MIT Schwarzman College of Computing – Organizational Structure

January 30, 2020

This document describes the initial organizational structure of the Schwarzman College of Computing (SCC), drawing from the reports of the Computing Task Force Working Groups[1] and on-campus forums in Spring 2019. The document further reflects input gathered through review of three major revisions of a "strawman" organizational plan, the first revision having been circulated with the academic Deans and the co-chairs of the Computing Task Force Working Groups, the second revision having been circulated with the membership of the five School Councils and the Faculty Policy Committee, and the third revision having been circulated with the full MIT faculty. This plan is being put in place in January 2020, but much remains to be defined and the organization will continue to be adapted over time.

The focus of this document is primarily the initial academic units and organizational structure of the College, intended to facilitate the College mission through improved collaboration and coordination of existing labs, centers, and other units that have a computing focus; through potential changes in such units; and through the development of new activities and programs. Individual degree programs, classes, and other academic activities are not covered in detail as they are largely the responsibility of units within this organizational structure, in collaboration with other units across MIT, under the guidance of the College leadership. A separate document considers details of the reorganization of the Department of Electrical Engineering and Computer Science (EECS), which was implemented this semester and was developed over multiple iterations with the EECS faculty and the Engineering Council between June and August.

The Schwarzman College of Computing is being created to lead MIT, academia, and the world in addressing the opportunities and challenges of the computing age. Widespread advances in computing – from hardware, to software, to algorithms, to artificial intelligence – have improved people's lives in myriad ways, and major advances will continue in nearly every arena. Yet at the same time, we face important and growing challenges regarding social and ethical implications and responsibilities of computing, perhaps most visibly with the increasing applicability of artificial intelligence. Moreover, despite unprecedented growth of computer science, artificial intelligence, and related academic program areas, there remains substantial unmet demand for expertise in computing, oversubscribed computer science academic programs, and constant need to keep up with rapidly changing material at both the graduate and undergraduate level.

Historical parallels with the era of industrialization in the latter 1800s in the United States are quite striking. Technological innovations then spurred rapid and broad changes in the economy and society, with the practice of technology often being ahead of the understanding, and with

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[1] These reports are available at https://comptf.mit.edu/working-group-final-reports.

substantial and sometimes disruptive social impact. The need for better understanding and training led to the establishment of MIT and other technology schools. In today's computing era, MIT and other leading academic institutions need to again play an important role in developing the research and educational basis for new technologies that can enable broad advancement of humankind, doing so with careful attention to addressing potential societal challenges.

The mission of the Schwarzman College of Computing (SCC) is to harness advances of the computing age, by transforming the capabilities of academia in three key areas:

(i) *computing fields* – supporting the rapid growth and evolution of computer science (CS) and computational areas of allied fields such as electrical engineering (EE), as reflected notably in the rise of artificial intelligence (AI);

(ii) *computing in other disciplines* – facilitating research and teaching collaborations in computing, across a broad range of fields from the social sciences, arts, and humanities, to the sciences and engineering, rather than disjoint activities or placing one field in service of another;

(iii) *social and ethical responsibilities of computing* – leading change in academic research and education, in both the development and use of computing, as well as in effectively informing practice and policy in industry and government.

These three areas are all critically important given the opportunities and challenges posed by today's and tomorrow's computing technologies. Moreover, these areas are not independent but rather should inform and amplify one another.

The SCC is expected to:

- Address the tremendous need for, and the rapidly changing content of, undergraduate and graduate computing education, particularly in: (i) CS, parts of EE, and evolving areas of computing such as AI; (ii) computing in other disciplines including "blended" majors incorporating computing and other programs; and (iii) social and ethical responsibilities of computing, educating students about impacts and responsibilities of computing and how it applies in their field of study.

- Lead in the rapid evolution of computing fields, both in research and education, currently exemplified by the rise of areas such as AI and machine learning, bringing together and better coordinating existing academic and research units focused on computing as well as forging new activities and programs.

- Lead in the social and ethical responsibilities of computing, by bringing scientific, technological, social science, and humanistic approaches together in the new Social and Ethical Responsibilities of Computing (SERC), described in Section 8, via: (i) education that helps develop "habits of mind and action" for those who create and deploy computing technologies; (ii) research on computing and society that brings together multiple disciplines and approaches; and (iii) impact on government and corporate

policy makers as well as active engagement with the general public.

- Facilitate continued change, through academic structures that are more flexible and interconnected than conventional departments and schools, while at the same time reinforcing MIT's strength in computing fields such as CS, which generally have traditional departments at other top institutions. The SCC will have multiple types of academic structures to meet this variety of needs.

- Build collaborations in computing across MIT, involving faculty from a broad range of departments and schools who are engaged in computing education and research, via a variety of programs and affiliations including: (i) the Common Ground – a new teaching collaborative across departments for both disciplinary and interdisciplinary computing classes described in Section 9; (ii) centers with graduate programs in computing-oriented areas; (iii) interdepartmental computing research labs and centers; and (iv) additional scholarly activities in computing, including workshops and other convenings.

- Improve equity and inclusion in computing, both at MIT and broadly, with the aim of helping address diversity in computing, with regards to gender, race, and range of backgrounds and experiences. Focus on increasing the diversity of top faculty candidates, with new programs for faculty, postdocs, and PhD students, as well as improvements to existing ones. Broaden participation in computing classes, majors, and minors at all levels, including improvements to the climate and the development of more effective connections with other disciplines.

- Facilitate novel educational pilots and emergent areas of computing research, education, and practice, in collaboration with departments and schools across MIT, in core computing areas, and in engagement with companies, government agencies, and civil society organizations.

The SCC will include both existing and new academic programs and units. Bringing existing programs and units together will help facilitate coordination and alignment of computing education and research, as well as provide opportunities for improvement, such as improving coordination of the set of classes, majors, and minors that blend computing and other disciplines. Creating new programs and units will help address areas that are not well covered by existing ones, such as integrating computing with the social sciences and humanities, and addressing social and ethical responsibilities of computing.

Forming the College with a mix of existing and new programs does pose some organizational challenges, because existing programs come with substantial numbers of people and existing organizational culture(s), whereas new programs take time to get off the ground and need to develop ways of working. However, by recognizing and managing these differences, there can be benefits to having both existing and new programs in different stages of organizational development.

This organizational planning document is primarily focused on the overall structure of the College, rather than the content and activities of the academic programs or the internal organization of the various units which will be planned by those units under guidance of the Dean's office.

OUTLINE

Section 1: TYPES OF FACULTY MEMBERSHIP IN THE SCC

There will be several forms of faculty membership in the Schwarzman College of Computing, based on research, teaching, or external engagement activities as a member of one or more units of the College. Building on the history of strong MIT faculty participation in interdepartmental labs, centers, and institutes, the following faculty memberships are currently envisioned, each of which also confers membership in the College. These draw on suggestions contained in the Computing Task Force Working Group reports.

1. **Faculty member in the new Common Ground for computing education**, an interdepartmental teaching collaborative for computing education, described further in Sections 4 and 9 below. Activities are envisioned to include development and teaching of classes or modules and coordination of curriculum as part of a shared set of educational offerings in computing. It is expected that this will include classes and modules in all three key areas of the College: computing fields, computing in other disciplines, and social and ethical responsibilities of computing. This is expected to be a

renewable affiliation based on educational activities of the faculty member, needs of their home academic unit, and needs of the Common Ground.

