Department of Radiology
UNIVERSITY OF WISCONSIN
SCHOOL OF MEDICINE AND PUBLIC HEALTH

Department of Medical Physics
UNIVERSITY OF WISCONSIN
SCHOOL OF MEDICINE AND PUBLIC HEALTH

COLLEGE OF ENGINEERING
Grainger Institute
for Engineering
UNIVERSITY OF WISCONSIN–MADISON

REQUEST FOR APPLICATIONS
MACHINE LEARNING FOR MEDICAL IMAGING:
PILOT RESEARCH GRANTS FOR COLLABORATIVE PROJECTS
Published on April 6, 2018

Program Overview

The purpose of this program is to foster interdisciplinary collaboration between machine learning (ML) experts and medical imaging clinicians and researchers at the University of Wisconsin, in order to develop and apply state-of-the-art ML solutions to challenging problems in medical imaging. This includes developing new ML methods for medical imaging applications, and exploring new imaging applications of state-of-the-art ML methods. Potential applicants are encouraged to contact Diego Hernando (dhernando@wisc.edu) or Po-Ling Loh (loh@ece.wisc.edu) with questions about programmatic relevance.

- Pilot awards are $50,000 maximum in direct costs for 12 months of support. Support for students and postdocs is permitted, but salary support for scientists and faculty (including PIs) is not permitted unless a clear need can be demonstrated.
- Researchers may submit only one application as PI or co-PI. However, PIs on one application may be co-Is in other applications.
- SMPH-CoE collaboration is a requirement: applications must originate from interdisciplinary teams with at least one PI or co-I from the SMPH Departments of Radiology or Medical Physics, and at least one PI or co-I from the College of Engineering. Applications with two PIs (co-PIs), one from SMPH and one from CoE, are also encouraged.
- All PIs or co-PIs are required to have home departments in Radiology, Medical Physics, or CoE. Additional co-Is (but not co-PIs) from other departments are allowed.
- Applications may include newly-formed or existing SMPH/CoE collaborative research teams. However, applications from existing teams must define a new collaborative project, rather than an incremental extension of an existing project.
- A pathway towards securing follow-on extramural funding should be included in the application.
- Full applications will be accepted by invitation only, based on selection of a subset of letters of intent (see below for details).

Relevant Research Topics

Suitable applications should leverage ***cross-disciplinary collaborations to advance the rapidly growing field of machine learning in medical imaging***. Applications must combine expertise in medical imaging (e.g., imaging physics, image processing, clinical and translational applications) with expertise in machine learning (e.g., algorithm development, model evaluation, novel computational solutions). Importantly, this RFA will seek to fund ***proposals that are likely to spark enduring collaborations and lead to external funding for further research***. Relevant research topics include, but are not limited to:

- Development and evaluation of novel ML techniques with a clear clinical/translational application in medical imaging.
- Novel applications of state-of-the-art ML techniques to significant medical imaging research problems.
- ML-based image reconstruction and analysis.
- Computer-aided diagnosis.
- Optimization of medical image acquisition and processing in the context of ML techniques.

- Rapid medical imaging.
- Quantitative imaging.
- Development of novel training algorithms with clear clinical/translational applications.
- Performance evaluation/optimization of ML algorithms in the context of medical imaging.

The scope of the RFA covers both basic and applied research with transformative potential that addresses compelling clinical or translational challenges. Research topics that can be adequately addressed without cross-disciplinary collaboration are unlikely to be funded.

Eligibility of Lead Applicants

- PIs or co-PIs must be UW-Madison faculty members or academic staff with home departments in Radiology, Medical Physics, or CoE. Eligible UW job titles include Professor (tenure, CHS, or clinical track), and Scientist with temporary or permanent PI status.
- Applications from Assistant Professors are particularly encouraged. Mentorship from senior faculty is similarly encouraged, as are senior-junior faculty/scientist collaborations (where the senior faculty can be included in a co-PI or co-I role, and identified as a mentor in the proposal).
- For proposals including multiple PIs, only one PI will act as the fiscal representative responsible for award account management.
- Whereas residents, fellows, and postdoctoral associates are **NOT** eligible to serve as PIs (or co-PIs), they are eligible to serve as co-Is.
- As mentioned above, applications require at least one PI or co-I from the SMPH Departments of Radiology or Medical Physics, and at least one PI or co-I from the College of Engineering.

