

Calendar No. 580116TH CONGRESS
2^D SESSION**S. 2904****[Report No. 116–289]**

To direct the Director of the National Science Foundation to support research on the outputs that may be generated by generative adversarial networks, otherwise known as deepfakes, and other comparable techniques that may be developed in the future, and for other purposes.

IN THE SENATE OF THE UNITED STATES

NOVEMBER 20, 2019

Ms. CORTEZ MASTO (for herself and Mr. MORAN) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

NOVEMBER 9, 2020

Reported by Mr. WICKER, with an amendment

[Strike out all after the enacting clause and insert the part printed in *italie*]

A BILL

To direct the Director of the National Science Foundation to support research on the outputs that may be generated by generative adversarial networks, otherwise known as deepfakes, and other comparable techniques that may be developed in the future, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Identifying Outputs
5 of Generative Adversarial Networks Act” or the “IOGAN
6 Act”.

7 **SEC. 2. FINDINGS.**

8 Congress finds the following:

9 (1) Research gaps currently exist on the under-
10 lying technology needed to develop tools to identify
11 authentic videos, voice reproduction, or photos from
12 manipulated or synthesized content, including those
13 generated by generative adversarial networks.

14 (2) The National Science Foundation’s focus to
15 support research in artificial intelligence through
16 computer and information science and engineering,
17 cognitive science and psychology, economics and
18 game theory, control theory, linguistics, mathe-
19 matics, and philosophy, is building a better under-
20 standing of how new technologies are shaping the
21 society and economy of the United States.

22 (3) The National Science Foundation has iden-
23 tified the “10 Big Ideas for NSF Future Invest-
24 ment” including “Harnessing the Data Revolution”
25 and the “Future of Work at the Human-Technology

1 Frontier”, in with artificial intelligence is a critical
2 component.

3 (4) The outputs generated by generative adver-
4 sarial networks should be included under the um-
5 brella of research described in paragraph (3) given
6 the grave national security and societal impact po-
7 tential of such networks.

8 (5) Generative adversarial networks are not
9 likely to be utilized as the sole technique of artificial
10 intelligence or machine learning capable of creating
11 credible deepfakes. Other comparable techniques
12 may be developed in the future to produce similar
13 outputs.

14 **SEC. 3. NSF SUPPORT OF RESEARCH ON MANIPULATED OR**
15 **SYNTHESIZED CONTENT AND INFORMATION**
16 **SECURITY.**

17 The Director of the National Science Foundation, in
18 consultation with other relevant Federal agencies, shall
19 support merit-reviewed and competitively awarded re-
20 search on manipulated or synthesized content and infor-
21 mation authenticity, which may include—

22 (1) fundamental research on digital forensic
23 tools or other technologies for verifying the authen-
24 ticity of information and detection of manipulated or

1 synthesized content, including content generated by
2 generative adversarial networks;

3 ~~(2) fundamental research on technical tools for~~
4 identifying manipulated or synthesized content, such
5 as watermarking systems for generated media;

6 ~~(3) social and behavioral research related to~~
7 manipulated or synthesized content, including the
8 ethics of the technology and human engagement
9 with the content;

10 ~~(4) research on public understanding and~~
11 awareness of manipulated and synthesized content,
12 including research on best practices for educating
13 the public to discern authenticity of digital content;
14 and

15 ~~(5) research awards coordinated with other~~
16 Federal agencies and programs, including the Net-
17 working and Information Technology Research and
18 Development Program, the Defense Advanced Re-
19 search Projects Agency, and the Intelligence Ad-
20 vanced Research Projects Agency.

21 **SEC. 4. NIST SUPPORT FOR RESEARCH AND STANDARDS ON**

22 **GENERATIVE ADVERSARIAL NETWORKS.**

23 (a) IN GENERAL.—The Director of the National In-
24 stitute of Standards and Technology shall support re-
25 search for the development of measurements and stand-

1 ards necessary to accelerate the development of the tech-
2 nological tools to examine the function and outputs of gen-
3 erative adversarial networks or other technologies that
4 synthesize or manipulate content.

5 (b) OUTREACH.—The Director of the National Insti-
6 tute of Standards and Technology shall conduct out-
7 reach—

8 (1) to receive input from private, public, and
9 academic stakeholders on fundamental measure-
10 ments and standards research necessary to examine
11 the function and outputs of generative adversarial
12 networks; and

13 (2) to consider the feasibility of an ongoing
14 public and private sector engagement to develop vol-
15 untary standards for the function and outputs of
16 generative adversarial networks or other technologies
17 that synthesize or manipulate content.