2. **Faculty member in the new Social and Ethical Responsibilities of Computing area**, described further in Sections 4 and 8 below, which remains to be defined with broad input from across MIT, under the leadership of the College. These activities are expected to be developed in close collaboration with, and often offered with or through, the Common Ground and academic units and centers of the College and MIT more broadly.

3. **Faculty member in an academic unit or program in the SCC**, contributing to the activities of that unit or program. Initially this will be the Center for Computational Science and Engineering (previously named the Center for Computational Engineering), the Operations Research Center (ORC), which jointly reports to the Sloan School and the College, the Electrical Engineering and Computer Science (EECS) Department, which jointly reports to the Engineering School and the College, and the Institute for Data, Systems, and Society (IDSS) including the Statistics and Data Science Center (SDSC) and Technology Policy Program (TPP), as discussed further in Section 5 below. The College will also investigate additional academic centers or programs with computing-oriented graduate degrees in order to meet needs for computing graduate students beyond current programs.

4. **PI or affiliate in an interdepartmental research lab or center in the SCC**, initially this will be CSAIL, Laboratory for Information and Decision Systems (LIDS), and Sociotechnical Systems Research Center (SSRC), the latter two being closely connected with IDSS, as discussed further in Section 5 below. As is currently the case, a PI in a lab or center performs a substantial portion of their sponsored research there (generally at least half). PIs and affiliates in a lab or center may be from any department at MIT and working in any of the three key areas of the College: computing fields, computing in other disciplines, and social and ethical responsibilities of computing. Space constraints will continue to be a substantial limiting factor, as is generally the case at MIT as well as other academic institutions, particularly before the new building for the College opens.

5. **Faculty fellow or participant in an envisioned new "Center for Advanced Studies of Computing,"** described further in Sections 4 and 10 below, as part of semester- or year-long residential programs in one of the three key areas of the College: computing fields, computing in other disciplines, and social and ethical responsibilities of computing. This is expected to be a temporary affiliation generally beginning a semester or year prior to the start of a program, for planning activities, and continuing a semester or year after the end of a program, for follow-up activities. Such a center remains to be more fully defined and requires substantial fundraising to support its activities.

6. **Member of a committee or holding an academic administrative role in the SCC**. It is expected that there will be faculty committees for a number of the activities of the SCC, with members from departments and schools across MIT.

Membership in these units conveys membership in the College. Faculty in these units will function and be listed as members of the College as well as the given program or unit. Faculty members in the College will be represented on the Computing Council through the leadership of these units, and will be included in College activities. As is customary not only at MIT but throughout academia, membership in units is determined by the units themselves. However, the academic leadership of the College is charged with ensuring the overall breadth of the College, whether through broadening of existing units or the creation of new ones. There may be additional means of faculty membership in the College over time with new units and programs in the College, and conversely some of the above will not immediately be available as it takes time and resources for new programs and units to become operational (e.g., the Center for Advanced Studies of Computing).

The College faculty is expected to be considerably larger than the number of faculty appointments in the departmental units of the College (EECS and IDSS). For instance, initially with a total of about 275 faculty who are members of CCSE, CSAIL, ORC and LIDS, not accounting for duplicates who are members of more than one, about 60% do not have appointments in the departmental units of EECS or IDSS, and moreover about 30% do not have faculty appointments within the School of Engineering. The breadth beyond EECS and Engineering is expected to increase with expansion of these units and creation of new ones.

Section 2: STUDENT ENGAGEMENT WITH THE SCC

At MIT the responsibility for classes and degree requirements rests with the departments and programs, other than the General Institute Requirements (GIRs) which apply to all undergraduate degrees. The schools play no direct curricular role in educational programs (with the exception of Sloan which acts as both a school and department). As with the schools, the SCC is not expected to play a direct role in educational programs. However, the College structure and leadership are intended to achieve important educational outcomes in existing degrees and classes, and to support the creation of additional computing classes and likely also new degrees over time.

Students in departments and programs that are part of SCC are students in the College, analogous to the case for schools. For instance, EECS is joint between SCC and Engineering, so students in EECS are in both the College of Computing and the School of Engineering. Similarly, ORC is joint between SCC and Sloan, so ORC students are in both the College of Computing and Sloan School. The full set of existing departments and programs that are becoming part of the College is covered in Section 5, and students in all of those programs are students in the College, either solely or jointly with a School (as in the case of EECS and ORC).

Several components of the College organization are intended to affect classes and degrees, notably the creation of the Common Ground for computing education described further in Section 9, the creation of Social and Ethical Responsibilities of Computing described further in Section 8, the reorganization of EECS into three Faculties of EE, CS, and AI+D described briefly in

Section 5 and more fully in the separate document referenced in that section, and the broadening of CCSE to more fully encompass all of Computational Science and Engineering (CS&E) possibly including new degree programs, described briefly in Section 5.

The Common Ground will be a cross-departmental organization to facilitate the collaborative offering of classes and degrees in computing areas that benefit from the involvement of multiple departments and programs, as discussed further in Section 9. This will include "blended" 6-x, x-6 and xC majors, both existing and potential new ones, and classes that would benefit from coordination across departments including those in introductory computing areas. As an example, classes in numerical and simulation methods are taught in a number of departments with relatively little coordination, and would seem to benefit from identification of that which could be taught in common and that which is truly specific to a particular department or program.

The Social and Ethical Responsibilities of Computing (SERC) has educational, research, and public engagement components to its mission, as discussed further in Sections 4 and 8 below. In education, a key objective is to develop "habits of mind and action" regarding ethical and social considerations and responsibilities in the creation and use of computing technologies. A critical shortcoming today is the lack of people who have a good understanding of both the social and ethical considerations on the one hand, and the technological ones on the other. Indeed, SERC is being co-headed by two Associate Deans, one from the liberal arts and one from engineering, for this reason. A key outcome is to develop curriculum that coalesces these quite different lenses. We expect to emphasize integrating social and ethical responsibilities into classes and curricula to avoid drawbacks that have been seen in some other areas where separate classes on ethical issues have had a tendency to be "check the box" rather than an integral part of the curriculum and educational outcomes.

The reorganization of EECS into three Faculties is expected to lead to consideration of a possible new undergraduate major in Course 6 focused on artificial intelligence and decision-making (combining subfields that are traditionally viewed as part of CS with ones that are seen as part of EE), as well as potential revisions to other majors and minors in Course 6.

At the graduate level it will be important to investigate potential gaps in computing offerings at MIT, particularly with regards to Computational Science and Engineering (CS&E), social aspects of computing, human-computer interaction, and digital humanities. This may warrant the creation of new graduate programs in order to meet needs for such graduates in government, industry and academia and to better address opportunities at MIT which are less well fulfilled by an EECS graduate program (e.g., other schools have HCI, information science, CSE and other computing graduate programs that are often integrally connected with other disciplines).

There are several formal and informal mechanisms for students to engage with College leadership. The two main formal groups thus far are the Dean's student academic advisory group and the SERC advisory group. There are also opportunities for students to continue to engage with leadership of the departments and programs in the College, particularly as those

units undertake potential changes. The Dean's academic advisory group is initially composed of students who are majoring or minoring in computing-oriented subjects, including not only Course 6 with an emphasis on the blended majors with other departments, 6-x, x-6, xC, but also computing tracks in 2A, NEET, and 21E. As new computing-oriented programs are developed, and with the building out of the Common Ground, the Dean's advisory group will further include students from these areas. The SERC advisory group is a mix of students, faculty and researchers from across MIT based on suggestions made by departments and programs. An additional SERC student group may be created due to interest, again selected from across departments.

