THE PAUL G. ALLEN
FAMILY FOUNDATION

March 4, 2014

The Paul G. Allen Family Foundation
Request for Proposals (RFP)
Allen Distinguished Investigators (ADI) Program
Artificial Intelligence (AI) Focus – 2014

RFP release date: March 4, 2014
RFP submission deadline: May 30, 2014

Purpose

The Allen Distinguished Investigator (ADI) Program seeks to fund a select group of investigators to pursue new, pioneering research in academic settings that, collectively, 'move the needle' towards answering broad scientific questions. **The most promising proposals will incorporate novel, creative, and ambitious approaches.** For this reason, the program is especially interested in proposals that are unlikely to receive funding from traditional governmental sources.

This 2014 request for proposals (RFP) focuses on three fundamental Artificial Intelligence topics: (1) Machine Reading (2) Diagram Interpretation and (3) Spatial and Temporal Reasoning. These topics are aligned with the vision of the Allen Institute for AI (www.allenai.org), but the AI ADI program is a distinct program funded and administered by The Paul G. Allen Family Foundation.

We expect to fund between 5 and 8 projects withtotal funding of $1M-$2M, for each project, spanning a 3-year period. The Paul G. Allen Family Foundation has a 0% indirect cost policy. 2014 AI ADI awards have an expected combined total of $8M. Funding is intended to provide a sustainable funding stream for one or more investigators allowing them sufficient time to investigate big questions in-depth using risky, novel approaches.

Research Initiative Details

ADI 2014 AI Focus #1: Machine Reading

Machine reading is one of the grand challenges of AI. While much current work has focused on entity linking and fact extraction, the next step in machine reading involves the computer constructing richer semantic representations from language that better support automated reasoning.

We are looking for proposals that explore innovative approaches to this challenge. We are particularly interested in proposals that include consideration of background knowledge and an operational use of machine-read knowledge to evaluate progress. A particular application context of interest is machine reading of material required for taking science exams. Examples include on-line text in support of the New York Regents exams (http://www.nysedregents.org/), or reading narrative text and answering comprehension questions (e.g., http://nces.ed.gov/nationsreportcard/itmrlsx/search.aspx?subject=reading).
Lines of inquiry might include:

- How can one extract inference-supporting representations from language?
- How does one "fill in the gaps" (implied facts) in textually presented information?
- What kinds of prior knowledge structures are useful for interpreting language? How might such knowledge structures be acquired?

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- How might larger knowledge structures (scripts, frames) that encode expectations be acquired and used to guide reading?

ADI 2014 AI Focus #2: Diagram Interpretation and Reasoning

Diagrams play a fundamental role in communicating knowledge. Textbooks are typically rich in diagrams, and people frequently sketch diagrams when communicating information with a spatial aspect. Diagrams communicate a stylistic, spatial abstraction that is otherwise hard to express in words, and can be an effective means of communicating quantitative and topological information. Despite this, diagrams remain very challenging to interpret, both at the lower image processing level (identifying and aligning spatial elements, labels, and other notation) and at the higher symbolic level (determining what information the elements, labels, and notation communicate.) Background knowledge and conventions for diagrams both play fundamental roles in guiding interpretation.

We are looking for proposals that explore innovative approaches to those problems. We are particularly interested in proposals that include consideration of background knowledge, that exploit the surrounding (linguistic) context in which diagrams are placed, and that include an operational use of the interpretations to evaluate progress. One good source of example problems to consider are exam questions that use diagrams, such as in the New York Regents exams (http://www.nysedregents.org/), the NAEP questions (http://nces.ed.gov/nationsreportcard/itmrlsx/landing.aspx), or the Massachusetts Comprehensive Assessment System (http://www.doe.mass.edu/mcas/search/).

