Call for MIT Quest Mission Concepts

The MIT Quest for Intelligence, a research unit of the MIT Schwarzman College of Computing, is a campus-wide initiative aimed at the most important challenge in human history – understanding intelligence. More precisely, MIT Quest believes that the engineering of artificial intelligence and the scientific understanding of natural intelligence are interlocking aspects of a single, collaborative grand challenge. To capitalize on that vision, MIT Quest research will be organized around long-term collaborative projects called “missions,” which are each rooted in a foundational question in intelligence – animal, human or collective. A foundational question is one that, if solved in engineering terms, is likely to bring about practical advances in machine intelligence and major benefits in human health, education, and well-being. The goal of this call is to encourage and fund concept projects that align with this vision. Looking beyond this call, we anticipate that each such concept could be expanded into a long-term, multi-year mission. We envision supporting up to 10 Mission Concepts for incubation at a range of funding levels.

DEADLINE & ELIGIBILITY

- Proposals should be submitted via this form no later than Feb. 22, 2021, 5 PM (EST). Early submissions are encouraged.
- Decisions will be announced in March 2021, for a start date of no later than June 1, 2021.
- The lead PI must be MIT faculty or a senior research scientist.
- Faculty may be listed as PIs in up to two proposals but may only serve as lead PI on one proposal.
- Teams interested in submitting a proposal may contact MIT Quest leadership to receive additional information by submitting specific questions to quest@mit.edu

MISSION FUELING

Funding will be available for up to $400K total, but we do not expect every selected concept to be funded at this level. MIT Quest also expects to be able to provide computing time, software engineering support, or support of networking events, workshops, etc. (at levels to be determined during the review process).
PROPOSAL STRUCTURE

Successful Mission Concepts will be aligned with the MIT Quest mission: that scientific understanding of natural intelligence and developing machine intelligence (AI) with real-world impact are interlocking aspects of a unified, collaborative challenge. We are looking for Mission Concepts that address the questions below.

1. **What aspect(s) of natural intelligence does the proposed mission investigate and aim to improve in current AI systems? What question(s) does the proposed mission hope to answer?**

Missions should be question-driven, with a long-term vision. How will this work contribute to advancing our understanding of natural intelligence and the expected corresponding improvements in the behavior (e.g. proficiency, accuracy, safety, power, learning efficiency, or some other criteria) of intelligent machine systems? Some missions may take a top-down approach rooted in one or more theories of intelligence. Others may take an approach focused on disparate knowledge and phenomena emerging from biological, physical and social observations that cannot yet be explained or modeled in machine systems. These two approaches are not mutually exclusive, and the most exciting long-term missions will likely have aspects of both.

2. **What real world problems would benefit from this mission? Who will be interested in the answers? What might the longer term and broader social impacts be?**

What real-world problem(s) does the research address? What application-domain and/or stakeholders will be interested in its outcomes? Stakeholders may be governments, national or international organizations, industry, academic institutions, citizens, etc. Outline broader areas of possible anticipated and unanticipated impact beyond the mission goal – both positive and negative.

3. **How will mission progress be measured? What process does the proposed mission plan for building/testing systems by comparison to natural intelligence and iterative assessment?**

Short-term deliverables could include: hosting a symposium, panel, workshop, challenge or hackathon; publishing papers (arXiv, conference, blogs), attracting funding from other sources (e.g. industry, philanthropy, government, etc.). Longer term deliverables may include a theoretical, experimental and/or computational explanation of phenomena of intelligence and/or an engineering / computational / theoretical model designed to test that understanding. Quantifiable assays of technical progress, congruency with natural intelligence, and real-world applications are encouraged, even if short-term progress on these is unlikely. The planning of systems and software integration to organize and coordinate your team effort is particularly encouraged, and could be supported by Quest technical staff (see Question 7 below).
4. What safety, ethical and societal issues might the proposed mission raise?

Include a description for integrating safety, ethical and societal considerations of the research and its potential technical or conceptual advances (e.g. How will AI complement human skills and activities and help to improve society? What are the risks?). This may include social benefits and/or policy considerations (i.e. guidelines to ensure that AI is used equitably, fairly and for the good of society), methods for debiasing AI and making AI systems acceptable.

For instance, are there places where your team foresees a misalignment between ethical impact and the mission research and application goals? If so, what are they, and how would your team anticipate navigating the misalignment? If there are none, explain why. What are ways that your mission might affect historically disadvantaged groups, even if the impact is minimal? If there are none, explain why.

5. Explain why the proposed mission is unlikely to be undertaken or achieved by industry or another academic/lab organization.

As part of your response to this question, please explain how the mission concept will draw on MIT strengths that industry or other organizations may lack, and how your team plans to leverage those MIT strengths.

6. List of PIs and their proposed contribution to the mission

Indicate the lead PI at the start of the project (a breadth of disciplines is preferred). Please only list members who will be closely involved. If there are more than four PIs, please carefully explain their roles and relationship to one another. Please describe processes you will implement to facilitate sustained and meaningful collaboration among your teammates. Optional: additional PIs/topics who would potentially join the mission as it develops.

7. Resources needed

Estimate the resources the proposed mission would need for 12 months initially (an “incubation stage”), including any PI salary needs, up to four co-mentored researchers (graduate students, postdocs and research scientists) equipment, computing expenses, miscellaneous materials and supplies (up to ~$400K). For this budget estimate, standard research rates should be applied. Your estimate of resources needed should also indicate resources such as computing time, software engineering effort, and staff events support, as some of these could be undertaken by MIT Quest (to be discussed with the lead PI case-by-case). And an explanation of why these resources would be important. No formal budget table needed, nor involvement of Research Administration Services at this time. Any questions, please contact quest@mit.edu

Proposal Format

Answers to the seven questions (above) should each be approximately 250 words (or less), and no more than 500 words. Proposals should be submitted using this online form where the answer
to each question can be submitted as pasted text. An additional two pages (max) of additional information may be submitted as a PDF using the online form, but that is neither required nor encouraged. Teams will be contacted for additional information if needed.

MISSION CONCEPT SELECTION

Mission Concept proposals will be evaluated by a committee that includes members of MIT Quest and MIT Schwarzman College of Computing leadership. Input will be sought from experts across the MIT community, and PIs submitting concepts may be asked to comment on aspects of other submitted concepts. Teams whose proposals best align with the vision of the Quest will be invited to give an oral presentation of their project (Zoom session).

SELECTED MISSION CONCEPTS

- Selected teams will discuss funding level and type of funding (unrestricted funds, sponsored-research funds, corporate funding) with the MIT Quest leadership before accepting any support.
- Teams leading Mission Concepts that are fueled by the Quest will be expected to present and discuss the Mission Concept at Quest events, meetings and workshops, upon reasonable request. This may include meetings with prospective donors, presenting research results in public and at industry events, and participating in media interviews, both internally and externally, to promote the Mission Concept. MIT Quest will cover costs associated with workshops, events, media/outreach, administrative staff and fiscal management.
- Fueled teams will also be expected to participate in programs led by the Schwarzman College of Computing SERC, which could include informal working groups, development of new teaching materials, presentation at research roundtable events, and/or outreach events.
- Successful proposals must adhere to MIT's Open Access policy.

PROGRESS TOWARD LAUNCH

Mission concepts will initially be funded for a 12-month incubation period, with an opportunity to renew at amplified funding levels for multiple years, depending on excitement generated within the MIT community and beyond. MIT Quest will provide institutional structures and protocols to support the development of the project.