Undergraduate research opportunities, including both UROP and SuperUROP, are expected to continue as currently structured.

Section 3: DEPARTMENTAL ENGAGEMENT WITH THE SCC

Although it may be natural for a department, program, lab, or center to seek to identify a single corresponding part of the College, the College is being structured to support the three components of its mission and the synergies between them – computing fields, computing in other disciplines, and social and ethical responsibilities of computing – rather than to mirror the current structure of MIT. The objective is for units across MIT to have the potential for multiple points of engagement with the College.

For many departments and programs, the new Common Ground for computing education will provide opportunities for the development and offering of cross-departmental computing-related courses as described further in Sections 4 and 9. The Social and Ethical Responsibilities of Computing area of the College will also provide many units with both educational and research engagement opportunities in the important area of impacts of computing as described further in Sections 4 and 8.

For a number of departments and programs, existing interdepartmental labs and centers that are becoming part of the College (CCSE, CSAIL, LIDS, ORC, SDSC, TPP) already include their faculty, and this will increase as these labs and centers broaden participation, particularly in the social sciences and humanities. It is possible that other centers with degree programs will also be created. ORC in particular offers a highly successful illustration of how a center with strong faculty and departmental commitment can operate top-ranked graduate programs, and the College will provide the opportunity to investigate the creation of other such graduate programs that fill needs for computationally-oriented students that are not well met by EECS. For instance, programs under a newly broadened Center for Computational Science and Engineering (CCSE), to meet needs for computational students in the sciences and engineering, and potentially new centers for programs in areas such social computing, human-computer interaction, or digital humanities, depending on student interest and faculty and departmental commitments.

The new shared faculty positions (formerly known as "bridge") will also provide important hiring opportunities between departments and academic units in the College as described in Section 7. Initially these academic units are IDSS and the three Faculties of EECS: EE, CS and AI+D. Over time it may be necessary to include or create other such units in order to adequately connecting to other departments and schools. It is also important to note, however, that the availability of such shared positions in any particular department will be quite limited due to the ratio of 25 new positions to dozens of departments and programs and over 1,000 existing MIT faculty.

Computing research and education is present in many disciplines, and thus in many departments and programs at MIT. A key objective of the College is to help bring more collaboration, coordination, and visibility across these sometimes quite disparate activities, in addition to developing new ones where appropriate. Some current examples include computing in medicine with the Institute for Medical Engineering and Science (IMES); music technology with Music and Theater Arts; geospatial analysis with the Department of Urban Studies and Planning (DUSP); computational molecular biology with the Department of Biology; computation and cognition with the Department of Brain and Cognitive Sciences (BCS); and computer science and economics with the Department of Economics. These are simply a few examples of the many exciting areas with interdisciplinary computing research and educational activities across departments, illustrating the types of interactions the College of Computing will facilitate, both new and existing. A possible benefit to departments of such collaboration and coordination can be attracting students who are interested in combining computing with another discipline in their research and education. Another possible benefit can be attracting new sources of research funding for interdisciplinary computing work.

There are many excellent current classes at MIT in computing, as well as in ethical and social aspects of computing. The Common Ground and the College do not aim to displace these, but rather to create a "whole that is more than the sum of the parts" by combining efforts where appropriate as well as to fill in gaps in current offerings. For instance, existing classes are often developed solely from the perspective of the needs of a single-offering department, as is only natural when classes are developed and staffed on a department-by-department basis. However, a number of faculty at MIT have identified apparent opportunities for coordination, co-development, and co-teaching that could benefit multiple departments and programs. These are the kinds of opportunities the College aims to facilitate. The College is not intended to replace the academic organization of departments and programs or their authority over classes and degrees, but rather to provide opportunities that benefit multiple departments and programs across MIT.

In the social sciences, humanities, and the arts, computing can serve as a means of study or as an object of study. The programs and units of the College are intended to support both such aspects of computing in these disciplines. Moreover, while the Social and Ethical Responsibilities of Computing is expected to be an important aspect of interactions between the College and the social sciences, humanities, and the arts, it is also expected that there will be a considerably broader range of such interactions.

In the sciences and engineering, computing is a part of many fields, but is frequently tailored to a particular disciplinary area. The College is intended to support such discipline-oriented computing by helping broaden it to constellations of disciplines where appropriate, and strengthening ties to core computing.

Section 4: NEW ACADEMIC PROGRAMS IN THE SCC

The following new academic program areas are expected to initially be developed in the SCC, although it will take time for them to achieve significant scope and they will advance at different rates. Other new areas may be considered as well. New program areas are less well-defined than existing ones by definition, and thus these descriptions are not at a level comparable to those of existing departments or programs at MIT, but will develop over the coming months and years.

- **Social and Ethical Responsibilities of Computing (SERC)**, facilitating, supporting and coordinating activities that help develop responsible "habits of mind and action" in computing education and research, across MIT and beyond, as well as policy and practice in government and industry. SERC activities are expected to be coordinated closely with academic and research units of the College and across MIT, under the leadership of two new Associate Deans for Social and Ethical Responsibilities of Computing. Further discussed in Section 8.

- **Common Ground** for computing education, facilitating, supporting and coordinating the cross-department development and offering of computing classes and modules, emphasizing co-teaching and shared responsibility between academic units of the College and departments or schools. The Common Ground is expected to have substantial involvement with SERC, with educational programs in units of the College, and with computing-related education in departments and programs across MIT. The Common Ground is expected to cover all three focal areas of the college: computing fields, computing in other disciplines, and social and ethical responsibilities of computing. Further discussed in Section 9.

- **Center for Advanced Studies of Computing**, driving new developments related to all three key areas of the College via project-oriented semester- or year-long programs co-led by MIT faculty, with "fellows" from within and beyond MIT as part of each project. Such a center requires substantial fundraising to support its activities. Further discussed in Section 10.

Section 5: EXISTING UNITS BECOMING PART OF THE SCC

The following current MIT academic units, programs, labs, and centers are expected to become part of the SCC at inception.

- **EECS** (Department of Electrical Engineering and Computer Science), which as the result of a planning process over the summer is being restructured into three overlapping sub-units, termed "Faculties" that together form the EECS Department. These Faculties are Electrical Engineering (EE), Computer Science (CS), and Artificial Intelligence and Decision-Making (AI+D) (following suggestions from the Computing Task Force). The Department and its three Faculties are jointly part of the School of Engineering (SoE) and the College, and thus EECS faculty appointments are in both the SoE and SCC. This structure provides considerable autonomy to the three Faculties for hiring, mentoring, and promotion, while retaining overall Department leadership and coordination. As noted in the introduction, a separate document[2] describes this structure, which is currently being implemented. It is expected that EECS and the three Faculties will work closely with the Common Ground and Social and Ethical Responsibilities of Computing.