Lines of inquiry might include:

- What types of diagram interpretation problems are there?
- How can notation, labels, and diagrammatic elements be correctly related?
- What kind of image processing technologies are appropriate for processing raw diagram files?
- How can prior symbolic knowledge guide diagram interpretation?
- How can diagrams that communicate representations (e.g., flow charts, food Webs) rather than real-world spatial information be interpreted?
- What kind of prior diagrammatic knowledge is useful for interpreting diagrams? How might one acquire it?
- How can one fill in the gaps in diagrammatically presented information?

ADI 2014 AI Focus #3: Spatial and Temporal Reasoning

Commonsense reasoning about space and time is a fundamental part of intelligence. People can effortlessly reason about configurations of objects (e.g., spatial layout, containment), motion (e.g., falling, sinking, rotation), spatial transformation (e.g., growing, eating), spatial actions (e.g., walking, climbing), and temporal relations (e.g., temporal ordering, periodicity, calendars). Similarly, people can easily communicate spatio-temporal information through language, even though spatio-temporal vocabulary is typically qualitative and/or vague. Despite this, the area remains very challenging for AI. Traditional logical approaches have struggled to reason effectively with quantitative spatio-temporal information, while at the same time the precision of computational geometry does not mesh easily with the semi-quantitative way that we perceive and communicate spatio-temporal information.

We are looking for innovative proposals that address these problems, in particular techniques that support commonsense spatio-temporal reasoning and that explore the integration of spatiotemporal inference with linguistic/symbolic inference. We are particularly interested in methods that address the kinds of spatio-temporal reasoning problems that arise in science exams, for example the New York Regents exams (http://www.nysedregents.org/) or the Massachusetts Comprehensive Assessment System (MCAS) exams (http://www.doe.mass.edu/mcas/search/), especially the earlier grade levels where commonsense spatial-temporal reasoning is more prevalent. We are particularly interested in proposals that include clear evaluations of progress.

Lines of inquiry might nclude:

- What representations best capture qualitative and semi-quantitative spatio-temporal information?
- How can the spatio-temporal effects of common actions be represented and reasoned with?
- What is the role of background knowledge in constructing and reasoning with spatio-temporal representations?
- What kinds of spatio-temporal computations are common and useful, and how can they be performed?
- How can representations support commonsense reasoning about motion and change?
- How can the semantics of spatio-temporal words be represented and reasoned with?
- How can one integrate spatio-temporal and linguistic inference?

Proposal Format

We request that all submissions be on 8 ½ x 11 paper, a font size of 12 points, and utilize 1" margins top, bottom, left and right. Submissions will have the following proposal sections and associated length limits:

a. Project summary	Short paragraph – (200 word limit)
b. Project description	5 pages
c. Project milestones & measurable outcomes	2 pages
d. Budget*	3 pages (including narrative)

***The Paul G. Allen Family Foundation has a 0% indirect cost policy.** Please note that the Foundation does supply a standardized budget template, which can be found on the Foundation website: www.pgafamilyfoundation.org/Programs/Investigators-Fellows/Key-Initiative/ADI-Artificial-Intelligence-RFP

Program Goals

The primary goal of the ADI Program is to advance the state of the art and increase human knowledge and understanding in the targeted topic areas. The program also seeks to have a lasting impact on the direction of research, aiming to serve as a catalyst upon which future research is founded.

One mechanism used by the program to promote the goal of lasting impact is supporting young faculty members. Early stage scientists often have significant hurdles to overcome that include building a new research group, teaching, writing proposals, and establishing themselves in a highly competitive research community. Receiving a significant award can be a substantial boost in their careers and seed ideas in their labs that may last a lifetime. A second mechanism used by the program is to support more established researchers who have creative, ambitious, and potentially high impact ideas, where those

ideas remain unfunded due to their high degree of risk and/or mismatch with traditional funding sources' goals. In all cases, the ADI program seeks to enable scientists to take risks with new ideas and approaches.

Methodological and technological advances are often necessary complements to scientific advance and yet these are often difficult to fund through traditional sources. The ADI Program encourages and supports researchers including novel methodological, theoretical and technological elements in their proposals. Supported projects are expected to have interim milestones and clearly described anticipated outcomes. Scientific goals in the topic area should be achievable within the award period.