Application and Submission Information
Important Dates
- Mandatory Letter of Intent Receipt Date: **May 15, 2018**
- Invitation to submit full application based on selected LOIs: **June 1, 2018**
- Application Receipt Date: **July 15, 2018**
- Peer Review Period: **July 15-August 7, 2018**
- Committee Review Date: **August 7-14, 2018**
- Award Announcement Date: **August 15, 2018**
- Grant Start Date: **September 1, 2018 – January 1, 2019 (per research team preference)**
- Grant End Date: **12 months after grant start date**

Letter of Intent: Prospective applicants must submit a 1-page letter of intent (LOI), as required in order to assess alignment of the project and collaborative team with the goals of the RFA. The LOI must include the following information:
- Title of proposed research project.
- Name, address, phone number, and email address of the lead PI.
- Names of other key personnel essential for the design and conduct of the proposed research.
- Description of the proposed activities, including:
    a. Brief statement of the overall research plan.
    b. Description of the collaborative team: Is this a new SMPH/CoE collaborative team, or an existing team proposing a new project?
    c. Brief statement of next steps towards extramural funding. If awarded, how will this application lead to enduring collaboration and external funding?
- Names of potential **non-conflicted** reviewers with appropriate scientific expertise. NOTE: this does not guarantee that the named individuals will be contacted. Applicants may also indicate reviewers who should not be invited.
- A *subset of the letters of intent will be selected based on thematic relevance and team strength*, and the corresponding teams will be invited to submit a full proposal.

The LOI should be sent electronically to **Karen Knipschild (KKnipschild@uwhealth.org)** on or before **May 15, 2018 at 4:00PM CST**.

Full Application Materials

Note that full applications will only be accepted for projects that are invited to apply based on the letter of intent (see timeline above). The pilot award application is composed of information arranged into separate components. A completed application in response to this Announcement must include the following components arranged **in this order**, **each page numbered sequentially,** starting with the Cover Page:

1. Cover page, with title, 50-word summary of the proposal, names and affiliations of investigators and key personnel, and contact information for lead PI
2. Project narrative (maximum 5 pages; see details below)
3. Timeline for completion of the project (see above for start and end dates)
4. Other information (see details below)
5. NIH Human Subjects and/or Animals section (if applicable)
6. Literature citations
7. Budget page; budget justification (maximum ½ page); lack of existing resources to carry out project (maximum ½ page)
8. Biosketches for key personnel
9. Other support for key personnel; include notation of overlap with previously funded projects to the proposed research
10. Essential letters of support, collaboration, and matching funds (if applicable)
11. Human subjects, animal protocol, biological safety letters of approval (if applicable and available)

Submission of Completed Application
1. Submit all applications electronically as a **SINGLE** document in PDF format.
2. Submit completed applications directly to Karen Knipschild, (KKnipschild@uwhealth.org) on or before **July 15, 2018 at 4:00PM CST.**

Application Characteristics
Project Narrative

The project narrative is limited to 5 pages in length, 8.5" X 11", single-spaced, with margins set at no less than 0.75 inches on each side. Use the font face Arial, 11-point. The narrative should include the following sections in the order presented below:
• Specific Aims with clear, measurable objectives.
• Significance, innovation, and approach. (A statement of hypothesis may be appropriate, depending on the proposed research.)
• Preliminary studies, if appropriate.
• Timeline.

Other Information

Following the Narrative, address the two items listed below:
• Relationship of anticipated pilot study results to emerging collaborative efforts and future extramural grant submissions.
• In recognition of the importance of team science, briefly address the following aspects of your project:
  – whether and how the team brings together techniques and insights from different fields to address the research objective(s) in ways that would not be possible within a single discipline;
  – how each member of the team (investigators, trainees, research staff) will contribute to and benefit from the pilot project. **Note**: this is not meant to reiterate information presented in the budget justification (e.g., effort, role);
  – how the application fosters the research of the collaborators in a new direction.

Budget

Use funds to directly support the research project. Examples of allowable expenses include laboratory and computing supplies, research subject incentives, and research personnel. Graduate student (including tuition remission) and postdoctoral associate stipends are allowed. Investigator salary is generally not allowed unless a clear need can be demonstrated. Equipment that is essential for the study and not otherwise available may be requested, but large equipment expenditures (> $5,000) are prohibited. **Indirect administrative costs are not allowed**. Applicants may use the PHS 398 budget form. Equally acceptable is to directly draft a line-item list of each expense. Include cost basis information in the budget justification.

Application Review Information

Reviews will be conducted by a panel of UW faculty. Each application will be evaluated by at least one reviewer with expertise in machine learning and one reviewer with expertise in medical imaging, using the NIH 9-point rating scale scoring system (1 = exceptional; 9 = poor; see sample review template below). Each application will receive a separate score for each of five core review criteria (Significance, Investigator(s), Innovation, Approach, and Environment) and Overall Impact. The panel will also consider whether the budget is reasonable and justified in relation to the proposed research, and may recommend further clarification or modifications. Each application will receive a brief summary statement explaining the rationale for the scores, funded or unfunded, following completion of the review process.