- **IDSS** (Institute for Data, Systems, and Society), which will be restructured to focus more on academically-oriented programs, including the Statistics and Data Science Center (SDSC) and Technology Policy Program (TPP). These academic programs will be more clearly delineated from the research labs and centers, LIDS and SSRC, that are also part of IDSS. It is also expected that IDSS will develop a more balanced faculty composition relative to its overall mission by expanding on the "Society" aspect of the mission, which has been a relatively small component of faculty hiring to date. This further broadening will support the social, ethical, and policy aspects of computing, as well as other work with the social sciences, humanities, and the arts. If such broadening is not successful then IDSS may be replaced by two units, one focused on data and statistics and the other on the liberal arts, but that would depend on the ability to create units with a viable scale and computing-oriented mission and thus is not the path initially being pursued.

  With a rebalancing of IDSS towards the "Society" aspect of its mission, it is expected that IDSS will remain a key locus of activities in and support for statistics at MIT, including SDSC. Over time it may make sense for SDSC to become more clearly delineated while remaining closely aligned with IDSS. Faculty with appointments in IDSS have a home department in addition to IDSS, and thus will be in both a school and the SCC. It is expected that IDSS will work closely with the Common Ground and Social and Ethical Responsibilities of Computing on education.

- **ORC** (Operations Research Center), which will report jointly to the Dean of Sloan School and the Dean of the College. The focus of ORC, on connecting data to decisions through mathematical modeling, optimization, and analytics, forms a natural connection between business and computing, and more broadly to many disciplines at MIT with participation of faculty members from all five schools. The ORC thus already serves as an exemplar of the kind of collaboration between departments and schools, including

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[2] https://www.eecs.mit.edu/news-events/announcements/eecs-reorganization-plan

highly successful degree programs, that the College is intended to facilitate. The ORC can also help foster broader connections between the College and Sloan School.

- **CCSE** (Center for Computational Science and Engineering), formerly Center for Computational Engineering (CCE), which is broadening to reflect a more substantial role of the School of Science as well as the importance of "CS&E" nationally. CCSE will, with the Dean's office, develop a plan for this broadening, including an expected substantial role in the numerical, simulation, and data science curriculum and classes in the Common Ground, possibly eventually including minors or additional degrees, and also involving collaboration with SERC. Faculty in CCSE, as currently, will be fully appointed in an academic unit (or units), and thus be members of the SCC, but not have faculty appointments other than via an academic unit.

- **CSAIL** (Computer Science and Artificial Intelligence Lab), which is being restructured to form research communities within the Lab comprising PIs who share common research interests, with a leader of each community who also plays a role in the CSAIL leadership. The nature of this restructuring is still underway and is expected to create some more highly focused areas within the Lab. CSAIL will also continue broadening beyond EECS (currently about 60% of PIs are EECS faculty members, with the rest being faculty from other departments or research scientists). Faculty who are CSAIL PIs or affiliates, as currently, will be fully appointed in an academic unit (or units), and thus be members of the SCC, but not have faculty appointments other than via an academic unit. It is expected that CSAIL will work closely with the Social and Ethical Responsibilities of Computing on research.

- **LIDS** (Laboratory for Information and Decision Systems), which will be more clearly delineated from IDSS, maintaining its focus on information and decision systems with strong intellectual ties to IDSS as well as to the new AI+D Faculty, Math, and SDSC. LIDS faculty and operations may overlap substantially with IDSS, but the converse will be less true as IDSS broadens to include more of the societal aspect of its mission. Faculty who are LIDS PIs or affiliates, as currently, will be fully appointed in an academic unit (or units), and thus be members of the SCC, but not have faculty appointments other than via an academic unit.

- **Quest for Intelligence**, including the Core and Bridge. Faculty PIs or affiliates of the Quest, as currently, will be fully appointed in an academic unit (or units), and thus be members of the SCC, but not have faculty appointments other than via an academic unit. It is expected that the Quest will work closely with Social and Ethical Responsibilities of Computing on research.

This set is based on the units that were indicated as likely being part of the College in the original announcement in Fall 2019, plus additional ones that subsequently expressed interest and are primarily focused on computing. It is possible that other computing-oriented units may

also become part of the College over time.

The existing units that are becoming part of the College are expected to expand their collaborations with one another and with departments, labs, centers, and programs across MIT. For instance, it is expected that CSAIL will continue to broaden its membership, which is already nearly 40% from outside EECS; Quest will continue funding research activities across campus, increasing its emphasis on social and ethical responsibilities of computing; CCSE will broaden its membership in the School of Science; and IDSS will broaden in the social sciences and humanities. Moreover, new programs such as SERC and Common Ground summarized in the previous section and described further below, will be designed to build ties across MIT and with the existing units.

Changes in curricula or classes will take time and are the domain of individual academic units or collaborations between units such as those envisioned for the Common Ground, not the College itself. Over time, this will result in new classes, concentrations, certificates, or degrees, as well as making changes to existing curricula and classes, with coordination by the College.
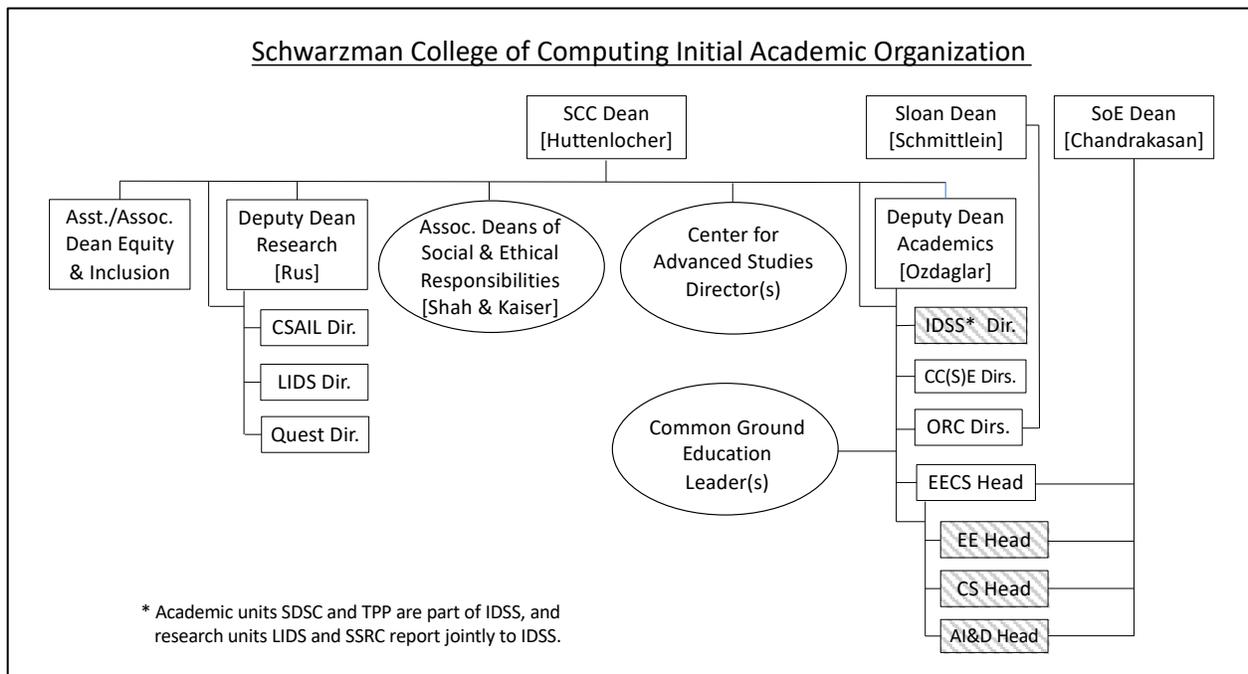
Some changes in planning and organization of individual units has already begun, with the EECS Department completing an organizational plan over the summer that is now being implemented; the Computer Science and Artificial Intelligence Lab (CSAIL) undertaking an organizational plan this fall to create smaller, more accessible research communities; the Institute for Data, Systems, and Society (IDSS) planning to broaden its scope in the social sciences and humanities; and the Center for Computational Science and Engineering (CCSE) planning to broaden its scope in the sciences and change its name to the Center for Computational Science and Engineering (CCSE). For new areas, such as in the Social and Ethical Responsibilities of Computing or the Common Ground for computing education, pilot programs are being discussed and developed, under the direction of the leaders of those activities and the Dean's office, and with participation of various faculty, departments, and programs from across MIT.

