



CALL FOR PROPOSALS IN A JOINT NSF-BSF PROGRAM IN Stimulating Collaborative Advances Leveraging Expertise in the Mathematical and Scientific Foundations of Deep Learning

The U.S. – Israel Binational Science Foundation (BSF) is accepting applications in joint funding programs in Foundational Research in Stimulating Collaborative Advances Leveraging Expertise in the Mathematical and Scientific Foundations of Deep Learning, with the Mathematical and Physical Sciences; the Computer and Information Science and Engineering (CISE); Engineering (ENG) and Social, Behavioral and Economic Sciences Directorates of the U.S. National Science Foundation (NSF).

Synopsis of the Program:

Deep learning has met with impressive empirical success that has fueled fundamental scientific discoveries and transformed numerous application domains of artificial intelligence. Our incomplete theoretical understanding of the field, however, impedes accessibility to deep learning technology by a wider range of participants. Confronting our incomplete understanding of the mechanisms underlying the success of deep learning should serve to overcome its limitations and expand its applicability. The National Science Foundation Directorates for Mathematical and Physical Sciences (MPS), Computer and Information Science and Engineering (CISE), Engineering (ENG), and Social, Behavioral and Economic Sciences (SBE) will jointly sponsor new research collaborations consisting of mathematicians, statisticians, electrical engineers, and computer scientists. Research activities should be focused on explicit topics involving some of the most challenging theoretical questions in the general area of Mathematical and Scientific Foundations of Deep Learning. Each collaboration should conduct training through research involvement of recent doctoral degree recipients, graduate students, and/or undergraduate students from across this multi-disciplinary spectrum. This program complements NSF's National Artificial Intelligence Research Institutes and Harnessing the Data Revolution programs by supporting collaborative research focused on the mathematical and scientific foundations of Deep Learning through a different modality and at a different scale.

When responding to this solicitation, even though proposals must be submitted through the Directorate for Mathematical and Physical Sciences, Division of Mathematical



Sciences (MPS/DMS), once received, the proposals will be managed by a cross-disciplinary team of NSF Program Directors. PI teams must collectively possess appropriate expertise in three disciplines - computer science, electrical engineering, and mathematics/statistics. Each project must clearly demonstrate substantial collaborative contributions from members of their respective communities; projects that increase diversity and broaden participation are encouraged.

A wide range of scientific themes on theoretical foundations of deep learning may be addressed in these proposals. Likely topics include but are not limited to geometric, topological, Bayesian, or game-theoretic formulations, to analysis approaches exploiting optimal transport theory, optimization theory, approximation theory, information theory, dynamical systems, partial differential equations, or mean field theory, to application-inspired viewpoints exploring efficient training with small data sets, adversarial learning, and closing the decision-action loop, not to mention foundational work on understanding success metrics, privacy safeguards, causal inference, and algorithmic fairness.

For more details please follow the link: [Stimulating Collaborative Advances Leveraging Expertise in the Mathematical and Scientific Foundations of Deep Learning \(SCALE MoDL\) \(nsf21561\) | NSF - National Science Foundation](#)

The terms of participation in this program are as follows:

General:

- 1. This NSF-BSF program is not a “special” program with the NSF setting aside money for potential grants. Rather, it is an integral part of the regular NSF programs in this discipline, with no “extra” funds. Clear understanding of this on part of the U.S. partner is essential before embarking on proposal writing.**
- 2. Prior to submission, the U.S. applicant should contact the appropriate NSF program manager to discuss the research focus of the international project.**
- 3. These programs have no deadlines and submission is welcome throughout the year. Please note that the Israeli PIs have to submit their proposals to the BSF within 7 days after the U.S. PIs submit to the NSF**
4. Applications must be submitted jointly by an Israeli, and an U.S. scientist from a U.S. research institution.

