Formal Methods in the Field (FMitF)

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Agenda

- Overview
- Solicitation highlights
- FAQs
- Questions and answers

FMitF: Motivation

Robin Milner - *the design of computing systems can only properly succeed if it is well grounded in theory, and that the important concepts in a theory can only emerge through protracted exposure to application*

Supported by findings from two workshops:

- NSF Workshop on Formal Methods: Future Directions & Its Transition To Practice, Ranjit Jhala & Rupak Majumdar (Eds.), Dec 2012
- NSF Workshop on Formal Methods for Security, Stephen Chong & Joshua Guttman (Eds.), Dec 2015

FMitF: Objectives

- The FMitF program aims to bring together researchers from different communities
  - To jointly develop rigorous and reproducible methodologies for designing and implementing systems and applications with provable correctness guarantees
  - To collaboratively forge new formal methods that are inspired by practical problems
  - To find novel, unanticipated applications of existing formal methods that can be validated in the field.

FMitF: Scope

- Formal Methods (FM) = principled approaches based on mathematics and logic, including modeling, specification, design, analysis, verification, synthesis, and programming language-based approaches.
- Field = areas that may directly benefit from a grounding in FM, defined in this solicitation as
  - computer networks
  - cyber-human systems
  - machine learning
  - operating and distributed systems.

FMitF: FY18 Solicitation (NSF 18-536)

- Budget: Up to $1,000,000
- Duration: Up to 4 years
- Estimated 8 awards, subject to availability of funds.
- Limit of one proposal per PI, co-PI
- Each proposal must have
  - at least one (co)-PI focusing on formal methods; and
  - at least one focusing on one or more of the field(s): computer networks, cyber-human systems, machine learning, and operating/distributed systems.
- Proposals are due May 8, 2018
- https://www.nsf.gov/pubs/2018/nsf18536/nsf18536.htm

FMitF: Proposal Preparation

- Proposals ***must*** include one or more of the following four keywords in the project summary: Computer Networks, Cyber Human Systems, Machine Learning, and Operating/Distributed Systems.
- Proposals ***should*** discuss the fundamental contributions made to both formal methods and the respective field(s).
- Proposals ***should*** include a detailed evaluation plan that discusses intended proof of concept, experiments in the field, scope of applicability, trade-offs and limitations.
- Proposals ***should*** describe the continuous bi-directional collaboration which is a critical component of the FMitF program.

Required Supplementary Documentation

- Collaboration plan (limited to 2 pages)
- Data management plan (limited to 2 pages)
- Description of mentoring activities for postdoctoral researchers, if requesting funding to support any (limited to 1 page)

Collaboration Plan

- Required for each proposal
  - Highlights and justifies the complementary expertise of the PIs in the designated areas
  - Plan to work together to advance knowledge in FM as well as at least one field area
  - Plan should clearly describes the mechanisms for continuous bi-directional interaction
- Up to 2 pages

- **Proposals without this document will be returned without review**

Solicitation specific review criteria

Proposals will be evaluated on the basis of the following solicitation-specific review criteria:

- the extent to which the proposal addresses one or more of the four field areas;
- the extent to which fundamental contributions to both formal methods and the field area are a likely outcome of this project; and
- the extent to which the collaboration plan meets the criteria identified in the solicitation.

FMitF PI Meeting

- The program plans to host a PI meeting in 2020 to be held in the U.S. (subject to availability of funds)
- Funded PIs are expected to participate in this meeting with representation from both FM and the fields(s)
- The budget should cover participation by the PIs, co-PIs, and their students

FAQ 1

- Q: Should I discuss my proposal with NSF Program Directors?

- A: Yes, PIs are encouraged to discuss planned proposals with Program Directors to assist them in determining whether FMitF is a suitable program for the work. Please be considerate of Program Directors' time and refrain from scheduling separate meetings or calls with multiple Program Directors in the same program. Once submitted, the substance of proposals will not be discussed by NSF Program Directors, as this would constitute unfair competition, or the perception thereof.

FAQ 2

- Q: Do FMitF proposals count against the Directorate for Computer & Information Science & Engineering (CISE) Core program limits on number of proposals allowable per year?

- A: No. The limits imposed by the CISE Core programs do not apply. No person, however, can be PI, co-PI, or senior personnel on more than one FMitF proposal.

FAQ 3

- Q: Is security in scope for FMitF?

- A: CISE has a long history of supporting related work in security through the Secure and Trustworthy Cyberspace (SaTC) program. And while research that includes security as part of a more general effort to ensure correctness and reliability is in scope for FMitF, the focus of FMitF in FY 2018 is on formal methods in the field areas that are specifically called out in the solicitation. Research that is focused on using formal techniques to protect against specific vulnerabilities or attacks is better suited for SaTC at this time

FAQ 4

- Q: My field area is not explicitly listed as one of the four areas, can I still submit to FMitF?

- A: No. Only proposals that focus the cyber human systems, distributed/operating systems, machine learning and networking are in scope. We may add other topics in future solicitations subject to availability of funds.

FAQ 5

- Q: Are fields areas like robotics, cyber-physical systems, and hardware in scope for FMitF?

- A: Not at this time. The use of formal methods in these areas is more mature than in the four field areas identified in the solicitation. Therefore, these are not in scope for FMitF, and are supported by existing programs at NSF like National Robotics Initiative 2.0: Ubiquitous Collaborative Robots (NRI-2.0), Cyber-Physical Systems (CPS), and Software and Hardware Foundations (SHF). Other field areas may be added in future solicitations, subject to the availability of funds.

For more information:

Slides and script available at: http://www.nsf.gov/events/

Program Director contacts:

- Formal Methods & Programming Languages
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