Section 6: SCC ACADEMIC LEADERSHIP AND ORGANIZATION

The academic leadership of the SCC initially comprises the Dean; the Deputy Dean of Research (DDR); the Deputy Dean of Academics (DDA); the Associate Deans of Social and Ethical Responsibilities of Computing; the Heads of the EECS Department and of the EECS Faculties of EE, CS, and AI+D; the Directors of the academic programs reporting to the Dean, CCSE, ORC, and IDSS; the Directors of the research labs and initiatives reporting to the Dean, CSAIL, LIDS, and the Quest; the Director(s) of the new Center for Advanced Studies of Computing; and the leader(s) of the Common Ground. The Head of EECS and the Faculties of EE, CS, and AI+D will report jointly to the Dean of Engineering, and the Directors of ORC will report jointly to the Dean of Sloan. The leadership will also include an Assistant or Associate Dean of Equity and Inclusion, who may be either a staff or faculty member as it is not yet clear which will be most appropriate for success of the role. That search is not expected to begin until the Institute Community and Equity Officer (ICEO) position is filled. The Deputy and Associate Dean roles

were filled during the planning process in order to begin implementation of the College. Future leadership, including of the Center for Advanced Studies of Computing and of the Common Ground, are expected to reflect faculty in the three key areas of: computing fields, computing in other disciplines, and social and ethical responsibilities of computing.

The academic leadership and organizational structure are illustrated in the chart shown below. It is important to emphasize, as discussed in Sections 1 and 2 above, that the structure of the College is not intended to mirror that of MIT schools and departments, and there are multiple points of engagement for departments and programs with units shown in the organization chart. Moreover, as also noted above, the existing units are necessarily more mature than new ones, with the latter indicated by ovals rather than the traditional boxes of an organizational chart. Furthermore, the four units, IDSS, EE, CS, and AI+D, are shown as shaded in the chart, as those are the units that, at least initially, are the locus of faculty appointments in the College.

Schwarzman College of Computing Initial Academic Organization

* Academic units SDSC and TPP are part of IDSS, and research units LIDS and SSRC report jointly to IDSS.

The organization chart shows the leaders who report directly to the Dean, with the Deputy Deans providing day-to-day oversight and management, where the research labs and initiatives are overseen by the DDR, and the academic units and programs are overseen by the DDA. The Social and Ethical Responsibilities of Computing and Center for Advanced Studies of Computing report only to the Dean because they cut across research and academic programs. The Deputy Dean roles are of critical importance given the high level of collaboration and coordination that is envisioned between the College and the Schools, as well as for helping manage the mix of new and mature units in the formation of the College. Note that the title Deputy Dean is already used elsewhere at MIT, and here it is used for the roles that involve shared oversight with the Dean of labs, centers, institutes, and departmental units.

The EECS Head and DDA roles are at least initially being filled by the same person, who is an EECS faculty member. This supports two objectives that are particularly important initially, the first is to minimize the number of layers of administration in the SCC, and the second is to facilitate coordination of the three EECS Faculties with other units and programs of the College. However, it is important that the DDA represent all the academic activities of the College and that the EECS Head represent the Department, so this will be carefully monitored and reviewed and if it is too challenging for a single person to fulfill both of these roles, then the approach will be reconsidered. Similarly, the DDR and CSAIL Director roles are at least initially being filled by the same person, and this will also be carefully monitored to ensure that the MIT-wide research mission and lab leadership roles are being fulfilled.

The Computing Council is expected to include the above academic leadership of the College, except for the Head of the Faculty of EE who will instead be a member of the School of Engineering Council (note also that the Head of the Faculty of AI+D and the Head of EECS are expected to be members of both the Computing and Engineering Councils). The Computing Council is expected to further include one member from each School Council, and key administrative leadership of the College, including the Assistant Deans of Administration and Development and the Director of Communications. The members who serve concurrently on the Computing Council and each School Council will be agreed upon mutually between the Dean of the College and the corresponding School, with consideration for their knowledge, interest, and involvement in connections between the School and the College. Promotion and tenure cases will be handled by an Academic Promotions Subcommittee of the Computing Council, consisting of the Dean, Deputy Dean of Academics, and leaders of units with academic appointments, initially the EECS, CS, and AI+D Heads, the IDSS Director, and the five members from the School Councils.

Promotion and tenure cases for faculty with primary appointments in the SCC who are hired after September 1, 2019, will be handled by the new processes involving the Computing Council which are outlined here. Given the joint reporting structure of EECS to both the SCC and SoE, promotion and tenure cases for candidates whose primary appointment is in the CS Faculty will be handled by the Academic Promotions Subcommittee of the Computing Council, and for those whose primary appointment is in the EE Faculty will be handled by the Engineering Council. Promotion and tenure cases for candidates with primary appointments in the AI+D Faculty will be handled through the Engineering or Computing Council as designated when they were hired (or as elected if they were hired prior to September 2019). Promotion and tenure cases for those with primary appointments in IDSS will be through the Computing Council, and those with secondary IDSS appointments will be through the appropriate School Council. For the new shared faculty positions between the SCC and a department or school, the approach to promotion and tenure is discussed in Section 7 below. Current untenured faculty affected by these changes will have the option of following their existing promotion and tenure process or the new process up through their tenure decision; all cases for current faculty are using existing processes for the 2019-20 academic year.

The following table summarizes how the units that will be part of the formation of the SCC, both existing and new, are expected to contribute to the three key aspects of the College mission: computing fields, computing in other disciplines, and social and ethical responsibilities of computing. A ∗ indicates it is expected that a unit will have a primary focus on that aspect of the mission, whereas a + indicates it will be a secondary focus. For instance, the EECS Faculties of EE, CS, and AI+D will primarily focus on computing fields, but through teaching and research and via coordination with SERC, as well as possible shared faculty positions, will also play a role in the other two aspects of the mission. IDSS will have a substantial focus on collaborations across disciplines, including an increased emphasis on social science and humanities and on ethical and policy aspects of computing, while at the same time continuing to contribute to statistics and other aspects of interdisciplinary computing such as data science.

	Computing Fields	Other Disciplines	Social & Ethical
EECS (EE, CS, AI+D)	∗	+	+
IDSS	+	∗	∗
CC(S)E	∗	∗	+
ORC	∗	∗	∗
Research Units	∗	+	+
SERC	+	∗	∗
Common Ground	+	∗	∗
Ctr. Adv. Studies	∗	∗	∗

Section 7: SHARED FACULTY POSITIONS BETWEEN SCC AND SCHOOLS

The College includes 25 new faculty positions which were initially described as serving to "bridge" between the College and Departments or Schools, which is a phrasing the Task Force Working Groups on Academic Appointments and on Organizational Structure suggested should be changed. We term these *shared* faculty positions, because most of the research and teaching by such a faculty member should be of shared value to both the Department or School and to the College, rather than being split into the portion which is of value to one and that which is of value to the other.

