the Ph.D. program, but must include at least one member of the DE. The DE member may be the Dissertation Committee Chair.
5. **Degree Conferral Process:**
The Designated Emphasis will be awarded solely in conjunction with the Ph.D. and will be signified by the degree designation “Ph.D. in X with Emphasis in Computational Social Science” where X is the Ph.D. program.

**G Student Advising**
The DE will appoint a faculty advisor for each student admitted, in agreement with the student’s main advisor. This advisor may be different from the advisor appointed by the student’s Ph.D. program, and if so will serve the candidate only in matters relating to the DE.

3. **Administrative Matters**
   A. **Bylaws**
   Appendix E provides the Bylaws for this DE.

   B. **Resources**
   No additional resources are required. The Chair of the DE will be responsible for record keeping and the Executive Committee of the DE for preparation of materials required for the periodic reviews by Graduate Council’s Program Review Committee.