Proposal
Data Science in the Liberal Arts: Shaping the Curriculum

Submitted to
Alliance to Advance Liberal Arts College (AALAC)

Coordinator: Deepak Kumar (Bryn Mawr College)

Faculty Workshop Location: Bryn Mawr College

Goals: The goal of the proposed workshop is to help define the role of Computer Science programs/departments in the emerging Data Science programs at AALAC institutions. The practice of Data Science, while currently grounded in Computer Science, Mathematics, and Statistics, spans and impacts intellectual enquiry in all disciplines across the campus. Given the enrollment challenges Computer Science programs are already facing, this workshop will closely examine the role Computer Science departments can effectively play in different incarnations of Data Science programs at liberal arts colleges.

Background: As an emerging discipline, Data Science defies definition. Whether it is a science is itself a topic of much debate, though most agree that the core of the discipline involves the principles and practices of data collection, storage/archival, integration, analysis, inference, communication, and ethics. It is also universally acknowledged that steps should be taken to ensure that all undergraduates should possess a basic understanding of data literacy and to offer Data Science majors/minors to those interested in deeper immersion. Initially, most new Data Science programs were created at the graduate-level. Only recently have undergraduate colleges started creating new programs in Data Science (for example, Amherst College, Denison University, Mount Holyoke College, Smith College, to name a few), or are actively in the process of creating one (included in this latter group are Bryn Mawr, Claremont Colleges Consortium, Haverford, Wellesley, and Swarthmore colleges). In the Computer Science, Mathematics, and Statistics domain, different proposals for undergraduate curricula in Data Science have been recently proposed. Further, most current instantiations of undergraduate Data Science curricula take a smorgasbord approach of essentially cobbling together existing courses to define the curriculum. In our view, this approach is insufficient for laying the foundations of Data Science in the liberal arts.

Computer Science programs at both small and large institutions are seeing unprecedented growth in the numbers of majors. Small liberal arts colleges like the AALAC member institutions are facing numerous challenges due to increased student interest and resource limitations. Taking on the additional commitments for Data Science programs will further stretch what are already overburdened programs. This workshop will present an opportunity for faculty in Computer Science to discuss and deliberate about these challenges and how best to address them and to effectively engage with the Data Science initiatives on their campuses.

Participants: This 2-day workshop will bring together faculty from Computer Science and other disciplines at AALAC colleges to examine, explore, and participate in the shaping of a vision for the education and scholarship of Data Science in liberal arts institutions. We will invite faculty

who have already implemented Data Science programs, as well as those who are either in the process of creating one, and those who are creating programs that are focused more on the Data Analytics domain. Additionally, the workshop will also bring together faculty from several existing consortia that are also trying to grapple with the questions raised above. These include the Liberal Arts Collaborative for Digital Innovation (LACOL) and the Liberal Arts Consortium for Computer Science. There is a healthy intersection of memberships in these consortia and AALAC colleges.

Topics & Outcomes: Of particular interest is the different curricular structures and how those have balanced Computer Science, Mathematics & Statistics, and exposure to other areas of study. Also of interest are the different administrative structures used to launch Data Science programs: as a free-standing department; as an interdisciplinary program; with dedicated faculty lines or built on existing institutional resources. An important topic of discussion will be the potential for changing or aligning existing courses to introduce some Data Science concepts. Based on the discussions and deliberations, we expect that an active working group or a community will be formed whose charge will be to create one or more white papers on the shape of Data Science curricula in the liberal arts, with a particular eye toward the role of and impact on computer science programs.

Workshop Leaders & Organizing Committee
Valerie Barr, Mount Holyoke College
Andrea Danyluk, William College
Elizabeth Evans, LACOL & Haverford College
Sorelle Friedler, Haverford College
David Kauchak, Pomona College
Deepak Kumar, Bryn Mawr College
Panagiotis Metaxas, Wellesley College
Eni Mustafaraj, Wellesley College
Richard Wicentowski, Swarthmore College

Designated Workshop Liaison
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Tentative Workshop Agenda

The workshop will have two invited keynote speakers, and discussion panels. The core of the workshop will be comprised of several mini-breakout workshops followed by reports. The following topics will shape the overall agenda:

- Review of current proposals for Data Science curricula. Identify core topics of an undergraduate Data Science major/minor (versus a graduate program).
- Different flavors of Data Science programs at liberal arts colleges.
- What other departments expect from Computer Science programs?
- What new courses can/should Computer Science programs offer to support the core of Data Science (an inventory)?
- What existing computer science courses can be redesigned to support Data Science?
- Challenges for enrollments in Computer Science with the addition of Data Science?
- What support is needed to host a new Data Science major/minor?
- What opportunities exist for professional development of current faculty?
- Follow up planning activities: white paper(s), development of new courses, etc.
- Workshop and follow-up evaluations.