Following suggestions of the Task Force Working Group reports on Academic Appointments and on Organizational Structure, these positions will generally be clustered to maximize the impact of hiring, focusing on selected interdisciplinary computing areas. This clustering of hiring provides the opportunity to develop innovative new areas at MIT, as well as to strengthen existing key areas, connecting computing and other disciplines. Conversely, given that the shared positions represent a growth in the faculty of only about 2%, they are unlikely to have sizable impact if treated as separate hires. It is important to note that cluster hiring refers to the coordinated hiring of shared faculty between the College and Departments, but "clusters" are not a new type of unit or organizational structure at MIT nor will faculty be "members of clusters." Some cluster hiring may be aligned with centers, labs, or other such non-

departmental units (either existing or new), particularly when there are a substantial number of existing MIT faculty actively engaged in an area of cluster hiring, but this need not be the case.

Faculty members in these shared positions will have responsibilities in both a "home" Department or School and in an academic unit of the SCC. As noted above, to the maximum extent possible, the research and teaching responsibilities of a shared faculty member should be of value to both the Department and the unit of the College, rather than split. The academic units of the SCC with such shared positions will initially be IDSS and the three Faculties of EE, CS, and AI+D of the restructured EECS Department. It is planned that IDSS will substantially broaden beyond its current faculty composition in fulfilling the "Society" part of its founding mission. If there prove to be systemic challenges to shared hiring with these four units, then other units of the College would need to be created or to have such faculty positions, as determined by the SCC Dean and Provost (and following appropriate processes to approve creation of new units with faculty hiring authority). Ideally a shared faculty member could teach classes in the Common Ground which are of value to both the Department and the unit of the College. However, if it were to prove necessary to split teaching, then half would be assigned by the Department and half by the unit of the College. Service responsibilities would likely more frequently need to be split between the two units.

For untenured faculty, the primary academic unit for promotion and tenure will be designated at the time of hiring, and generally will be the home Department or School. For each faculty member, a memorandum of understanding (MOU) between the two units will document the responsibilities as well as the promotion and tenure process, in order to avoid any potential future confusion due to differences in departmental processes. For concreteness, this MOU might include identification of senior faculty elsewhere who currently exemplify the area in which the faculty member is being hired. Tenure review will generally be done by the designated primary unit, according to its standard procedures, with the addition of participation from the secondary unit. While the details of this participation remain to be fully determined, they will include involvement in solicitation of referee letters, involvement in the deliberations of the home unit, and a letter from the head of the secondary unit that is part of the case file and the materials considered in deliberation. The tenure recommendation will be made by the primary academic unit, with the active participation of the secondary unit, but there will not be two separate recommendations. The process of the primary unit will be followed at the School level, with active participation of the Council corresponding to the secondary unit, and with a single recommendation made by the Council corresponding to the primary unit.

With each cluster hiring area consisting of 4 or 5 faculty, the 25 new shared faculty positions only yield 5 or 6 areas. However, some departments and schools have indicated potential interest in providing additional positions for shared hires, possibly as part of the cluster hiring process, because of the value to the department in attracting candidates as well as the department's interest in participating in the Common Ground and other College programs. Depending on the extent of such additional positions, it may be possible to have more than 5 or 6 areas for cluster hiring. The Task Force Working Groups noted that while it can be most

natural from the departmental point of view to simply hire for their own needs, coordinated interdisciplinary shared hiring holds the potential for broader transformative impact. Thus, it is important to keep that in mind that these positions are intended to have mutual benefits across a department and a unit of the College, and a cluster of these positions to have such benefits across multiple departments and units of the College.

For an approved cluster hiring area, searches for individual positions will be authorized jointly by the SCC Dean and the School Dean, together with the Head of the particular Department, depending on their normal procedure. A joint search process between the Department and the academic unit of the College will be followed. This process will include some exercise to calibrate the joint search, such as mutual agreement regarding leading faculty in the search area. Close coordination of the search with other relevant searches is very important, as strong candidates for a shared position may be identified through a department search, a College search, or another search in the cluster hiring area. Broad and diverse applicant pools are critically important and will be a factor in extending offers. Proposed recommendations of offers will be made jointly by the Department or School and the academic unit of the SCC, with approval jointly by the SCC Dean and the normal approval for the Department or School. Startups for such positions will be funded through a combination of SCC, the unit of the College, the Department, the School, any relevant lab, and other sources.

Vacated shared slots provided by SCC will return to SCC, or if provided by a Department or School, then to that unit. The 25 designated "bridge" shared slots in SCC can only be used to hire faculty in some cluster hiring area (not necessarily the same area) together with some Department or School, unless otherwise approved by the Provost. A Department or School is not constrained in this manner regarding slots it may provide for shared hiring.

While faculty may naturally change their research and teaching interests over time, in the event that a faculty member's research and teaching shift substantially so as to no longer fall across both the Department or School and the SCC, the Heads of the academic units would raise the issue with the Dean of the School and the Dean of SCC, who would seek mutually agreeable means of addressing that shift. Any change to positions would not be an evaluation of the faculty member's work, but rather based on their areas of research and teaching falling outside the College or home Department.

Faculty hired in shared positions may have space in the Department or in the College, depending both on space availability and desired co-location. The planned new SCC building includes space for the additional faculty positions, but is not expected to open for several years. The new building need not be occupied only by new faculty hires, but is intended to provide enough net new space at MIT to accommodate them. For example, it could be desirable to house a new shared faculty member in their departmental home, making room for that faculty member by moving an existing departmental faculty member with relevant collaborations to the SCC space. The existing and new College space is not adequate to support faculty members having multiple offices or labs on campus.

Proposals for potential new cluster hiring areas will be solicited from Departments, Schools, and other academic units. A cluster hiring area will generally involve multiple Departments and Schools and also multiple academic units of the College. Proposed areas will be reviewed by the Computing Council and then selected by the Academic Deans, Provost, and perhaps other members of the Academic Council as determined by the Provost. For approved areas, a hiring plan will be developed including the designation of planned shared searches between Departments/Schools and units of the College. In order to begin hiring of shared positions this year, the Deans may authorize a small number of joint hires in advance of the cluster hiring process. If such a hire fits a cluster hiring area, it will be a pre-fill for that area.

As noted above, shared faculty appointments are not intended to address the broad range of ways in which MIT faculty might be members of the Schwarzman College of Computing, which were summarized above in Section 1.

Section 8: NEW AREA – SOCIAL AND ETHICAL RESPONSIBILITIES OF COMPUTING

The Social and Ethical Responsibilities of Computing (SERC) area of the College is being created to facilitate the development of "habits of mind and action" regarding responsible development and use of computing technologies, drawing on suggestions made by the Computing Task Force Working Group on Social Implications and Responsibilities of Computing. An important aspect of SERC activities is that they not solely form a separate area of the College, but rather effect change in computing education, research, and practice across MIT and beyond. SERC activities are expected to help achieve the following objectives.