5. The NSF accepts applications only from U.S. scientists. Submission to the NSF should be made by the U.S. PI alone, but they have to note in the research title on the cover page that it is an “NSF-BSF Application” (the Israeli does not appear as a formal co-PI on the application). In the submission by the US PI, the role of the Israeli partner(s) must be described. Furthermore, it should be clearly explained why the contribution of the Israeli PI to the research project is important/essential.
6. If awarded a grant, the U.S. scientist will receive a grant from the NSF, while the Israeli scientist will receive a grant from the BSF.
7. The size of the BSF grant to the Israeli is expected to be up to \$80,000/year for experimental programs and up to \$55,000/year for theoretical or computer based research, **subject to the availability of funds**. If more than a single Israeli group is involved in the research, the budget may be increased by up to 50%.
8. BSF will follow the decision by the U.S. funding agency regarding the length of the project.
9. We have put together a short presentation with tips for Israeli PIs who are interested in submitting an NSF-BSF proposal. We advise that you read it carefully before starting to look for a partner. You can download it [here](#)

Eligibility

- **U.S. scientists** that apply with an Israeli colleague to the NSF are subject to the NSF rules only.
- **Israeli scientists without an active NSF-BSF grant** can submit **up to two** NSF-BSF applications per year. At least one of the applications must be to an NSF-BSF program **with no deadline**.
- **Israeli scientists with an active NSF-BSF grant** are allowed to submit **one** additional research proposal to the NSF-BSF program, provided that either the grant or the new submission is to an NSF-BSF program **with no deadline**. Otherwise, a submission is allowed only in the last year of the active grant.
- Israeli scientists can hold **no more than two** NSF-BSF awards at any point in time.
- **Both US and Israeli scientists** can simultaneously submit research proposals to the NSF-BSF program and the traditional BSF program. In the event that proposals are

recommended for funding in both programs, they will each be awarded, unless there is significant overlap in the scientific question and research objectives (to the sole distinction of the BSF office). In the latter case BSF will only fund the application under the NSF-BSF program.

- In case of **similar or overlapping applications to both NSF-BSF and traditional BSF programs**, where the BSF proposal is recommended for funding but evaluation of the NSF-BSF application has not yet been completed, the BSF will defer its funding decision until the NSF-BSF awards for that program are announced.

Evaluation

1. Proposals will be evaluated by the NSF, using its [criteria](#). The BSF will create a small screening panel to quickly examine the role of the Israelis in the applications, and ascertain that it is meaningful, and that they have the knowhow and facilities to perform their part in the research. This panel will also advise the BSF regarding the budget requests, but will not evaluate the scientific merit of the applications. However, Israelis may possibly take part in the NSF evaluation process as panel members and/or external reviewers.

2. BSF is likely to fund any Israeli whose partner in this program is funded by the NSF.

3. NSF uses a conventional peer review system with expert panels and ad-hoc (external) reviews for full proposals. However, unlike the practice in Israel, panel members serve in an advisory capacity, and final decisions lie with the program managers and their management. These post-panel officials may introduce additional considerations, such as whether the research topic already has support from the U.S. government, whether support from other NSF programs may be sought, etc.

4. Israeli applicants are advised that they should pay particular attention to the NSF evaluation criteria, http://nsf.gov/bfa/dias/policy/merit_review/, which may include issues such as broader impact, data management, etc., that are either missing in BSF and ISF applications, or have a greatly different meaning (particularly the term ‘broader impact’). **Failure to appropriately refer to such topics by the U.S. partner may be detrimental to the proposal, in the worst case leading to rejection without review.**

Submission

Proposals will be submitted to the program twice:

The U.S. scientist (only) will submit to the NSF using its regulations (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg) and submission



system (<https://www.fastlane.nsf.gov/>). The US PI submission **MUST include the BIOGRAPHY (in the NSF format) and BUDGET (in BSF format) of the Israeli partner as supplementary documentation.**

The Israeli scientist (only) will submit the same proposal to the BSF, including information for the U.S. scientist(s), according to its regulations and submission system: find [here](#).

Timetable

Full proposals should be submitted to the BSF no later than 5 pm (Israel time) on May 18, 2021. NSF deadline is May 12, 2021

Applicants are requested to acquaint themselves with the BSF regulations before they submit an application. In particular, they should acquaint themselves with the special document that describes the changes in the submission process from the regular (core) BSF program. The forms and regulations can be downloaded from the BSF website (<https://www.bsf.org.il/funding-opportunities/nsf-bsf-joint-research-grants/the-programs/>).

Questions regarding the applicability of the proposed research for this program should be directed by the U.S. partner to the program officer at the NSF. BSF will not respond to such inquiries. Other questions regarding this special BSF-NSF program can be discussed with the BSF management by mail or phone (972-2-5828239): Dr. Rachel (Heni) Haring (heni@bsf.org.il; ext 110) or Ms. Yael Dressler (yael@bsf.org.il; ext. 103). Questions regarding the online application system should be directed to Ms. Orli Rozenchwajg (orli@bsf.org.il; ext .109).