- **Overall Impact.** Reviewers will provide an overall impact score assessing the likelihood for the project to exert a sustained, powerful influence on the research field(s) involved, in consideration of the following five core review criteria and additional project-specific criteria. Of particular importance is the likelihood that the proposed research will spark an enduring collaboration and lead to external funding for further research.
- **Significance***.* Does the project address an important problem or critical barrier to progress in the field? If the aims of the project are achieved, how will technical capability and/or clinical practice be improved? How will successful completion of the aims change the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field?
- **Investigator(s)***.* Are the PIs, collaborators, and other researchers well suited to the project? If Early Stage Investigators or New Investigators, do they have appropriate experience and training? If established, have they demonstrated an ongoing record of accomplishments that has advanced their field(s)? Of specific importance to this collaborative pilot program, do the investigators have complementary and integrated expertise; are their leadership approach, governance, and organizational structure appropriate for the project?
- **Innovation***.* Does the application challenge and seek to shift current research or clinical practice paradigms by utilizing novel methodologies? Are the concepts, approaches, or methodologies novel in a broad sense? Is a refinement, improvement, or new application of theoretical concepts, approaches, methodologies, or instrumentation proposed?
- **Approach***.* Are the overall strategy, methodology, and analyses well-reasoned and appropriate to accomplish the specific aims of the project? Are potential problems, alternative strategies, and benchmarks for success presented? If the project is in the early stages of development, will the strategy establish feasibility, and will particularly risky aspects be managed?
- **Environment***.* Will the scientific environment in which the work is conducted contribute to the probability of success? Are the institutional support, equipment, and other physical resources available to the investigators adequate for the proposed project? Will the project benefit from unique features of the scientific and computing environment, subject populations, or collaborative arrangements?

Award Administration Information

All applicants receiving pilot awards must adhere to the following administrative requirements:
- PIs must obtain the appropriate regulatory assurances for all protocols (e.g., IRB , IACUC), and forward copies of all approval documents to Karen Knipschild (kknipschild@uwhealth.org).
- Progress reports outlining accomplishments to date and spending projections will be required of all awardees quarterly, from the post-award date. **In addition, awardees must acknowledge pilot funding in all publications and presentations, and notify the program of such publication submissions/acceptances, as well as any grant applications using data generated from the pilot project.**
- Within 60 days of the project end date, PIs must submit a written description of accomplishments, including publications, new grant applications/awards, and plans to further develop the novel methodology, including plans for dissemination.

Awardees must acknowledge the support obtained from this pilot program on all presentations and publications: *This work was supported in part by the University of Wisconsin-Madison's Machine Learning for Medical Imaging (ML4MI) initiative (funded by the UW-Madison Departments of Radiology and Medical Physics, and the Grainger Institute for Engineering).*

For any administrative questions, please contact:
- SMPH/Radiology contact: Karen Knipschild (kknipschild@uwhealth.org)
- CoE/GIE contact: Page Metcalf (pmetcalf@wisc.edu)

FULL APPLICATION REVIEW TEMPLATE

Application #:

Principal Investigator(s):

Reviewer #:

The 9-point NIH scale:

Impact	Score	Descriptor	Additional Guidance on Strengths/Weaknesses
High	1	Exceptional	Exceptionally strong with essentially no weaknesses
	2	Outstanding	Extremely strong with negligible weaknesses
	3	Excellent	Very strong with only some minor weaknesses
Medium	4	Very Good	Strong but with numerous minor weaknesses
	5	Good	Strong but with at least one moderate weakness
	6	Satisfactory	Some strengths but also some moderate weaknesses
Low	7	Fair	Some strengths but with at least one major weakness
	8	Marginal	A few strengths and a few major weaknesses
	9	Poor	Very few strengths and numerous major weaknesses

Minor weakness: easily addressable, does not substantially lessen impact

Moderate weakness: lessens impact

Major weakness: severely limits impact

OVERALL IMPACT

Reviewers will provide an overall impact score to reflect their assessment of the likelihood for the project to exert a sustained, powerful influence on the research field(s) involved, in consideration of the following five scored review criteria, and additional review criteria. An application does not need to be strong in all categories to be judged likely to have major scientific impact.

Overall Impact: 1-9	SCORE:

Strengths

-

Weaknesses

-

SCORED REVIEW CRITERIA

Reviewers will consider each of the five review criteria below in the determination of scientific and technical merit, and give a separate score for each.

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1. Significance: 1-9: Potential of method/device to lead to improved healthcare? Important clinical area? Important technical contribution to field of machine learning?   SCORE:

Strengths

-

Weaknesses

-

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2. Investigator(s): 1-9: Expertise of investigator and team appropriate?   SCORE:

Strengths

-

Weaknesses

-

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3. Innovation: 1-9: Novel method or novel application of existing technology/methods? SCORE:

Strengths

-

Weaknesses

-

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4. Approach: 1-9: Feasible? Alternative strategies, benchmarks presented?   SCORE:

Strengths

-

Weaknesses

-

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5. Environment: 1-9: Required resources available?   SCORE:

Strengths

-

Weaknesses

-

WRITTEN COMMENTS TO APPLICANT

Reviewers should provide specific guidance regarding ways to improve the application.

Additional Comments to Applicant

PLEASE NOTE, all information contained within each pilot application is to be considered confidential and may contain proprietary information. Destroy all application materials upon completion of the review.