- Facilitating productive collaborations between science, engineering, social science, and humanist disciplines and points of view; for example, creating interdisciplinary communities of discussion and practice.
- Facilitating collaborative curriculum development and course offerings on social and ethical responsibilities of computing. These may be current courses, modifications of current courses, or new courses offered in the humanities and social sciences or in the sciences and engineering, and possibly as part of the Common Ground. It will be important to facilitate effective, mutually respectful cross-disciplinary engagement, as well as to avoid cursory "check the box" approaches.
- Supporting researchers to better understand social and ethical implications of computing; acting as an advisor or consultant rather than an enforcer (e.g., unlike IRB review which is more enforcement oriented).
- Engaging with practitioners in government and companies, including policy makers, to formulate effective and practical approaches for computing policies and practices; including a focus on AI as it has so clearly captured popular interest and concern about computing.
- Addressing best practices about the impacts of computing on constituencies beyond those who intend to have a profession in computing.

SERC will at least initially be led by two Associate Deans, one from an engineering, science or computing field and one from a social science or humanities field, so as to bring lenses from both areas to the work. Given the importance and cross-cutting nature of SERC activities, these roles at least initially report solely to the SCC Dean, but are further expected to coordinate closely with the DDA and DDR on academic and research activities in the College. The Associate Deans are also forming a SERC advisory committee that reflects a range of disciplinary areas at MIT, including drawing on the membership of the Computing Task Force Working Group on Social Implications and Responsibilities of Computing, to continue to have the kinds of important and productive discussions that arose in the Working Group. The membership of this advisory committee is by approval of the Dean on the recommendation of the two Associate Deans.

In addressing educational aspects of its objectives, it is expected that SERC will work closely with the Common Ground on classes and course materials that are co-taught or are a shared responsibility between the SCC and Departments or Schools, as well as with individual departments that offer computing courses, notably EECS and its three Faculties of EE, CS, and AI+D, or that offer courses on social and ethical responsibilities of computing. This includes not only coordination and support in development of courses, but also in development of modules and materials that could be integrated into courses. SERC is also expected to help develop curricula, including possible concentrations or certificate programs (the latter possibly for MIT students as well as professional education). There are excellent existing classes and curricula in a number of departments and programs that cover social and ethical responsibilities and considerations regarding computing, but fewer of these reflect collaborations of faculty in computing with those in the humanities, arts, and social sciences. Expanding such collaborations is expected to be an emphasis of the SERC.

In addressing research and policy aspects of its objectives, it is expected that SERC will engage actively with the research labs in the College as well as elsewhere at MIT. In the policy arena it is expected that SERC will draw on the expertise of the Internet Policy Research Initiative (IPRI), which as part of CSAIL will be part of the College, as well as collaborating closely with other relevant technology policy activities that have a broader mission than only computing, such as the Technology Policy Program (TPP), which as part of IDSS is planned to be part of the College.

It is also expected that SERC will likely develop new activities, as part of existing academic units, labs or centers, or possibly new ones. It is important to emphasize that SERC is not intended to be the only, or even necessarily the primary means, by which faculty and programs in the social sciences, humanities, or the arts engage with the College, as discussed in Sections 1 and 2 above.

Two initial pilot programs are already being pursued, which are good illustrations of the kinds of activities SERC might undertake. One such pilot is to create a set of "MIT Cases in Social and Ethical Responsibilities of Computing." These cases would be rigorously reviewed by an editorial board drawn broadly from across MIT, including senior academics known for their work in the area. It might further include a series jointly with the MIT Press or serve as the

materials for online courses with edX, as well as being made available for public access. It is possible that there would be assistance with developing materials for different audiences including the general public, as well as for MIT faculty using these case materials in their teaching. Another such pilot is to create an interdisciplinary community of practice at MIT on social and ethical responsibilities of computing, including regular working groups, topically-focused forums, and peer consultation for those seeking to better understand relevant issues in their research or teaching. This could further involve facilitation of research collaboration and consultation, particularly for those working in different disciplines where such interactions can be valuable but challenging to find.

Section 9: NEW AREA – COMMON GROUND FOR COMPUTING EDUCATION

Drawing on suggestions of the Computing Task Force Working Group on Organizational Structure, the Common Ground will be created to facilitate the offering of computing classes and coordination of computing-related curricula across academic units within the SCC and across MIT. The scope of the Common Ground is envisioned to include classes in computer science and artificial intelligence that are widely taken by students outside EECS; classes in computing offered in many other disciplines across MIT, such as numerical and simulation methods; and classes in social and ethical responsibilities of computing. The precise leadership structure of the Common Ground remains to be determined, but it will report jointly to the DDA and the SCC Dean. The objectives of the Common Ground include creating more coordinated and coherent curricula in computing, better distributing computing teaching across faculty as appropriate, and facilitating cross-department teaching and curriculum. These educational initiatives may also lead to other joint activities such as research collaborations.

The full structure of the Common Ground remains to be determined, but the following aspects are likely to be a part.

- Departments and Schools will retain control over the content and who may staff classes for which they are the "owner" or "master" listing, and in the case of cross-listing, will determine whether a class may be cross-listed under their course number. Departments and Schools will also retain control over what classes outside their course number count towards a degree.

- Within these constraints of department control over class listings and content, it is expected that a number of computing classes which are of broad interest to students, including some classes from EECS, would be part of the Common Ground and benefit from the broader collaboration of multiple departments. It is also expected that computing classes taught in multiple departments, such as numerical and simulation topics, which currently are often primarily taken by students from the particular department, would be examined to determine those that would benefit from additional coordination or co-teaching by multiple departments.

- It is expected that course modules, assignments, problem sets, and other means of incorporating social and ethical issues into classes will be part of the Common Ground, in partnership with the Social and Ethical Responsibilities of Computing.

- Classes designated as part of the Common Ground will likely have course numbers and staffing approved by one or more Departments or Schools. While there could also be a new course number for the Common Ground, that is not currently expected, at least initially.

- Common Ground classes are expected to often be co-taught by faculty from different academic units, comprise modules taught by faculty from different academic units, or have recitation sections staffed by multiple academic units. Support for course development and co-teaching will be a funding priority.

- It is expected that there will be one or more faculty committees for the Common Ground, with faculty from academic units that have classes which are designated as part of the Common Ground.

From early discussions, there are likely three areas for the Common Ground to focus on initially: numerical and simulation methods, social and ethical responsibilities, and introductory computer science and AI; all at both the undergraduate and graduate levels. These are all areas where there are exciting possibilities for course development and coordination, and where there have been expressions of interest from multiple departments in working together to develop classes and curriculum that are jointly taught and/or jointly coordinated. It is not expected, at least initially, that the Common Ground will have its own course number, but rather will work to coordinate between courses. That assumption will be re-evaluated over time.

It is expected that the Common Ground will begin initial pilots in the spring. Some pilots have been discussed, which serve to illustrate the types of classes and collaborations of the Common Ground. One model to pilot is classes that contain some material for all enrolled students and some that is specialized to those in a particular discipline or disciplines. This could be done by splitting a class into two halves, with one half common to all students and one half having several sections with different discipline-based material. A related alternative is to have a single class where some of the problem sets, recitations, or tutorials that are specialized to particular disciplines. These approaches could be envisioned for introductory programming classes such as 6.0001/6.0002, as well as for introductory numerical methods and simulation classes.

Another model to pilot is to have classes co-taught by some faculty who are not from the offering department(s). This approach could be envisioned for classes in areas such as machine learning, algorithms, optimization, data science, and numerical methods, particularly those where the enrollments are currently very high and there are faculty from other departments with relevant interests and experience to possibly participate in teaching.

