CARD PROJECT: LONG-READ SEQUENCING TO DETECT GENOMIC AND EPIGENETIC FEATURES OF ADRD

STATEMENT OF WORK (SERVICES)
(SOW)

GENERAL INFORMATION

Title of Project:

Long-read sequencing to detect genomic and epigenetic features of Alzheimer's Disease and Related Dementias

Statement of Need and Purpose:

The National Institutes of Health Center for Alzheimer's and Related Dementias (NIH/CARD) will generate long-read sequencing data from roughly 4000 patients with Alzheimer's disease (AD), frontotemporal dementia (FTD), Lewy body dementia (LBD), and healthy subjects. This project will produce roughly 8000 terabytes of data, so the government will need a Contractor to develop pipelines for storing, analyzing, and harmonizing these large data sets on cloud-based computing platforms. The Contractor will then use these datasets to identify DNA methylation changes and single nucleotide variants, both of which have been linked to normal aging and neurodegenerative diseases. The government will then use this service provided by the Contractor to evaluate how the epigenetic and genomic landscape in challenging regions contribute to the development of neurodegenerative diseases.

Background Information and Objective:

The last decade has demonstrated the power of genomics to unravel the genetic etiology of complex neurological diseases. These efforts have primarily used short-read sequencing technologies, which are not optimized to identify large structural changes in the human genome that may substantially contribute to risk for neurodegenerative diseases. In particular, long-read sequencing can detect the methylation status of sequenced DNA and identify single nucleotide variations in genomic regions that are challenging to sequence with short-read sequencing. Gaining a full understanding of the genetic architecture of the dementia genome with long-read sequencing will drive forward gene discovery, leading to greater insight into disease and pathway mechanisms and new potential therapeutic targets.

Period of Performance:

The period of performance will consist of a 12 month base period, followed by a six (6) month optional period of performance to be exercised at the discretion of the Government.

SCOPE OF WORK

General Requirements:

Independently and not as an agent of the Government, the Contractor shall furnish all the necessary services, qualified personnel, material, equipment, and facilities, not otherwise provided by the Government as needed to analyze the results of long-read sequencing to detect genomic and epigenetic features of Alzheimer's Disease and Related Dementias, as described in this Statement of Work.

Specific Requirements:

The Contractor will develop and use algorithms to analyze single nucleotide variants and methylation profiles in long-read sequencing data, as well as pipelines to harmonize and store long-read sequencing data shared between NIH and the Contractor on cloud-based computing platforms. The Contractor will upload all finalized algorithms for processing single nucleotide variants and methylation profiles to a GitHub repository maintained by CARD. The Contractor will then perform analyses for single nucleotide variant detection and methylation calling and upload these files to a shared cloud-based platform. The Contractor will also conduct laboratory work to generate long read sequencing data using Oxford Nanopore Technology. This work includes establishing and optimizing protocols for DNA isolation from blood and brain tissue, creating libraries for DNA sequencing, and operating the PromethION sequencer. The Contractor will work with and advise CARD on the finalized documents on cloud storage and GitHub. NIH/CARD shall have unlimited rights to use the algorithms developed by the Contractor in the completion of the Statement of Work, including algorithms uploaded to GitHub.

LEVEL OF EFFORT:

Senior Researcher, 100% effort.

GOVERNMENT RESPONSIBILITIES

CARD will sequence all samples and upload the raw data to a cloud-based platform. The Contractor will process and analyze the data to detect single nucleotide variants and methylation profiling. The Contractor will have access to CARD data stored on the cloud-based platform and GitHub but will not have access to NIH property or facilities. CARD will be responsible for maintaining the cloud-based platform and a GitHub repository to store algorithms and pipelines.

DELIVERY OR DELIVERABLES

Deliverables will be long-read sequencing data from patients and controls, pipelines to process and store long-read sequencing data, algorithms for detection of single nucleotide variants and methylation profiles using Pepper, Deep Variant, Whatshap, and other open-source methods,

and results of analyses. All Deliverables and related information provided to the Contractor shall be De-identified Information as defined by HIPAA (45 CFR § 164.514). The Contractor will upload the results of analyses (fastq and vcf files), for single nucleotide variant detection and methylation calling, to a shared cloud-based platform maintained by CARD. The Contractor will also upload all algorithms and pipelines to an public open-access GitHub repository that CARD will create and maintain.

REPORTING REQUIREMENTS

Progress towards completion of the deliverables will be made quarterly in a written summary update to NIA. The written summary should include a summary of progress that can include the number of samples analyzed by the Contractor, the pipelines and algorithms the Contractor has developed to process the data, and the location of all analyzed and stored data.

OTHER CONSIDERATIONS

Travel:

No contractor travel is required for this project.

Key Personnel:

A Senior Researcher with expertise in data science, analysis and storage of large data sets.

Information System Security Plan:

The Contractor must ensure that any computer system used in the course of this contract shall include the following features:

1. Any computer used in relation to this contract must be patched with most updated IT Security Patches.
2. Any Contractor computer used in relation this contract must have virus protection loaded and running with definition files that are updated on at least a daily basis.
3. Hard drives and portable media used for this contract must be encrypted using the FIPS 140-2 standard.
4. Any computers used in reference to this contract must be assessed for vulnerabilities.
5. Any computers used in reference to this contract must be backed up on an external hard drive which is password protected.
6. Any computers used in reference to this contract must have auditing enabled such that if an incident occurred then that event could be reconstructed.
7. Any computers that are used in reference to this contract must employ at a minimum user name and password authentication or if possible two factor authentications.
8. Any computer used in relation to this contract must be password protected. All Password must meet the NIH standard such that users must choose passwords that have at least eight characters and at least three of the following types of characters:

a. capital letters
b. lower case letters
c. numeric characters
d. special characters (!@#$%^&*()_+|~-=\`{}[]:";'<>?,./)

Data Rights:

To be determined at time of award.

Section 508—Electronic and Information Technology Standards:

Section 508 of the Rehabilitation Act of 1973 requires that Federal agencies' electronic and information technology (EIT) is accessible to people with disabilities. The Federal Acquisition Regulations (FAR) Final Rule for Section 508 (EIT Accessibility) can be found at www.section508.gov and at the Access Board's Web site at https://www.access-board.gov/508.htm. Unless it is an "undue burden" or compliant products or services do not exist, the products must conform to Section 508. The contractor must state that they will comply with the requirements of Section 508 or cite a justifiable reason for an exception.

Publications and Publicity:

The Contractor retains the right to publish articles of data produced as a result of the requirements of the Statement of Work.

Confidentiality of Information:

Confidential Information means information or data of a personal nature about an individual, or proprietary information or data submitted by or pertaining to an institution or organization. Confidential Information or records shall not be disclosed by the Contractor without written authorization from the Contracting Officer. Whenever the Contractor is uncertain with regard to the confidentiality of or a property interest in information under this contract, the Contractor should consult with the Contracting Officer prior to any release, disclosure, dissemination, or publication.