18 **SEC. 5. REPORT ON FEASIBILITY OF PUBLIC-PRIVATE**
19 **PARTNERSHIP TO DETECT MANIPULATED OR**
20 **SYNTHESIZED CONTENT.**

21 Not later than 1 year after the date of enactment
22 of this Act, the Director of the National Science Founda-
23 tion and the Director of the National Institute of Stand-
24 ards and Technology shall jointly submit to the Committee
25 on Science, Space, and Technology of the House of Rep-

1 representatives, the Subcommittee on Commerce, Justice,
 2 Science, and Related Agencies of the Committee on Appro-
 3 priations of the House of Representatives, the Committee
 4 on Commerce, Science, and Transportation of the Senate,
 5 and the Subcommittee on Commerce, Justice, Science,
 6 and Related Agencies of the Committee on Appropriations
 7 of the Senate a report containing—

8 (1) the Directors' findings with respect to the
 9 feasibility for research opportunities with the private
 10 sector, including digital media companies to detect
 11 the function and outputs of generative adversarial
 12 networks or other technologies that synthesize or
 13 manipulate content; and

14 (2) any policy recommendations of the Direc-
 15 tors that could facilitate and improve communication
 16 and coordination between the private sector, the Na-
 17 tional Science Foundation, and relevant Federal
 18 agencies through the implementation of innovative
 19 approaches to detect digital content produced by
 20 generative adversarial networks or other technologies
 21 that synthesize or manipulate content.

22 **SEC. 6. GENERATIVE ADVERSARIAL NETWORK DEFINED.**

23 In this Act, the term “generative adversarial net-
 24 work” means, with respect to artificial intelligence, the
 25 machine learning process of attempting to cause a gener-

1 ator artificial neural network (referred to in this para-
2 graph as the “generator”) and a discriminator artificial
3 neural network (referred to in this paragraph as a “dis-
4 criminator”) to compete against each other to become
5 more accurate in their function and outputs, through
6 which the generator and discriminator create a feedback
7 loop, causing the generator to produce increasingly higher-
8 quality artificial outputs and the discriminator to increas-
9 ingly improve in detecting such artificial outputs.

10 **SECTION 1. SHORT TITLE.**

11 *This Act may be cited as the “Identifying Outputs of*
12 *Generative Adversarial Networks Act” or the “IOGAN Act”.*

13 **SEC. 2. FINDINGS.**

14 *Congress finds the following:*

15 *(1) Gaps currently exist on the underlying re-*
16 *search needed to develop tools that detect videos, audio*
17 *files, or photos that have manipulated or synthesized*
18 *content, including those generated by generative ad-*
19 *versarial networks. Research on digital forensics is*
20 *also needed to identify, preserve, recover, and analyze*
21 *the provenance of digital artifacts.*

22 *(2) The National Science Foundation’s focus to*
23 *support research in artificial intelligence through*
24 *computer and information science and engineering,*
25 *cognitive science and psychology, economics and game*

1 *theory, control theory, linguistics, mathematics, and*
2 *philosophy, is building a better understanding of how*
3 *new technologies are shaping the society and economy*
4 *of the United States.*

5 *(3) The National Science Foundation has identi-*
6 *fied the “10 Big Ideas for NSF Future Investment”*
7 *including “Harnessing the Data Revolution” and the*
8 *“Future of Work at the Human-Technology Frontier”,*
9 *with artificial intelligence is a critical component.*

10 *(4) The outputs generated by generative adver-*
11 *sarial networks should be included under the umbrella*
12 *of research described in paragraph (3) given the grave*
13 *national security and societal impact potential of*
14 *such networks.*

15 *(5) Generative adversarial networks are not like-*
16 *ly to be utilized as the sole technique of artificial in-*
17 *telligence or machine learning capable of creating*
18 *credible deepfakes. Other techniques may be developed*
19 *in the future to produce similar outputs.*

20 **SEC. 3. NSF SUPPORT OF RESEARCH ON MANIPULATED OR**
21 **SYNTHESIZED CONTENT AND INFORMATION**
22 **SECURITY.**

23 *The Director of the National Science Foundation, in*
24 *consultation with other relevant Federal agencies, shall sup-*
25 *port merit-reviewed and competitively awarded research on*