It is expected that the Common Ground will work closely with the leadership of CCSE, SERC, and EECS (and the individual EECS Faculties of EE, CS, and AI+D) in the development and offering of such pilots and classes.

There is exciting potential for combined and blended degree programs between computing and other disciplines, but at the same time such programs have sometimes not fared well at other institutions. The Common Ground offers potential for identifying commonalities and differences in such programs, and for building on the success and lessons learned from existing blended computing majors, 6-x, x-6 and x-C, which thus far have been approached as individual "one off" programs. For instance, the Common Ground could provide pooling of expertise in ensuring that such programs are more integrated than simply double majoring with reduced requirements (which was part of the justification in originally proposing these blended majors). The Common Ground can also help determine what classes, modules, or other educational offerings make sense to coordinate across multiple majors and blended majors.

In order to facilitate cross-listing and shared teaching of classes in the Common Ground, departments and programs will receive credit for teaching of Common Ground classes based on the faculty appointment of the instructor(s), split for two co-instructors, not based on the cross listing of classes nor the majors of the enrolled students.

Section 10: NEW AREA – CENTER FOR ADVANCED STUDIES OF COMPUTING

Drawing on suggestions made by the Task Force Working Groups on Academic Appointments and on Organizational Structure that the College "incubate" areas of work and have "academic fellowship" programs, it is envisioned that a new Center for Advanced Studies of Computing would host semester- or year-long project-oriented programs in focused topic areas. This would be different from programs such as the Radcliffe Fellows at Harvard that are more oriented towards individual scholars, and rather would be organized around specific topics or projects that could possibly seed new research, scholarly, educational, or policy work. Programs would be aligned with one or more of the three key mission areas of the College: computing fields, computing in other disciplines, and social and ethical responsibilities of computing.

Programs at the Center would be proposed by MIT faculty members and selected by the Center Director upon recommendation of a review committee. Programs would involve faculty from MIT and other institutions, practitioners from industry, as well as postdocs and advanced graduate students. Some participants in a program would devote half-time and would be Fellows of the Center and the others would be Affiliates. The affiliations would start before a program begins for planning and last until after it ends for wrap-up. Fundraising to provide some support to Departments for faculty members while they are serving as half-time Fellows would be a priority.

The Center would be led by a Director or Co-Directors appointed by the Dean. Members of a review committee for evaluating proposed projects would be suggested by the Director(s) and

approved by the Dean, and recommended projects would be approved by the Co-Directors and the Dean.

It is envisioned that there would be several objectives for outcomes of programs at the Center. One would be mapping new areas through "future of" types of reports; another would be facilitating new multi-investigator research collaborations by bringing together a set of faculty and researchers for a planning period with the intention of subsequently attracting substantial sponsored research funding; and another would be facilitating new educational offerings by bringing together a set of faculty and other teaching staff. Some programs may deliver on multiple of these objectives.

A fully operational Center would have space and funding to support multiple such programs per year, which would require substantial fundraising to support the operations of the Center.

Section 11: EQUITY AND INCLUSION

Computing fields at MIT, at universities more generally, as well as at companies, remain notable for their relative lack of diversity. While considerable attention and effort have gone into addressing the breadth of participation in computing, the challenges remain substantial. At the level of specific programs and activities, it is important to improve those that exist at MIT, learning from successes on campus and elsewhere, as well as to develop new ones. The SCC, with leadership from the Assistant or Associate Dean of Equity and Inclusion and the entire senior administration of the College, will work to improve and create programs and activities that help broaden participation in computing classes and degree programs, help increase the diversity of top faculty candidates in computing fields, and help ensure that faculty search and graduate admissions processes have diverse slates of candidates and interviews. The Assistant or Associate Dean of Equity and Inclusion will have responsibility for driving and coordinating such programs and activities across the College and in partnership with the Schools, and will work with Institute leadership including the ICEO, the Provost's office, and HR on diversity, equity, and inclusion.

More generally, it is important to develop an academic culture that welcomes a broad range of backgrounds, life experiences, and interests. There are no easy answers here, and the College should seek out things that are working elsewhere, and actively engage in pilots to help build a welcoming culture. In an academic setting, where individual work is often important, it can be particularly challenging to create such a culture, as students have relatively little opportunity to experience the value of working with others from multiple backgrounds and viewpoints. And indeed, as working in a diverse team can be harder than working alone or in a team of similar individuals, without proper support and coaching, such experiences can simply reinforce pre-existing biases. Thus, one potential area for the College to investigate is how to provide better support for diverse teams. Another related area to investigate is how building ties with other more diverse disciplines might help develop a more welcoming culture and broaden participation in computing classes and majors.

Section 12: COMPUTING INFRASTRUCTURE

As computing becomes an increasingly important part of nearly every area of academic inquiry, the needs for computing infrastructure support continue to grow. These needs can differ substantially across disciplinary areas, involving not only access to computing hardware, software, storage, and networking resources, but importantly also the expertise for utilizing these resources effectively in research and education. As identified by the Task Force Working Group on Computing Infrastructure, a number of peer institutions have substantial research and/or academic computing service centers providing hardware, software, and expert personnel, generally with a mix of fee-for-service and subsidized or base services. The scale of such centers is often thousands of server nodes, tens of thousands of CPU cores, tens of petabytes of data storage, and tens of professional staff. Advances in commercial cloud computing can potentially provide much of the physical infrastructure, but this is generally not cost effective at standard list pricing nor does it address the need for expert staff to support research and teaching use of the infrastructure.

The differences in computing infrastructure needs across disciplines are substantial, as are the resources available to help support them, the differences across universities are also sizable. For instance, much of today's research computing infrastructure is aimed at needs in the sciences and engineering. However, increasingly research and scholarship in the social sciences, humanities, and the arts are making use of computing tools that involve substantial amounts of data or computation. Educational computing needs are also quite different across disciplines, including the use of quite different software environments catered to specific types of problems and disciplinary areas.

With the advent of the College of Computing, MIT should also take the opportunity to transform its support for research and academic computing infrastructure. As indicated in the report of the Task Force Working Group on Computing Infrastructure, some computing resources seem to make most sense to provide locally, while others seem to benefit from scale and centralization. To be successful, such a hybrid model requires adequate investment both locally and centrally, as well as strong leadership to guide and coordinate it. MIT has the opportunity to bring together additional academic vision and leadership for computing infrastructure with the College, in coordination with services and expertise provided by the Vice President of Research (VPR) and/or Information Systems and Technology (IS&T). In particular, the College can help focus attention, build industry partnerships, and help attract additional resources, as well as help coordinate direction setting for computing infrastructure. Such an approach could be coupled with pilots for new computing infrastructure initiatives undertaken in the College, such as the AI infrastructure work currently being undertaken by the Quest Bridge.

Some have mentioned project Athena as a model, and it is possible that there are parallels to today in which broadly available cloud computing could hold the kind of transformational potential that broadly available networked desktop computing did in the early 1980s. However, Athena was focused on educational support whereas today's needs are for both research and

education. Athena was also a fixed-length project to effect a transformation. While it did have some long-lasting effects on computing at MIT, arguably neither it nor a modern successor is adequate for addressing computing infrastructure needs.

Regardless of the specific approach, MIT needs to develop and pursue a coordinated approach to computing infrastructure support and the College can play an important role.