Program and Award Structure

The ADI Program expects to issue a Request for Proposals through our academic and other research partners periodically with the number of projects concurrently funded remaining more or less constant over time. The question posed for each round may continue or refocus a previous research agenda or may focus on a new topic area.

The Foundation's Science Advisory Board (SAB) develops the question(s) defining the research agenda for a given cohort within topic areas of interest to The Paul G. Allen Family Foundation Board. The Foundation Board makes the final approval of all scientific questions. The SAB consists of researchers and scientists from a range of disciplines reflecting the breadth of backgrounds and perspectives necessary to define the research agenda and to evaluate proposals for the given topic area.

Distribution of funds is made over the period of the grant based on the budget submitted with the proposal.

Eligibility Requirements

Scientists at any stage of their career may apply. The Foundation has a particular interest in both supporting the careers of exceptional young scientists showing particular promise as thought leaders in their fields and supporting more established researchers with ambitious, high-risk ideas that could have a revolutionary impact in the field but remain outside the scope of traditional funding sources.

Application Process

The ADI AI Program accepts unsolicited applications or nominations from all accredited institutions. The Foundation may, at its discretion, solicit proposals directly from researchers.

Institutions may submit proposals from up to three qualified applicants. The program seeks new and novel approaches and encourages risk taking to address the target area specified by the question. Institutions should evaluate submissions with this in mind. The most creative proposals are most likely to succeed.

Applications must include a description of the proposed project, an explanation of how the proposed project fits in the research agenda focused on a topic area and why it has significant potential to 'move the needle' towards answering a broad scientific question posed for the cohort. Any interdisciplinary elements

of the project should be described. The proposal should also include an explanation of why the proposed project is unlikely to receive funding through traditional sources.

Previous ADI winners (in any category) are not eligible.

Proposals are due by midnight PST on May 30, 2014 and sent to:
AIADI@pgafamilyfoundation.org Subject: Proposals

Questions

Please submit questions to AIADI@pgafamilyfoundation.org. Subject: Question.
Generally questions will not be answered directly. We will publish FAQs with answers to http://pgafamilyfoundation.org on April 7, 2014 and May 3, 2014.

Selection Process

Proposals are reviewed by the ADI Panel of Experts, which will make recommendations to the Foundation Board. The Foundation Board has the final decision on the Allen Distinguished Investigator awards.

Post-award Activities

Primary Investigators granted awards are named "Allen Distinguished Investigators." The Foundation will announce awards and release biographies of investigators along with summary descriptions of their projects to the press and on the Foundation website and other communication channels.

The Foundation believes post-award engagement is important and seeks to build a relationship with investigators. We strive to promote interaction among awardees to stimulate idea exchange around the broad scientific question asked of the cohort. Recipients are required to participate in an annual symposium of the Allen Distinguished Investigators in Seattle.

Current Allen Distinguished Investigators may be asked to help identify and refine the topic area and question for future cohorts and offer advice for improving the program. Current and past Allen Distinguished Investigators are encouraged to recruit new and fresh proposals from distinguished colleagues.

Reporting Requirements

Recipients are required to provide annual reports describing progress towards milestones and anticipated outcomes as well as any barriers encountered since the last report and how they are being addressed. Participation in an annual symposium of the Allen Distinguished Investigators in Seattle is also required.

The Foundation will typically conduct annual site visits of current awardees to gain first-hand understanding of progress and gather information for promotion of the ADI Program through Foundation communication channels.

A final report must be submitted at the end of the grant period describing the results of the project, including successes, barriers encountered and anticipated next steps. The final report should also include a discussion of how the outcomes attained 'moved the needle' towards answering the question posed for the cohort.

We require recipients to provide annually updated budget information as well as identify and explain any major deviations (>10%) from previously reported budgets.

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