1 *manipulated or synthesized content and information au-*
2 *thenticity, which may include—*

3 (1) *fundamental research on digital forensic tools*
4 *or other technologies for verifying the authenticity of*
5 *information and detection of manipulated or syn-*
6 *thesized content, including content generated by gen-*
7 *erative adversarial networks;*

8 (2) *fundamental research on technical tools for*
9 *identifying manipulated or synthesized content, such*
10 *as watermarking systems for generated media;*

11 (3) *social and behavioral research related to ma-*
12 *nipulated or synthesized content, including human*
13 *engagement with the content;*

14 (4) *research on public understanding and aware-*
15 *ness of manipulated and synthesized content, includ-*
16 *ing research on best practices for educating the public*
17 *to discern authenticity of digital content; and*

18 (5) *research awards coordinated with other fed-*
19 *eral agencies and programs, including the Defense*
20 *Advanced Research Projects Agency and the Intel-*
21 *ligence Advanced Research Projects Agency, with co-*
22 *ordination enabled by the Networking and Informa-*
23 *tion Technology Research and Development Program.*

1 **SEC. 4. NIST SUPPORT FOR RESEARCH AND STANDARDS ON**
2 **GENERATIVE ADVERSARIAL NETWORKS.**

3 (a) *IN GENERAL.*—*The Director of the National Insti-*
4 *tute of Standards and Technology shall support research for*
5 *the development of measurements and standards necessary*
6 *to accelerate the development of the technological tools to*
7 *examine the function and outputs of generative adversarial*
8 *networks or other technologies that synthesize or manipulate*
9 *content.*

10 (b) *OUTREACH.*—*The Director of the National Insti-*
11 *tute of Standards and Technology shall conduct outreach—*

12 (1) *to receive input from private, public, and*
13 *academic stakeholders on fundamental measurements*
14 *and standards research necessary to examine the*
15 *function and outputs of generative adversarial net-*
16 *works; and*

17 (2) *to consider the feasibility of an ongoing pub-*
18 *lic and private sector engagement to develop vol-*
19 *untary standards for the function and outputs of gen-*
20 *erative adversarial networks or other technologies that*
21 *synthesize or manipulate content.*

22 **SEC. 5. REPORT ON FEASIBILITY OF PUBLIC-PRIVATE PART-**
23 **nership TO DETECT MANIPULATED OR SYN-**
24 **thesized CONTENT.**

25 *Not later than 1 year after the date of enactment of*
26 *this Act, the Director of the National Science Foundation*

1 *and the Director of the National Institute of Standards and*
2 *Technology shall jointly submit to the Committee on*
3 *Science, Space, and Technology of the House of Representa-*
4 *tives, the Subcommittee on Commerce, Justice, Science, and*
5 *Related Agencies of the Committee on Appropriations of the*
6 *House of Representatives, the Committee on Commerce,*
7 *Science, and Transportation of the Senate, and the Sub-*
8 *committee on Commerce, Justice, Science, and Related*
9 *Agencies of the Committee on Appropriations of the Senate*
10 *a report containing—*

11 (1) *the Directors' findings with respect to the*
12 *feasibility for research opportunities with the private*
13 *sector, including digital media companies to detect*
14 *the function and outputs of generative adversarial*
15 *networks or other technologies that synthesize or ma-*
16 *nipulate content; and*

17 (2) *any policy recommendations of the Directors*
18 *that could facilitate and improve communication and*
19 *coordination between the private sector, the National*
20 *Science Foundation, and relevant Federal agencies*
21 *through the implementation of innovative approaches*
22 *to detect digital content produced by generative adver-*
23 *sarial networks or other technologies that synthesize*
24 *or manipulate content.*

1 **SEC. 6. GENERATIVE ADVERSARIAL NETWORK DEFINED.**

2 *In this Act, the term “generative adversarial network”*
3 *means, with respect to artificial intelligence, the machine*
4 *learning process of attempting to cause a generator artifi-*
5 *cial neural network (referred to in this paragraph as the*
6 *“generator” and a discriminator artificial neural network*
7 *(referred to in this paragraph as a “discriminator”) to*
8 *compete against each other to become more accurate in their*
9 *function and outputs, through which the generator and dis-*
10 *criminator create a feedback loop, causing the generator to*
11 *produce increasingly higher-quality artificial outputs and*
12 *the discriminator to increasingly improve in detecting such*
13 *artificial outputs.*

Calendar No. 580

116TH CONGRESS
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